ACOUSTICS AND AIR

MINTO WAREHOUSING & LOGISTICS HUB

NOISE & VIBRATION IMPACT ASSESSMENT

REPORT NO. 16048
VERSION A

APRIL 2016

PREPARED FOR

TACTICAL GROUP
LEVEL 15, 124 WALKER STREET
NORTH SYDNEY NSW 2060

WILKINSON MURRAY

DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	14 March 2016	Lee Hudson	John Wassermann
A	Final	5 April 2016	Lee Hudson	John Wassermann

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.

Celebrating 50 Years in 2012
Wilkinson Murray is an independent firm established in 1962, originally as Carr & Wilkinson. In 1976 Barry Murray joined founding partner Roger Wilkinson and the firm adopted the name which remains today. From a successful operation in Australia, Wilkinson Murray expanded its reach into Asia by opening a Hong Kong office early in 2006. 2010 saw the introduction of our Queensland office and 2011 the introduction of our Orange office to service a growing client base in these regions. From these offices, Wilkinson Murray services the entire Asia-Pacific region.

TABLE OF CONTENTS

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.

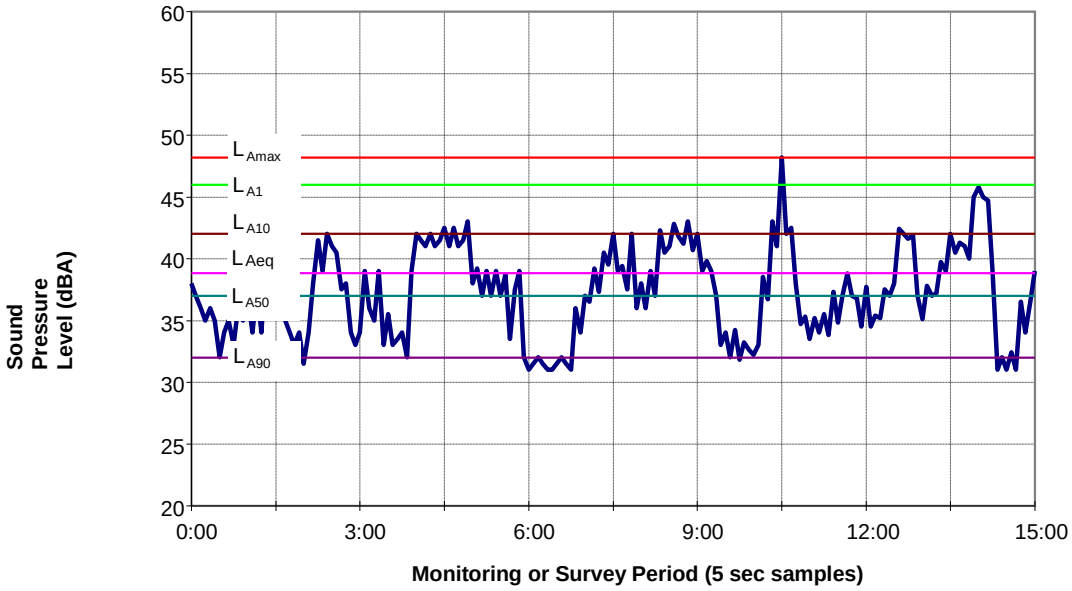
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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

Wilkinson Murray Pty Limited has been commissioned to undertake an assessment of the noise emissions associated with the proposed construction and operation of a Warehouse and Logistics Hub (WH & LH) at 5 and 9 Culverston Road, Minto. This assessment has been prepared to form part of the Environmental Impact Statement to be submitted to the Department of Planning and Environment for the State Significant Development.

The primary purpose of this report is to determine the potential impacts of noise emissions associated with heavy vehicle movements on the site access roadways, loading/unloading operations and mechanical plant and equipment upon nearby residential receivers. Particular reference has been made to the potential for sleep disturbance due to short duration, high noise level events occurring during the night time. Noise emissions during construction works and road traffic noise generated by the project are also addressed.

The key issues to be addressed as identified in the Secretary's Environmental Assessment Requirements (SEARS), together with the relevant cross-reference, are documented in Table 1-1.

Table 1-1 SEARS – Key Issues

SEARS – Noise and Vibration	Report Reference
A description of all potential noise and vibration sources during the construction and operational phases of the development, including on and off-site traffic noise.	Sections 5.1.1, 5.2.1, 5.3, 5.4, 5.5
A noise impact assessment, including a cumulative noise impact assessment in accordance with relevant Environment Protection Authority Guidelines.	Sections 5.1.3, 5.1.4, 5.2.1, 5.2.2, 5.3.1, 5.3.2, 5.4, 5.5
Details of noise mitigation, management and monitoring measures.	Section 6

This report presents the assessment methodology, regulatory criteria relevant to continuous and short duration operational noise, construction works and road traffic. Where required, recommendations have been included to ensure operations do not result in any adverse noise impacts upon the surrounding community.

2 PROJECT DESCRIPTION

2.1 Site Location

The proposed development site is located at 5 and 9 Culverston Road, Minto, covering an area of approximately 29.63ha. The site is bounded by Airds Road to the north and west and Rose Payten Drive to the south which is elevated with respect of the site. To the east the site adjoins a drainage corridor and the Main Southern Railway line.

The site is currently used for a vehicle storage and processing facility with hardstand, shade structures and a warehouse building currently existing. Access to the site is via Culverston Road from the round-about intersection of Culverston Road and Airds Road.

The site is located within the Campbelltown LGA, approximately 50km south-west of the Sydney CBD. It is in close proximity to major transport infrastructure including the Hume Motorway Narellan Road (A9), Camden Bypass, Camden Valley Way and the M7.

The subject site is surrounded by similar industrial and warehouse developments. The nearest residential development is located in the suburbs of Woodbine, approximately 300m to the west and Leumeah, approximately 500 m to the east.

The location of the site and surrounding land uses are shown in Figure 2-1 and Figure 2-2.

Figure 2-1 Site Location

Image supplied by Willow Tree Planning courtesy of SIX Maps

Figure 2-2 Site & Surrounding Development

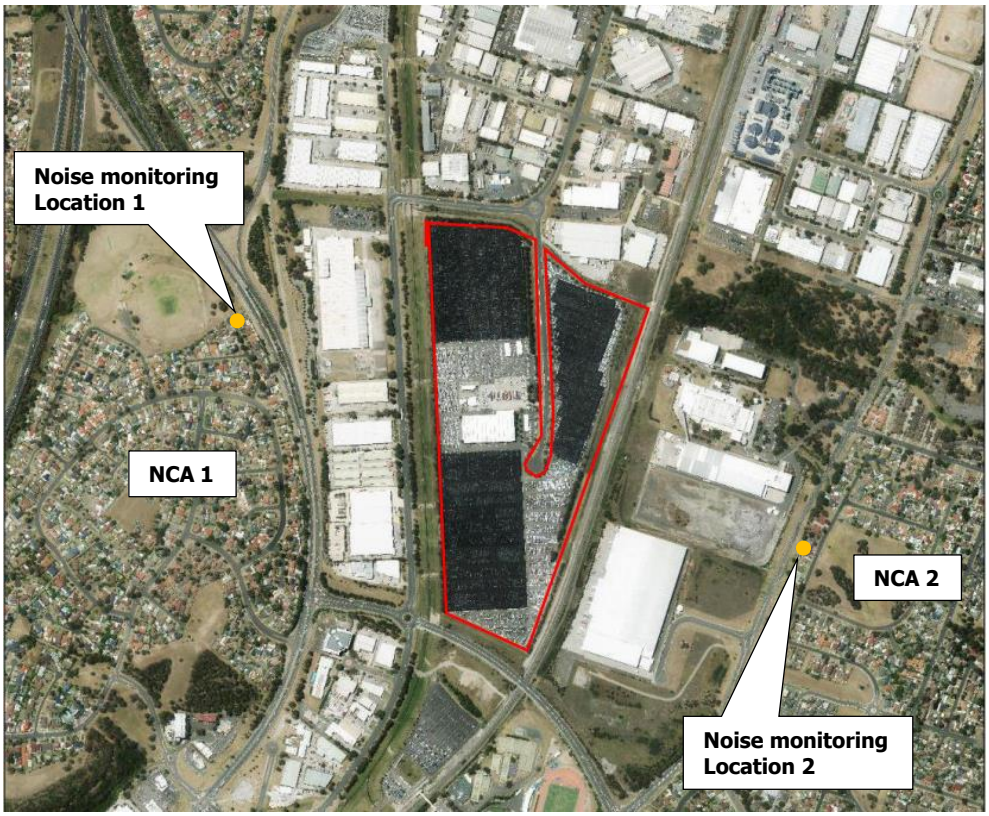


Image supplied by Willow Tree Planning courtesy of SIX Maps

2.2 Proposed Development

The project involves developing the site for the purpose of a Warehouse Logistics Hub. Use of the facilities will be for warehousing and distribution on a 24 hour, 7 day basis, consistent with surrounding operations.

The proposed development will be undertaken in three stages and includes:

- Four (4) warehouses including a total of four (4) offices, loading docks and car parking.
  - **Warehouse 1A** – approx. 40,000sqm GFA

    Office – approx. 2,000sqm GFA
  - **Warehouse 1B** – approx. 22,000sqm GFA;

    Office – approx. 1,000sqm
  - **Warehouse 1C** – approx. 22,000sqm GFA;

    Office – approx. 2,300sqm
  - **Warehouse 1D** – approx. 23,000sqm GFA;

    Office – approx. 1,00sqm

Total Building Area = approx. 112,000sqm

- Approximately 6ha for storage associated with warehousing and logistics.
- 200 employees.

The warehouses will be accessed by a total of 71 loading docks, 16 of which are recessed. Goods will arrive and depart from Culverston Road. Light vehicles would park in the allocated parking area adjacent to each warehouse, and heavy vehicles would progress to the truck loading/unloading areas alongside each warehouse. Once in location these trucks would be loaded/unloaded via manual handling equipment. Loaded trucks would then be distributed to the designated destination via the nearby major road network.

The proposed warehouse buildings will be steel-framed with precast concrete wall panel dado walls (to approx. 2.4 m height) and metal cladding wall panels above and metal roof sheeting. The maximum ridge height is generally 13.7 m.

An external paved storage area will receive large freight on heavy vehicles direct from Culverston Road at an entrance in the northern and southern ends of the storage area. Heavy vehicles will enter and exit through these points. Empty heavy vehicles would then either circulate around the eastern perimeter of the storage area to the cul-de-sac at the southern end of Culverston Road to exit the site, or continue to warehouse 1A for re-loading and distribution to market.

The external storage area would operate in conjunction with warehouse 1A initially, with potential for future association with subsequent warehouse stages if operations require this service. The storage area would be used for the temporary storage of large freight, some of which will be containerised. The large freight would then be forwarded internally within the site to warehouse 1A for processing, assembly, and subsequent distribution to customers via the nearby major road network.

3 EXISTING NOISE ENVIRONMENT

3.1 Surrounding Environment

The environment immediately surrounding the project site is occupied by existing or developing industrial premises. The nearest residential communities to the proposed WH&LH are Woodbine, located approximately 300 m to the west and Leumeah / Minto, approximately 500 m to the east. The noise environment is generally controlled by noise emissions from road traffic on the surrounding road network.

In terms of surrounding receivers, there are two noise environments to be characterised:

- Residential receivers in Woodbine – separated from the industrial area by Campbelltown Road.
- Residential receivers in Leumeah/Minto – separated from the industrial area by Pembroke Road.

3.2 Ambient Noise Survey

In order to establish the existing ambient noise environment of the area, unattended environmental noise monitoring was conducted at two (2) locations between Wednesday 2 March 2016 and Wednesday 9 March 2016.

The instrumentation used for the survey consisted of two (2) Acoustic Research Laboratories (ARL) Environmental Noise Loggers Type EL-215 (serial number 194449 - Location 1 and serial number 194637 – Location 2) both fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The selected monitoring locations, which are shown in Figure 2-2, were:

- **Location 1** (**Woodbine Residential Area):** The logger was located in the rear yard of the residential property at 19 Bungan Place, Woodbine to establish the ambient noise environment at residential receivers on the western side of the industrial area.
- **Location 2 (Leumeah/Minto Area):** The logger was located in the rear yard of the residential property at 22 Kimberley Street, Leumeah to establish the ambient noise environment at residential receivers on the eastern side of the industrial area.

