Lindt Warehouse, Sydney Business Park

Noise Impact Assessment

SYDNEY
A: 9 Sarah St Mascot NSW 2020
T: (02) 8339 8000
F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au
ABN: 11 068 954 343

DOCUMENT CONTROL REGISTER

Project Number	20140726.2
Project Name	Lindt Warehouse, Sydney Business Park
Document Title	Noise Impact Assessment
Document Reference	20140726.2/1407A/R1/RL
Issue Type	Email
Attention To	Qanstruct (Aust) Pty Ltd Mr Trent Franks

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	11/07/2014	20140726.2/1107A/R0/RL	RL		BW
1	14/07/2014	20140726.2/1407A/R1/RL	RL		BW

TABLE OF CONTENTS

1 INTRODUCTION

This report presents an assessment of acoustic impacts associated with the Lindt facility, proposed to be located on a currently vacant lot on Hollinsworth Road, Marsden Park which is part of the Sydney Business Park.

In this report we have:

- Identified potential noise sources for the proposed development
- Identified potential noise receivers at the surrounding areas.
- Setup noise emission criteria based on background noise measurements conducted on site.
- Assessed noise emission from operations, additional traffic and from proposed construction activities.

The assessment is based on survey plans, drawings and information provided by Qanstruct Pty Ltd.

2 SITE DESCRIPTION

The proposed development is proposed to be located on a currently vacant site on Hollinsworth Road, Marsden Park.

The facility will consist of a warehouse, a manufacturing area, ancillary offices and a showroom. The proposed facility is proposed to operate up to 24 hours a day, 7 days a week.

The site is bounded by Hollinsworth Road to the south which is an existing local road. The site will be bounded to the north by a proposed road that will service Sydney Business Park.

There are residential properties and a caravan park located in the vicinity of the site, within the IN1 and IN2 industrial zones, with the closest receiver located approximately 300 metres to the south-west.

The proposed development will provide 340 car parking spaces. Access to that car park will be provided by two driveways on Hollinsworth Road, to the south of the site.

Trucks servicing the site will access the site via an entry gate on Hollinsworth Road end exit via a future road proposed to be built to the north of the site.

The nearest potential noise receivers are dwellings located around the site at the following addresses:

Table 1 – Noise Sensitive Receivers

Receivers	Type	Address	Description
Receivers 1	Residential	Lot 17 Hollinsworth Road	Residential property on IN2 industrial zone
Receivers 2	Residential	Lot 21 Hollinsworth Road	Residential property on IN2 industrial zone
Receivers 3	Residential	Lot 22 Hollinsworth Road	Residential property on IN2 industrial zone
Receivers 4	Residential	Lot 25 Hollinsworth Road	Caravan park on IN1 industrial zone

