

ST CATHERINE'S SCHOOL CAMPUS MASTERPLAN & STAGE 1 CONSTRUCTION & OPERATIONAL NOISE REPORT

**REPORT NO. 14066
VERSION B**

SEPTEMBER 2014

PREPARED FOR

ST CATHERINE'S SCHOOL
C/ SANDRICK PROJECT DIRECTIONS
SUITE 412 NEXUS NORWEST
COLUMBIA COURT
NORWEST BUSINESS PARK
BAULKHAM HILLS NSW 2153

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	4 July 2014	Brian Clarke	NG
B	Final	11 September 2014	Barry Murray	-

Note

All materials specified by Wilkinson Murray Pty Limited have been selected solely on the basis of acoustic performance. Any other properties of these materials, such as fire rating, chemical properties etc. should be checked with the suppliers or other specialised bodies for fitness for a given purpose. The information contained in this document produced by Wilkinson Murray is solely for the use of the client identified on the front page of this report. Our client becomes the owner of this document upon full payment of our **Tax Invoice** for its provision. This document must not be used for any purposes other than those of the document's owner. Wilkinson Murray undertakes no duty to or accepts any responsibility to any third party who may rely upon this document.

Quality Assurance

We are committed to and have implemented AS/NZS ISO 9001:2008 "Quality Management Systems – Requirements". This management system has been externally certified and Licence No. QEC 13457 has been issued.



AAAC

This firm is a member firm of the Association of Australian Acoustical Consultants and the work here reported has been carried out in accordance with the terms of that membership.



TABLE OF CONTENTS

	Page
GLOSSARY OF ACOUSTIC TERMS	
1 INTRODUCTION	1
2 OVERVIEW OF PROPOSED WORKS	2
3 AMBIENT NOISE MONITORING	3
3.1 Ambient Noise Levels at Site	3
4 CONSTRUCTION NOISE ASSESSMENT	5
4.1 Construction Noise Criteria	5
4.1.1 Construction Noise Management Levels	5
4.2 Vibration Criteria	7
4.2.1 Building Damage	8
4.3 Construction Equipment & Noise Source Levels	10
4.4 Construction Noise Predictions	10
4.5 Discussion of Results	12
4.6 Construction Noise & Vibration Mitigation Measures	13
4.7 Community Liaison & General Approaches to Mitigation	14
4.8 Construction Vibration Assessment	14
4.9 Noise & Vibration Management Plan	15
5 OPERATIONAL NOISE & VIBRATION	16
5.1 Operational Noise Criteria	16
5.1.1 Intrusiveness Noise Criterion	16
5.1.2 Amenity Noise Criterion	16
5.1.3 Determination of Site Specific Noise Criteria	17
5.2 Operational Mechanical Noise Assessment	18
5.3 Auditorium , Multi Purpose and Aquatic Centre Noise Emissions	18
5.3.1 Evening Musicals in the Performing Arts Auditorium	19
5.4 Evening Functions in the Multi Purpose Hall	19
5.5 Aquatic Centre Operation	20
6 ROAD TRAFFIC NOISE ASSESSMENT	22
6.1 Traffic Noise Criteria	22
6.2 Traffic Noise Assessment	22

7	SUMMARY OF RECOMMENDATIONS	25
7.1	Construction Noise Management Levels	25
7.2	Construction Noise	25
7.3	Operational Noise	26
8	CONCLUSION	27

APPENDIX A NOISE MEASUREMENTS

APPENDIX B ST CATHERINE'S SCHOOL - INDICATIVE USAGE PROFILE

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.

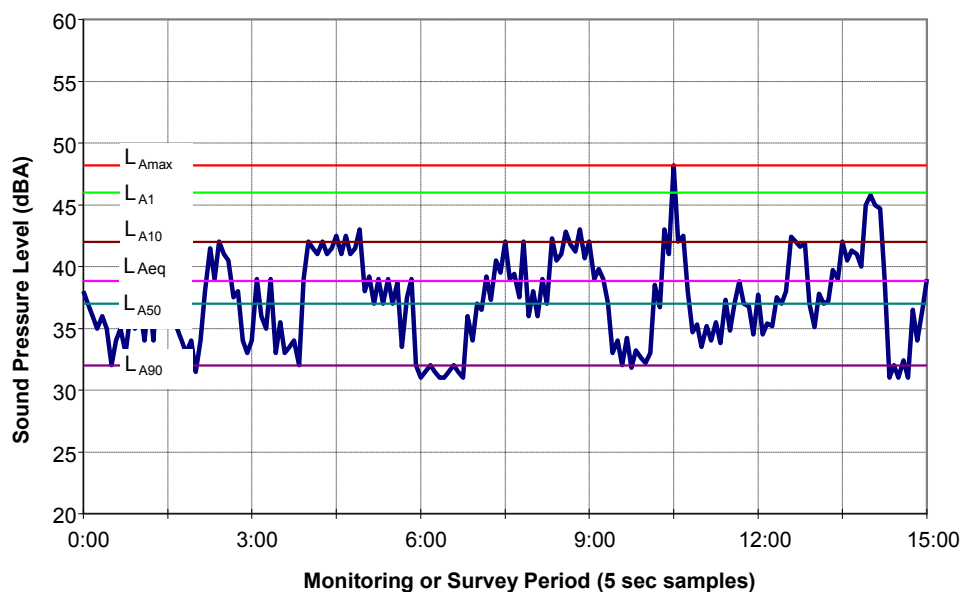
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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 10th percentile (lowest 10th 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 SSD 6339 seeking approval for construction and operation of St Catherine's School Campus Masterplan and Stage 1 (RPAC) development.

The assessment details established site specific noise and vibration criteria to be applied to the entire Masterplan. In addition, an assessment of the Stage 1 proposal has been conducted in accordance with the Director General Requirements (DGR's) being:

"Noise

Identify and provide a quantified assessment of the main noise generating source and activities of all stages of construction, and any noise sources during operation. Outline measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land.

Relevant Policies and Guidelines

NSW Industrial Noise Policy (EPA)

Interim Construction Noise Guideline (DECC)"

The above requirements cover the issues identified by Waverley Council in correspondence supplied to the school.

Wilkinson Murray Pty Limited has reviewed and assessed the drawings and relevant documentation prepared in respect of the State Significant Development (SSD) submission.

2 OVERVIEW OF PROPOSED WORKS

The St Catherine's SSD application seeks approval for the School's Campus Masterplan and in particular the construction works and operation within 'Stage 1' RPAC.

- The proposed Campus Master Plan comprises a number of new buildings, internal refurbishments and the reallocation of some internal spaces across the site. The primary new buildings (and associated demolition works) include:
- Demolition of the existing outdoor swimming pool and construction of a new multi-level building (RPAC). The core facilities proposed within the RPAC include a new Research Centre, Performing Arts Auditorium, Aquatic Centre and Multi-Purpose Hall, with pedestrian links to the existing Dame Joan Sutherland Centre (DJSC) and Jo Karaolis Sports Centre (JKSC).
- Demolition of the existing Jane Barker Hall (JBH) and construction of a new building.
- Demolition of the existing print room, reception and link building between Lenthall and the Administration Building (Level 6) and construction of new boarder's common room.

The Masterplan Site area is located within school grounds as shown in Figure 2-1.

Figure 2-1 St Catherine's Concept Site Plan



The site is surrounded by multi level residences which surround the site.

3 AMBIENT NOISE MONITORING

3.1 Ambient Noise Levels at Site

Residential receivers surrounding the site that may be affected by construction and operational noise have been identified in three areas and are detailed in Table 3-3-1 and are shown in Figure 3-1.

Figure 3-1 Aerial showing Noise Monitoring Locations



Table 3-3-1 Surrounding Receivers

Receivers	Comments
A – Albion Street	Multi storey residential building
B – Macpherson Street	Multi storey residential buildings to the east of the school and on the southern side of the street
C – Leichhardt Lane	Mix of single and multi storey residential building to the east of the school

In order to quantify the existing noise environment, long-term ambient noise levels were monitored at three (3) locations surrounding the site, selected to cover the range of environments in the potentially affected areas.

The locations are presented in Table 3-2. The noise logger locations are shown in Figure 3-1.

Table 3-3-2 Long-Term Noise Monitoring Locations

Logger	Location	Monitoring Period
1	School Carpark at boundary opposite 47 Albion Street	10 – 17 April 2014
2	Macpherson Street in front of the pool adjacent to 4 Macpherson Street	10 – 17 April 2014
3	Leichhardt Lane on the school boundary	10 – 17 April 2014

The noise monitoring equipment used for the Wilkinson Murray noise measurements consisted of ARL Type EL-215 environmental noise loggers set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines 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.

Table 3-3 summarises the noise results, for daytime, evening and night time periods as defined in the EPA's *Interim Construction Noise Guidelines (ICNG)* and the NSW *Industrial Noise Policy (INP)*. Additionally, noise monitoring results for Saturday (7.00am-5.00pm) has been included as construction is proposed outside standard hours.

Table 3-3-3 Summary of Measured Noise Levels

Noise Logging Site	RBL (dBA)				$L_{Aeq,period}$ (dBA)			
	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am	Saturday 7am-6pm	Daytime 7am- 6pm	Evening 6-10pm	Night Time 10pm-7am	Saturday 7am-6pm
1	51	42	34	51	63	61	56	63
2	52	44	35	47	65	63	57	63
3	48	47	46	47	67	52	48	51

Since it is proposed that some activities at the school would commence at 6.00am, it is also necessary to know the RBL during the 6.00am and 7.00am shoulder period. This information is shown in Table 3-4.

Table 3-4 RBL during Morning Shoulder Period

Noise Logging Site	RBL (dBA) 6.00am – 7.00am
1	43
2	40
3	47

Background noise levels at all locations were free of the influence of extraneous noise sources, such as plant or construction activities. Noise data measured during inclement weather was excluded in accordance with EPA procedures.

4 CONSTRUCTION NOISE ASSESSMENT

4.1 Construction Noise Criteria

The following sections detail the applicable site-specific noise and vibration criteria based on the guidelines from EPA, being:

- *Interim Construction Noise Guideline; and*
- *Road Noise Policy (RNP).*

4.1.1 Construction Noise Management Levels

The EPA released the "*Interim Construction Noise Guideline*" (CNG) in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the $L_{Aeq, 15min}$ noise management level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside the standard hours, where construction is justified, the noise management level would be background + 5dBA. Table 4-1 details the ICNG noise management levels.

Table 4-1 Construction Noise Management Levels at Residences using Quantitative Assessment

Time of Day	Management Level $L_{Aeq,(15min)}$	How to Apply
Recommended Standard Hours:		The noise affected level represents the point above which there may be some community reaction to noise.
Monday to Friday		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.
7am to 6pm	Noise affected	
Saturday	RBL + 10dBA	
8am to 1pm		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.
No work on Sundays or		
Public Holidays		
	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. For guidance on negotiating agreements see section 7.2.2.

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

- Classrooms at schools and other educational institutions: internal $L_{Aeq,15 min}$ 45dBA

Based on the above, Table 4-2 presents the applicable noise management levels for construction activities at surrounding receivers that have been adopted for all applications.

Table 4-2 Site-Specific Construction Noise Management Levels

Location	Construction Noise Management Level, L _{Aeq} – dBA				Highly noise affected Noise Level, L _{Aeq} – dBA
	Day	Evening	Night	Saturday	
1 – Albion St Residences	61	47	39	56	75
2 – Macpherson St Residences	62	49	40	52	75
3 – Leichhardt Lane Residences	58	52	51	52	75
Parks / Outdoor Play Areas			65		N/A

4.3 Vibration Criteria

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set “preferred” and “maximum” vibration levels in the document *Assessing Vibration: A Technical Guideline* (2006) produced by the NSW DECCW.

Acceptable values of human exposure to continuous vibration, such as that associated with drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 4-3.

Table 4-3 Criteria for Exposure to Continuous Vibration

Place	Time	Peak Particle Velocity (mm/s)	
		Preferred	Maximum
Critical working areas (e.g. hospital operating theatres precision laboratories)	Day or night time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or night time	0.56	1.1
Workshops	Day or night time	1.1	2.2

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

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

Location	Daytime		Night Time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Calculation of VDV requires knowledge of the number of events, and their duration in the relevant time period.

4.3.1 Building Damage

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187: Part 2-2006 *"Explosives – Storage and Use – Part 2: Use of Explosives"* recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 *"Evaluation and measurement for vibration in buildings Part 2"*, as they "are applicable to Australian conditions".

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

The recommended limits (guide values) from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 4-5.

Table 4-5 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

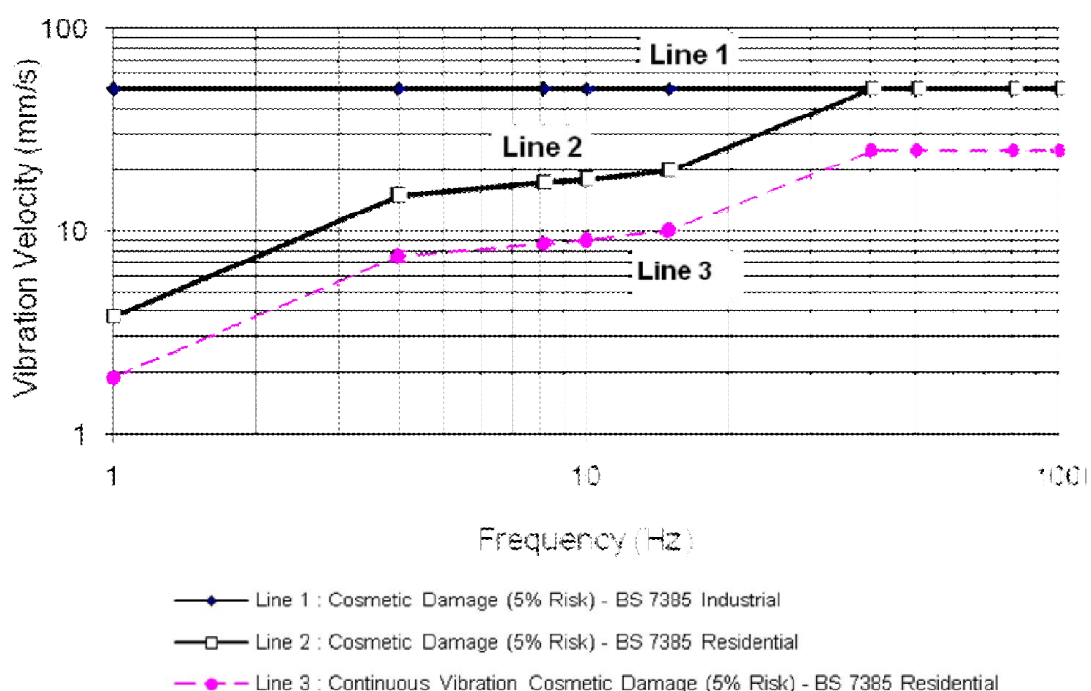
Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures	50mm/s at 4 Hz and above	N/A
Industrial and heavy commercial buildings		
Un-reinforced or light framed structures	15mm/s at 4 Hz increasing to	20mm/s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

The Standard states that the guide values in Table 4-5 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings.

Note that rock breaking / hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures (e.g. residences) and it may therefore be appropriate to reduce the transient values by 50%.

The British Standard goes on to state that "*Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity*". In addition, a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.

Figure 4.1 Graph of Transient Vibration Guide Values for Cosmetic Damage



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*". The following Table 4-6 details these recommendations for heritage buildings.

Table 4-6 DIN 4150 recommend PPV vibration level for Heritage Buildings

Guideline Values for Velocity – mm/s		
1-10 Hz	10 to 15 Hz	40 to 50 Hz
3	3 to 8	8-10

4.4 Construction Equipment & Noise Source Levels

Sound Power Levels (SWLs) for typical construction plant are identified in Table 4-7. 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 4-7 Typical Construction Plant Sound Levels – dBA

Plant	Sound Power Level	Sound Pressure Level at 7m
Concrete Truck	109	84
Angle Grinder	109	84
Concrete Pump – 120 mm diameter / 50 bar	112	87
Concrete Saw	116	91
Mobile Crane	98	73
Dump Truck	108	83
Compressor	100	75
Bobcat	103	78
Hand Tools	90	65
Bulldozer	114	89
Excavator	108	83
Crawler Cranes	98	73
Front End Loader	112	87
Excavator	107	82
Hammer Hydraulic	122	97
Bored Pile Rig	112	87

4.5 Construction Noise Predictions

Assessment of likely construction noise at surrounding receivers has been undertaken for the proposed construction works.