Both measurement locations were primarily dictated by accessibility and security issues for the instrumentation.

The measured data was processed according to the NSW EPA's *Industrial Noise Policy* (INP) assessment time periods.

Table 3-1 details the RBL (background) and L_{Aeq} noise levels recorded during the daytime, evening and night time periods Data affected by adverse meteorological conditions was removed from the data prior to processing.

Table 3-1 Measured Ambient Noise Levels Corresponding to NSW INP Assessment Time Periods

Logger Location	Noise Level – dBA re 20 µPa					
	Daytime 7am – 6pm		Evening 6pm – 10pm		Night Time 10pm – 7am	
	RBL [1]	L_{Aeq} [2]	RBL	L_{Aeq}	RBL	L_{Aeq}
Location 1	54	62	52	61	43	60
Location 2	48	58	46	57	40	53

Note 1: The RBL noise level is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

Note 2: The LAeq is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

3.3 Discussion of Results

The ambient noise survey results reflect a noise environment principally dominated by traffic on surrounding roads, general urban activities and other environmental noise sources (birds, insects, aircraft, community activity etc). The measurements show daytime background L_{A90} noise levels generally ranging between 49 dBA and 56 dBA at receivers on the western side of Campbelltown Road and between 44 dBA and 50 dBA at the residential area to the east of Pembroke Road.

No significant shift in levels was observed during the evening period, due to the influence of road traffic.

During the night time period (ie. between 10.00 pm and 7.00 am), background L_{A90} noise levels fell to 43 dBA and 40 dBA at the western and eastern residential areas, respectively.

4 ASSESSMENT CRITERIA

4.1 Operational Noise Emissions

4.1.1 Continuous Operational Noise

The NSW Environment Protection Authority (EPA) oversee the NSW *Industrial Noise Policy 2000* which provides a framework and process for deriving noise criteria for consents and licences that enable the EPA and others to regulate premises that are scheduled under the Protection of the Environment Operations Act 1997.

The *INP* criteria for industrial noise sources have two components:

- Controlling the *intrusive* noise impacts for residents and other sensitive receivers in the short-term; and
- Maintaining noise level *amenity* for particular land uses for residents and sensitive receivers in other land uses.

Intrusiveness Criterion

For assessing intrusiveness, the background noise level must be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than 5 dBA above the measured background level (L_{A90}).

Amenity Criterion

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. If present, the existing noise level from industry is generally measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion. For high-traffic areas the amenity criterion for industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 10 dB.

The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. In order to determine the amenity noise goal, the maximum ambient L_{Aeq} noise levels within an area should not normally exceed the acceptable noise levels specified in Table 4-1. Where existing L_{Aeq} noise levels approach or exceed the acceptable noise levels given in Table 4-1, L_{Aeq} noise design goals are set below the existing L_{Aeq} levels in order to limit any further increase or "creep" in the ambient levels.

An extract from the NSW *INP* that relates to the amenity criteria recommended for surrounding residential receivers (Urban Amenity Area) is given in Table 4-1.

Table 4-1 Amenity Criteria – Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day [1]	Recommended L_{Aeq} [2] Noise Level	
			Acceptable	Recommended Maximum
Residence	Urban [3]	Day	60 dBA	65 dBA
		Evening	50 dBA	55 dBA
		Night	45 dBA	50 dBA

Note 1: Daytime 7.00 am-6.00 pm; Evening 6.00 pm-10.00 pm; Night Time 10.00 pm-7.00 am, Sundays & Public Holidays, Daytime 8.00 am-6.00 pm; Evening 6.00 pm-10.00 pm; Night Time 10.00 pm-8.00 am.
Note 2: The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
Note 3: Based upon the results of ambient noise monitoring, the existing noise environment most closely aligns with an "Urban" noise amenity area.

The project-specific goals for continuous nature operational noise emissions associated with loading and unloading activities, vehicular movements on-site and mechanical plant become the lower, or more stringent of the intrusive and amenity criteria and are shown in bold in Table 4-2.

Table 4-2 Assessment Criteria for Continuous Operational Noise Emissions

Location	Area Classification	Period	ANL [1] $L_{Aeq(period)}$ dBA	RBL [2] $L_{A90(15min)}$ dBA	$L_{Aeq(period)}$ Noise Level dBA	Criteria for New Sources [3]	
						Intrusive [4] $L_{Aeq(15min)}$	Amenity $L_{Aeq(period)}$
Woodbine (western receivers)	Urban	Day	60	54	62	59	52
		Evening	50	52	61	57	51
		Night	45	43	60	48	50
Leumeah / Minto (eastern receivers)	Urban	Day	60	48	58	53	56
		Evening	50	46	57	51	47
		Night	45	40	53	45	43

Note 1: Recommended – ANL Acceptable Noise Level.
Note 2: RBL – Rating Background Level.
Note 3: Assuming existing noise levels unlikely to decrease in the future.
Note 4: Intrusive criterion only applicable to residential receivers.

4.1.2 Short Duration Events - Sleep Disturbance

Noise sources of short duration and high level that may cause disturbance to sleep if occurring during the night time are not adequately addressed by the long-term-noise assessment procedure required by the *INP*.

The approach currently recommended by the EPA to assess short duration, high level noise sources with the potential to cause sleep disturbance is to apply an initial screening criterion of background plus 15 dBA (as described in the Application Notes to the *INP*), and to undertake further detailed analysis if the screening criterion cannot be achieved. The sleep disturbance screening criterion applies outside bedroom windows during the night time period.

Where the screening criterion cannot be met, the additional analysis should consider the number of potential sleep disturbance events during the night, the level of exceedance and noise from other events. It may also be appropriate to consider other guidelines including the *NSW Road Noise Policy* (RNP) which contains additional guidance relating to potential sleep disturbance impacts.

A review of research on sleep disturbance in the RNP indicates that in some circumstances, higher noise levels may occur without significant sleep disturbance. Based on currently available research results, the *RNP* concludes that:

- "Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions."
- "One or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA, are not likely to affect health and wellbeing significantly."

It is generally accepted that internal noise levels in a dwelling, with the windows "normally" open, are 10 dBA lower than external noise levels. Based on a worst case minimum attenuation, with windows open, of 10 dBA, a short-term external noise level of 60 dBA to 65 dBA is unlikely to cause awakening reaction. One or two noise events per night with maximum external noise levels of 75 dBA to 80 dBA are not likely to affect health and wellbeing significantly.

Based on night time RBLs of **43 dBA and 40 dBA** (established in accordance with *INP* procedures) at the nearest potentially sensitive residential properties to the west and east of the project site, respectively, the applicable sleep disturbance criteria become **58 dBA and 55 dBA**.

4.2 Road Traffic Noise

The *NSW Road Noise Policy* (2011) was released by the EPA to replace the *Environmental criteria for road traffic noise* (1999) from 1 July 2011. The key provisions of the policy are an emphasis on the use of land use planning, better road design and vehicle noise emission control to avoid or minimise road traffic noise impacts. The assessment criteria for residences potentially affected by additional traffic generated by land use developments on arterial and sub-arterial roads and on local roads are summarised in Table 4-3.

Table 4-3 Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Development	Assessment Criteria – dB(A)	
		Day (7am-10pm)	Night (10pm-7am)
Freeway / arterial / sub-arterial roads	Existing residences affected by **additional traffic** on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,15hr}$, 60 (external)	$L_{Aeq,9hr}$ 55 (external)
	Relative Increase Criteria	Existing traffic $L_{Aeq,15hr}$ + 12 dB (external)	Existing traffic $L_{Aeq,9hr}$ + 12 dB (external)

Where predicted noise levels exceed the project-specific noise criteria, an assessment of all feasible and reasonable mitigation options should be considered. The *RNP* states that *an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person*.

4.3 Construction Noise

The NSW EPA released the "*Interim Construction Noise Guideline*" (ICNG) in July 2009 for the management of construction works noise.

The guideline promotes a best practicable means approach to the management of noise emissions from construction in order to allow works to proceed during recommended standard hours. Additional constraints apply to minimise potential impacts upon sensitive receivers where works are proposed outside these standard hours.

The *ICNG* recommends the following approaches to mitigating adverse noise impacts from construction sites.

4.3.1 Hours of Construction

Where possible, the *ICNG* recommends confining work times to those outlined in Table 4-4.

Table 4-4 Standard Hours for Construction

Day	Preferred Construction Hours
Monday to Friday	7.00 am to 6.00 pm
Saturdays	8.00 am to 1.00 pm
Sundays or Public Holidays	No construction

4.3.2 Construction Noise Assessment Method

The *ICNG* recognises that people are usually annoyed more by noise from longer-term works than by the same type of works occurring for only a few days. For this reason the Guideline identifies two methods of assessing noise from construction:

- The quantitative assessment method which applies to long-term duration work.
- The qualitative assessment method which applies to short-term duration work.

Quantitative Assessment Method

The *ICNG* recommends that the $L_{Aeq,15min}$ noise levels arising from a construction project, measured within the curtilage of an occupied noise-sensitive premises (ie. at boundary or within 30 m of the residence, whichever is the lesser), should not exceed the levels indicated in Table 4-5. For industrial premises an external level of 75 dBA is recommended.

Table 4-5 Recommended General Construction Noise Management Levels for Residences

Period of Noise Exposure	$L_{Aeq,15min}$ Construction Noise Management Level
Recommended Standard Hours	Noise affected[1] RBL[2] + 10 dBA
	Highly noise affected[3] 75 dBA
Outside Recommended Standard Hours	Noise affected[1] RBL + 5 dBA

Notes: 1. The noise affected level represents the point above which there may be some community reaction to noise.
2. Refer to Glossary of Acoustic Terms.
3. The highly noise affected level represents the point above which there may be strong community reaction to noise.

Scope for Exceedances

Where predicted or measured levels exceed the Noise Management Levels the *ICNG* recommends that the proponent apply all "feasible and reasonable" work practices in order to minimise noise.

Where $L_{Aeq,15min}$ construction noise levels are predicted to exceed the "highly noise affected" level (ie. 75 dBA) the relevant authority (consent, determining or regulatory) may require respite periods to be observed. This may include restricting the hours that the noise-generating activities can occur, taking into account:

- times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences); and
- if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

The implementation of an effective community consultation and liaison programme is emphasised as being a critical tool in successfully handling adverse noise impacts from construction works.

The *ICNG* provides comprehensive guidance for work practices which aim to achieve *"desired environmental outcomes - there are no prescribed noise controls for construction works."*

Qualitative Assessment Method

The qualitative method for assessing construction noise is a simplified way to identify the cause of potential noise impacts. It avoids the need to perform complex predictions by using a checklist approach to assessing and managing noise. This is applicable for works that are not likely to affect an individual or sensitive land use for more than three weeks in total.

The following checklist for work practice can be used:

- Community notification.
- Operate plant in a quiet and efficient manner.
- Involve workers in minimising noise.
- Handle complaints.

The quantitative assessment method is considered appropriate for this project since the construction works will operate for more than 3 weeks.

4.3.3 Site Specific Construction Noise Management Levels

On the basis of the background noise logging results presented in Section 3, a summary of the noise management levels adopted for construction activities at residential receivers are presented in Table 4-6.

Table 4-6 Site-Specific Construction Noise Management Levels – Residences

Time Period	Construction Noise Management Level $L_{Aeq,15\ min}$ – dBA	
	NCA 1 [1]	NCA 2 [2]
Standard hours	64	58
Outside standard hours (evening)	57	51
Outside standard hours (night)	48	45

Note 1: Noise Catchment Area (NCA) 1 represents residential receivers in Woodbine to the west of Campbelltown Road.
Note 2: Noise Catchment Area (NCA) 2 represents residential receivers in Leumeah and Minto to the east of Pembroke Road.

The (external) noise management level for industrial receivers is 75 dBA.