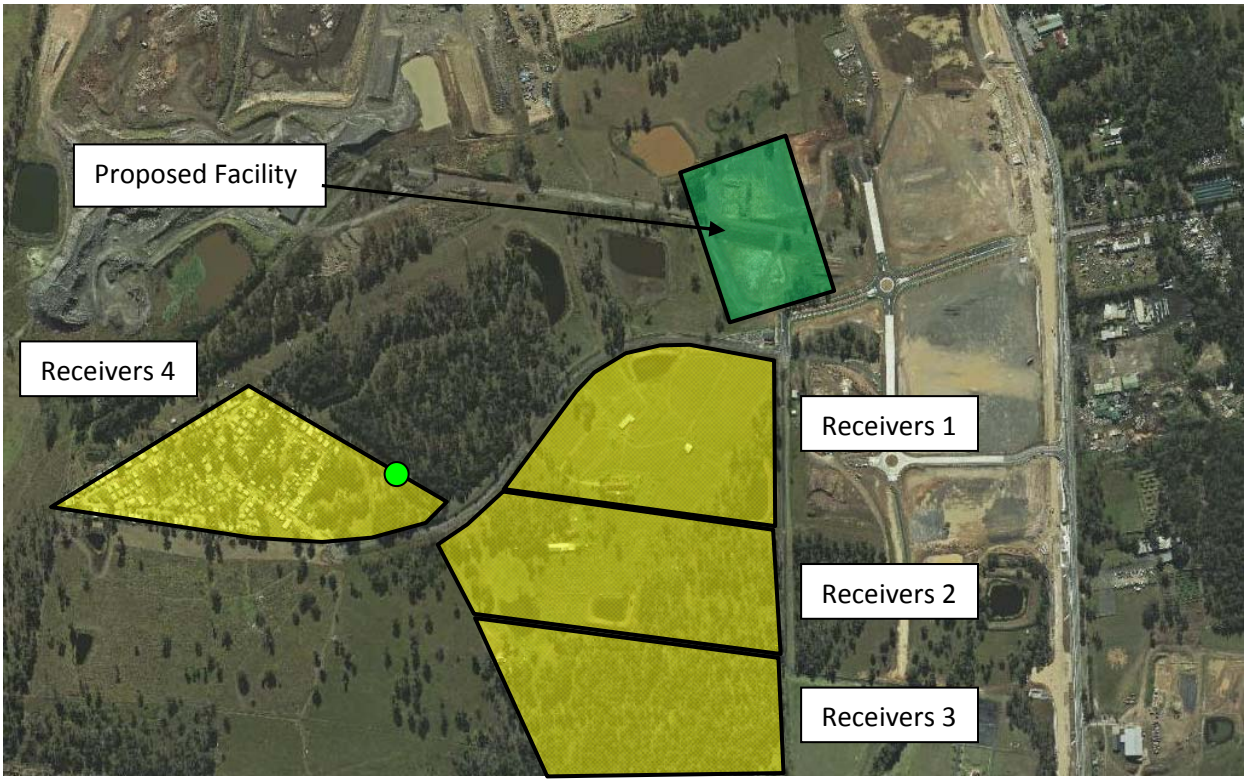


Figure 1: Site Survey and Monitoring Location

Unattended noise measurement location

Subject site

Potentially affected residential properties

3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

4 BACKGROUND NOISE MONITORING

Noise emission objectives from the premises will be determined with reference to the existing ambient noise levels. Current ambient noise levels have been determined based on long-term noise monitoring conducted on site.

4.1 MEASUREMENT LOCATION

A noise monitor was installed adjacent to the eastern boundary of the caravan park, as shown in Figure 1.

4.2 MEASUREMENT PERIOD

The long-term noise monitor was conducted between 5th May, 2014 and 12th May, 2014.

4.3 MEASUREMENT EQUIPMENT

Equipment used consisted of an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise logger data is provided in Appendix 1.

4.4 MEASUREMENT RESULTS

The measured background noise data have been graphed and attached to this report. Rating background noise levels have been determined based on the requirements of NSW INP. The summarised Rating Background noise Levels are presented in Table 2 below.

Table 2 – Rating Background Noise Level dB(A)

Location	Time	Noise Level L_{90} dB(A)
Hollinsworth Road, Marsden Park	Day (7am to 6pm)	38
	Evening (6pm to 10pm)	35
	Night (10pm to 7am)	32

5 OPERATIONAL NOISE EMISSION OBJECTIVES

5.1 BLACKTOWN CITY COUNCIL

Blacktown City Council DCP 2006 states the following with regards to mechanical or hydraulic plant items:

"No electrical, mechanical or hydraulic plant or equipment shall generate a noise level greater than 5dBA above the ambient L90 sound level at the boundaries of any allotment at any time of day."

5.2 NSW EPA INDUSTRIAL NOISE POLICY.

The EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity.

The EPA Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residence would be assessed against the rural criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

5.2.1 Intrusiveness Criteria

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 4. Noise emissions from the site should comply with the noise levels presented at the following:

The boundary of the affected property boundaries or in the event the premises is located at a significant distance from the boundary the noise levels are assessed at 30m for the affected building. For details of the assessment locations see Figure 1 above.

5.2.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by the urban/industrial interface. For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm;

- Night is defined as the remaining periods.

Table 3 – EPA Amenity Noise Levels

Type of Receiver	Indicative Noise Amenity Area	Time of day	Recommended Noise Level dB(A)$L_{eq(period)}$	
			Acceptable	Recommended Maximum
Residences	Urban/Industrial Interface*	Day	65	70
		Evening	55	60
		Night	50	55

*Receivers 1, 2, 3 and 4 are all located on Industrial land as per the *Marsden Park Industrial Precinct Indicative Layout Plan* and will therefore require compliance with Amenity criteria for Urban/Industrial Interface as described in the INP (page 18).