Site-related noise emissions were modeled with the "CadnaA" noise prediction program, using the ISO 9613 noise prediction algorithms. Factors that are addressed in the noise modeling are:

- equipment sound level emissions and location;
- screening effects from buildings;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground absorption; and
- atmospheric absorption.

Modelling has been conducted for a number of construction scenarios. The three works scenarios considered are summarised in Table 4-8.

Table 4-8 Construction Scenarios for Construction Works

Scenario	Description	Works
A	Bulk Excavation	<p>Bulk Excavation in rock - excavation using rocksaw, ripping using excavator mounted claws or bulldozers</p> <p>Bulk Excavation other than rock(OTR) - mainly using excavators with dozers used to breakdown large rock elements</p> <p>Truck Movements - loaded into trucks sent offsite</p>
B	Building Construction	<p>This scenario includes concreting and lifting.</p> <p>1 concrete pump, 2 forklifts, 1 compressor, 1 crane, a boom truck and lift are assumed to operate in 15minutes. Also concrete trucks and normal delivery trucks assumed to be 2 movements in 15minutes.</p>
C	Façade / Fitout	<p>In the event that the construction of the facade occurs in isolation. Forklift, truck, crane and power tools assumed. 2 truck movements in 15minutes assumed.</p>

Noise modelling has been conducted for each of the above scenarios, with plant located across the construction site as follows.

Line Noise Source – Truck movement is modelled as line noise sources with the number of trucks on the haulage route in a 15-minute period applied to these sources.

Point Noise Sources – Fixed plant and equipment are modelled as point sources.

The modelling assumes a “typical worst-case” scenario whereby all plant, is running continuously. As such, the modelling represents 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.

Once noise sources have been applied to the model, the resultant noise levels at identified surrounding receivers are predicted. These results are then compared with established site-specific noise criteria.

Table 4-9 details results of noise modelling for each scenario.

Table 4-9 Predicted Construction Noise Levels at Residence – $L_{Aeq}(15 \text{ min})$ – dBA

Residential Receiver	Predicted Noise Level	Weekday NML*	Exceedance	Sat NML	Exceedance
<i>Scenario A – Bulk Excavation (with Rock)</i>					
1 – Albion St	38	61	0	56	0
2 –4 Macpherson St - East	78	62	16	52	26
3- 21 Macpherson St - South	71	62	9	52	19
4– Leichhardt Lane	74	58	16	52	22
<i>Scenario B – Building Construction</i>					
1 – Albion St	36	61	0	56	0
2 –4 Macpherson St - East	72	62	10	52	20
3- 21 Macpherson St - South	68	62	6	52	16
4– Leichhardt Lane	68	58	10	52	16
<i>Scenario A – Façade / Fitout</i>					
1 – Albion St	30	61	0	56	0
2 –4 Macpherson St - East	60	62	0	52	8
3- 21 Macpherson St - South	56	62	0	52	4
4– Leichhardt Lane	56	58	0	52	4

A review of results of construction noise indicates that these may be well above construction noise management levels at nearby residences during excavation and construction stages. On Saturdays, the exceedance is likely to be greater for extended construction hours.

4.6 Discussion of Results

Exceedances of up to 16dBA at residences to the east of the site are expected during excavation period when major equipment is located on site. This magnitude of exceedance is consistent with similar sites where residences overlook development sites.

During the structure stage the magnitude of exceedance will reduce due to the nature of construction activities. Fitout works are less noise intensive and this is reflected in general compliance at residences during this stage.

Greater exceedances are predicted on Saturdays due to more stringent noise management levels that are triggered by the proposed extended hours of operation on this day.

Based on these findings the adoption of reasonable and feasible noise management and mitigation will be required. These measures should be determined in detail when a contractor, with defined construction techniques, has been engaged on the project. However, “in-principle” mitigation measures are detailed in the following sections.

4.7 Construction Noise & Vibration Mitigation Measures

Without mitigation, noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures are recommended to ensure that noise is reduced where feasible.

The following project specific mitigation measures are recommended;

- Selection of quietest feasible construction equipment;
- Use of rocksaws and ripping in preference to rockbreakers;
- Localised treatment such as barriers, shrouds and the like around fixed plant such as pumps, generators and concrete pumps;
- Provision of respite periods, particularly on Saturdays; and
- Trial testing of vibration levels is conducted where equipment is identified as having the potential to exceed the human comfort criteria.

In addition, the following measures should be included in a 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.
- Install a 2.4 metre noise barrier between the site and street frontages. This should be a minimum 17mm thick structural plywood or equivalent panel.

The adoptions of the above measures are aimed at working towards achieving the noise management levels established at surrounding receivers.

4.8 Community Liaison & General Approaches to Mitigation

An effective community relations programme should be put in place to keep the community that has been identified as being potentially affected apprised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners/tenants, etc) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms. This programme should include a *Community and Stakeholder Engagement Strategy* developed specifically for the Project.

Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

4.9 Construction Vibration Assessment

Operation of rock breakers and the like generate ground vibration that has the potential to transmit to nearby buildings.

Table 4-10 sets out the typical ground vibration levels at various distances for safe working distances

Table 4-10 Recommended safe working distances for vibration intensive plant

Item	Description	Safe working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300 kg – 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	N/A
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

- Construction Noise Strategy, 2012, Transportation Construction Authority

The highest vibration levels will occur when construction equipment is located on the eastern side of the site near residences on Macpherson Street and Leichhardt Lane.

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 6-7 metres. Therefore the use of medium to large rockbreakers should be carefully managed at distances closer than 20 metres from residences.

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

Structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and predicted vibration levels are within these criteria under most circumstances. The exception, should heavy rockbreakers be used, is for areas near eastern residences on Macpherson Street. Therefore, the uses of alternative excavation measures, such as rocksaws on excavators are recommended. If hammers are required, test vibration monitoring is recommended to ensure that vibration levels at residences are not excessive.

4.10 Noise & Vibration Management Plan

A construction Noise and Vibration Management Plan for the site is recommended. Areas that should be addressed in plan include:

- noise and vibration monitoring;
- response to complaints;
- responsibilities;
- monitoring of noise emissions from plant items;
- reporting and record keeping;
- non compliance and corrective action; and
- Community consultation and complaint handling.

5 OPERATIONAL NOISE & VIBRATION

Operational noise from the proposed Stage 1 facilities will be from activities within the new buildings as well as mechanical plant located predominantly on the western end of level 6 of the development.

It is noted that the building will operate outside normal school hours and as such activities proposed have been reviewed with respect to potential noise impact on residences.

5.1 Operational Noise Criteria

Noise impact from the general operation of the proposed Stage 1 facilities is to be assessed with respect to the site specific noise criteria based on site monitoring and the NSW *Industrial Noise Policy (INP)*. The assessment procedure in terms of the *INP* has two components:

- Controlling intrusive noise impacts in the short-term for residences
- Maintaining noise level amenity for particular land uses for residences and other land uses.

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.

5.1.1 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 3.3 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.

An intrusiveness criterion applies for residential receivers only.

5.1.2 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*.

5.1.3 Determination of Site Specific Noise Criteria

Table 5-1 presents the intrusiveness criteria for each residential receiver. This was calculated by adding 5dB to the RBL of the nearest long term monitoring location, as discussed in Section 5.1.1 above.

Table 5-1 RPAC Intrusive Noise Criteria

Site	Intrusiveness Criterion			
	$L_{Aeq,15min}$ (dBA)			
	Daytime 7-6pm	Evening 6-10pm	Night Time 10pm-7am	Morning Shoulder 6am-7am
1 – Albion St Residences	56	47	39	48
2 – Macpherson St Residences	57	49	40	45
3 – Leichhardt Lane Residences	53	52	51	52

For this assessment, all residential receivers were considered as 'suburban' in line with the *INP*. Given our observations on and around site, noise at all locations is dominated by general traffic or 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 5-2 presents the amenity criteria for each receiver.

Table 5-2 RPAC Amenity Criteria

Site	Type of Receiver	Amenity Criterion		
		$L_{Aeq,period}$ (dBA)		
		Daytime 7-6pm	Evening 6-10pm	Night Time 10pm-7am
1 – Albion St Residences	Residential	55	45	40
2 – Macpherson St Residences	Residential	55	45	40
3 – Leichhardt Lane Residences	Residential	55	45	40
Commercial Receivers	Commercial	65	65	65

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 the source. However, for noise from continuously-operating mechanical plant this difference is small and for mechanical plant the lower of the criteria are applicable.

It is noted that in the day and evening period, when the facility is likely to operate it will be the amenity criteria that are the controlling noise criteria. Therefore these should be adopted as site specific noise criteria for operation of the facility and its associated equipment.

5.2 Operational Mechanical Noise Assessment

Mechanical Services associated with the development will consist of the following equipment:

- Research Centre – Exhaust fans and small Air conditioning Plant
- Auditorium, Aquatic Centre and Multi Purpose Hall – Supply and Exhaust Fans, rooftop chillers and Fan Coil Units.

Detailed specifications of mechanical services equipment that would otherwise allow an acoustic assessment of noise emission from the site are not available at this stage of the project as selection and design is conducted after project approval. In line with the approvals for other development detailed assessment of operational noise emission should form a conditional requirement of the development, to be satisfied prior to the issue of the construction certificate.

An initial review noted that the major noise source associated with the development will be chillers located on the western end of level 6 within the building footprint. Based on preliminary selection of plant noise, levels at the nearest residences on Macpherson Street will be in the order of 46dBA. Therefore, noise mitigation in the order of 1dBA will be required to meet evening amenity criteria at these residences. This can be readily achieved by standard noise control measures such as acoustic screening around plant areas.

Mechanical plant such as rooftop exhausts, air-conditioning and chillers associated with 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 uses in the school area.

5.3 Auditorium, Multi Purpose and Aquatic Centre Noise Emissions

A review of the indicative usage profile, presented in Appendix B, indicates that the activities that will have the potential to produce the greatest noise levels outside normal school hours are:

- Evening Musicals in the Performing Arts Auditorium,
- Evening functions in the Multi Purpose Hall,
- Use of the Aquatic Centre.

These are reviewed in the following sections

5.3.1 Evening Musicals in the Performing Arts Auditorium

Musicals for up to 500 persons operating up to 9:30 pm are proposed several times a year. Such events will generate reasonably high internal noise levels when musical events occur (typically around 95dBA). However, it is noted that an essential component of the acoustic design of the auditorium is to control external noise intrusion so the noise from outside is inaudible, being generally below 20dBA.

As a result, walls and ceilings to the auditorium will consist of masonry and composite constructions that provide a high level of sound isolation. This will also result in containment of noise emitted from the theatre to nearby residences.

At this stage of development the details of these constructions have not been determined. These are likely to consist of masonry walls and ceilings designed to contain noise to meet design objectives as detailed in Tables 5-1 and 5.2.

5.4 Evening Functions in the Multi Purpose Hall

A one off function for up to 600 persons operating up to 10.00pm is proposed each year in the southern Multi Purpose Hall. In this area, large groups will generate significant noise levels which will need to be contained within the Multi Purpose Hall.

Noise levels at residences have been predicted at nearby residence based on typical group noise levels detailed in Table 5-3.

Table 5-3 L_{Aeq} Function Sound Power Levels – dB

Source	Frequency (Hz)									A
	31.5	63	125	250	500	1K	2K	4K	8K	
40 Patrons in Function Area / Restaurant with Background Music	85	94	91	91	92	89	84	76	66	93
40 Patrons in Function Area / Restaurant no music	81	80	80	85	88	87	83	74	64	91

*Octave band levels are unweighted noise levels. These noise levels are to be increased or decreased to account for patron numbers, for example the noise levels in the larger tenancy will be increased by adding 10xlog(number of patrons/40).

Noise levels at nearby residences have been predicted based on the following:

- Noise Levels corrected for 600 person with and without background music
- The southern facade of the auditorium being a fixed facade of 10mm laminated glass
- A masonry or composite eastern auditorium wall.
- Distance of 24 metre and 8 metres from the nearest facade to the southern and eastern residences on Macpherson Street, respectively.

Based on the above constructions and source noise levels detailed above resultant noise levels have been predicted and are detailed in Table 5-4.

Table 5-4 Predicted Function Noise Levels at Macpherson Street Residences - dBA

Receiver	Noise Level		Evening Noise Criterion	Compliance
	With Music	No Music		
Eastern Residences	30	26	45	Yes
Southern Residences	33	29	45	Yes

A review of the results indicates that the use of the Multi Purpose Hall under the proposed operational conditions will comply with the most stringent site specific noise criteria during the proposed hours of operation.

Any cars using the carpark under the proposed RPAC building will use the existing carpark entrance on Macpherson Street

5.5 Aquatic Centre Operation

The new indoor Aquatic Centre will replace the existing outdoor pool area. It is proposed to use these areas between 6.00am-8.00pm on weekdays and 8.00am-6.00pm on weekends. Whilst the proposed hours of use represent an increase in hours of operation, noise will be contained within the pool area by the new building.

The loudest noise events associated with the pool area are likely to be shouts and whistles which typically are:

- Shout 95dBA at 1 metre
- Whistle 105dBA at 1 metre

Noise levels at nearby residences have been predicted based on the following:

- Whistle and shouting occurring in the pool area for a conservative 10% of the time.
- The southern facade of the auditorium being a fixed facade of 10mm laminated glass
- A masonry and opaque glass wall on the eastern pool area wall.
- Distance of 24 metres and 8 metres to the southern and eastern residences respectively.

Based on the above constructions and source noise levels detailed above, resultant noise levels have been predicted and are detailed in Table 5-5.

Table 5-5 Predicted Pool Area Noise Levels at Macpherson Street Residences - dBA

Receiver	Intermittent Noise Level		Evening Noise Criterion	Morning Shoulder Criterion	Compliance
	Shout	Whistle			
Eastern Residences	25	32	45	40	Yes
Southern Residences	19	25	45	40	Yes

A review of the results indicates that the use of the Aquatic Centre under the proposed operational conditions will comply with the most stringent site specific noise criteria during the proposed hours of operation.

ROAD TRAFFIC NOISE ASSESSMENT

The proposed development will result in additional traffic on the local road network.

5.6 Traffic Noise Criteria

Noise Criteria for assessment of road traffic noise are set out in the NSW Government's *NSW Road Noise Policy (RNP)*. Table 6-1 sets out the assessment criteria for residences to be applied to particular types of project, road category and land use.

Table 6-1 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	L _{Aeq} , (15 hour) 60 (external)	L _{Aeq} , (9 hour) 55 (external)
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments		
Local roads	4. Existing residences affected by noise from new local road corridors	L _{Aeq} , (1 hour) 55 (external)	L _{Aeq} , (1 hour) 50 (external)
	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		

In summary, the noise level goals at the residential receivers on all the surrounding roads which are classified as sub-arterial roads, based on the *RNP* are:

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

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'.

5.7 Traffic Noise Assessment

Arup, the traffic consultants, has provided daily traffic flows (day and night) for existing and future construction and operational scenarios as detailed in Table 6-1. The latter is when the Multi-Purpose Hall is used by 600 patrons which has been determined as a "worst case scenario".

Table 6-2 Existing and Projected Daily Traffic Flows

Location	Number of Vehicles in the Period			
	Day (7am-10pm)	Percentage Heavy Vehicles	Night (10pm-7 am)	Percentage Heavy Vehicles
Traffic Existing				
Leichhardt Street (between Macpherson Street and Bronte Road)	13416	2.6%	1126	2.1%
Albion Street (between Macpherson Street and Bronte Road)	9471	7.0%	774	9.4%
Macpherson Street (between Albion Street and Leichhardt Street)	13175	3.6%	1250	5.8%
Construction Traffic				
Leichhardt Street (between Macpherson Street and Bronte Road)	13432	2.8%	1126	2.1%
Albion Street (between Macpherson Street and Bronte Road)	9499	7.2%	774	9.4%
Macpherson Street (between Albion Street and Leichhardt Street)	13211	3.8%	1250	5.8%
Operational Traffic (function for 600)				
Leichhardt Street (between Macpherson Street and Bronte Road)	13606	2.6%	1126	2.1%
Albion Street (between Macpherson Street and Bronte Road)	9804	6.8%	774	9.4%
Macpherson Street (between Albion Street and Leichhardt Street)	13365	3.6%	1250	5.8%

The noise contribution of these movements along surrounding streets has been assessed with respect to the total $L_{Aeq,15hr}$ day and $L_{Aeq,19hr}$ night hour traffic noise level at surrounding residences, using the *Calculation of Road Traffic Noise (CORTN)* traffic noise prediction technique.