4.4 Construction Vibration Criteria

4.4.1 Surface Structures

Most commonly specified "*safe*" structural vibration limits are designed to minimise the risk of threshold or cosmetic surface cracks, and are set well below the levels that have potential to cause damage to the main structure.

British Standard 7385: Part 2 – 1993 Guidelines

In terms of the most recent relevant vibration damage goals, 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 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 minimal risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration that are considered in the Standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (eg. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (guide values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 4-7 and graphically in Figure 4-1.

Table 4-7 Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

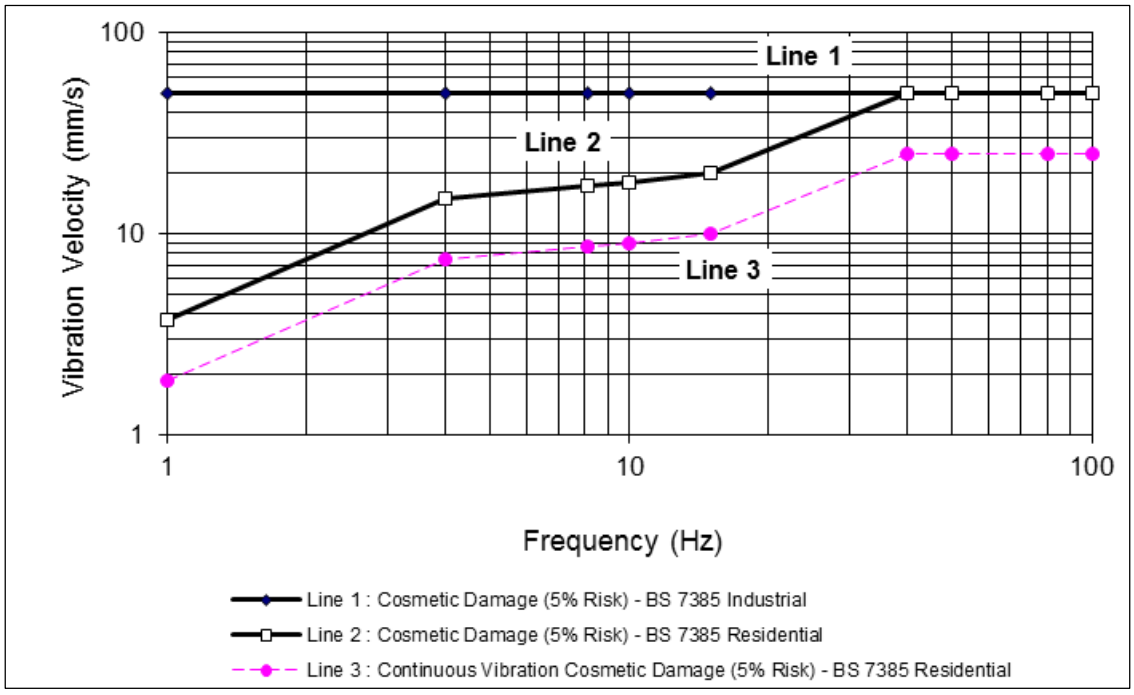
Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz & Above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The Standard states that the guide values in Table 4-7 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 4-7 may need to be reduced by up to 50%.

Activities such as rockbreaking, rock hammering and sheet piling are considered to have the potential to cause dynamic loading in some structures and it may therefore be appropriate to reduce the transient values for these activities by 50%.

Figure 4-1 Graph of Transient Vibration Guide Values for Cosmetic Damage



The Standard goes on to state that minor damage is possible at vibration magnitudes which are greater than twice those given in Table 4-7, and major damage to a building structure may occur at values greater than four times the tabulated values.

Fatigue considerations are also addressed in the Standard and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the guide values in Table 4-7 should not be reduced for fatigue considerations.

In order to assess the likelihood of cosmetic damage due to vibration, AS 2187 specifies that vibration measurements should be undertaken at the base of the building, and the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) should be compared with the guidance curves presented in Figure 4-1.

It is noteworthy that in addition to the guide values nominated in Table 4-7, the standard states that:

> *"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK."*

and also that:

"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."

4.4.2 Human Comfort

The NSW *Assessing Vibration: a technical guideline* (2006) is applicable for this project and is based on the guidelines contained in British Standard BS 6472-1992 *Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz*). The guideline refers only to human comfort considerations and nominates preferred and maximum vibration goals for critical areas, residences and other sensitive receivers.

The criteria in the guideline are non-mandatory: "they are goals that should be sought to be achieved through the application of all feasible and reasonable mitigation measures. Where all feasible and reasonable measures have been applied and vibration values are still beyond the maximum value, the operator would need to negotiate directly with the affected community".

Construction vibration can be continuous, intermittent or impulsive and the NSW vibration guideline provides different goals for each category. The continuous vibration goals are most stringent and higher vibration levels are acceptable for intermittent and impulsive vibration on the basis of the shorter exposure times. Examples of typical vibration sources are provided in Table 4-8.

Table 4-8 Examples of Vibration (NSW Vibration Guideline)

Continuous Vibration	Impulsive Vibration	Intermittent Vibration
Machinery, steady road traffic, continuous construction activity.	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, eg. occasional dropping of heavy equipment, occasional loading and unloading. Blasting is assessed using ANZECC (1990).	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer this would be assessed against impulsive vibration criteria.

The applicable human comfort vibration goals for continuous, intermittent and impulsive vibration sources are provided in Table 4-9, Table 4-10 and Table 4-11 respectively. In all cases, the vibration goals are expressed in terms of the RMS vibration velocity level in mm/s, measured in the most sensitive direction (z-axis).

The EPA vibration guideline notes the following in relation to the preferred and maximum vibration levels:

"There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Activities should be designed to meet the preferred values where an area is not already exposed to vibration. Where all feasible and reasonable measures have been applied, values up to the maximum value may be used if they can be justified. For values beyond the maximum value, the operator should negotiate directly with the affected community. Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short-term duration. An example is a construction or excavation project.

In circumstances where work is short-term, feasible and reasonable mitigation measures have been applied, and the project has a demonstrated high level of social worth and broad community benefits, then higher vibration values (above the maximum) may apply. In such cases, best management practices should be used to reduce values as far as practicable, and a comprehensive community consultation programme should be instituted."

Table 4-9 Preferred and Maximum Vibration Levels for Continuous Vibration

Building Type	Preferred Vibration Level RMS Velocity (mm/s)	Maximum Vibration Level RMS Velocity (mm/s)
Critical Working Areas (eg. hospital operating theatres, precision laboratories)	0.10	0.20
Residential Daytime	0.20	0.40
Residential Night time	0.14	0.28
Offices, schools, educational institutions and places of worship	0.40	0.80
Workshops	0.80	1.60

Note: Daytime is 7.00 am-10.00 pm and Night Time is 10.00 pm-7.00 am.

Table 4-10 Preferred and Maximum Vibration Levels for Intermittent Vibration (Vibration Dose Values)

Building Type	Preferred Vibration Dose Value ($m/s^{1.75}$)	Maximum Vibration Dose Value ($m/s^{1.75}$)
Critical Working Areas (eg. hospital operating theatres, precision laboratories)	0.10	0.20
Residential Daytime	0.20	0.40
Residential Night Time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80
Workshops	0.80	1.60

Note: For the definition of the Vibration Dose Value refer to the discussion in the following section. Daytime is 7.00 am-10.00 pm and Night Time is 10.00 pm-7.00 am.

Table 4-11 Preferred and Maximum Vibration Levels for Impulsive Vibration

Building Type	Preferred Vibration Level RMS Velocity (mm/s)	Maximum Vibration Level RMS Velocity (mm/s)
Critical Working Areas (eg. hospital operating theatres, precision laboratories)	0.1	0.2
Residential Daytime	6.0	12.0
Residential Nigh Time	2.0	4.0
Offices, schools, educational institutions and places of worship	13.0	26.0
Workshops	13.0	26.0

Note: Daytime is 7.00 am-10.00 pm and Night Time is 10.00 pm-7.00 am.

5 ASSESSMENT OF ENVIRONMENTAL NOISE EMISSIONS

5.1 Construction Noise

5.1.1 Construction Schedule, Plant and Equipment

Construction is estimated to take place over approximately 36 months. The works would commence in the first quarter of 2017 and be carried out over three (3) stages as follows:

- **Stage 1** – Warehouse 1A;
- **Stage 2** – Warehouse 1B + 1C; and
- **Stage 3** – Warehouse 1D

The construction works have been divided into three 'phases' which may potentially overlap. The order of the phases may also be subject to minor changes.

A summary of the indicative activities occurring throughout each of the construction phases is shown in Table 5-1.

Table 5-1 Construction Activities

Construction Phase	Activities
Phase 1 – Site preparation, bulk earthworks and utilities infrastructure	• Establishment of construction compound fencing and hoardings • Installation of temporary sediment and erosion control measures • Vegetation clearance and demolition of existing shade structures and removal of pavements as required • Installation of temporary site offices and amenities • Establishing construction traffic management devices • Set up of construction monitoring equipment • Stockpiling and/or placement of imported clean fill • Installation of permanent drainage and other utilities

Construction Phase	Activities
Phase 2 – Construction and fit-out of: Stage 1 Warehousing (approx. 40,000m2); Stage 2 Warehousing (approx. 44,000m2); Stage 3 warehousing (approx. 23,000m2)	• Importation and placement of engineering fill • Compaction of engineering fill • Excavation, foundation and floor slab installation • Erection of framework and structural walls • Installation of roofing and wall coverings • Internal fit out of building • Final connection of new utilities • Landscaping and surrounds • Preparation of warehouse access road and carpaking areas • Forming of new kerbs, gutters, medians and other structures • Construction of asphalt and concrete pavements • New line marking, lighting and sign posting • Removal of construction traffic management and opening of the facility to traffic
Phase 3 – Miscellaneous structural construction and finishing works	• Decommissioning/demobilisation of construction sites • Landscaping • Rehabilitation of affected areas • Post-construction condition surveys • Removal of construction environmental controls • Removal of construction ancillary facility related traffic signage

The typical construction activities and major plant and equipment associated with the works are summarised in Table 5-2. Sound power levels for the major items are included.

Table 5-2 Construction Works and Equipment Sound Power Levels

Plant	$L_{Aeq(15min)}$ Sound Power Level dBA re 10^{-5}W	Construction Activities			
		Period 1 – Site Preparation	Period 2 – Warehouse & Pavement	Period 3 – Warehousing	Period 4 – Miscellaneous
Loaders	107	✓	✓	✓	✓
Static and vibratory rollers, and high energy impact compaction	109	✓	✓	✓	✓
Mobile cranes	99	✓	✓	✓	✓
Excavators	102	✓	✓	✓	
Excavators with hammers	120	✓			
Backhoes	97	✓	✓	✓	✓
Crushing plant	110	✓			
Concrete agitators (or similar)	104	✓	✓	✓	✓
Concrete pumps	103		✓	✓	
Concrete saws	111	✓	✓	✓	✓
Air compressors	104	✓	✓	✓	✓
Jackhammers	111	✓	✓	✓	✓
Dozers	107	✓			
20-40 tonne articulated tipper trucks	107	✓	✓	✓	
Graders	107	✓	✓	✓	
Water trucks	109	✓	✓	✓	✓
Forklifts	102		✓	✓	✓
Small earthmoving equipment	103	✓	✓	✓	✓
Welder	98		✓	✓	✓

5.1.2 Construction Hours

Construction works would generally be undertaken during the standard daytime construction working hours, being:

- 7.00 am to 6.00 pm Monday to Friday.
- 8.00 am to 1.00 pm Saturday.
- No works on Sunday or Public Holidays.

Any works undertaken outside of these hours would be carried out in consultation with the relevant regulatory authorities. Works outside these hours that may be permitted would include:

- Any works which do not cause noise emissions to be audible at any nearby sensitive receptors or comply with the 'Outside Standard Construction Hours'.
- The delivery of materials which is required outside of these hours as requested by Police or other authorities for safety reasons.
- Emergency work to avoid the loss of lives, property and/or to prevent environmental harm.
- Any other work as approved through the Construction Noise and Vibration Management Plan.