5.3 TRAFFIC NOISE GENERATED ALONG PUBLIC ROADS – NSW EPA ROAD NOISE POLICY

Access to the site and car park for staff and visitors' vehicles will be provided by two driveways on Hollinsworth Road, to the south of the site.

Trucks servicing the site will access the site via an entry gate on Hollinsworth Road end exit via a future road proposed to be built to the north of the site.

The NSW Environment Protection Authority's (EPA) Road Noise Policy document, outlines assessment criteria for existing residences affected by additional traffic on existing roads.

Section 2.3.1 of The NSW Road Noise Policy outlines assessment criteria for existing residences affected by additional traffic on existing local roads generated by land use developments. These are detailed in the table below.

Table 4 – Assessment Criteria for Vehicles Movements along Hollinsworth Road

Type of Development	Time of day	Criteria for Acceptable Traffic Noise Level dB(A) $L_{eq(1hr)}$
Land use developments with potential to create additional traffic on local roads	Day (7am to 10pm)	55
	Night-time (10pm to 7am)	50

5.4 SLEEP AROUSAL ASSESSMENT

Potential sleep arousal impacts should be considered for noise generated before 7am. Short duration, intermittent noise events (such as cars driving into the car park) are typically assessed with reference to additional acoustic criteria specifically to assess potential sleep disturbance.

Potential impacts have been assessed using the recommended procedure in the Application Notes to the EPA Industrial Noise Policy. As recommended in the Application Notes, when assessing potential sleep arousal impacts, a two stage test is carried out:

- Step 1 - An "emergence" test is first carried out. That is, the L_1 noise level of any specific noise source should not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. If the noise events are within this, then sleep arousal impacts are unlikely and no further analysis is needed. This is consistent with the Noise Guide for Local Government. The guideline level is set out below.

Table 5 - Sleep Arousal (Emergence Criteria)

Location	Background Noise Level (10pm-7am) dB(A)$_{L90}$	Emergence Level dB(A) $L_{1(1min)}$
All Potentially Affected Residential Properties	32	47

- Step 2 - If there are noise events that could exceed the emergence level, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA Industrial Noise Policy, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy.

Most relevantly, the Road Noise Policy states:

"For the research on sleep disturbance to date it can be concluded that:

- *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
- *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly."*

The internal noise level guidelines have been adopted in this assessment.

5.5 SUMMARY OF NOISE EMISSION OBJECTIVES

Based on the requirements stated in the sections above, Table 6 provides a summary of the assessment criteria applicable to the receivers surrounding the project site. The assessment criteria are also based on the background noise monitoring conducted at the site.

Table 6 – Environmental Noise Emission Criteria

Receivers	Time Period	Assessment Background Noise Level dB(A)L_{90}	Amenity Criteria * dB(A) L_{eq}	Intrusiveness Criteria * Background + 5 dB(A) $L_{eq(15min)}$	Additional Traffic Noise dB(A) $L_{eq(1hr)}$	Sleep Disturbance Criteria
Receivers 1, 2, 3 and 4	Day	38	65	43	55	N/A
	Evening	35	55	40	55	N/A
	Night	32	50	37	50	47

*As per the INP, amenity criteria for residences on urban/industrial interface will be assessed at the boundary of sensitive receivers. Intrusiveness criteria are to be assessed at the boundary of the affected property boundaries or in the event the premises is located at a significant distance from the boundary the noise levels are assessed at 30m for the affected building.

6 OPERATIONAL NOISE EMISSION ASSESSMENT

Noise emissions associated with the development have been assessed for vehicle movements, which will be the primary noise source generated by the proposed site. Predicted noise levels at most sensitive receivers have been determined using the SoundPlan™ noise modelling software and the assumptions detailed below.

Trucks and cars movements will be the main noise source generated by the proposed site.

Predicted noise levels have been presented for the worst case noise scenario in each modelling scenario. Modelling has also taken into account the screening effect provided by surrounding building structures and by the topography.

6.1 NOISE MODELLING PARAMETERS

The assessment of noise emissions from the different operational noise activities have been assessed using the following assumptions detailed in the table below.