Table 6-3 details predicted existing and future traffic noise levels due to projected traffic movements.

Table 6-3 Predicted Traffic Noise Levels at Residences – $L_{Aeq,period}$ – dBA

Location	Existing Traffic		With Construction Traffic		With 600 person event in Multi-Purpose Hall	
	Day	Night	Day	Night	Day	Night
Leichhardt Street	67.6	58.9	67.6	58.9	67.6	58.9
Albion Street	67.2	59.0	67.2	59.0	67.2	59.0
Macpherson Street	67.7	60.3	67.8	60.3	67.8	60.3

A review of the results indicates that existing facade reflected traffic noise levels are currently above recommended RMS traffic noise levels for the day and night periods. It is noted that the maximum increase associated with proposed operations will result in a minor increase in the order of 0.1dBA. This increase is well below the increase of 2dB which is described as the acceptable level of increase by the RMS.

Therefore, based on the above predictions and the road classification the operation of the facility will not result in unacceptable traffic noise impacts at surrounding residences when assessed over the whole day and night time periods.

6 SUMMARY OF RECOMMENDATIONS

Based on our investigations of the project, the following findings have been determined.

6.1 Construction Noise Management Levels

Noise objectives for construction have been established based on EPA guidelines. The noise management levels should be adopted as objectives to work toward in minimising any noise impact at surrounding residences.

Table 6-1 presents applicable noise management levels at residential receivers in the vicinity of the site.

Table 6-1 Site Specific Construction Noise Management Levels – dBA

Location	Construction Noise Management Level, L _{Aeq} – dBA				Highly noise affected Noise Level, L _{Aeq} – dBA
	Day	Evening	Night	Saturday	
1 – Albion St Residences	61	47	39	56	75
2 – Macpherson St Residences	62	49	40	52	75
3 – Leichhardt Lane Residences	58	52	51	52	75
All Commercial Properties			70		N/A
Parks / Outdoor Play Areas			65		N/A

6.2 Construction Noise

It has been determined that noise from construction activities during the day period will potentially exceed established construction noise management levels. Therefore, the planning and management of construction activities must take into account the sensitivities of surrounding residents so as to minimise the impact of construction activities at these receivers.

The control of construction noise and vibration should be addressed in a Noise and Vibration Management for Stage 1.

The following project specific mitigation measures are recommended;

- Selection of quietest feasible construction equipment
- Use of rocksaws and ripping in preference to rockbreakers
- Localised treatment such as barriers, shrouds and the like around fixed plant such as pumps, generators and concrete pumps
- Provision of respite periods, particularly on Saturdays
- Trial testing of vibration levels is conducted where equipment identified as having the potential to exceed the human comfort criteria

In the case of potential vibration the following measures are recommended:

- Use rock saws in lieu of rockbreaker or alternatively use smaller rockbreakers in the eastern side of the site.
- Conduct trail vibration testing prior to use of rockbreakers when near the eastern site boundary.

6.3 Operational Noise

Site specific noise criteria for the development have been established based on the lower of intrusive and amenity noise criteria. These are presented in Table 7-2.

Table 7-6-2 RPAC Amenity Noise Criteria.

Site	Type of Receiver	Noise Criterion			
		L _{Aeq} (dBA)			
		Daytime 7-6pm	Evening 6-10pm	Night Time 10pm-7am	Shoulder 6am-7am
1 – Albion St Residences	Residential	55	45	40	40
2 – Macpherson St Residences	Residential	55	45	40	40
3 – Leichhardt Lane Residences	Residential	55	45	40	40
Commercial Receivers	Commercial	65	65	65	65

Mechanical plant such as rooftop exhausts, air-conditioning and chillers associated with the development should be assessed at the time of detailed design and selection, having regard to nearby residential properties surrounding the development, and to future uses in the school area.

7 CONCLUSION

A construction and operational noise assessment of the St Catherine School Campus Masterplan and Stage 1 RPAC development at Waverley has been conducted. Site-specific noise criteria that are applicable to this entire project have been presented. These have been determined for surrounding receivers to be applied on all State Significant Development applications. A noise assessment has been conducted for the proposed construction activities associated with Stage 1 to determine the potential for noise and vibration impact at surrounding receivers. Exceedances of noise management levels are expected at many surrounding receivers.

Vibration associated with on-site construction activities has the potential to impact on residences to the east of the site should large equipment, such as rock breakers be used. Trial monitoring and selection of less vibration intensive equipment is recommended.

Accordingly, management of noise from construction activities will be required to be included in the Site Construction Environmental Management Plan.

Site specific operational noise criteria for mechanical services have been determined for the project based on ambient noise monitoring. A preliminary review of major plant indicate that noise levels will comply with established noise criteria during proposed operation with minor acoustic treatment. A review of all plant with respect to site specific noise criteria is required at detailed design stage. At this stage any necessary noise mitigation should be determined and included in the detailed design of mechanical design .

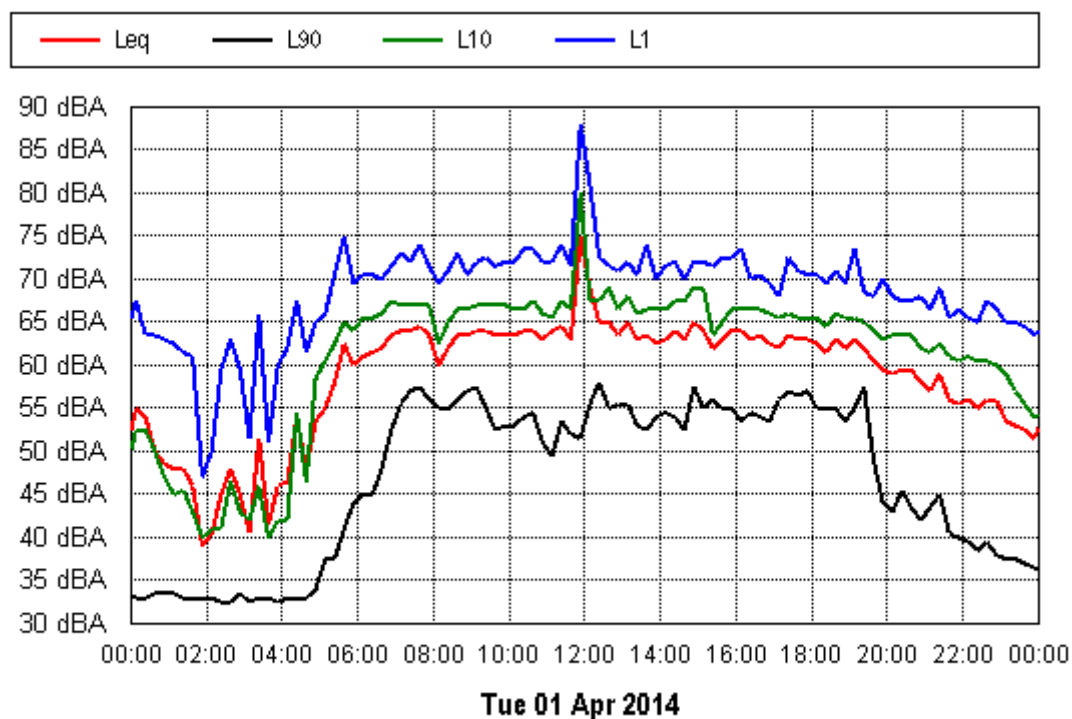
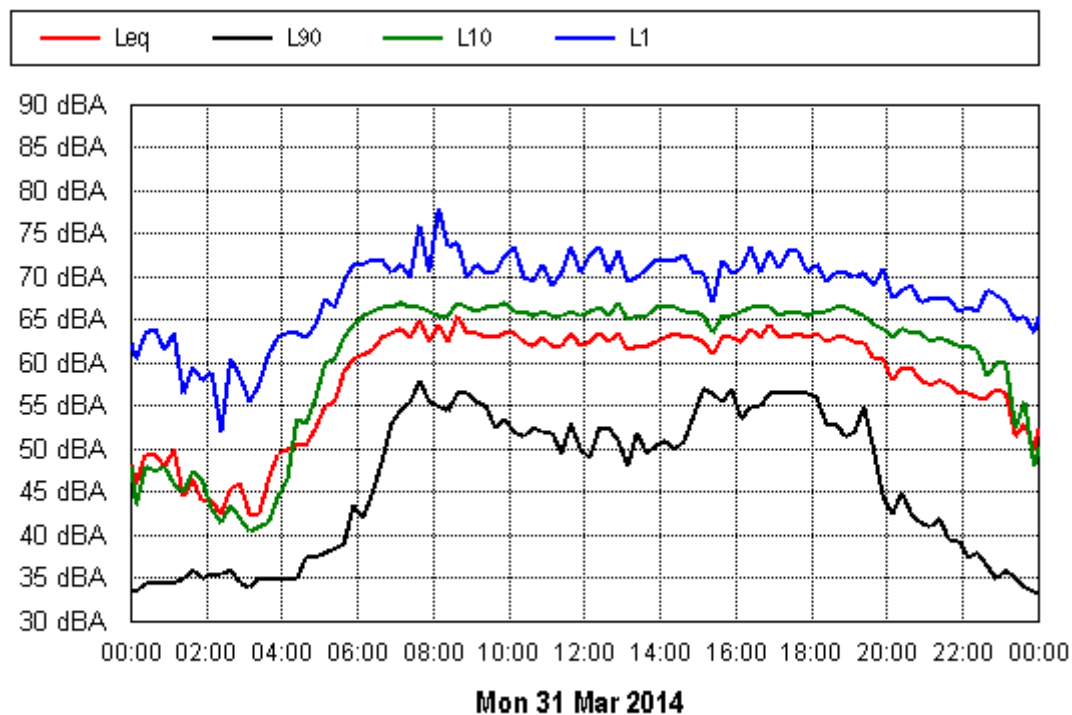
By satisfying the relevant criteria at the subject site, compliance will readily be achieved at surrounding noise sensitive receptors. Noise emission from the site will be addressed during the detailed design phase.

A review of potential noise from activities inside the new buildings such as concerts, swimming use has determined that patron noise is likely to be well below site specific noise objectives for all proposed hours of operation.

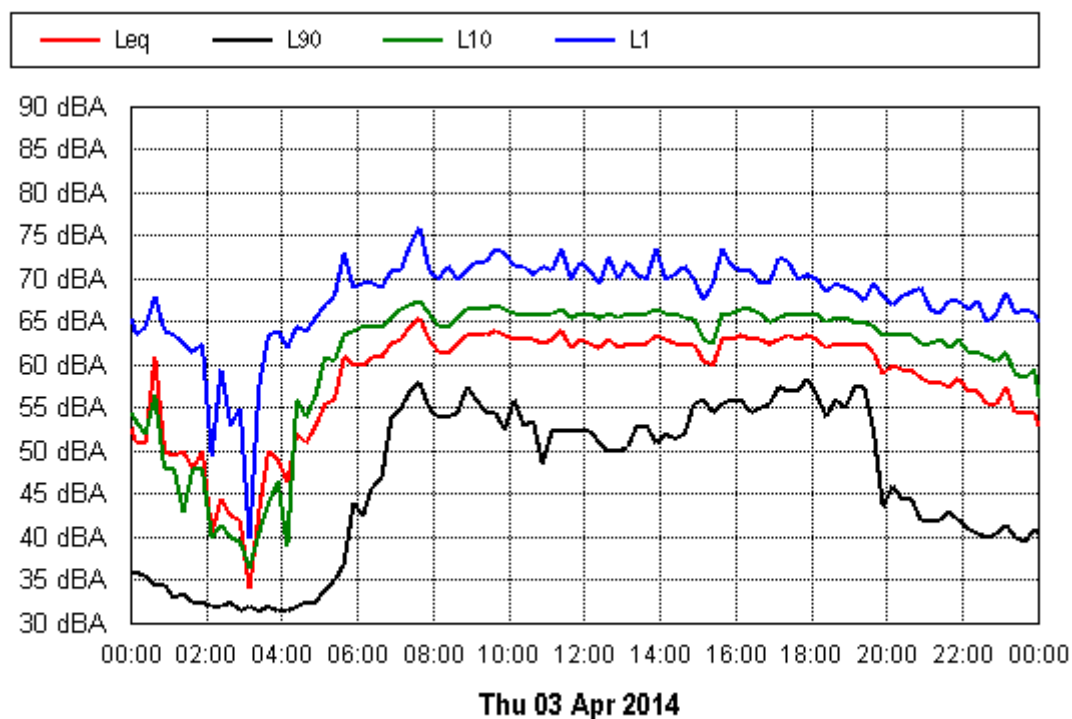
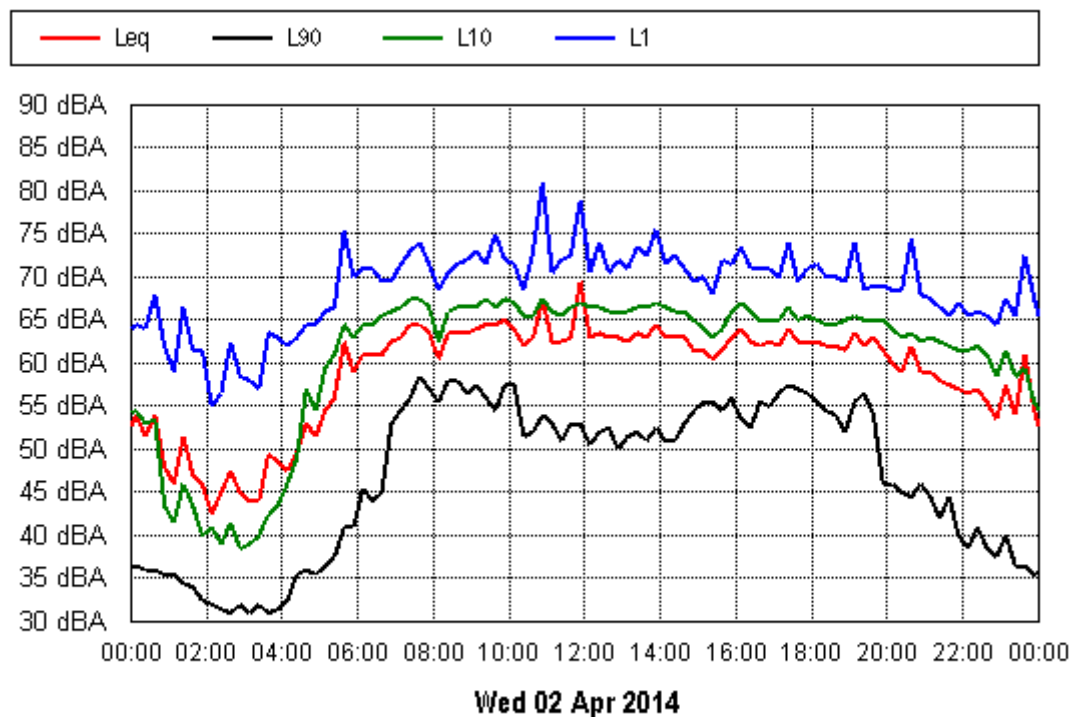
APPENDIX A