5.1.3 Noise Prediction

Prediction of the noise levels potentially generated during typical activities and operations associated with the proposed construction works were carried out using Brüel & Kjær Predictor V10.10. This noise modelling software enables calculations to be performed using various recognised algorithms. Modelling of construction noise was carried out in accordance with ISO 9613.1 procedures.

Noise emissions from construction works have been predicted to representative receiver locations within the residential areas to the east and west of the project site. Modelling has been conducted for construction scenarios throughout each of the major phases based on the typical usage of all major plant items over a 15-minute period. Table 5-3, Table 5-4 and Table 5-5 detail the total received noise level at each receiver considered. The exceedances of the NMLs for all time periods have been shown in order to demonstrate the extent of potential noise impacts were construction works to be conducted outside hours.

Noise predictions have been conservatively assessed on the basis of the following:

- The concurrent operation of all plant and equipment during each scenario/activity.
- No acoustic shielding assumed for structures on site such as hoardings. The modelling includes only topographical shielding and surrounding (intervening) industrial premises.
- No mitigation measures are incorporated in the modelling.

Table 5-3 Predicted L_{Aeq} Construction Noise Levels – Phase 1

Rec.	Address	L_{Aeq} Construction Noise Level dBA Rockhammer / No Rockhammer	NCA	NML dBA			Exceedance of NML dBA		
				Day	Evening	Night	Day	Evening	Night
R1	26 Kippax Ave, Leumeah	38/35	NCA 2	58	51	45	0	0	0
R2	42 Leicester St, Leumeah	42/39	NCA 2	58	51	45	0	0	0
R3	22 Kimberley St, Leumeah	45/42	NCA 2	58	51	45	0	0	0
R4	42 Kimberley St, Leumeah	43/36	NCA 2	58	51	45	0	0	0
R5	401 Pembroke Rd, Minto	38/34	NCA 2	58	51	45	0	0	0
R6	32 Collaroy Rd, Woodbine	42/41	NCA 1	64	57	48	0	0	0
R7	5 Soldiers Pl, Woodbine	43/41	NCA 1	64	57	48	0	0	0
R8	28 Queenscliff Dr, Woodbine	47/45	NCA 1	64	57	48	0	0	0
R9	38 Queenscliff Dr, Woodbine	47/41	NCA 1	64	57	48	0	0	0
R10	7 Bungan Pl, Woodbine	46/40	NCA 1	64	57	48	0	0	0
R11	19 Bungan Pl, Woodbine	43/39	NCA 1	64	57	48	0	0	0

Table 5-4 Predicted L_{Aeq} Construction Noise Levels – Phases 2 & 3

Rec.	Address	L_{Aeq} Construction Noise Level dBA	NCA	NML dBA			Exceedance of NML dBA		
				Day	Evening	Night	Day	Evening	Night
R1	26 Kippax Ave, Leumeah	32	NCA 2	58	51	45	0	0	0
R2	42 Leicester St, Leumeah	37	NCA 2	58	51	45	0	0	0
R3	22 Kimberley St, Leumeah	39	NCA 2	58	51	45	0	0	0
R4	42 Kimberley St, Leumeah	37	NCA 2	58	51	45	0	0	0
R5	401 Pembroke Rd, Minto	34	NCA 2	58	51	45	0	0	0
R6	32 Collaroy Rd, Woodbine	36	NCA 1	64	57	48	0	0	0
R7	5 Soldiers Pl, Woodbine	37	NCA 1	64	57	48	0	0	0
R8	28 Queenscliff Dr, Woodbine	41	NCA 1	64	57	48	0	0	0
R9	38 Queenscliff Dr, Woodbine	42		64	57	48	0	0	0
R10	7 Bungan Pl, Woodbine	44	NCA 1	64	57	48	0	0	0
R11	19 Bungan Pl, Woodbine	39	NCA 1	64	57	48	0	0	0

Table 5-5 Predicted L_{Aeq} Construction Noise Levels – Phase 4

Rec.	Address	L_{Aeq} Construction Noise Level dBA	NCA	NML dBA			Exceedance of NML dBA		
				Day	Evening	Night	Day	Evening	Night
R1	26 Kippax Ave, Leumeah	30	NCA 1	58	51	45	0	0	0
R2	42 Leicester St, Leumeah	36	NCA 1	58	51	45	0	0	0
R3	22 Kimberley St, Leumeah	39	NCA 1	58	51	45	0	0	0
R4	42 Kimberley St, Leumeah	35	NCA 1	58	51	45	0	0	0
R5	401 Pembroke Rd, Minto	32	NCA 1	58	51	45	0	0	0
R6	32 Collaroy Rd, Woodbine	34	NCA 2	64	57	48	0	0	0
R7	5 Soldiers Pl, Woodbine	35	NCA 2	64	57	48	0	0	0
R8	28 Queenscliff Dr, Woodbine	38	NCA 2	64	57	48	0	0	0
R9	38 Queenscliff Dr, Woodbine	37	NCA 2	64	57	48	0	0	0
R10	7 Bungan Pl, Woodbine	38	NCA 2	64	57	48	0	0	0
R11	19 Bungan Pl, Woodbine	34	NCA 2	64	57	48	0	0	0

5.1.4 Discussion of Results

The levels of noise received during construction works will be dependent upon the location of plant across the site, the operational noise levels of the plant, the manner in which the equipment is operated and the number of items operating simultaneously. Levels can be expected to vary according to increased distance, shielding and variations in plant operations. From the predicted results shown in Table 5-3, Table 5-4 and Table 5-5, the daytime, evening and night time construction noise management levels will be achieved at all nearby residential receivers under typical construction operational scenarios across all phases of construction works.

5.2 Construction Vibration

5.2.1 Source Levels of Vibration

During construction activities, the major potential sources of vibration are likely to include plant associated with excavation and bulk earthworks, such as rockhammers, excavators, and compactors.

Vibration goals have been provided in **Section 4.4** of this report. As a guide, indicative working distances for typical items of vibration intensive plant are listed in Table 5-6. The indicative working distances are quoted for both "structural" damage and human comfort.

Table 5-6 Typical Vibration Emission Levels from Construction Plant

Plant Item	Rating / Description	Indicative Working Distance	
		Structural Damage (BS 7385)	Human Response (BS 6472) [1]
Small Hydraulic Hammer	(300 kg – 5-12t Excavator)	2 m	10 m
Medium Hydraulic Hammer	(900 kg – 12-18t Excavator)	5 m	25 m
Large Hydraulic Hammer	(1600 kg – 18-34t Excavator)	20 m	75 m
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	60 m
Excavator	≤ 30 t	10 m	15 m
Compactors	-	15 m	100 m
Dozer	-	2 m	10 m
Jackhammer	Hand held	1 m (Nominal)	Avoid contact with structure
Trucks	-	-	10 m

Note: 1. The working distances for Human Response assume that the source of the vibration is continuous throughout the 16-hour daytime period. Section 4.4.1 indicates that higher levels of vibration are acceptable when the vibration levels are intermittent or impulsive. The safe working distances are therefore considered to be conservative and it is likely that the safe working distances corresponding to a "low probability of adverse comment" would be less than indicated.

5.2.2 Vibration Levels at Surrounding Receivers

Human Comfort

The minimum distance from any residence to the location of construction plant operation exceeds that required for the human comfort criteria to be achieved.

Building Damage

The distances to residential receivers (and to surrounding industrial premises) exceed those applicable to safe working distances for building damage. Vibration levels due to construction

works are not predicted to result in damage to buildings.

5.3 Operational Noise

Potential sources of "continuous" noise emissions associated with the WH&LH operation include any mechanical ventilation plant and equipment (generally roof-mounted), trucks entering the site and proceeding to the loading docks, loading and unloading activities, trucks within the external paved storage area and outbound truck movements.

Other noise events likely to occur are of short – duration nature and include reversing alarms as vehicles reverse into the loading docks and impacts generated during loading and unloading activities.

Given the purpose of the facility is warehousing, no high noise level plant or activities will operate inside the buildings. As such, noise breakout from within the facility will not be acoustically significant.

On-site noise producing activities due to staff and visitor vehicles entering the site, doors slamming, engine start-ups and people conversing in the carpark are also expected however given the distances to the nearest surrounding residential properties, these activities are not considered to be acoustically significant.

5.3.1 Noise Prediction

Prediction of the noise levels potentially generated during typical operations of the WH&LH were carried out using Brüel & Kjær Predictor V10.10. Modelling of operational noise was carried out in accordance with ISO 9613.1 procedures.

Operational noise emissions have been predicted to the nominated representative receiver locations within the residential areas to the east and west of the project site. Modelling has been conducted of the overall WH&LH operation (ie. Stages 1, 2 and 3). The scenario adopted was considered representative of a typical 15-minute period involving vehicular movements on site, loading and unloading activities and building mechanical ventilation plant.

The assumptions adopted for assessment purposes are summarised as follows:

HVAC Mechanical Plant

Details of the proposed mechanical services design were not available at this stage of the project. Much of the HVAC mechanical plant and equipment required is likely to be roof-mounted. Such plant typically generates sound power levels of around 95 dBA. A total of nine (9) roof-mounted units (Warehouse 1A – three units and Warehouse 1B, 1C and 1D – two units per building) each operating concurrently with a sound power level of 95 dBA.

Loading and Unloading Activities and Vehicular Movements On-Site

The noise model includes two trucks travelling along Culverston Road, thirty six trucks idling in loading bays, eleven gas-powered forklifts distributed across the warehouse loading areas, two trucks within the paved storage area (one travelling along the eastern boundary) and a mobile crane/forklift in the paved storage area. All items are assumed to operate concurrently and continuously over a 15 minute period.

To assess the potential for sleep disturbance at surrounding residential premises due to high-level short duration activities that may take place during the night time period, reversing alarm operation and the noise levels generated due to impacts associated with loading/unloading (container dropping) have also been modelled.

Typical sound power levels for warehousing-related activities are included in Table 5-7.

Table 5-7 Sound Power Levels of Loading/Unloading and Vehicular Activities

Noise Source	Typical Sound Power Level L_W (dBA)
Reversing Alarm	110
Truck Engine – Semi-trailer idling /low speed manoeuvre	95
Truck (passby)	107
Forklift	103
Mobile Crane	98
Impacts (container dropping)	124

5.3.2 Predicted Operational Noise Levels

The noise levels generated during operation of the WH&LH will ultimately depend upon the location and number of vehicles, the length of time truck engines operate, forklift numbers, locations and operation. The total received $L_{Aeq(15\ minute)}$ noise levels at the nominated surrounding residences for the representative operation of the overall WH&LH are presented in Table 5-8. The predicted maximum $L_{A1(60\ second)}$ noise levels due to short duration high noise events that may potentially result in sleep disturbance are presented in Table 5-9.

Table 5-8 Predicted $L_{Aeq(15\ minute)}$ Operational Noise Levels at Residential Receivers

Rec.	Address	Predicted $L_{Aeq(15min)}$ Noise Level dBA	Criterion $L_{Aeq(15min)}$ dBA		
			Day	Evening	Night
R1	26 Kippax Ave, Leumeah	34	53	47	43
R2	42 Leicester St, Leumeah	38	53	47	43
R3	22 Kimberley St, Leumeah	40	53	47	43
R4	42 Kimberley St, Leumeah	34	53	47	43
R5	401 Pembroke Rd, Minto	35	53	47	43
R6	32 Collaroy Rd, Woodbine	40	52	51	48
R7	5 Soldiers Pl, Woodbine	36	52	51	48
R8	28 Queenscliff Dr, Woodbine	40	52	51	48
R9	38 Queenscliff Dr, Woodbine	38	52	51	48
R10	7 Bungan Pl, Woodbine	36	52	51	48
R11	19 Bungan Pl, Woodbine	35	52	51	48

Table 5-9 Predicted $L_{A1(60\ second)}$ Operational Noise Levels at Residential Receivers

Rec.	Address	Predicted $L_{A1(60\ sec)}$ Noise Level dBA		Sleep Disturbance Criterion $L_{A1(60\ sec)}$ dBA
		Reversing Alarms	Impacts	
R1	26 Kippax Ave, Leumeah	36	41	55
R2	42 Leicester St, Leumeah	39	46	55
R3	22 Kimberley St, Leumeah	43	49	55
R4	42 Kimberley St, Leumeah	36	46	55
R5	401 Pembroke Rd, Minto	35	45	55
R6	32 Collaroy Rd, Woodbine	42	43	58
R7	5 Soldiers Pl, Woodbine	42	44	58
R8	28 Queenscliff Dr, Woodbine	38	48	58
R9	38 Queenscliff Dr, Woodbine	43	39	58
R10	7 Bungan Pl, Woodbine	37	44	58
R11	19 Bungan Pl, Woodbine	36	44	58

Based upon the representative scenarios modelled for the overall operation of the WH&LH, continuous operational noise emissions due to HVAC plant operation, loading / unloading activities at the warehouse loading docks and the paved storage area and vehicular movements on-site comply with the project-specific assessment criteria for environmental noise emissions across all time periods.