Table 7 – Noise Sources Characteristics

Noise Source	Sound Power Level dB(A)	Speed	Description
Semi-trailer	105	10km/h	7 inbound semi-trailers per day/ 7 outbound semi-trailers per day
Cars	84	10km/h	285 vehicle during peak hour periods
Air brakes (semi-trailers)	118	-	-
Air Handling Unit	100*		13 AHUs along the eastern façade of the facility

*Typical AHU sound power level

6.2 NOISE EMISSION PREDICTIONS

6.2.1 Operational noise

The prediction will be based on the following information and assumptions:

1. The number of peak hour movements for each period detailed in the table above will be considered our worst case scenario for the assessment.
2. The worst case scenario includes the operation of the 13 Air Handling Units at the same time. A sound power level of 100dB(A) for each has been assumed.

Table 8 – Predicted Operational Noise Emission - Amenity Criteria

Receiver	Time of Day	Predicted Level dB(A)L_{eq}	Project Objectives dB(A)L_{eq}	Compliance
Receiver 1 – point most affected point within the boundary	Day (7am to 6pm)	48	65	Yes
	Evening (6pm to 10pm)		55	Yes
	Night (10pm to 7am)		50	Yes
Receiver 2 – point most affected point within the boundary	Day (7am to 6pm)	31	65	Yes
	Evening (6pm to 10pm)		55	Yes
	Night (10pm to 7am)		50	Yes
Receiver 3 – point most affected point within the boundary	Day (7am to 6pm)	29	65	Yes
	Evening (6pm to 10pm)		55	Yes
	Night (10pm to 7am)		50	Yes
Receiver 4 – point most affected point within the boundary	Day (7am to 6pm)	22	65	Yes
	Evening (6pm to 10pm)		55	Yes
	Night (10pm to 7am)		50	Yes

Table 9 – Predicted Noise Emission– Intrusiveness Criteria*

Receiver	Time of Day	Predicted Level dB(A)L_{eq}	Project Objectives dB(A)L_{eq}	Compliance
Receiver 1	Day (7am to 6pm)	33	43	Yes
	Evening (6pm to 10pm)		40	Yes
	Night (10pm to 7am)		37	Yes
Receiver 2	Day (7am to 6pm)	30	43	Yes
	Evening (6pm to 10pm)		40	Yes
	Night (10pm to 7am)		37	Yes
Receiver 3	Day (7am to 6pm)	28	43	Yes
	Evening (6pm to 10pm)		40	Yes
	Night (10pm to 7am)		37	Yes
Receiver 4	Day (7am to 6pm)	22	43	Yes
	Evening (6pm to 10pm)		40	Yes
	Night (10pm to 7am)		37	Yes

* Boundary of the affected property boundaries or in the event the premises is located at a significant distance from the boundary the noise levels are assessed at 30m for the affected building.

6.2.2 Noise Generated by Additional Traffic on existing roads

Trucks servicing the development and light vehicles will arrive at the site via Hollinsworth Road. This road is a two lane local road, primarily used by the residents living along this road and tenants at the caravan park.

For the purpose of this assessment, we have assumed a worst case scenario of all 285 light vehicles departing or arriving and 7 trucks arriving at the site within a 1 hour period, as per information provided by the client and the traffic report. This scenario is highly unlikely as a typical operation.

Table 10 – Predicted Noise Levels generated by Bus Movements along Hollinsworth Road

Receiver Location	Predicted Level dB(A)$L_{eq(1hr)}$	Criteria dB(A)$L_{eq(1hr)}$	Complies
Receiver 1	36	55 Daytime (7am to 10pm)	Yes
Receiver 2	33		Yes
Receiver 3	31	50 Night-time (10pm to 7am)	Yes
Receiver 4	<30		Yes

6.2.3 Peak (Intermittent) Noise Events

As the facility will operate 24/7, an assessment of potential sleep disturbance has been undertaken. The loudest noise source has been considered to be the noise created by the air brakes from semi-trailers servicing the facility. Noise emissions have been predicted on the basis that the sound power level of airbrakes is 118 dB(A)L_{Max}

Predictions are made at the nearest bedroom windows to the site (the ground floor windows of the nearest residence (Receivers 1).