NOISE MEASUREMENT RESULTS

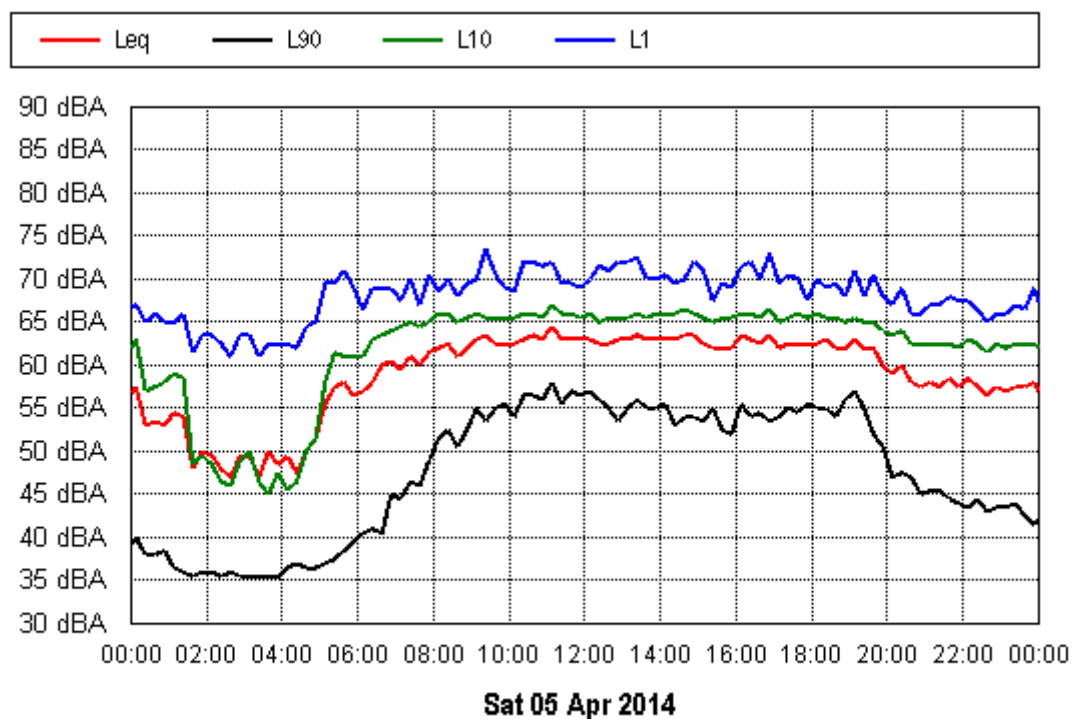
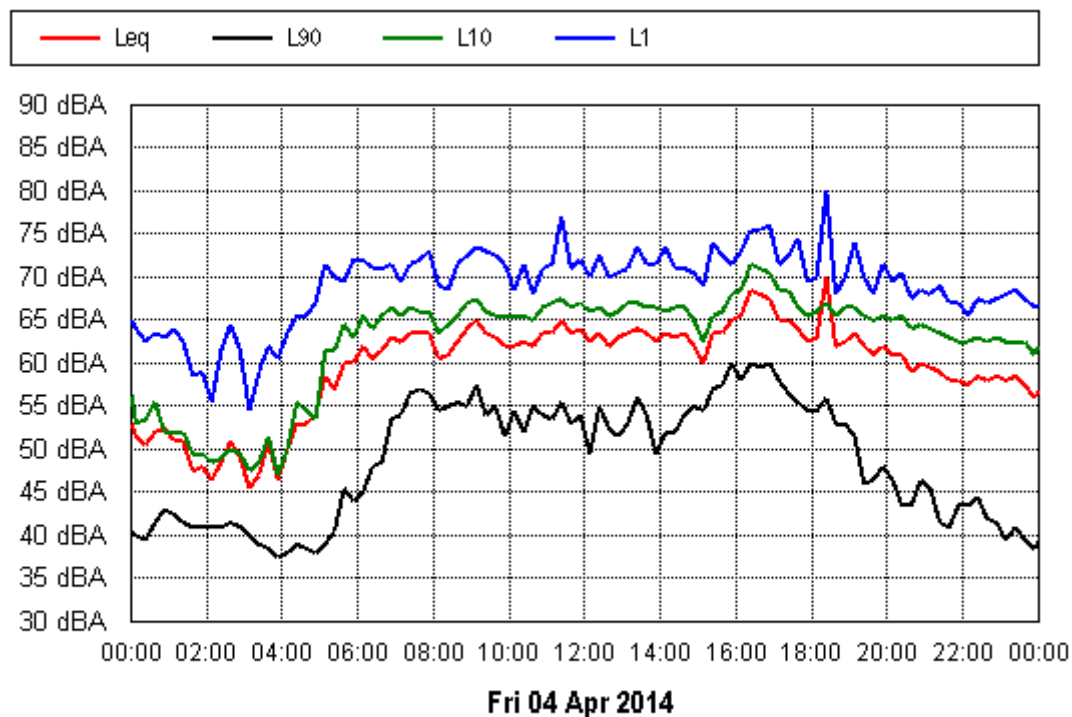
Location 1: Albion Street



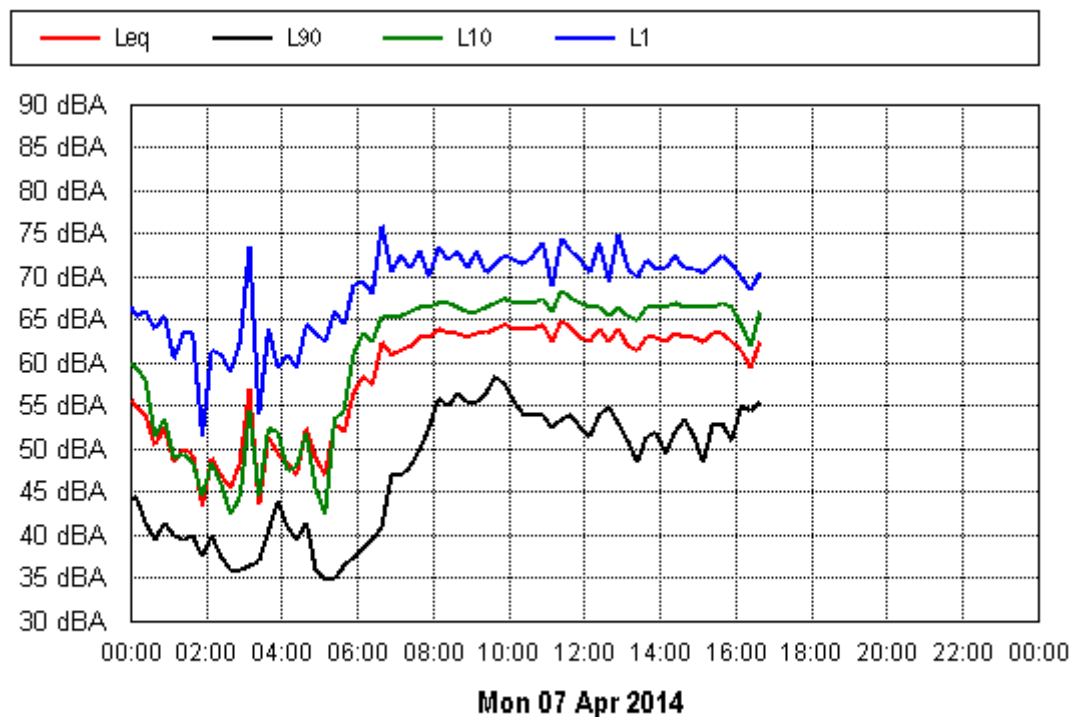
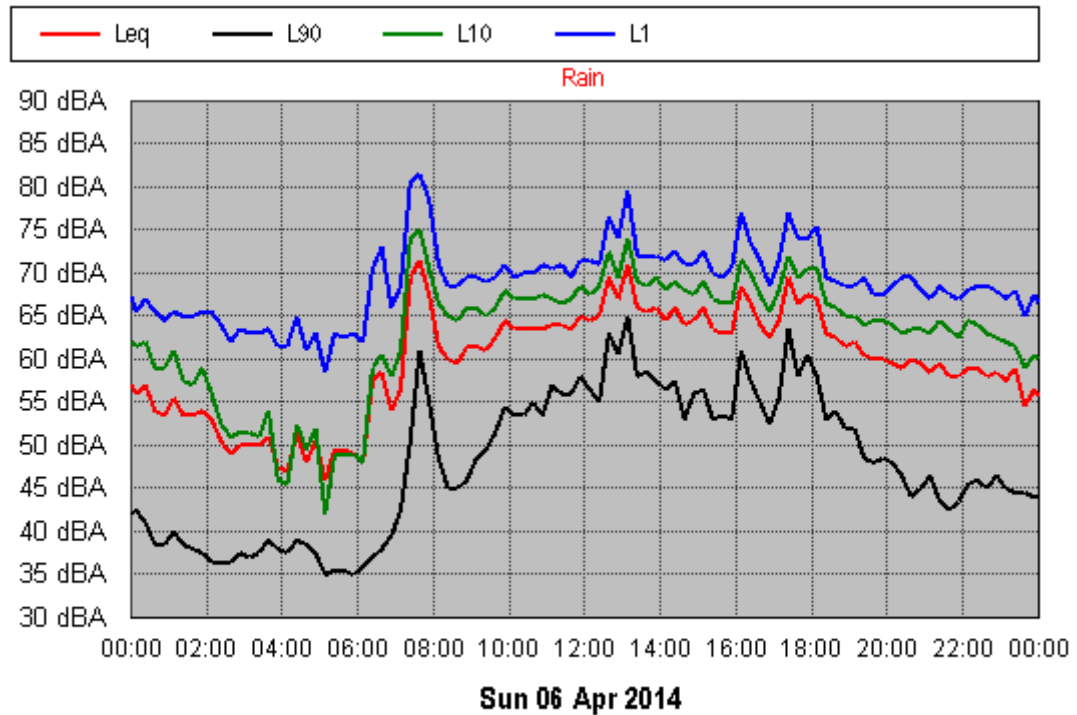
Location 1: Albion Street



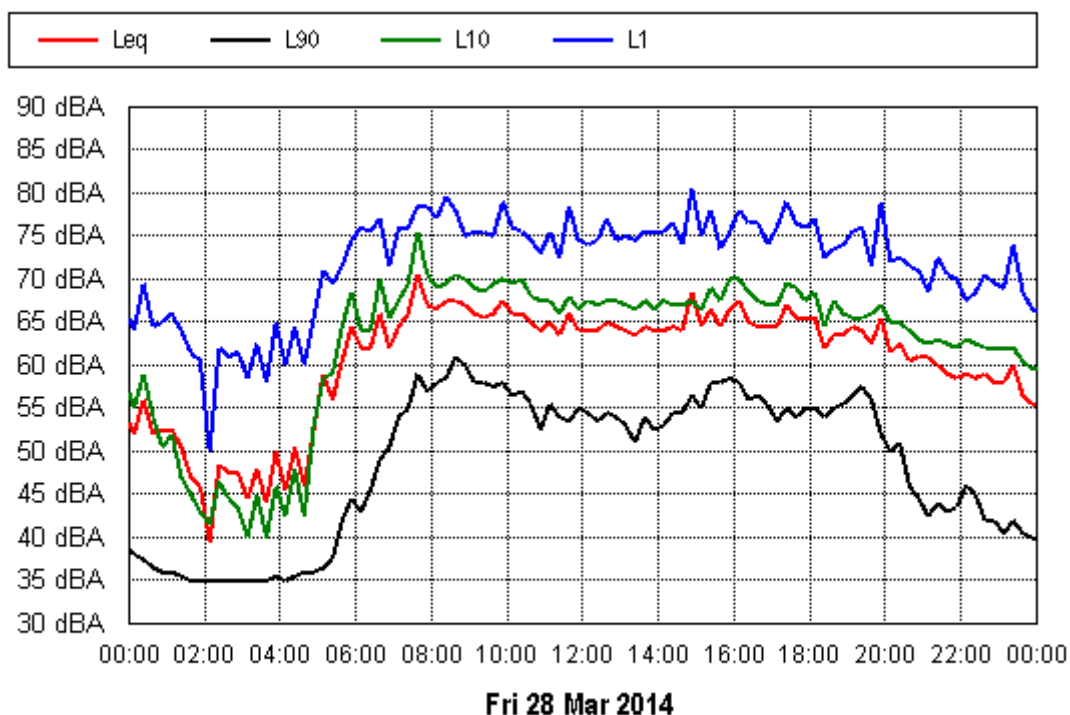
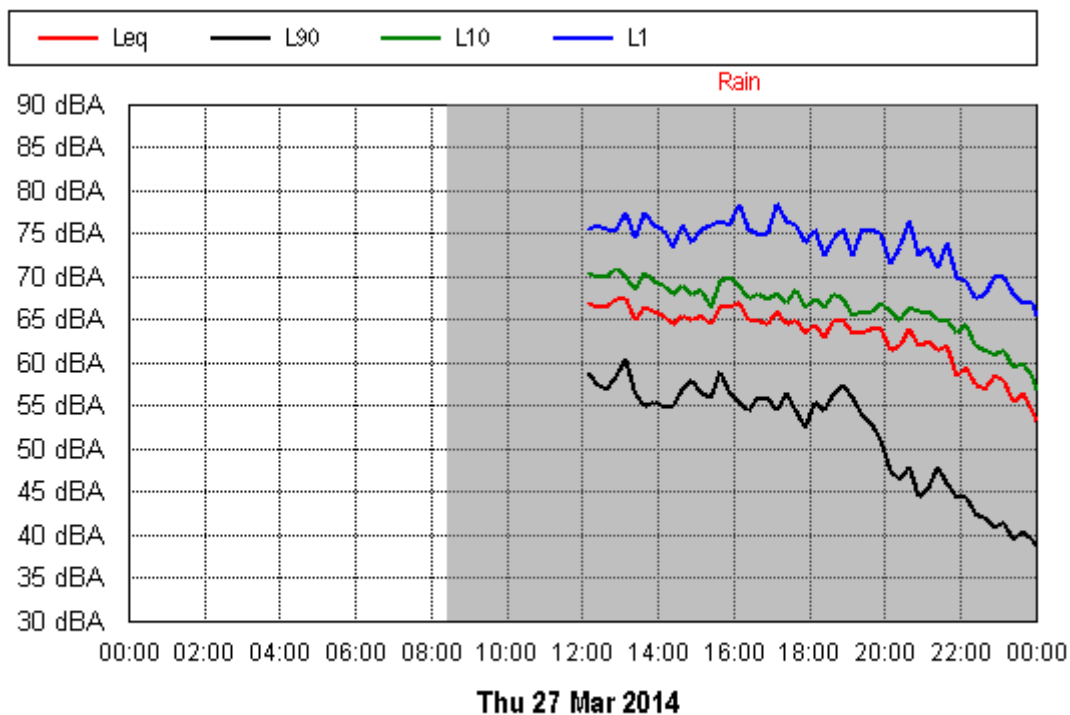
Location 1: Albion Street