Short duration events such as reversing alarm operation and impact-generated noise will comply with the project-specific criteria applicable during the night time period for assessment of potential sleep disturbance.

5.4 Operational Vibration

Vibration levels generated by the plant and equipment associated with the operational phase of the project will not give rise to significant levels of vibration. The limits applicable to human comfort and building damage will be achieved at surrounding residential and industrial properties.

5.5 Road Traffic Noise

Analysis of traffic movements generated as a result of the project has been carried out by Ason Group. Existing traffic volumes on the road network surrounding the site have been established by peak hour turning counts for Airds Road at the roundabout junctions of Culverston Road and Rose Payton Drive and at the intersection of Campbelltown Road and Rose Payton Drive. A 24 hour, 7 day tube count was carried out on Culverston Road. The results of the base counts together with the projected morning and afternoon peak traffic generated by the proposed WH&LH are shown in Table 5-10. The relative increase in the road traffic noise level generated as a result of the additional traffic is included.

Table 5-10 Existing and Projected Peak Traffic Flows and Relative Noise Level Increase

Location	AM Peak		Relative Increase in Noise Level dBA	PM Peak		Relative Increase in Noise Level dBA
	Existing	Projected		Existing	Projected	
Culverston Rd	94	253	+4	79	248	+5
Airds Rd north of Culverston Rd	446	454	<1	620	628	<1
Airds Rd south of Rose Payton Dr	672	680	<1	885	893	<1
Rose Payton Dr	1449	1473	<1	1531	1556	<1
Campbelltown Rd north of Rose Payten Dr	4042	4106	<1	4413	4481	<1
Campbelltown Rd south of Rose Payten Dr	3329	3385	<1	3753	3813	<1

Based upon the network analysis and traffic demand modelling, the additional traffic generated by the proposed WH&LH will not result in any significant increase in the existing levels of road traffic noise on the road network surrounding the project. There are no residential receivers on Airds Road and Culverston Road. Traffic noise levels on Culverston Road are expected to increase by up to 4 dBA as a result of the project. However, this increase will not significantly impact upon potentially sensitive receivers in neighbouring residential areas.

6 NOISE CONTROLS

Although construction noise levels are predicted to achieve the management levels applicable at surrounding residential communities, best practice mitigation and management measures are recommended to ensure noise emissions are minimised and will be described in a construction noise management plan.

The plan would be in accordance with the *ICNG*, and would include:

- Development of notification and negotiation procedure for receivers where noise impact cannot be mitigated to meet the criteria.
- A procedure for dealing with and responding to complaints.

7 CONCLUSION

An assessment of the noise impact associated with construction and operation of a new Warehousing and Logistics Hub (WH&LH) located at Minto in south-western Sydney. This assessment has been carried out in accordance with NSW regulatory requirements and this report is to form part of the Environmental Impact Statement to be submitted to the Department of Planning and Environment in support of the State Significant Development.

The scope of the assessment involved a survey of the existing noise environment; derivation and establishment of assessment criteria for noise emissions; a noise impact assessment relative to appropriate criteria; and recommendations for measures to minimise the potential for disturbance to surrounding residents. The findings are as follows:

Construction Noise and Vibration

Prediction of the noise generated during works involving typical construction plant demonstrate that the applicable noise management levels are likely to be achieved at all surrounding residential receivers.

Due to the distance of any potentially sensitive receivers or structures, vibration generated during construction works is not considered to be of significance.

Operational Noise

Although details of the proposed mechanical services design were not available at this stage of the project, based upon assumed roof-mounted HVAC plant and equipment, noise emissions are likely to achieve the criteria for continuous operational noise emissions at the nearest residential receivers to the east and west of the site.

Compliance with project specific INP noise goals can be achieved at all surrounding residential areas under typical operating conditions on the access roadway, the hardstand and loading dock and paved storage areas.

Reversing alarm operation and impact noise generated by loading/unloading activities during the night time will achieve recommended environmental assessment criteria for sleep disturbance.

Noise breakout from within the warehouse buildings is not considered to be of acoustical significance given the nature of the activities and the distance to surrounding receivers.

Operational Vibration

The operational phase of the development will not generate significant levels of vibration.

Road Traffic

Road traffic noise generated by the project will comply with the NSW *Road Noise Policy* guidelines. Existing levels of road traffic noise on the surrounding road network will not be significantly increased as a result of the proposal and emissions associated with individual vehicular events will be indistinguishable from existing traffic noise levels at surrounding residential receivers.

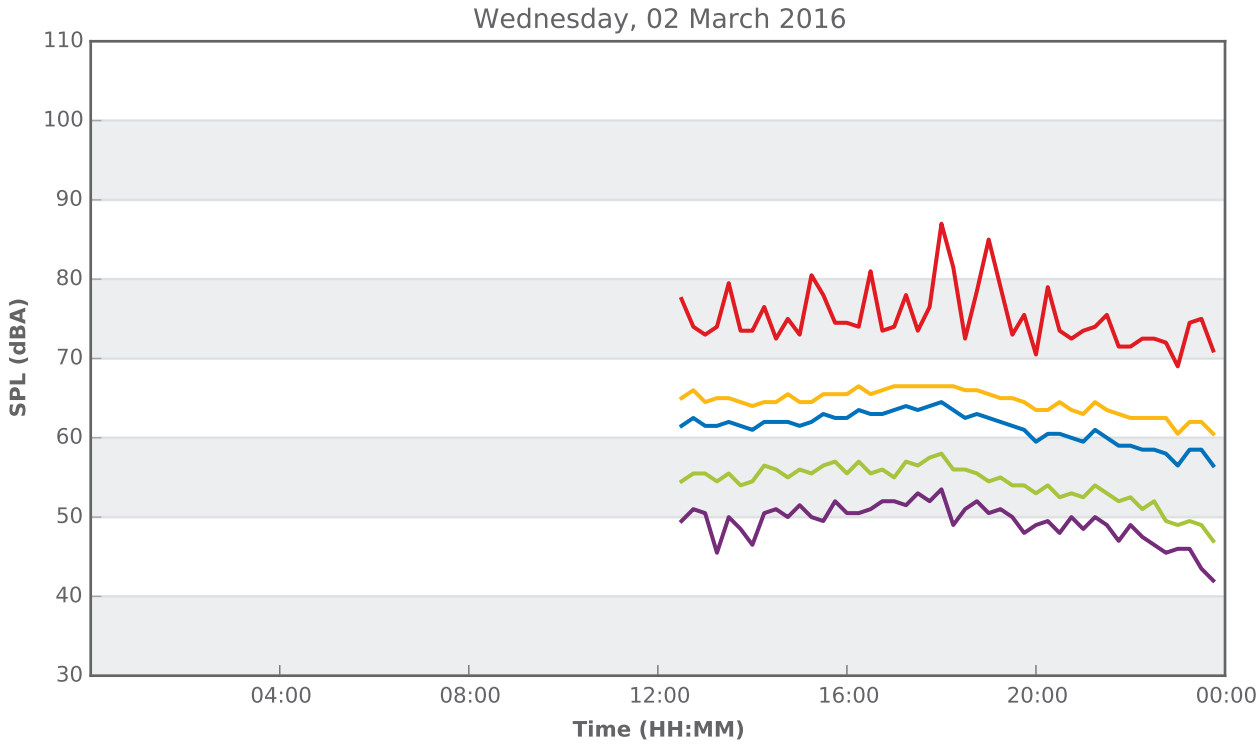
The existing road traffic noise level along Culverston Road is projected to increase by up to 5 dBA during peak periods. Given the location of the road within the development site, this increase will not adversely impact upon surrounding residential neighbourhoods.

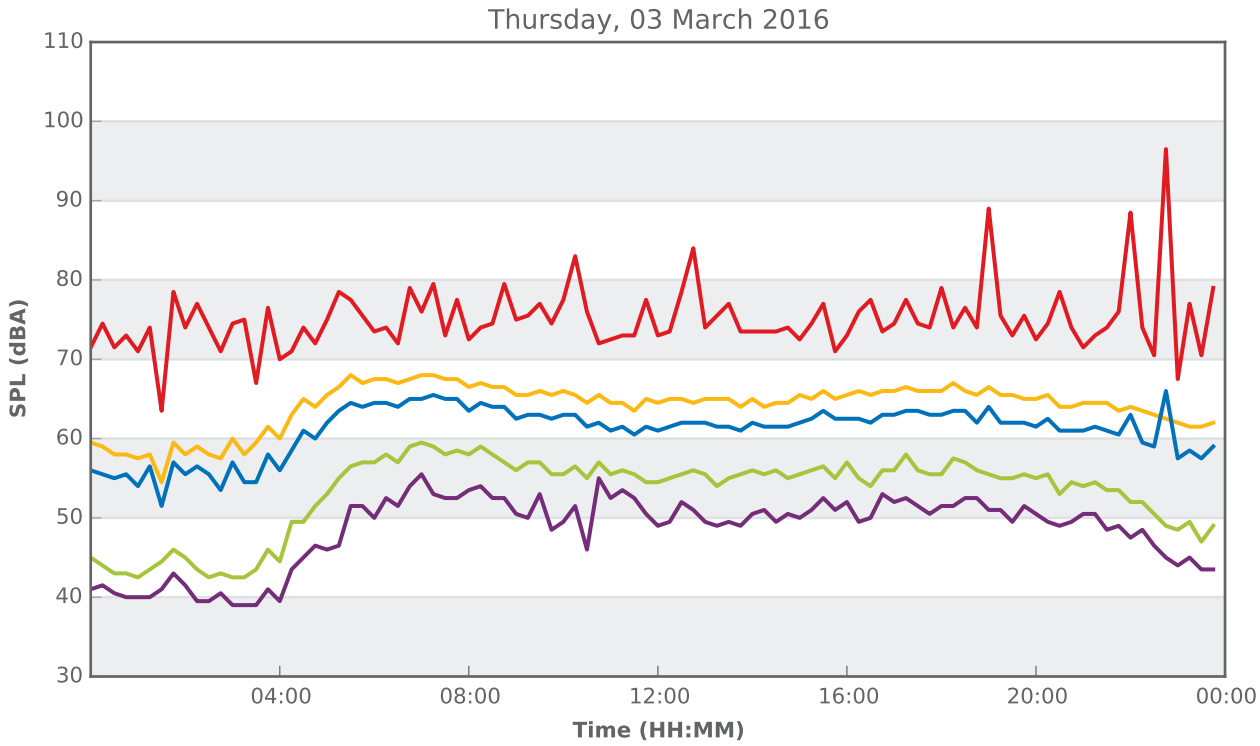
In conclusion, the proposed development is supported on the basis of acoustics.