Analysis will be conducted as follows:

- Firstly, the noise event will be assessed with reference to the "background+15dB(A)" criteria (this is the first step of the sleep arousal test outlined in section 5.3).
- Secondly, in the event that compliance with the "background+15" test is not satisfied, a more detailed assessment will be undertaken, in which the noise level is predicted inside the bedroom itself.

Step 1 - Predicted noise levels and assessment against "background+15dB(A)" criteria are as follows.

Table 8 – Sleep Arousal Assessment (Background+15dB(A) test)

Receiver Location	Noise Source	Predicted Noise Level	Acoustic Criteria	Complies?
Ground floor Bedroom Windows Receivers 1	Air brakes	59dB(A)$L_{1(1min)}$	47dB(A)$L_{1(1min)}$	No

As shown in the table able, noise emissions from vehicle movements complies with "background+15dB(A)" acoustic criteria. However, given that an exceedance of criteria is predicted for the car start/door close noise event, a more detailed assessment has been conducted. This involves predicting the noise level in the bedroom itself, and comparing to the EPA recommended criteria as presented in section 5.3, and is outlined below.

Step 2 - The predicted noise levels *inside* the bedroom (assuming the bedroom window is left open) is presented below.

Table 9 – Sleep Arousal Assessment (Internal Noise Level test)

Receiver Location	Noise Source	Predicted Noise Level	Acoustic Criteria	Complies?
Ground floor Bedroom Windows Receivers 1	Air brakes	49dB(A)$L_{1(1min)}$	50-55dB(A)$L_{1(1min)}$	Yes

Predicted noise levels inside the bedrooms are 49dB(A)$L_{1(1min)}$ from trucks air brakes, which is compliant with the more stringent end of the range specified in the EPA guidelines.

6.3 MECHANICAL NOISE EMISSION ASSESSMENT

All mechanical plant for the proposed development that are yet to be selected and treated to comply with the Blacktown City Council and Industrial Noise Policy acoustic requirements as detailed in Section 5.

If necessary, acoustic treatments for mechanical plant should be determined at CC stage, with the provision of acoustic screens, silencers etc as necessary.

7 CONSTRUCTION NOISE EMISSION ASSESSMENT

This section presents processes to manage noise and vibration impacts associated with the proposed construction activities for the Lindt Warehouse facility and the potential for noise and vibration impact to surrounding receivers.

The principal objective of this study is to undertake an evaluation of works to be performed during the operation of the various activities during construction and develop a management plan to ensure noise and vibration:

1. Does not excessively impact on the sensitive receivers.
2. Is minimised to all surrounding receivers.
3. Does not exceed OH&S standards at surrounding receivers.
4. Is monitored when potentially high noise and vibration generating activities are being used.

This assessment will formulate/present the relevant noise and vibration criteria which construction activities are required to comply with as well as recommended criteria for MRI equipment. Additionally effective mitigation measures will be recommended where possible to ensure criteria is achieved and impacts are minimised.

The principal issues to be addressed in this report are:

- Identification of the noise and vibration standards which will be applicable to this project.
- Formulation of a strategy for construction activities to comply with the standards identified in the above point.
- Development at demolition and excavation methods which will minimise the impact on other areas of the NRP including the animal research facilities.

The expected activities can be expected to include:

1. Excavation of soil and soft sand stone.
2. Construction of proposed facility.

7.1 CONSTRUCTION NOISE CRITERIA

It is proposed to adopt criteria from the New South Wales Construction Noise Guideline developed by The NSW EPA and the Australian Standard AS2436-2010 *"Guide to Noise Control on Construction Maintenance and Demolition Sites"*.

7.1.1 Australian Standard AS2436

The Australian Standard AS2436 "Guide to noise control on construction, maintenance and demolition sites" states that where all reasonable and available measures have been taken to

reduce construction noise, mitigation strategies may be put in place to reduce levels noise levels to within a reasonable and acceptable level.

For the control and regulation of noise from construction sites AS2436:2010 *"Guide to noise control on construction, maintenance and demolition sites"* nominates the following:

1. That reasonable suitable noise criterion is established,

2. That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes to locations of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours, and

3. The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the construction site.

7.1.2 Interim Construction Noise Guideline

The guideline reflects on feasible and reasonable mitigation strategies, management controls and public liaising in the effort to reach realistic compromises between construction sites and potential noise affected receivers.