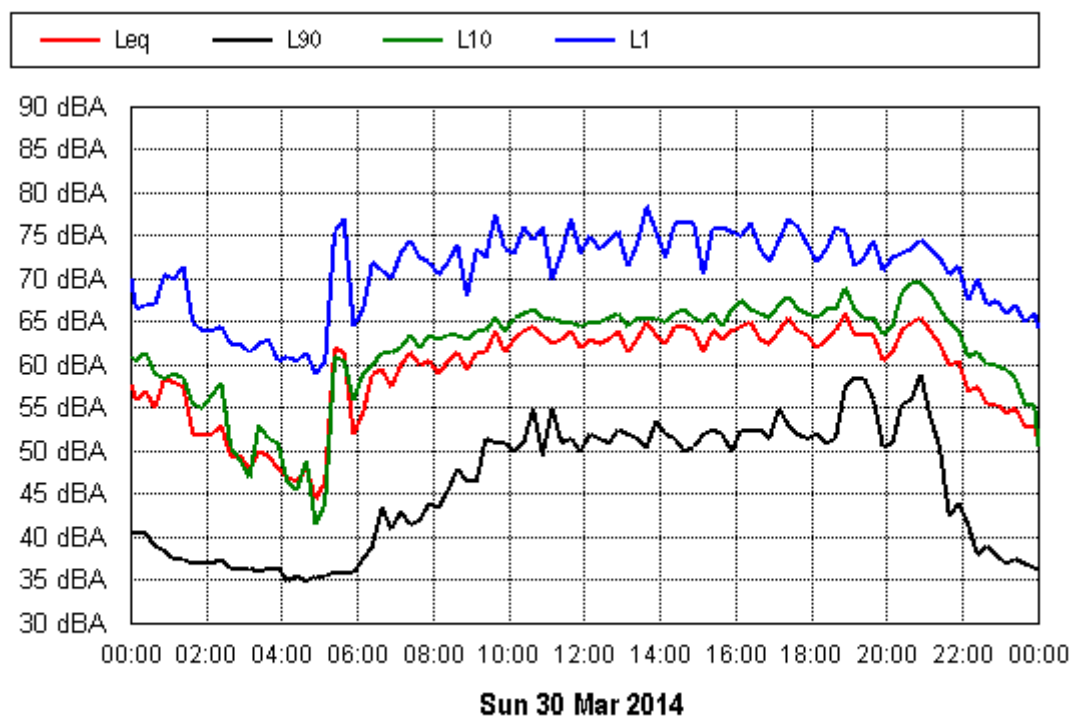
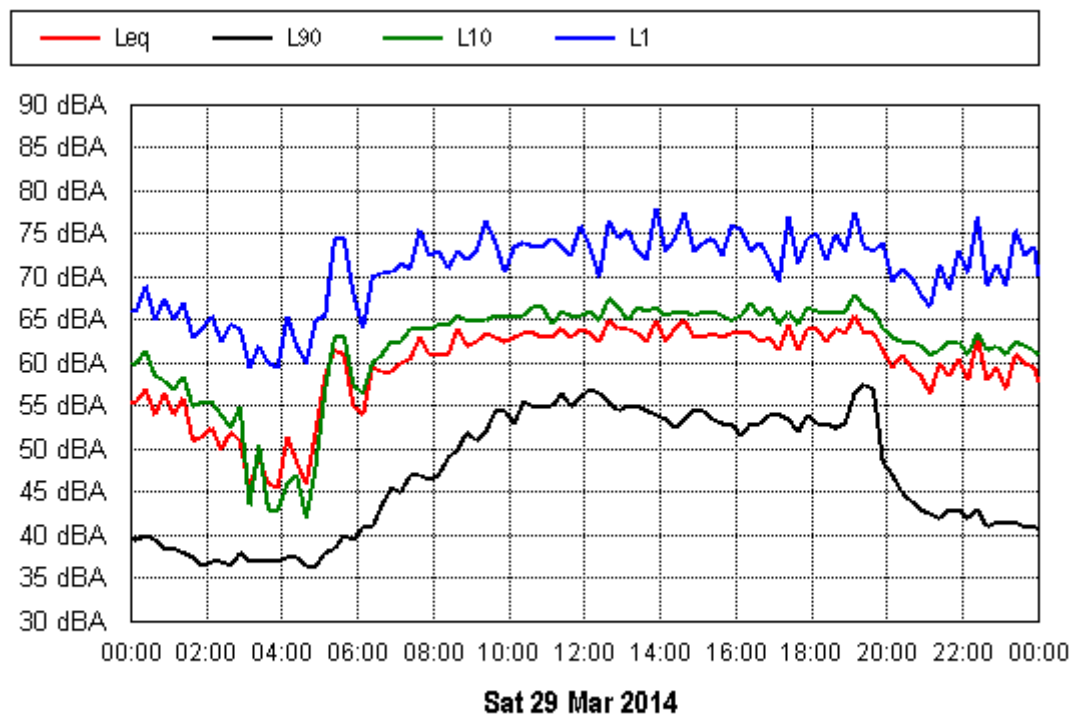
Location 1: Albion Street



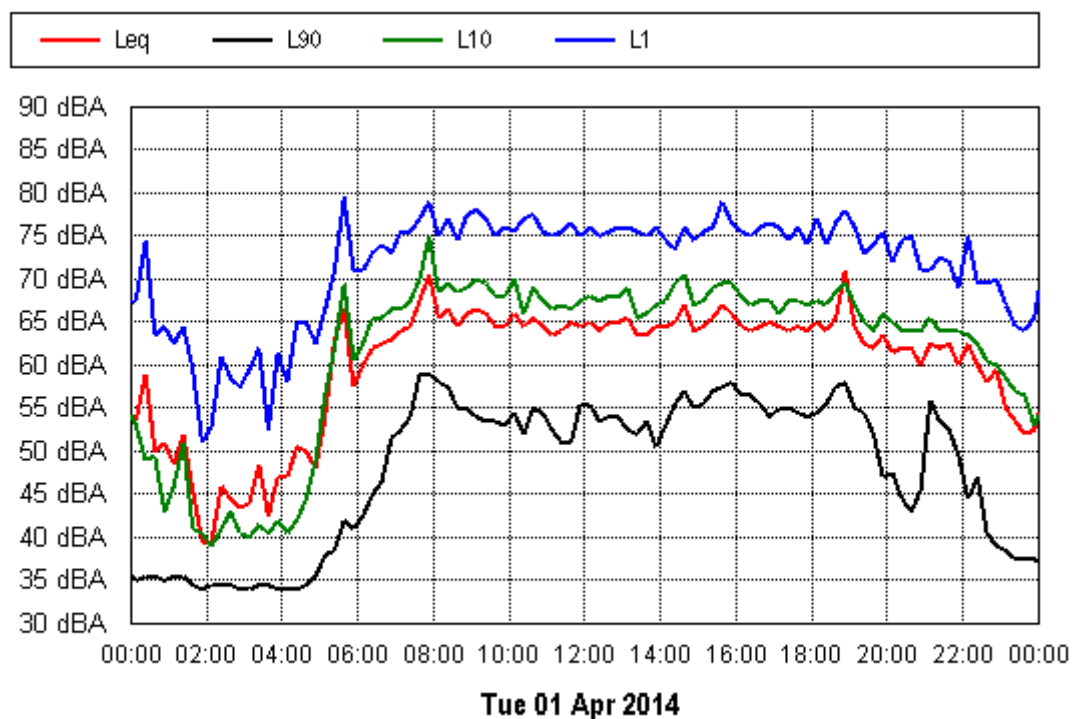
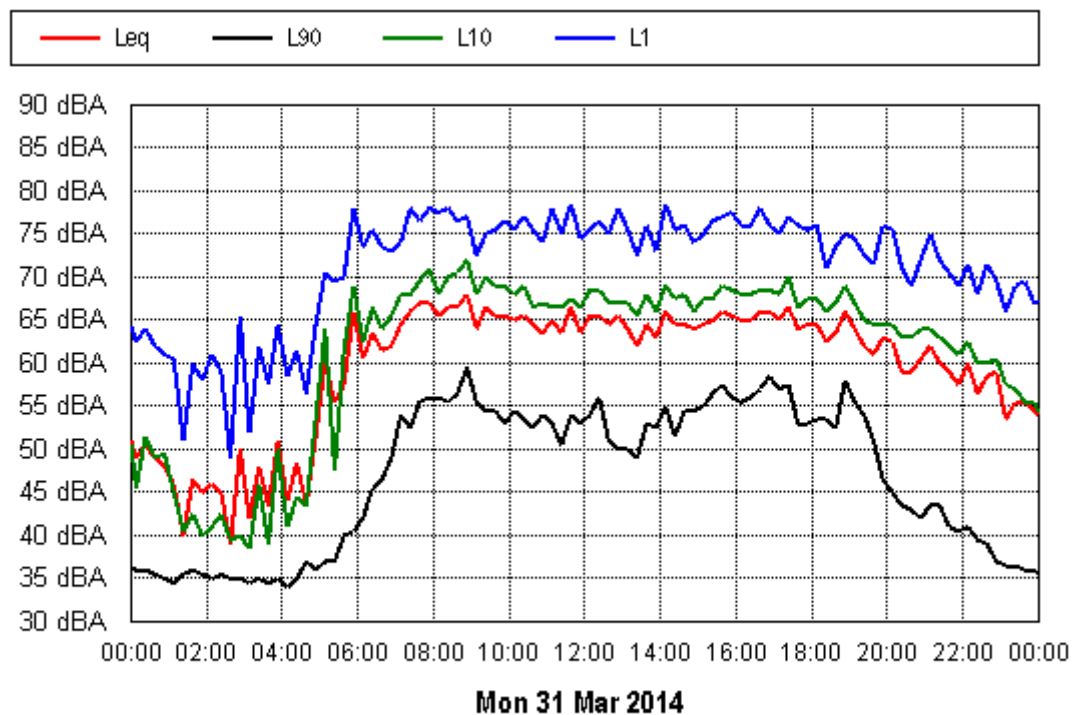
Location 2: Macpherson Street



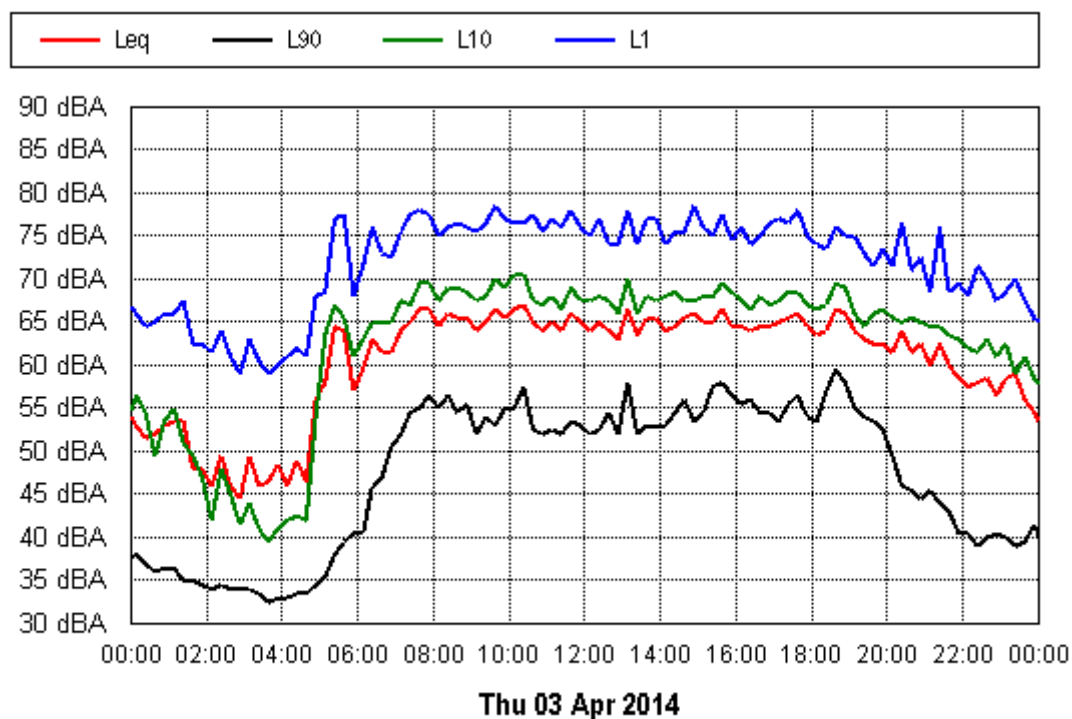
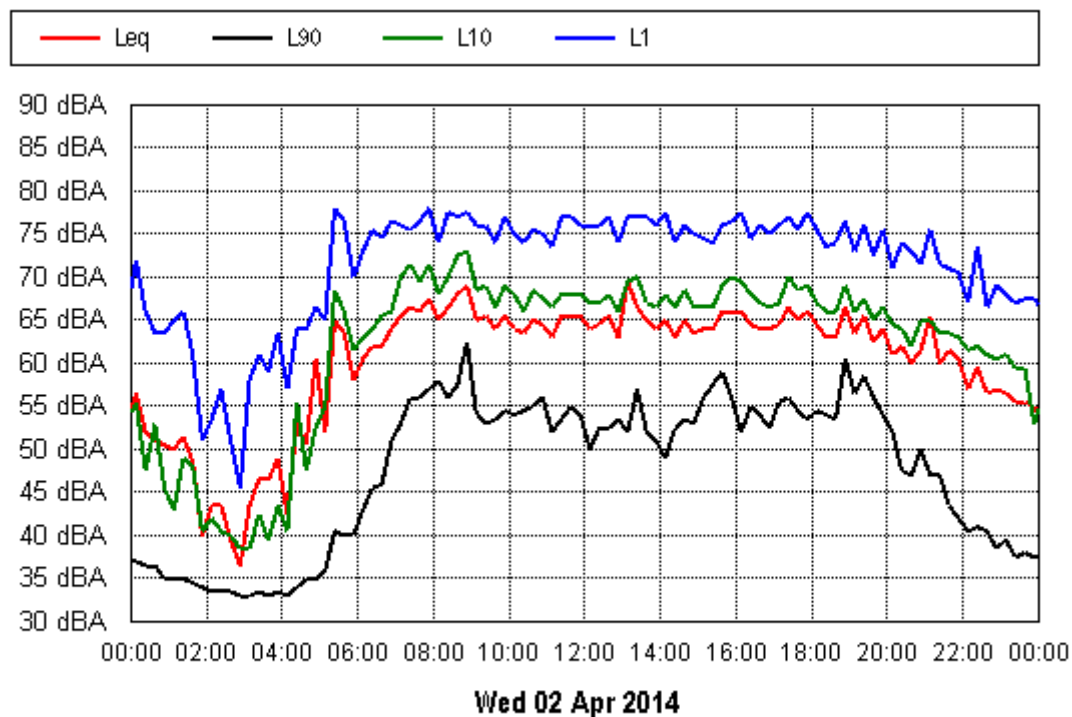
Location 2: Macpherson Street



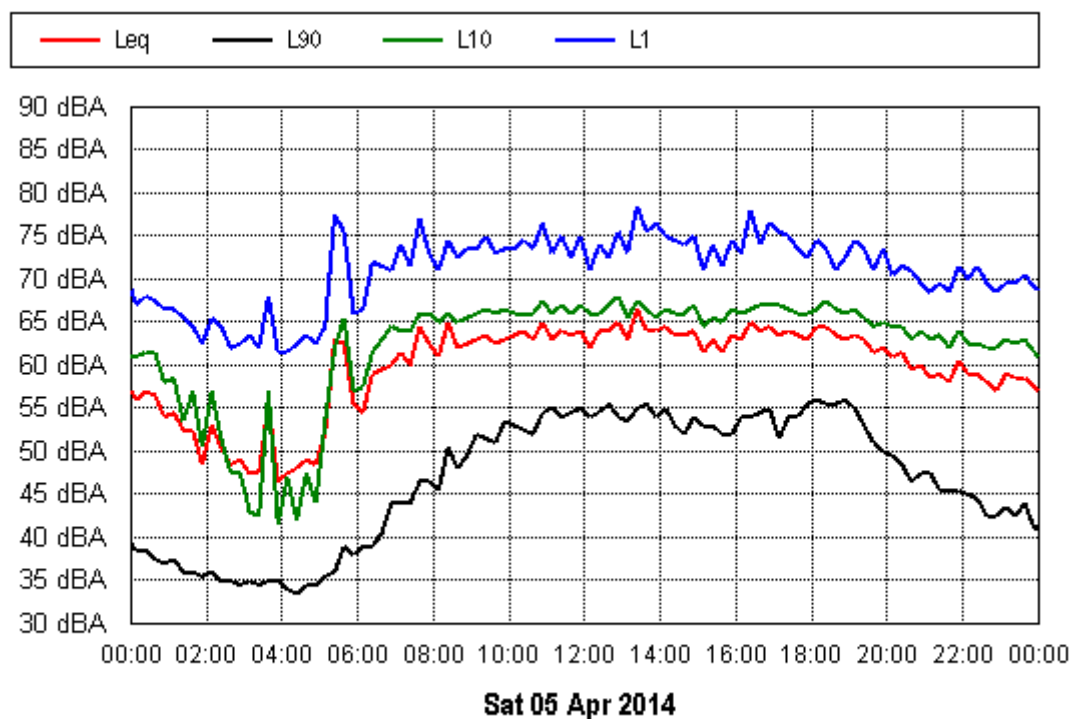
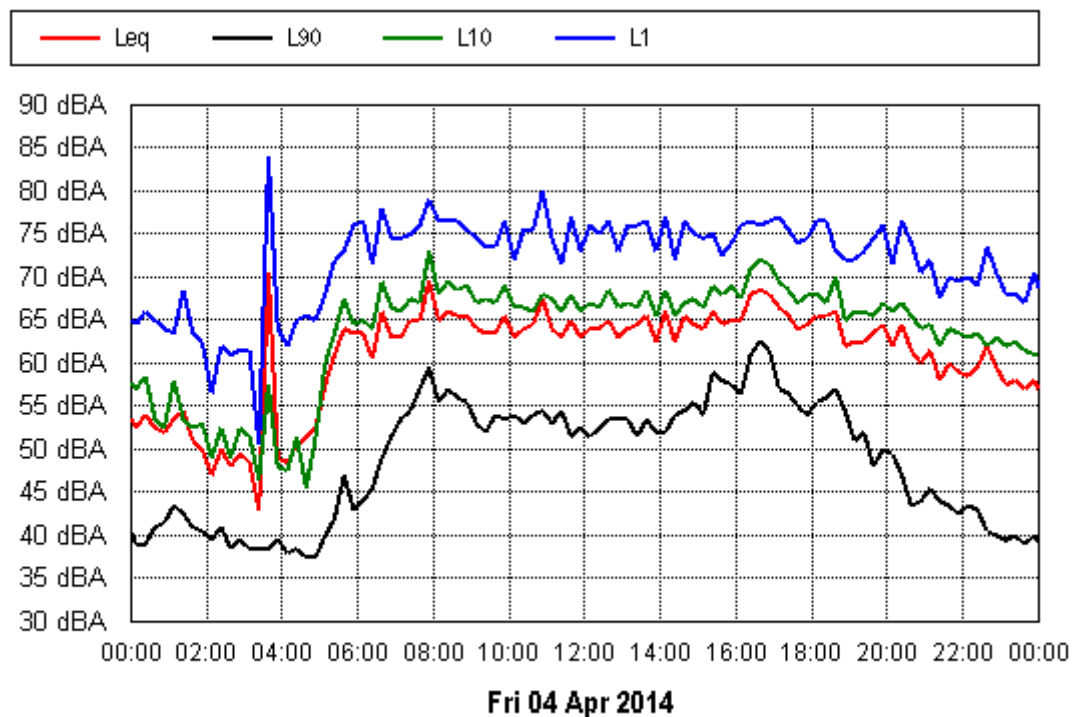
Location 2: Macpherson Street