APPENDIX A

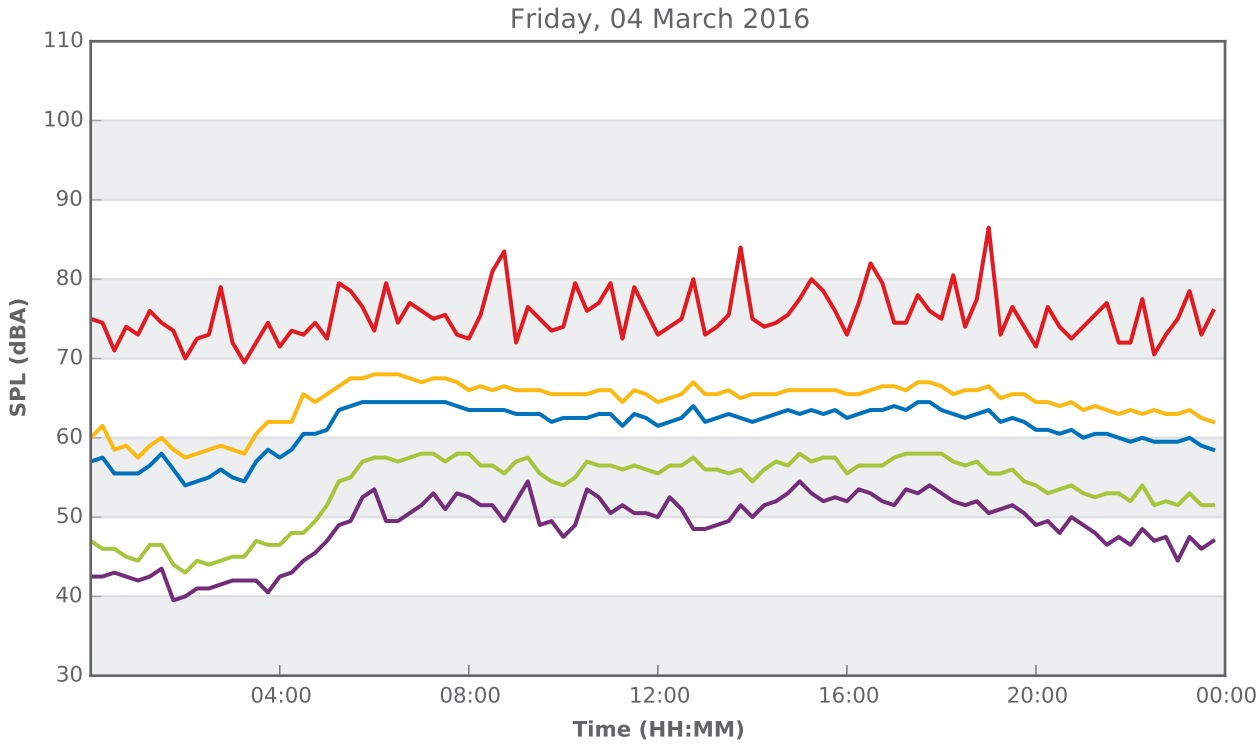
NOISE MONITORING RESULTS

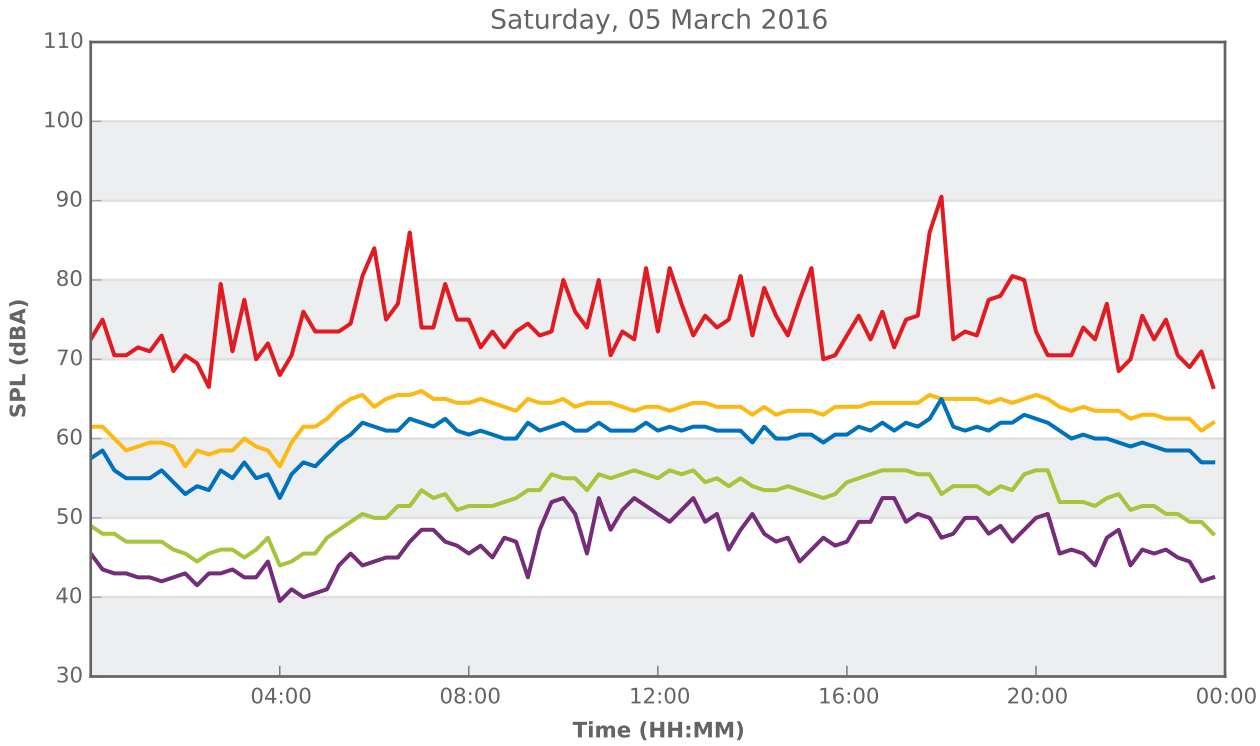
19 Bungan Place, Woodbine



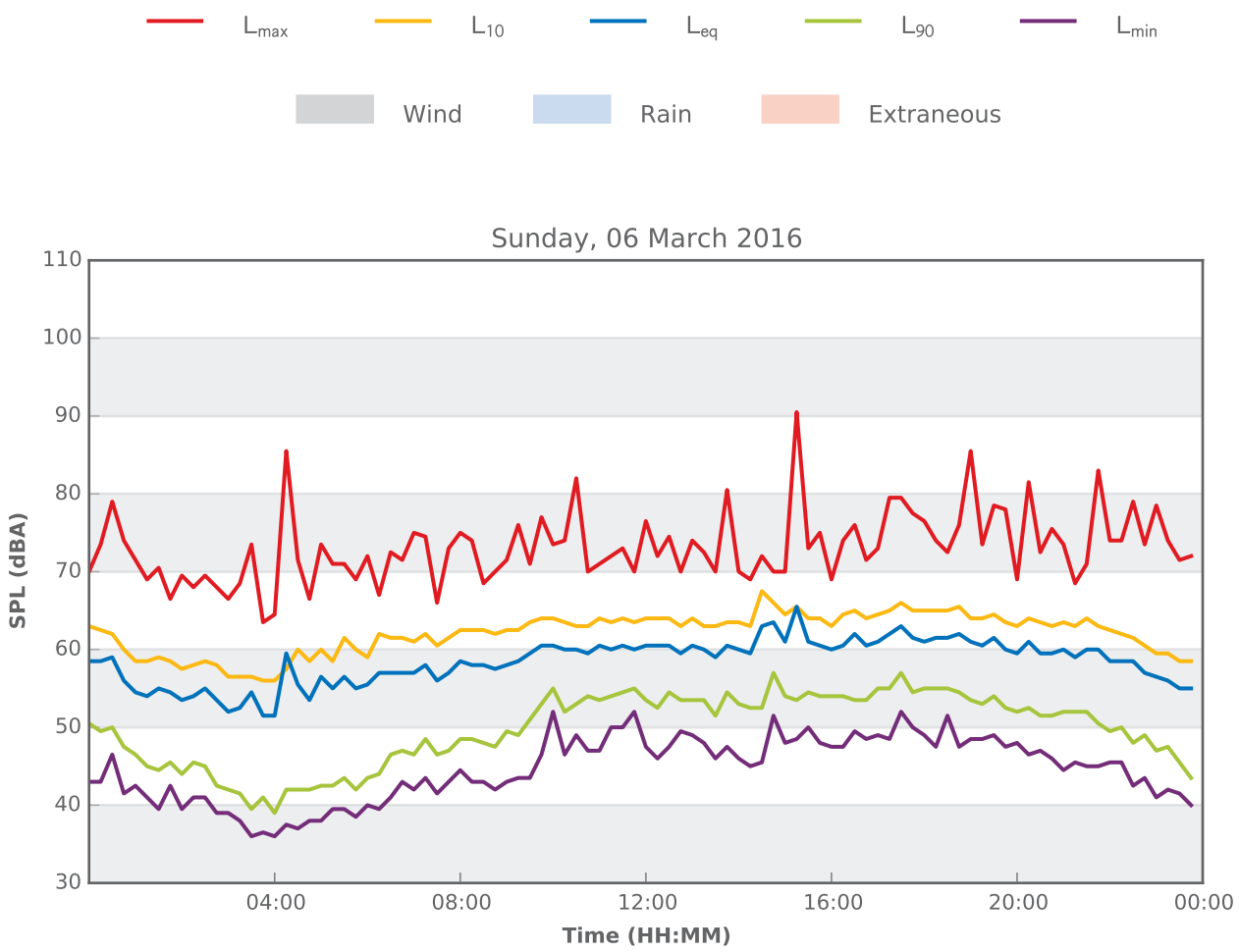


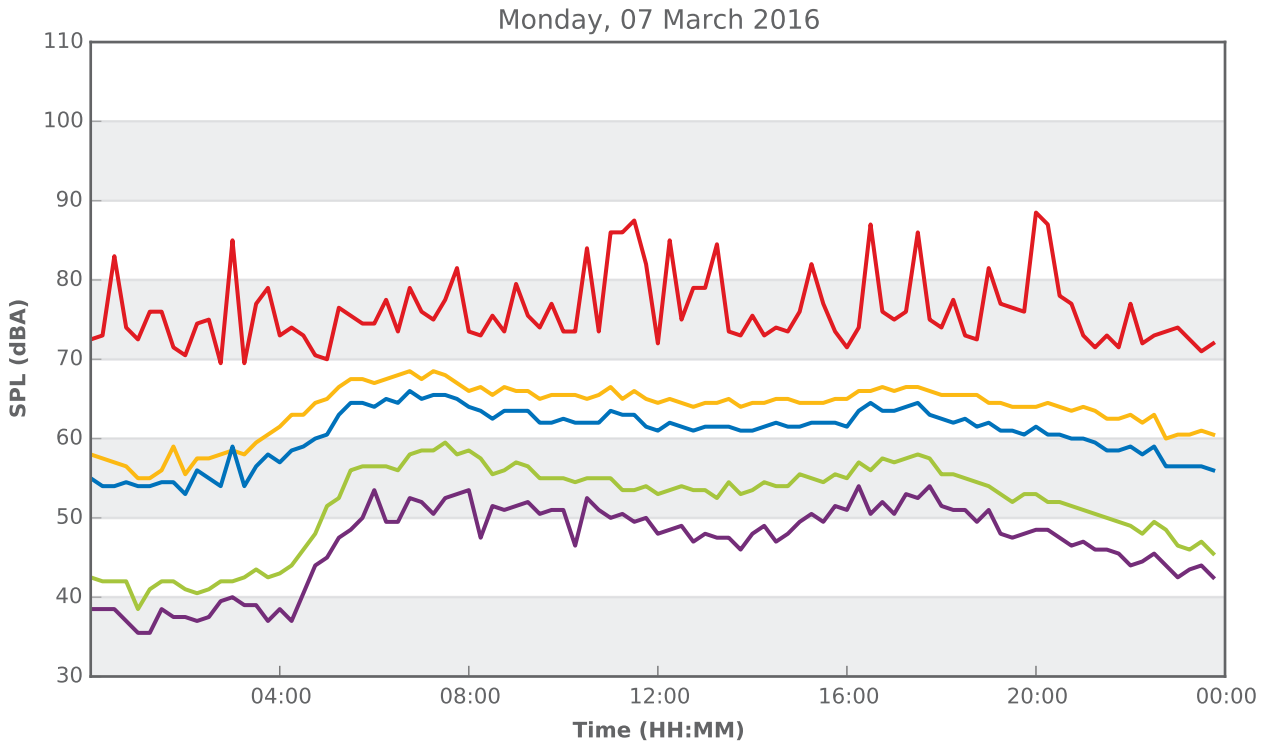
19 Bungan Place, Woodbine