The guideline refers to a qualitative assessment method in which construction noise is assessed on a case by case basis with regard to various activities to be conducted on site. This assessment method was developed to smaller scale projects.

Essentially this method of assessment requires that the proponent take into consideration and employ all reasonable and feasible measures to ensure that the impact on noise receivers is minimised. This is generally conducted in the following manner:

- Develop a noise management plan outlining all reasonable and feasible mitigation methods for the reduction of noise impact, which are detailed in this report;

- The assessment of high impact equipment such as hammers, saws and the like for lower noise producing methods of construction or locating them in acoustically advantageous positions where possible;

- The implementation of a complaints handling register and community consultation system;

- Employee (builders, contractors etc) education in effective noise reducing techniques and site etiquette; and

- The operation of plant in a quiet and efficient manner (i.e.: Turning off machinery when not in use) where possible.

In addition, the guideline specifies goals which can be used in the effort of minimising noise from construction related activities.

Table 11 – EPA Recommended Construction Noise Goals

Noise criteria	Receiver	External sound level, $L_{eq\ 15\ min}$ dB(A)
EPA	Residential	Background + 10dB(A)[1]
		75dB(A)[2]
	Retail/Commercial	75dB(A)[2]

1: Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise.

2: 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.

These criteria for resultant noise from construction are aimed at maintaining comfort levels within the surrounding residential dwellings. Additionally, noise mitigation techniques as discussed in Section 7.8 should be used if noise emissions exceed the above criteria. All work is to be carried out in accordance with AS 2436:2010 "Guide to noise control on construction, maintenance and demolition sites".

7.2 CONSTRUCTION NOISE PROCEDURES

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers' locations.
- If noise levels exceed "background + 10 dB(A)" noise goal at sensitive receiver locations, investigate and implement all practical techniques to limit noise emissions. For residential receivers, a background + 10 dB(A) goal has been adopted at all times. When these noise levels cannot be met all possible and practical acoustic treatments/management controls will be investigated.
- If the noise goal is still exceeded after applying all practical engineering controls to limit noise emissions, review the management techniques to mitigate noise emissions in accordance with AS2436.

7.3 POTENTIALLY AFFECTED NOISE SENSITIVE RECEIVERS

1. The sensitive receivers for construction noise are identical to those detailed

7.4 AMELIORATIVE MEASURES

The analysis indicates that proposed construction work activities will not adversely impact the surrounding receivers. However, when possible, high noise generating activities such as hammering, sawing and concrete pumping should be conducted away from the nearest affected receiver to avoid adverse impacts on residential receivers.

Recommendations are made to reduce noise emissions to the noise goals, and to implement other measures to minimise noise emissions where practicable:

In the event noise levels at receivers exceed criteria the following recommended treatments may be used to minimise noise high noise generating activities:

- Acoustically screen activities from surrounding receivers by using building structures or a specifically constructed screen, which will occur on the site regularly.
- Acoustic testing to plant and equipment to confirm if site noise levels comply with nominated manufacturing noise levels.
- Regular maintenance of equipment.

7.5 VIBRATION ASSESSMENT

Construction vibration criteria associated with works on the site when measured at the potentially affected receivers should not exceed the following sets of vibration criteria to ensure no architectural or structural damage to surrounding buildings. These standards have been selected as they are widely used in the assessment of vibration associated with construction activities within Australia, namely:

- German Standard DIN 4150-3 (1999-02): "Structural Vibration – Effects of Vibration on Structures"; and
- British Standard BS 6472:1992 "Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz).

The criteria and the application of these Standards are discussed in separate sections below.

7.5.1 German Standard DIN 4150-3 (1999-02)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in the Table below.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 12 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			**Plane of Floor of Uppermost Storey**
		< 10Hz	**10Hz to 50Hz**	**50Hz to 100Hz**	**All Frequencies**
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (eg buildings that are under a preservation order)	3	3 to 8	8 to 10	8

7.5.2 British Standard BS 6472:1992

British Standard BS 6472:1992 develops criteria relating to levels of building vibration that may be expected to give rise to "adverse comment", in the frequency range most applicable to impacts associated with construction, which is 1 to 80Hz. These threshold values are used as criteria for assessing the loss of amenity and are presented below in Table 3.