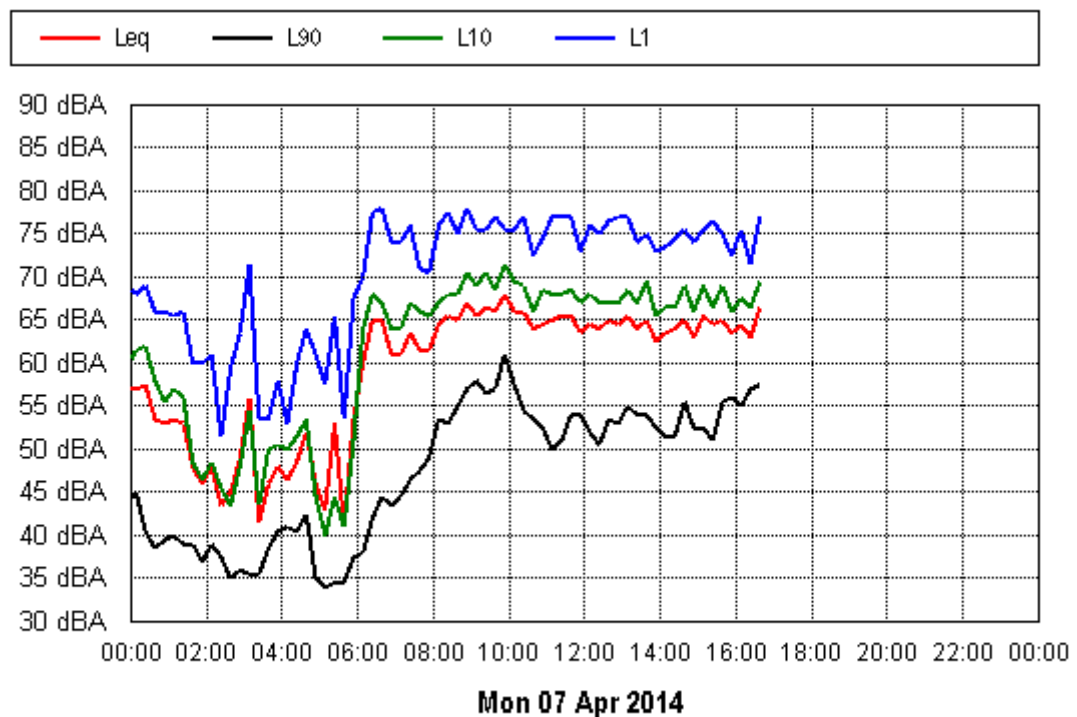
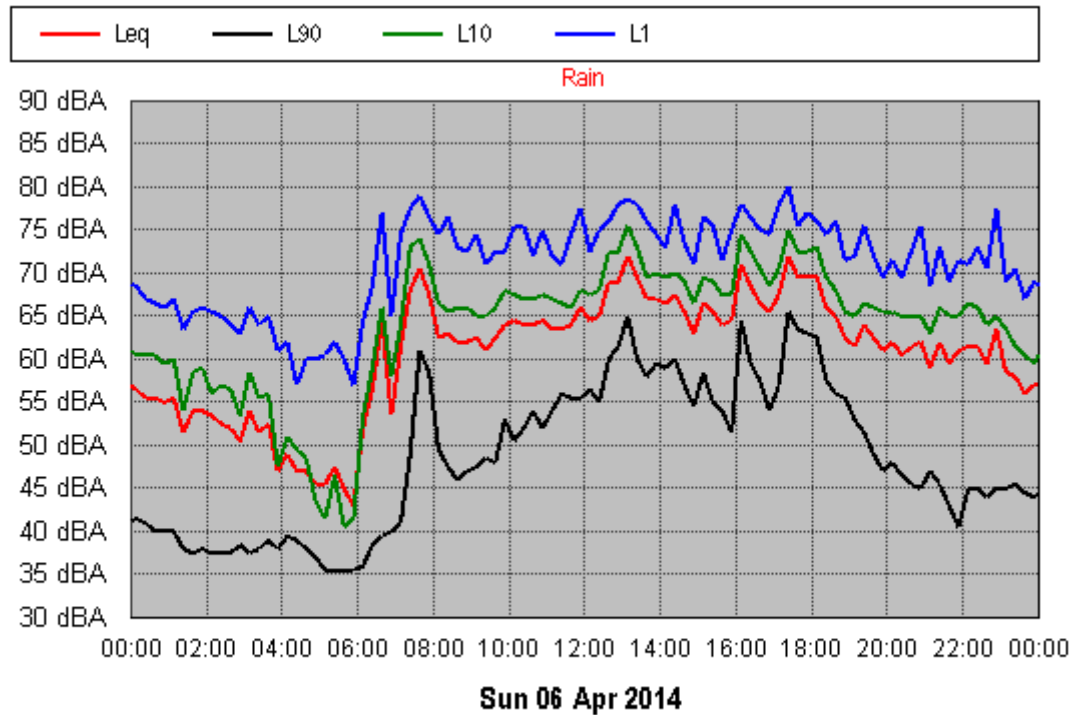
Location 2: Macpherson Street



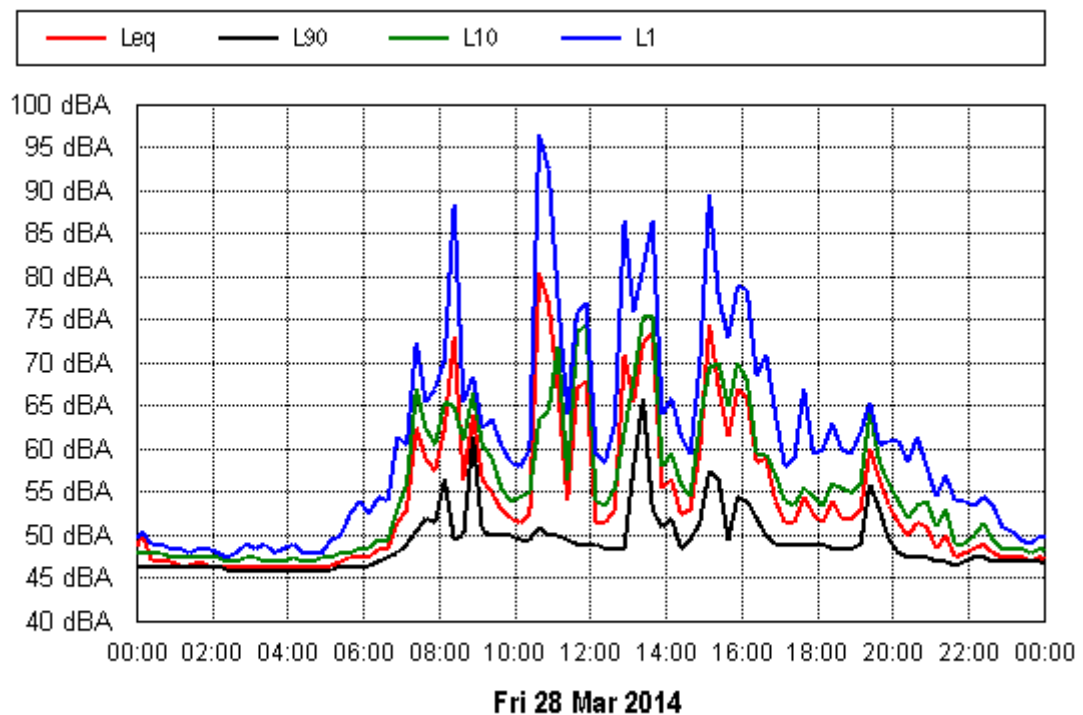
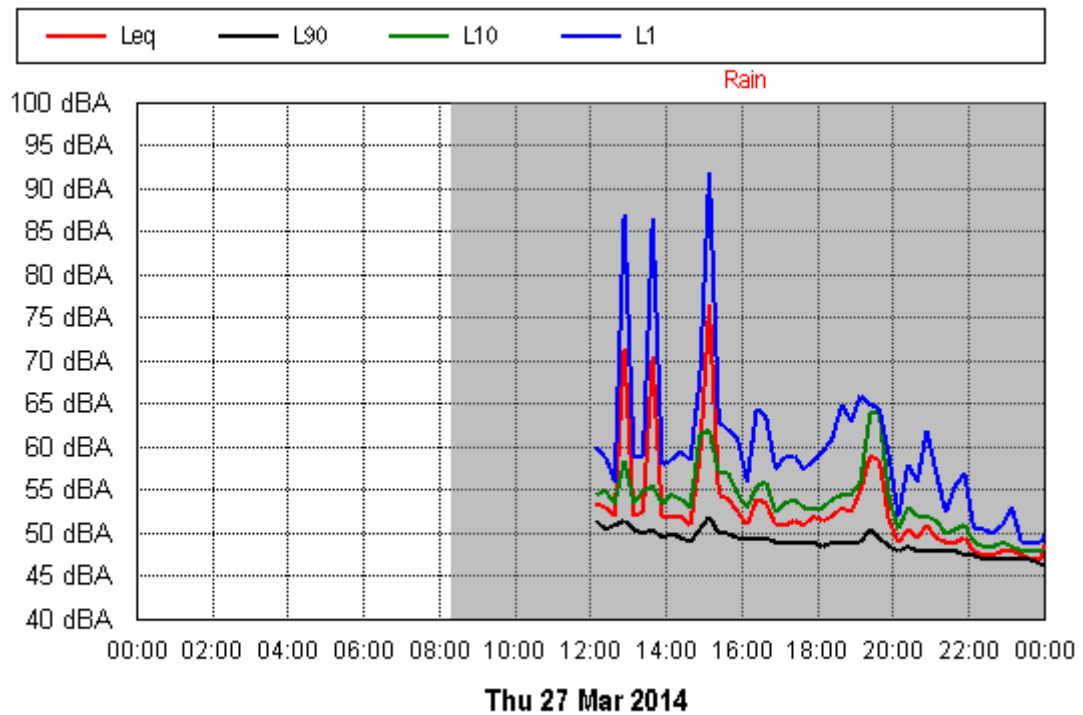
Location 2: Macpherson Street



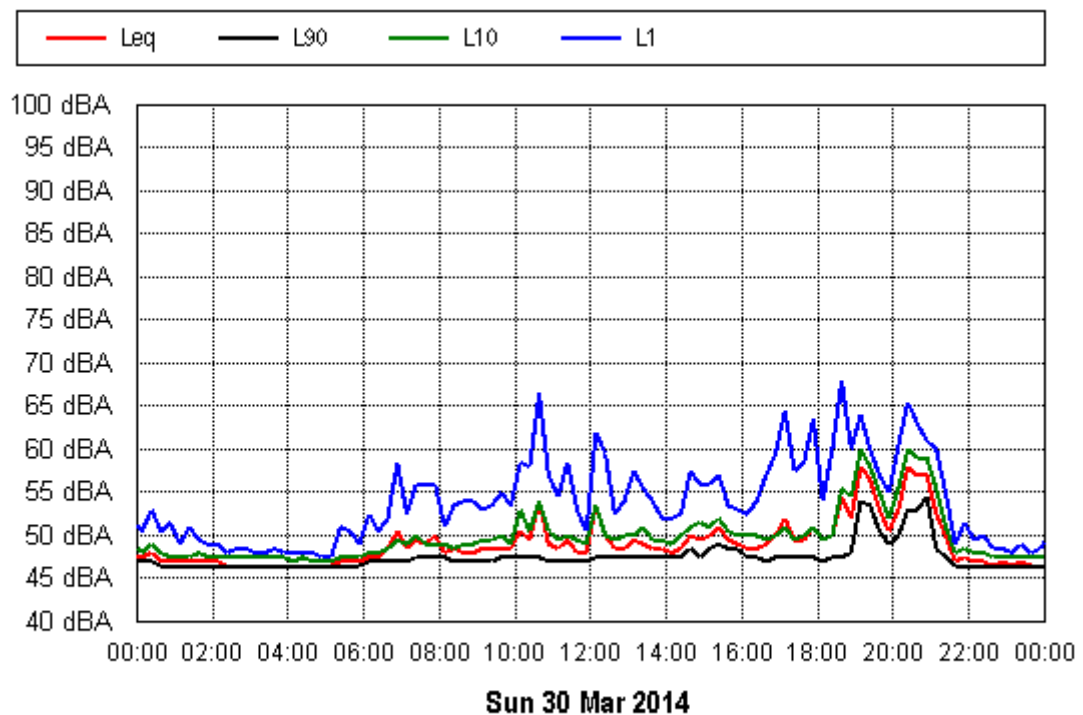
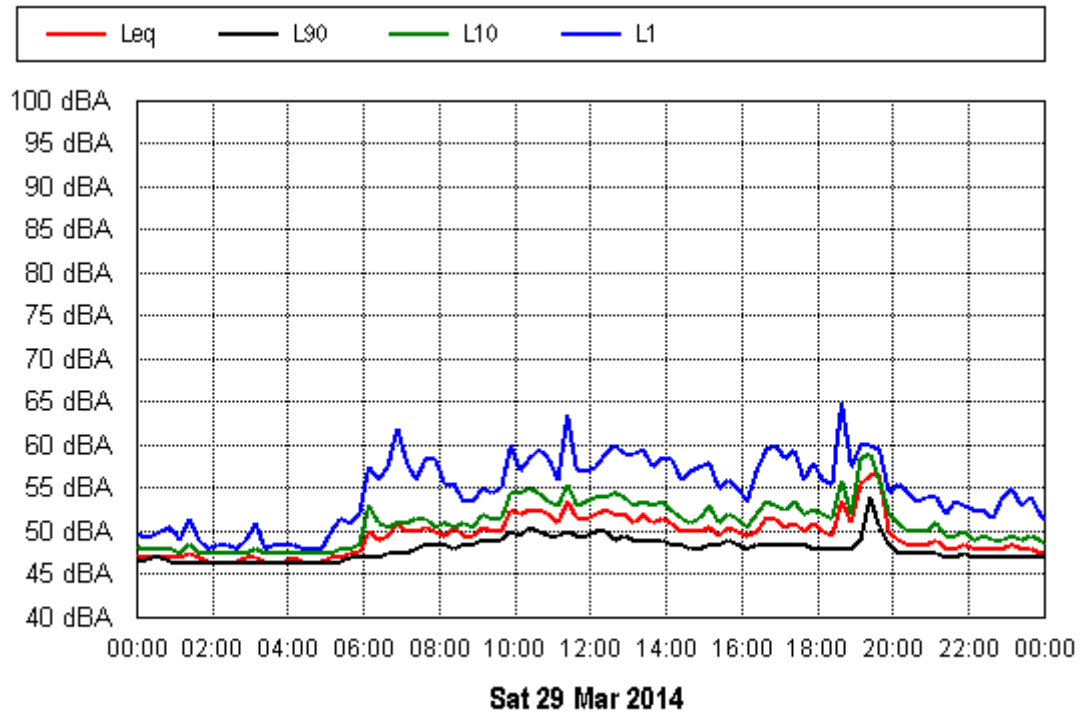
Location 2: Macpherson Street