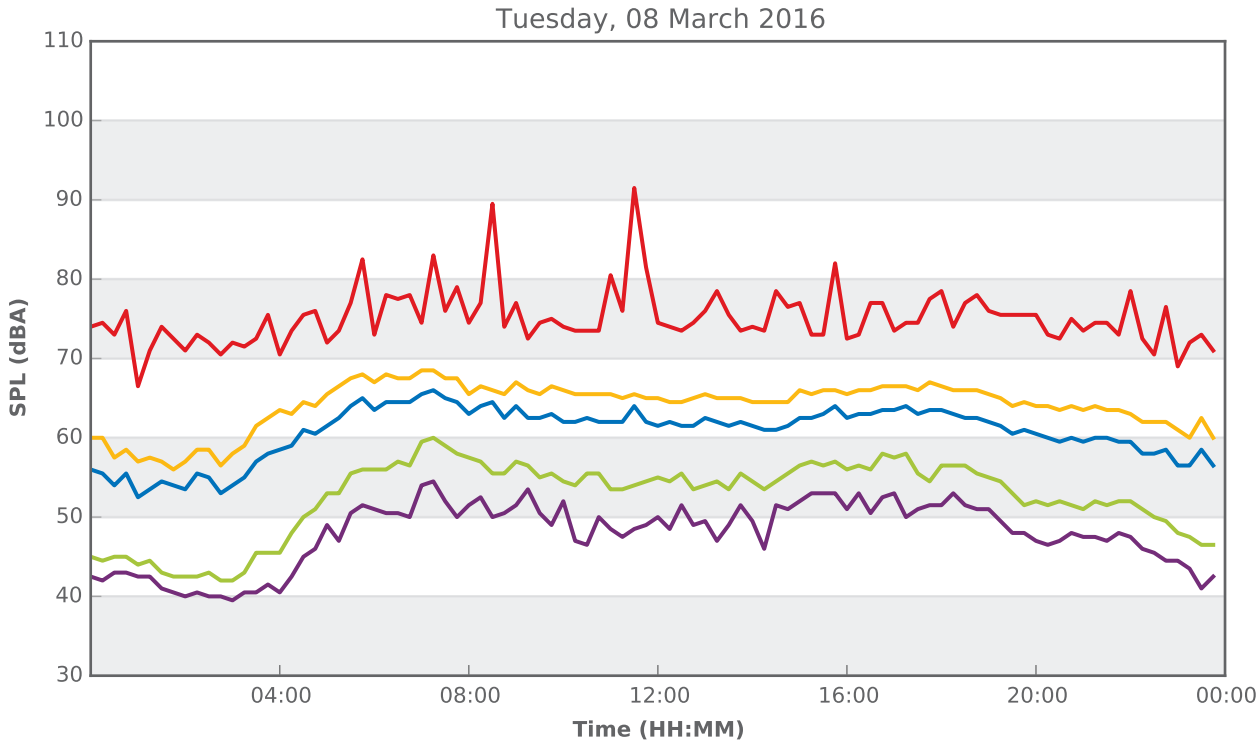


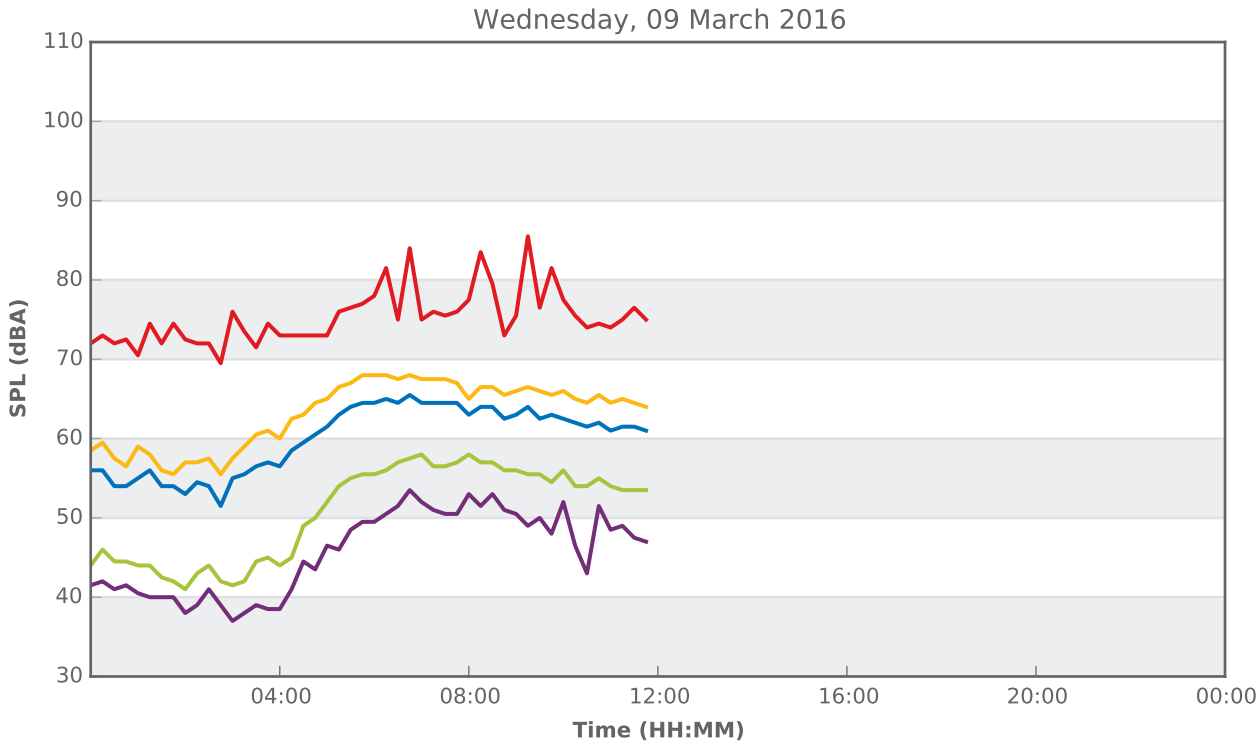
19 Bungan Place, Woodbine



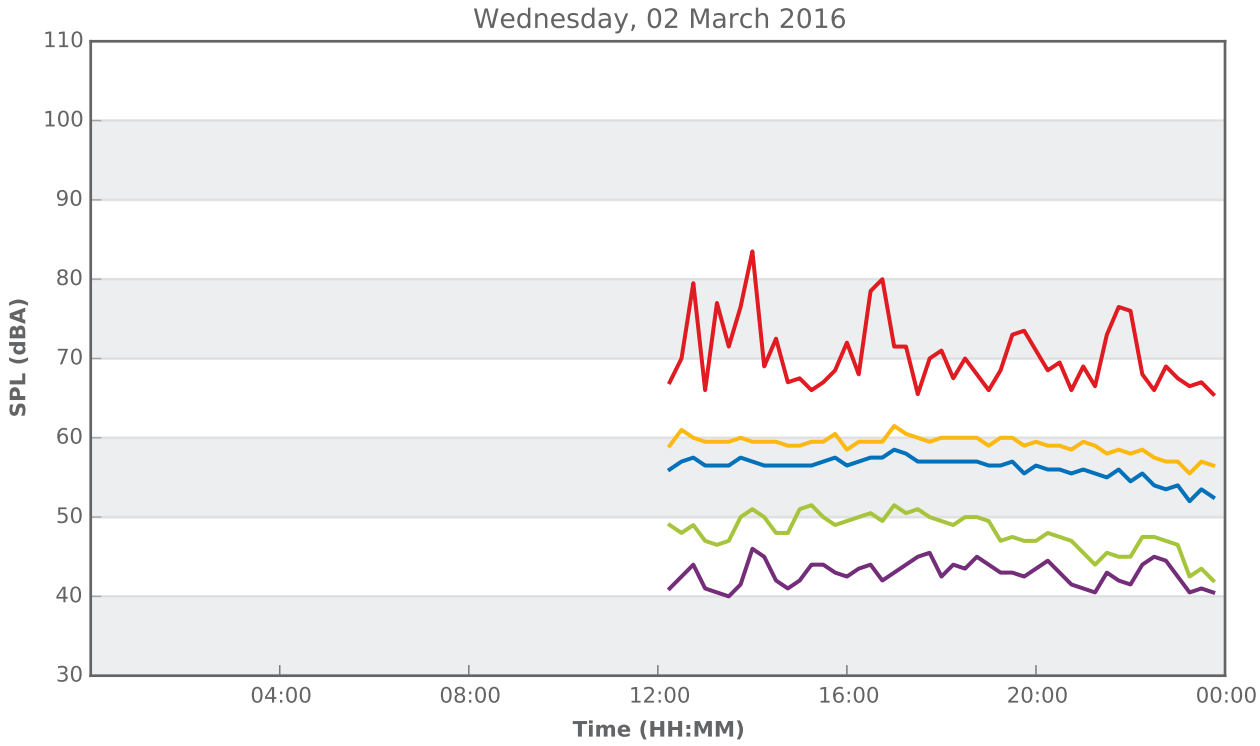


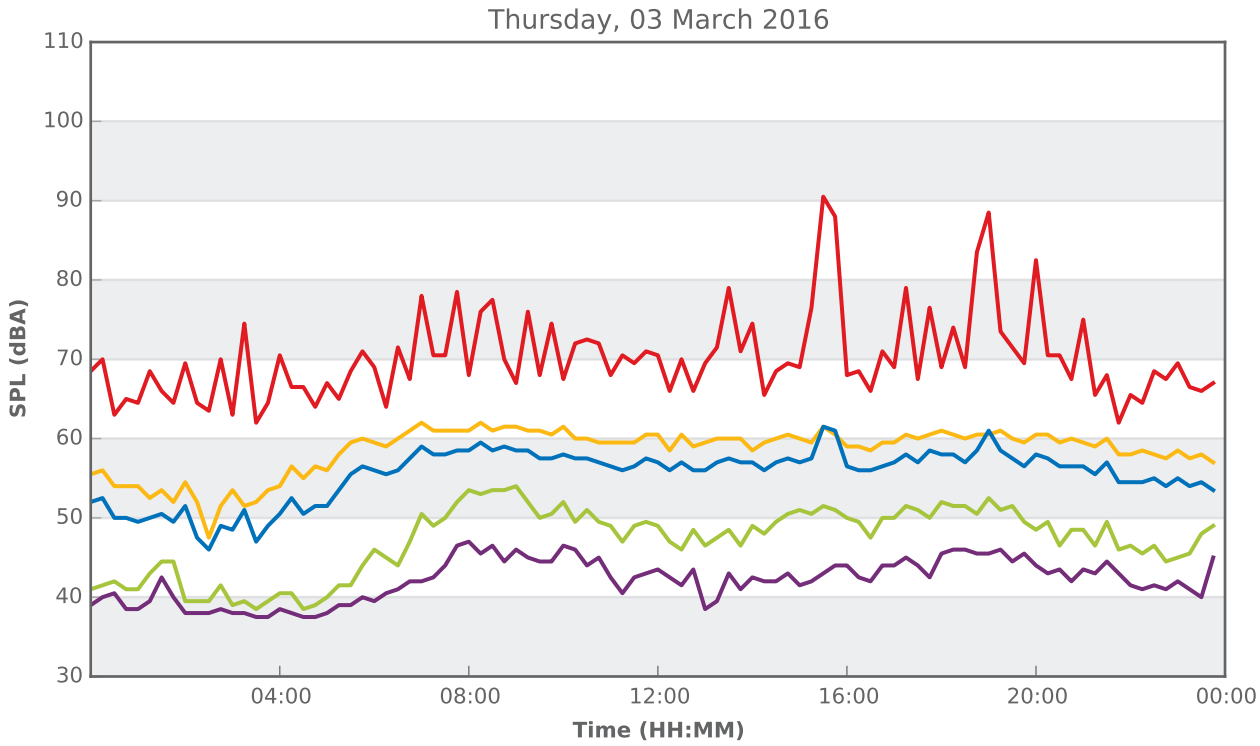
19 Bungan Place, Woodbine



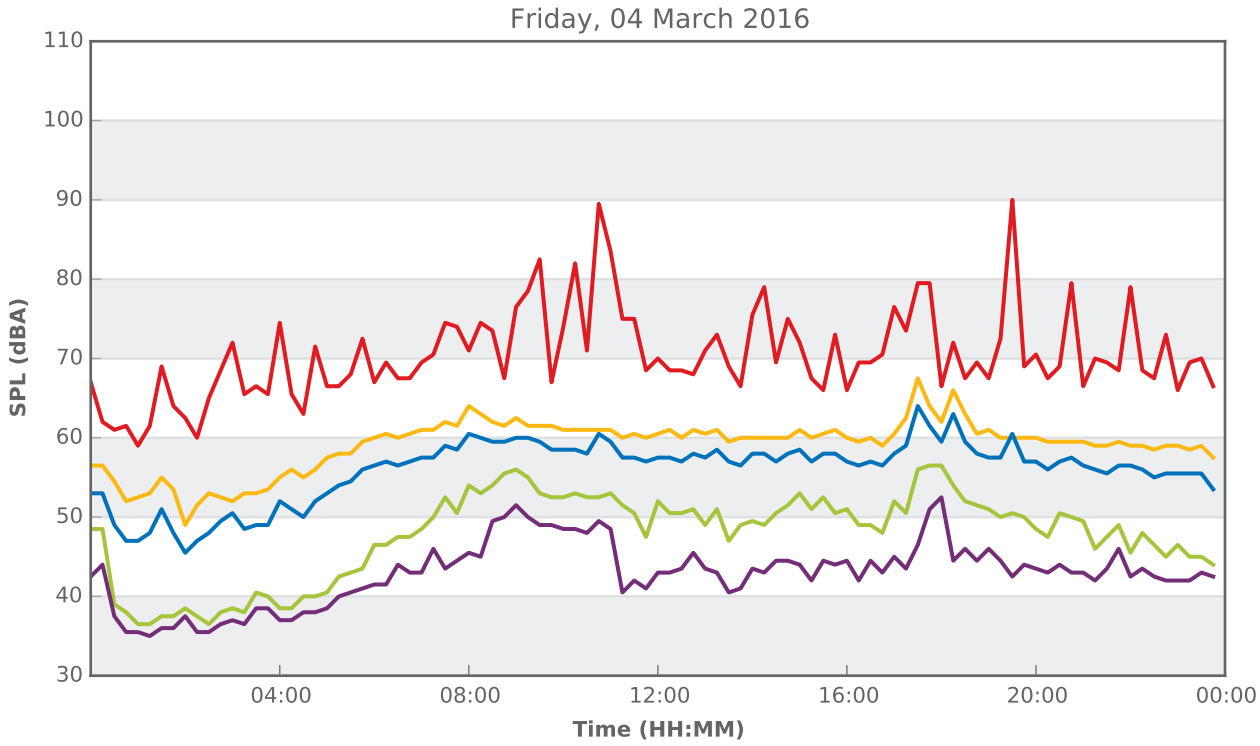