Table 13 – BS 6472:1992 Criteria to Avoid "Adverse Comment"

Type of Occupancy	Time of Day	Peak Particle Velocity (mms^{-1}) between 1Hz to 80Hz Likely to Cause *"Adverse Comment"*			
		Continuous Vibration		Intermittent Vibration and Impulsive Vibration Excitation with Several Occurrences per day	
		Vertical	Horizontal	Vertical	Horizontal
Residential	Day	0.3 to 0.6	0.8 to 0.6	8.4 to 12.6	24 to 36
	Night	0.2	0.6	2.8	8
Offices	Day	0.6	1.6	18	51
	Night	0.6	1.6	18	51
Workshops	Day	1.2	3.2	18	51
	Night	1.2	3.2	18	51

The limits indicate that people in buildings are significantly less susceptible to horizontal vibration than to vertical vibration. Furthermore, Section 4.1 of BS 6472 notes that situations can exist where vibration magnitudes above those generally corresponding to minimal "adverse comment" levels can be tolerated, particularly for temporary disturbances and infrequent and intermittent events such as those associated with construction projects.

Based on the proposed works to be conducted on this site and experience on other similar developments compliance with the vibration standards and criteria above will be achieved as a result of works undertaken as part of the Lindt facility construction.

7.6 NOISE AND VIBRATION MONITORING, REPORTING AND RESPONSE PROCEDURES

Noise and vibration monitoring will either consist of manned and/or unmanned measurements.

Active monitoring will be conducted by Acoustic Logic during the construction work phase of the project if required in the event complaints are received from neighbours. In the event complaint are received from neighbours the following process will be followed:

1. Determining the offending plant/equipment/process
2. Locating the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implementing additional acoustic treatment in the form of localised barriers, silencers etc
4. Selecting alternative equipment/processes

Where monitoring is required and indicates exceedences of the noise limits immediate action should be taken to identify any further controls as required to reduce noise emissions so that the noise limits are complied with. Monitoring of the activities following the implementation of these additional controls will be undertaken to confirm compliance.

7.6.1 Reporting requirements

The following shall be kept on site:

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed below.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedences occurring including, the actions taken and results of follow up monitoring.
4. A report detailing complaints received and actions taken shall be presented.
5. All monitoring and reporting shall be conducted in conjunction with the conditions of consent.

7.6.2 Response procedures

Complaints associated with noise and vibration generated by site activities shall be recorded on a Noise Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager and the general public and their contact telephone number