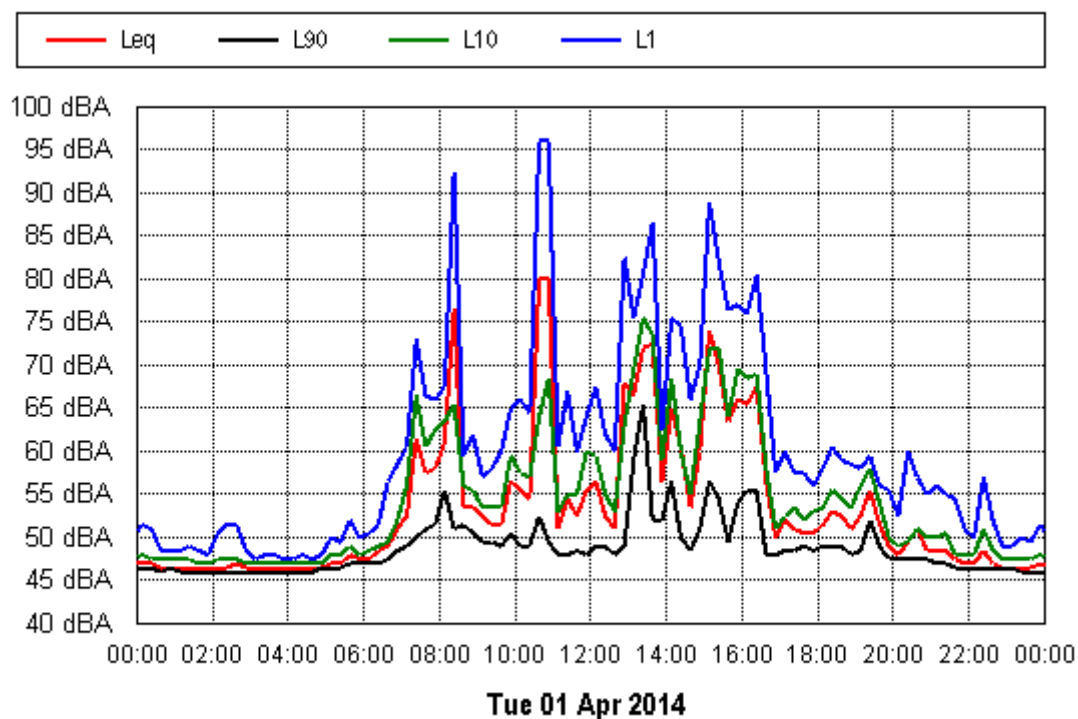
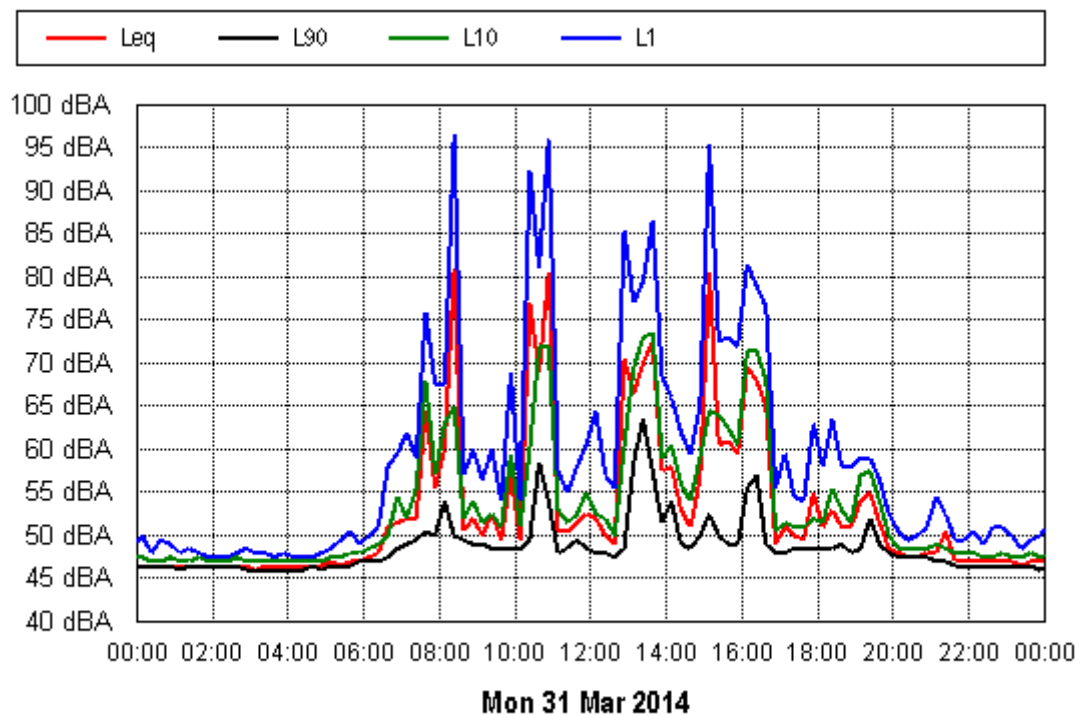
Location 3: Leichhardt Lane



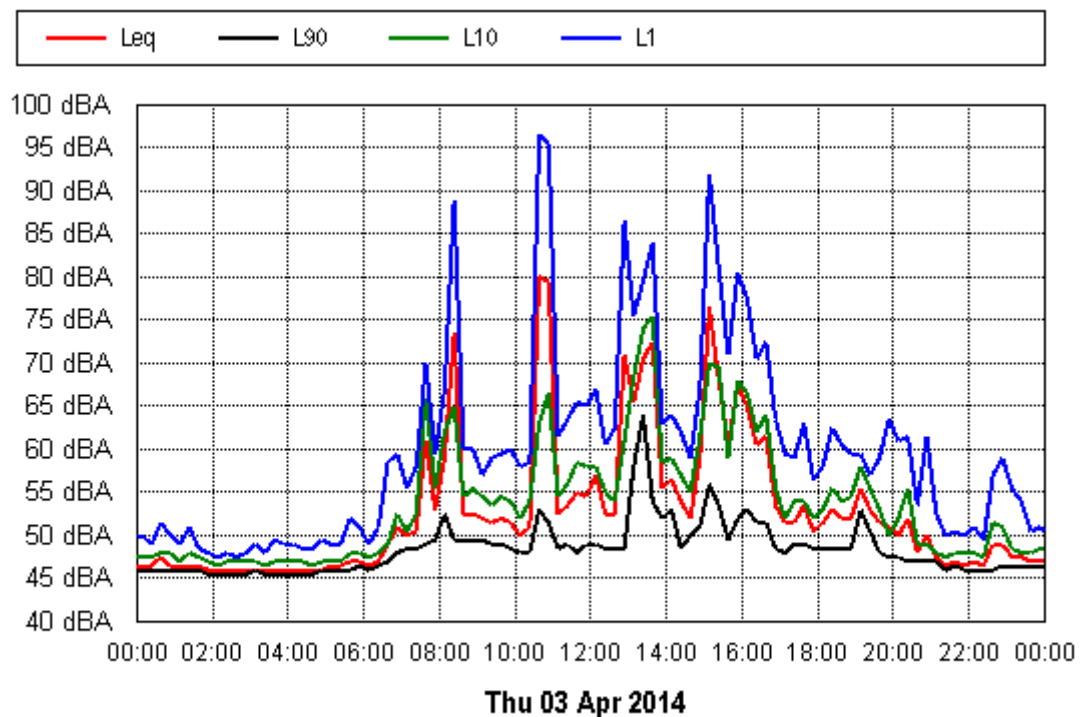
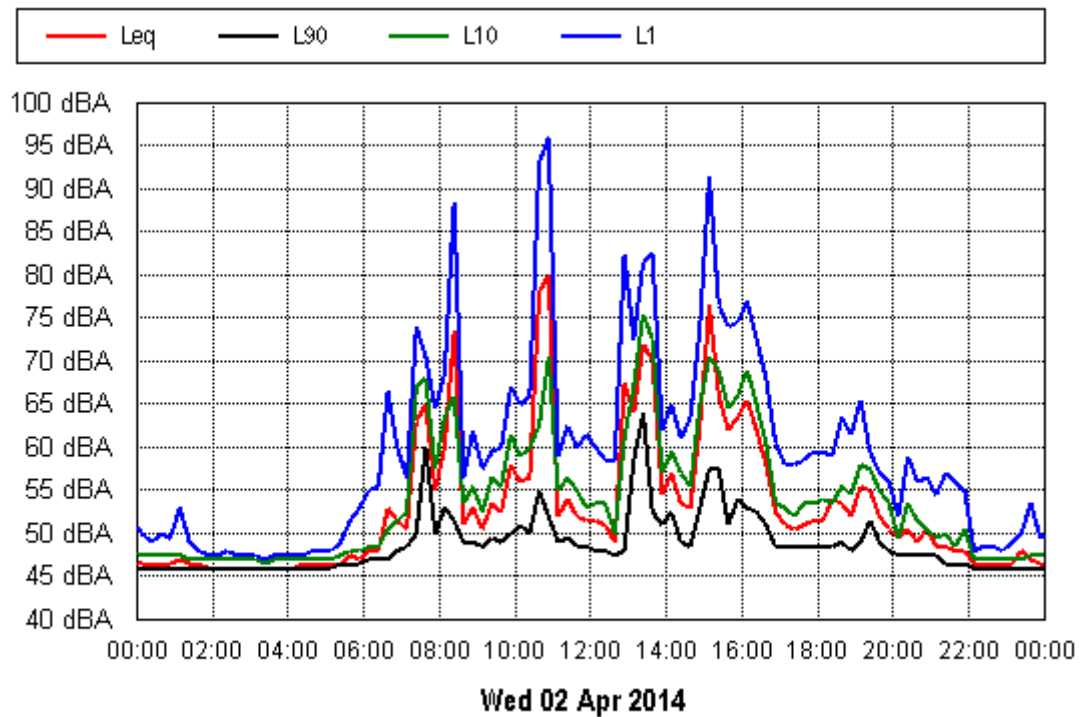
Location 3: Leichhardt Lane



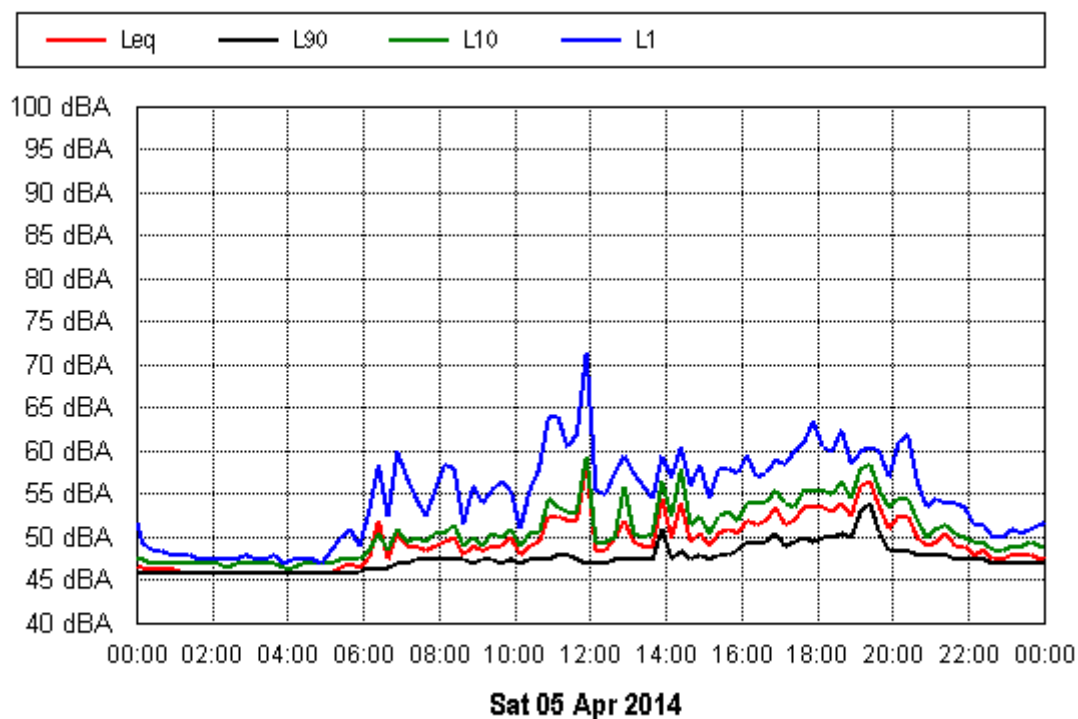
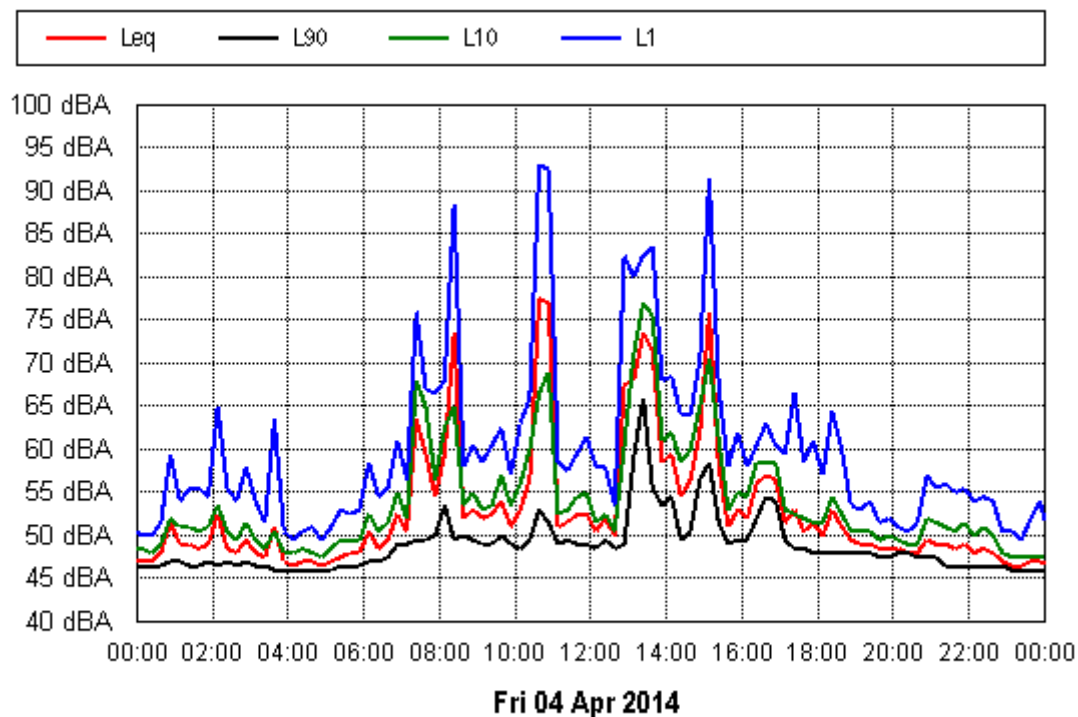
Location 3: Leichhardt Lane