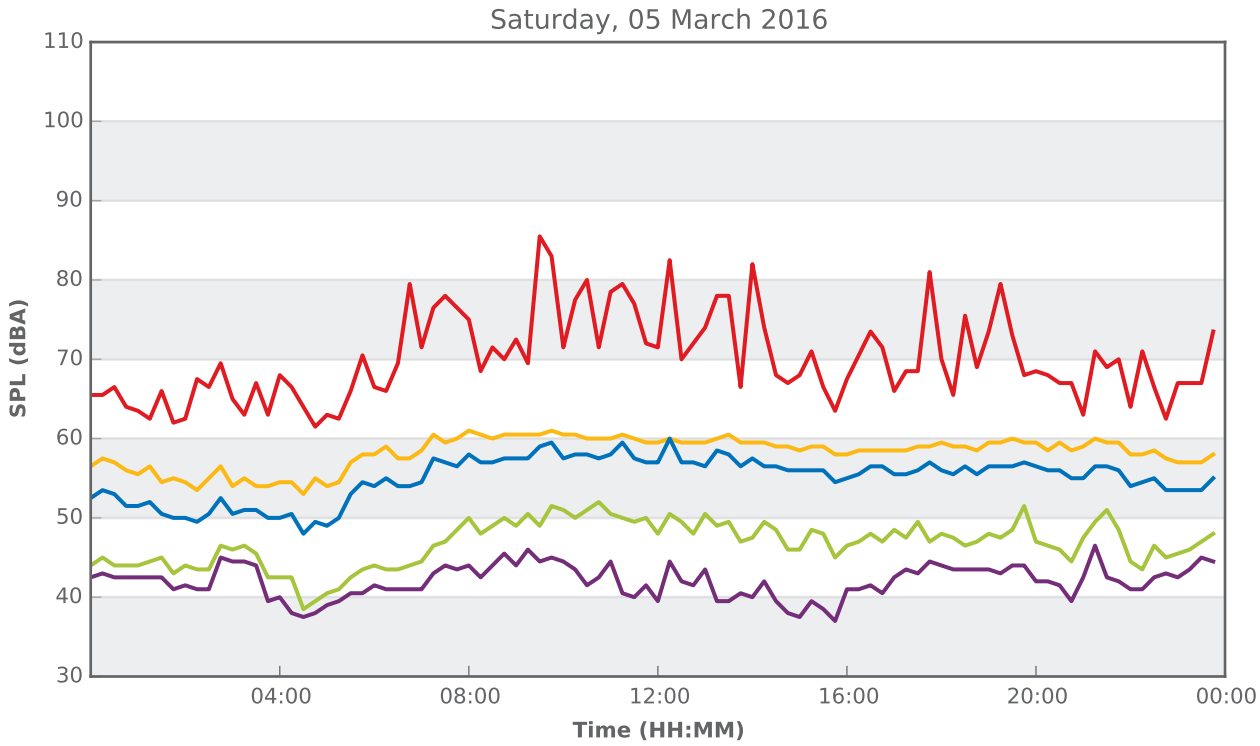
22 Kimberley Street, Leumeah



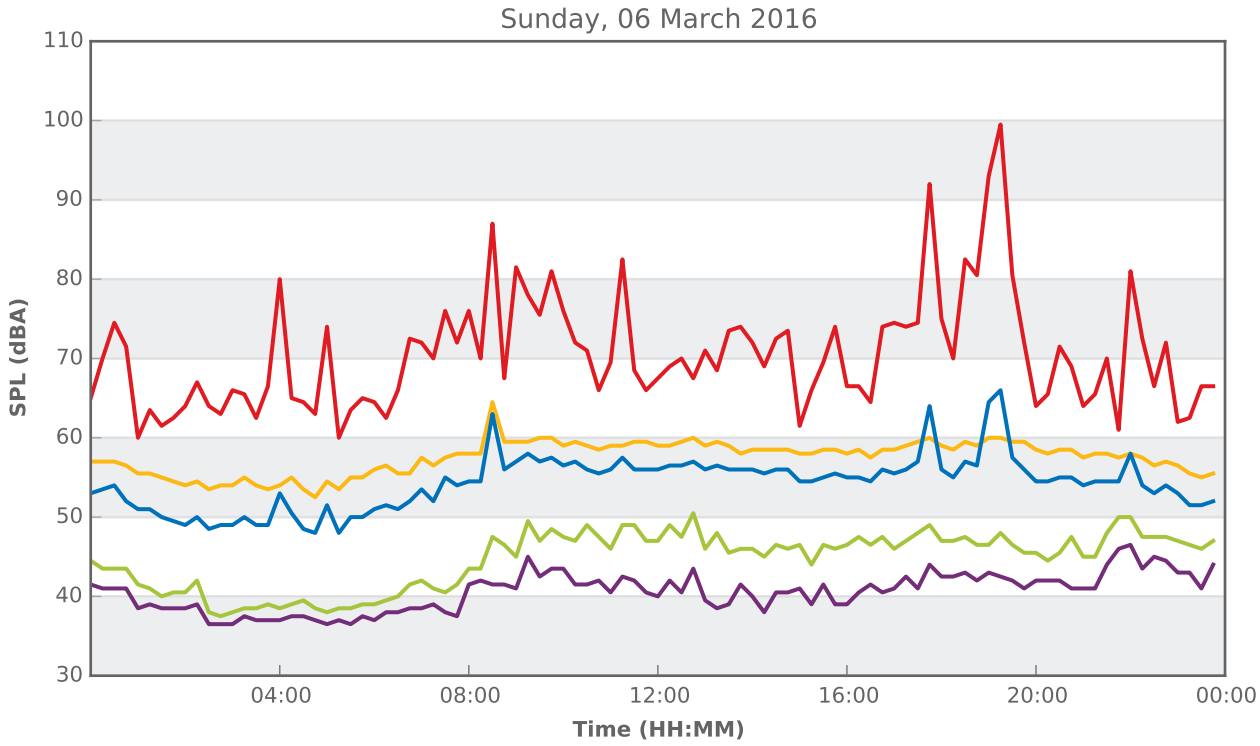


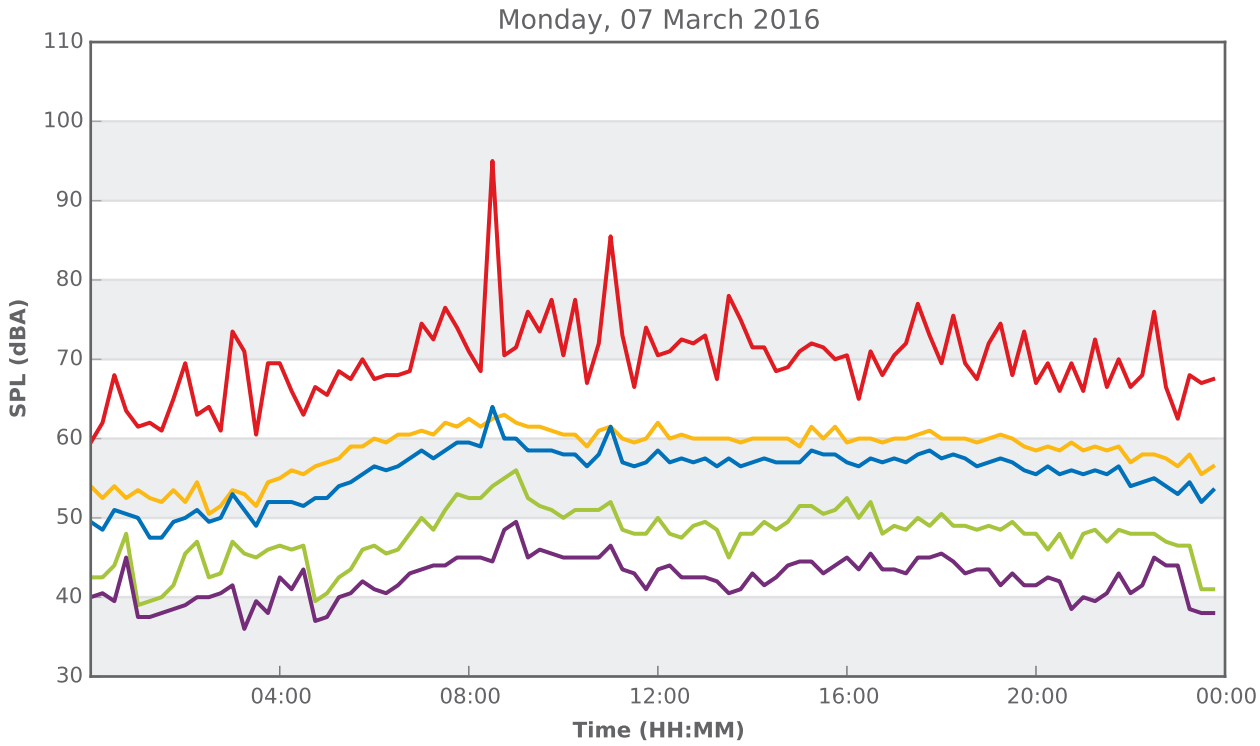
22 Kimberley Street, Leumeah





22 Kimberley Street, Leumeah





22 Kimberley Street, Leumeah