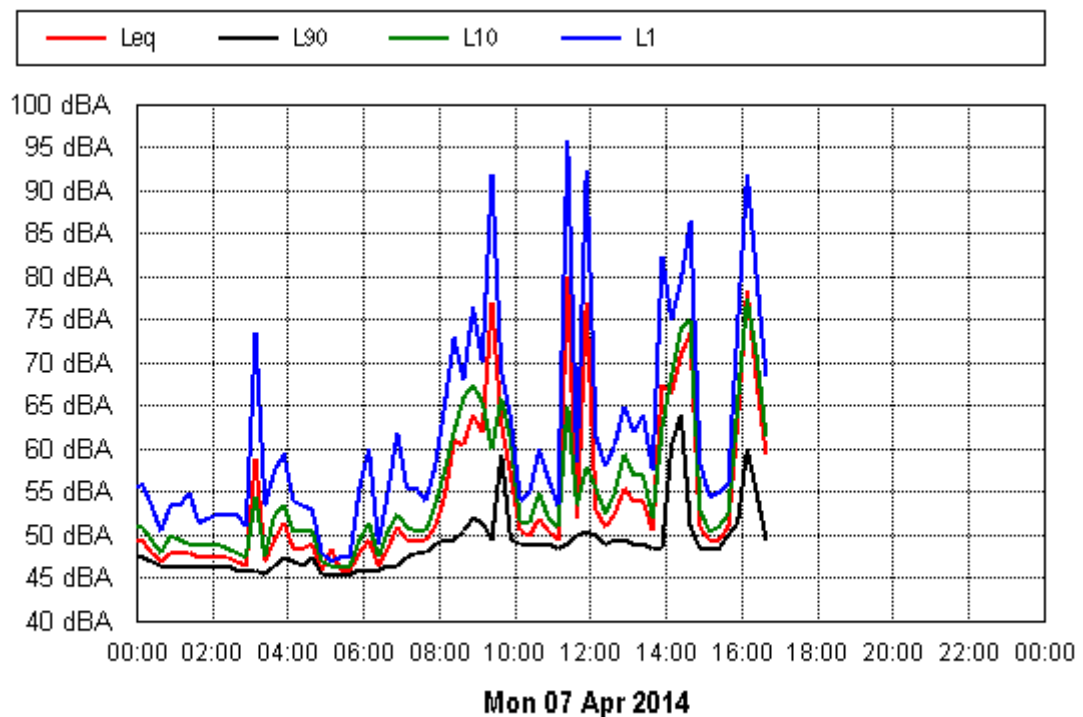
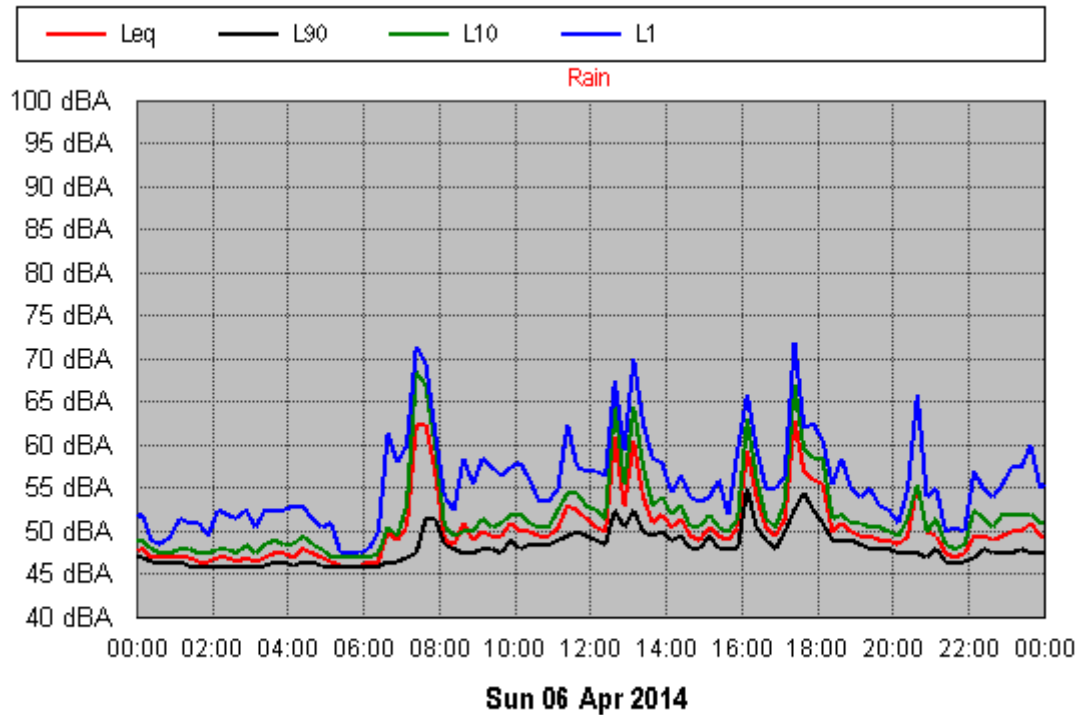
Location 3: Leichhardt Lane



Location 3: Leichhardt Lane



Location 3: Leichhardt Lane



APPENDIX B

ST CATHERINE'S SCHOOL – INDICATIVE USAGE PROFILE

St. Catherine's School - Indicative Usage Profile
June 2014 - Rev 7

Event	Current indicative usage profile				Forecasted indicative usage profile				
	Day of Week	Hours	Existing facility where event is currently held	Estimated current attendance at event	Day of Week	Frequency (days p/yr)	Hours	New facility where event is proposed	Estimated forecasted attendance at event
Water polo training	Weekdays	6.30am - 8.20am 3.20pm - 6.30pm	Outdoor Pool	20 p/hr	Weekdays	Mon - Fri throughout the yr	6am - 8.20am & 3.20pm - 8pm	Aquatic Centre (Main Pool)	50 p/hr
Squad swimming	Weekdays	5am - 8.20am 3.20pm - 6pm	Outdoor Pool	20 p/hr	Weekdays	Mon - Fri throughout the yr	6am - 8.20am & 3.20pm - 8pm	Aquatic Centre (Main Pool)	30 p/hr
Diving program	Weekdays	6am - 8.20am	Waverley College	20	Weekdays	Mon - Fri throughout the yr	6am - 8.20am & 3.20pm - 8pm	Aquatic Centre (Main Pool)	20 students
Water Polo (Term 1 and 4)	Saturday	7.30am - 2pm	Outdoor Pool	75p/hr	Saturday	Every Saturday throughout Term 1 & Term 4	8am - 6pm	Aquatic Centre (Main Pool)	150 p/hr
Winter Water Polo (Term 2 and 3)	Saturday	NA	NA	NA	Saturday	Every Saturday throughout Term 2 & Term 3	8am - 6pm	Aquatic Centre (Main Pool)	150 p/hr
Water Polo (Term 1 and 4)	Sunday	NA	NA	NA	Sunday	Every Sunday throughout Term 1 & Term 4	8am - 6pm	Aquatic Centre (Main Pool)	150 p/hr
Learn to swim (weekdays)	Weekdays	3.20pm - 6pm	Outdoor Pool	20	Weekdays	Mon - Fri throughout the yr	7am - 7pm	Aquatic Centre (Shallow Pool)	100 p/hr
Learn to swim (weekends)	Weekends	NA			Weekends	Saturday and Sunday throughout the year	8am - 6pm	Aquatic Centre (Shallow Pool)	100 p/hr
School Open Day	Weekday	9am - 11am	Dame Joan Sutherland	120 externals	Weekday	5	9am - 11am	Performing Arts Auditorium	120 externals
School Open Night (Twilight Session - Term 1 and 4 only)	Weekday	5.30pm - 7.30pm	Dame Joan Sutherland	120 externals	Weekday	3	5.30pm - 7.30pm	Performing Arts Auditorium	120 externals
Rehersal Senior School Musical	Weekend	9am - 2pm	NIDA	60 students	Weekend	5	10am - 1pm	Performing Arts Auditorium	60 students
Senior School Musical Event	Weekday	6.30pm - 9.30pm	NIDA - Parade Playhouse	659 audience with orchestra pit in use	Weekday	2	6.30pm - 9.30pm	Performing Arts Auditorium	500 audience (school community)
Senior School Musical Event	Saturday	NA	NA	NA	Weekday	1	6.30pm - 9.30pm	Performing Arts Auditorium	500 audience (school community)
Prep - St. Cath's Got Talent	Weekday	3pm - 6.30pm	Dame Joan Sutherland	60 students	Weekday	2	3pm - 6.30pm	Performing Arts Auditorium	60 students
St. Cath's Got Talent Event	Weekday	6pm - 9pm	Dame Joan Sutherland	250 audience	Weekday	1	6pm - 9pm	Performing Arts Auditorium	500 audience (school community)
Prep - Trinity Evening	Weekday	3pm - 6.30pm	Dame Joan Sutherland	60 students	Weekday	12	3pm - 6.30pm	Performing Arts Auditorium	60 students
Trinity Evening	Weekday	6pm - 10pm	Dame Joan Sutherland	250 audience	Weekday	1	6pm - 10pm	Performing Arts Auditorium	500 audience (school community)
Reherse BTC Showcase Event	Weekday	3pm - 6.30pm	Dame Joan Sutherland	60 students	Weekday	11	3pm - 6.30pm	Performing Arts Auditorium	60 students
BTC Showcase Event	Weekday	6pm - 9pm	Dame Joan Sutherland	250 audience	Weekday	2	6pm - 9pm	Performing Arts Auditorium	500 audience (school community)
Infants Christmas Musical Rehersal	Weekday	9am - 5pm	Dame Joan Sutherland	130 students	Weekday	3	9am - 5pm	Performing Arts Auditorium	130 students
Infants Christmas Musical	Weekday	9am - 12pm	Dame Joan Sutherland	250 audience	Weekday	1	9am - 12pm	Performing Arts Auditorium	300 audience
Junior Musical Rehersal	Weekend	9am - 5pm	Dame Joan Sutherland	150 students	Weekend	2	9am - 5pm	Performing Arts Auditorium	150 students
Junior Musical Rehersal	Weekday	During school hours	Dame Joan Sutherland	150 students	Weekday	2	During school hours	Performing Arts Auditorium	150 students
Junior Musical	Weekday	6.30pm - 9.30pm	Dame Joan Sutherland	250 audience	Weekday	2	6.30pm - 9.30pm	Performing Arts Auditorium	400 audience
Stage 2 Music Evening Rehersal	Weekday	During school hours	Dame Joan Sutherland	100 students	Weekday	2	During school hours	Performing Arts Auditorium	100 students
Stage 2 Music Evening	Weekday	6.30pm - 9.30pm	Dame Joan Sutherland	250 audience	Weekday	1	6.30pm - 9.30pm	Performing Arts Auditorium	300 audience
Stage 3 Music Evening Rehersal	Weekday	During school hours	Dame Joan Sutherland	150 students	Weekday	2	During school hours	Performing Arts Auditorium	150 students
Stage 3 Music Evening	Weekday	6.30pm - 9.30pm	Dame Joan Sutherland	250 audience	Weekday	1	6.30pm - 9.30pm	Performing Arts Auditorium	350 audience
Potential Use by Educational Establishment (Evening)	NA	NA	NA	NA	Weekday	4	6.30pm - 9.30pm	Performing Arts Auditorium	500 audience
Potential Use by Educational Establishment (Matinee)	NA	NA	NA	NA	Weekday	1	1.30pm - 4.30pm	Performing Arts Auditorium	500 audience
Amateur Societies Performance Evening	NA	NA	NA	NA	Weekday	6	6.30pm - 9.30pm	Performing Arts Auditorium	500 audience
Amateur Societies Performance Matinee	NA	NA	NA	NA	Weekday	2	1.30pm - 4.30pm	Performing Arts Auditorium	500 audience
Parent Breakfast - Junior School (K-6)	Weekday	7am - 9am	Jane Barker Hall	30 parents	Weekday	7	7am - 9am	Multi-Purpose Hall	30 parents
Parent Breakfast - Senior School (7-12)	Weekday	7am - 9am	Jane Barker Hall	45 parents	Weekday	6	7am - 9am	Multi-Purpose Hall	45 parents
Welcome Cocktail Party	Weekday	6pm - 9pm	Isabell Hall Wing Courtyard	600 externals (standing)	Weekday	1	6pm - 9pm	Multi-Purpose Hall	600 externals (standing)
Old Girls Union - Annual 5yr Reunion	Weekday	6pm - 8pm	Cloisters*	60 externals	Weekday	1	6pm - 8pm	Multi-Purpose Hall	60 externals
Alliwell Scholarship Testing	Weekend	10am - 1pm	Dame Joan Sutherland	100 external students	Weekend	1	10am - 1pm	Multi-Purpose Hall	100 external students
Kindergarten Parents DVD evening	Weekday	6pm - 9pm	Nan Hind Centre	100 parents	Weekday	1	6pm - 9pm	Multi-Purpose Hall	100 parents
Old Girls Union - Mothers and Daughters Breakfast	Weekday	7.30am - 9.30am	Jane Barker Hall	60 (30/30 split)	Weekday	1	7.30am - 9.30am	Multi-Purpose Hall	60 (30/30 split)
Old Girls Union - Jane Barker Luncheon	Weekday	10.30am - 1.30pm	Jane Barker Hall	80 externals	Weekday	1	10.30am - 1.30pm	Multi-Purpose Hall	80 externals
Evening of Eminence - Junior School	Weekday	6pm - 8.30pm	Dame Joan Sutherland	160 parents	Weekday	1	6pm - 8.30pm	Multi-Purpose Hall	250 externals
Creative Connections	Weekday	4.30pm - 8.15pm	Dame Joan Sutherland + Chapel	250 (yr 12 + parents + staff)	Weekday	1	4.30pm - 8.15pm	Multi-Purpose Hall	250 (yr 12 + parents + staff)
Kindergarten Grandparents Morning	Weekday	8am - 11am	Nan Hind Centre	60 grandparents	Weekday	1	8am - 11am	Multi-Purpose Hall	60 grandparents
Old Girls Union Year 12 Afternoon Tea	Weekday	2.30pm - 4pm	Jane Barker Hall	120 students (Yr 12)	Weekday	1	2.30pm - 4pm	Multi-Purpose Hall	120 students (y12)
Blues Sports Breakfast	Weekday	7am - 9am	Jane Barker Hall	100 students	Weekday	1	7am - 9am	Multi-Purpose Hall	100 externals
Kindergarten Orientation Day	Weekday	8am - 1pm	Jane Barker Hall	50 externals	Weekday	1	8am - 1pm	Multi-Purpose Hall	50 parents
Orientation Day yr 4-11	Weekday	9am - 4pm	Dame Joan Sutherland	20 p/hr externals	Weekday	1	9am - 4pm	Multi-Purpose Hall	20 p/hr external
Rowing Season Launch	Weekday	6pm - 10pm	Nan Hind Centre	100 parents	Weekday	1	6pm - 10pm	Multi-Purpose Hall	100 external
Duke of Edinburgh Presentation Evening	Weekday	6pm - 9pm	Dame Joan Sutherland	90 parents	Weekday	1	6pm - 9pm	Multi-Purpose Hall	90 parents
Yr 6 Graduation Dinner	Weekday	6pm - 9pm	Jane Barker Hall	250 (seated)	Weekday	1	6pm - 9pm	Multi-Purpose Hall	250
Chairman's Thank You Cocktail Party	Weekday	6pm - 9pm	Cloisters*	80 (volunteers, parents etc.)	Weekday	1	6pm - 9pm	Multi-Purpose Hall	80 (volunteers, parents etc)
HSC Results Event	Weekday	During school hours	Cloisters*	120 students (Yr 12)	Weekday	1	During school hours	Multi-Purpose Hall	120 students (Yr 12)
Staff Christmas Lunch	Weekday	During school hours	Jane Barker Hall	200 (seated)	Weekday	1	During school hours	Multi-Purpose Hall	200
Alliwell testing Yr 4	Weekday	During school hours	Dame Joan Sutherland	50 external students	Weekday	1	During school hours	Multi-Purpose Hall	50 external students
Boarders dance	Weekday	7pm - 10pm	Jane Barker Hall	300 external students and boarders	Weekday	1	7pm - 10pm	Multi-Purpose Hall	300 external students and boarders
Boarder Parents Dinner	Weekdays	6.30pm - 9.30pm	Magnolia Room	40 parents	Weekdays	1	6.30pm - 9.30pm	Multi-Purpose Hall	40 parents
Valedictory Dinner	Weekdays	6.30pm - 9.30pm	Magnolia Room	120 (boarders + parents + staff)	Weekdays	1	6.30pm - 9.30pm	Multi-Purpose Hall	120 (boarders + parents + staff)
Boarders Xmas Dinner	Weekdays	6.30pm - 9.30pm	Magnolia Room	140 (boarders + parents + staff)	Weekdays	1	6.30pm - 9.30pm	Multi-Purpose Hall	140 (boarders + parents + staff)
Parent Event	Weekday	NA	NA	NA	Weekday	4	During school hours	Research Centre	50 parents
Book week activities	Weekday	During school hours	Senior/Junior Library	Students only	Weekday	5	During school hours	Research Centre	Students + parental involvement
Boarders after school tutorials	Weekdays	3.20pm - 9pm	Lenthall Building	70 students/tutors mix	Weekday	Weekdays throughout the yr	3.20pm - 9pm	Research Centre	70 students/tutors mix

*Cloisters refers to the grass area west of the central artificial netball courts

Additional notes:

Currently Moriah College hold one event at DJSC per year - requires week of rehersal also - they will not be using new auditorium - remain in the DJSC
Currently Paddington Public hold one event at DJSC per year (approx. Sep 20) with an audience of approx. 200 - they will not be using new auditorium - remain in the DJSC
BTC holiday program currently occurs on weekdays during vacation period between the hours of 7.30am and 6pm and attracts approx. 60 people per day