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

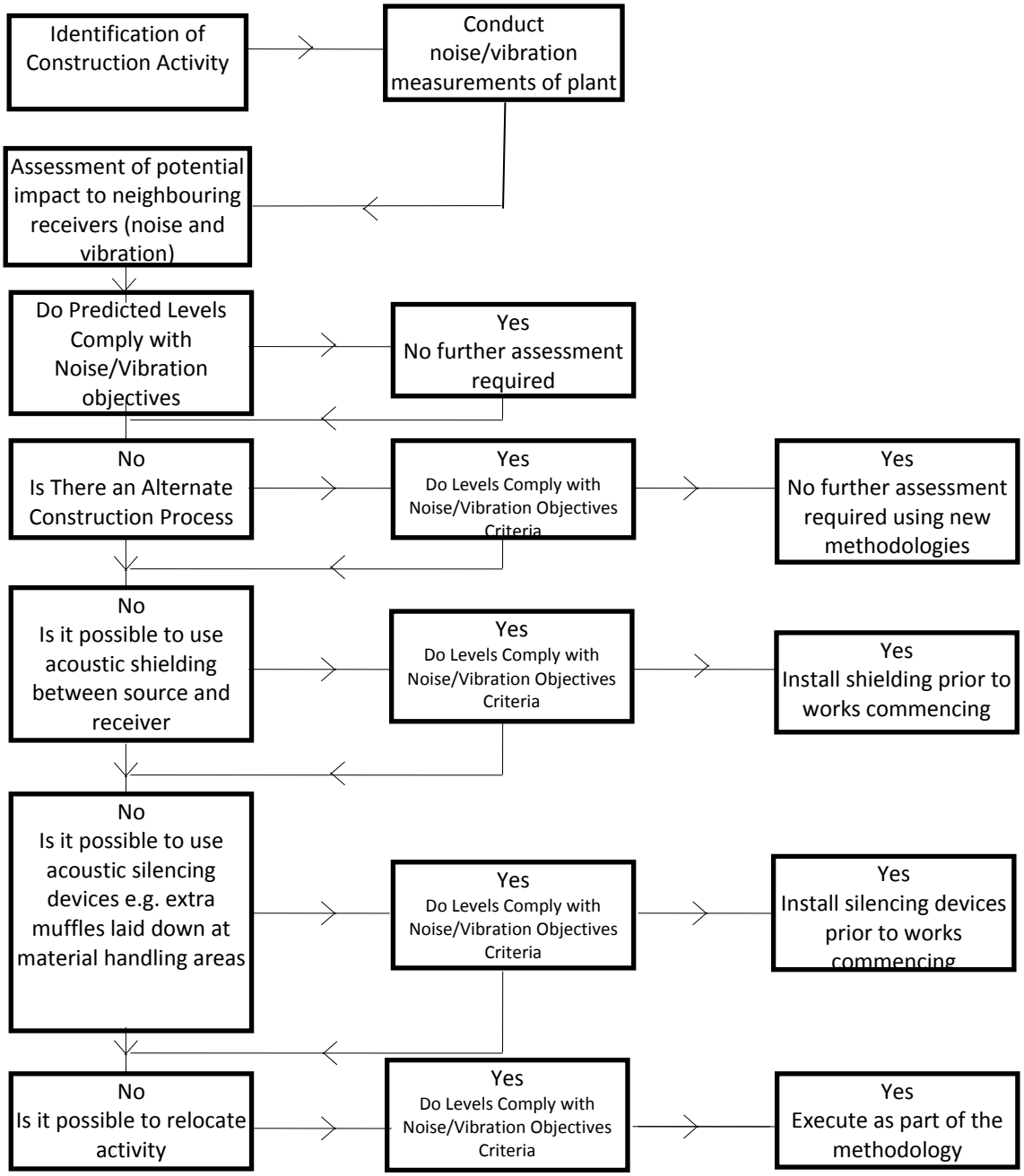
- The name and address of the complainant (if provided).
- The time and date the complaint was received.
- The nature of the complaint and the time and date the noise was heard.
- The name of the employee who received the complaint.
- Actions taken to investigate the complaint, and a summary of the results of the investigation.
- Indicate what operations were occurring on site at the time of the complaint.
- Required remedial action, if required
- Validation of the remedial action.
- Summary of feedback to the complainant.

7.6.3 Control of construction noise

As a part of the noise management plan a detailed study has been undertaken of each of the proposed activities that will occur as a part of the construction work on this project. The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow charts that follow illustrate the process followed to assess construction activities prior to the start of work on site and well as the ongoing investigation into noise during the construction period.

Chart 1 – Initial Assessment of Procedures



7.7 PROPOSED EQUIPMENT

The proposed construction activities to be undertaken at the site as summarised below:

Demolition/Excavation/shoring

a. 12.5 tonne excavators
b. Medium sized bogey
c. 30 tonne excavators
d. Truck & Dog (onsite)
e. Mobile cranes
f. Graders
g. Compactors
h. Rollers

Construction

a. Concrete pump (onroad)
b. Concrete mixer trucks (onroad)
c. Folk lifts for movement of materials
d. Powered hand tools
e. Elevated work platforms (boom & scissor lifts);
f. Bobcats

7.8 Noise Control Methods

The determination of appropriate additional noise control measures will be dependent on the particular activities and construction appliances identified as requiring future acoustic treatments to those already identified in this report. This section provides an outline of available methods which have previously been used on similar construction sites and may be possible on this site.

7.8.1 Selection of Alternate Appliance or Process

Where a particular activity or construction appliance is found to generate noise levels that exceed the criteria, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

7.8.2 Acoustic Barriers

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

Barriers can also be placed between the source and the receiver. The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers. A double paled or lapped and capped fencing construction is recommended for such barriers.

7.8.3 Silencing Devices

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

7.8.4 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

7.8.5 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

8 CONCLUSION

This report presents our assessment of potential noise emission associated with the proposed construction and operation of the Lindt facility within the Sydney Business Park in Marsden Park.

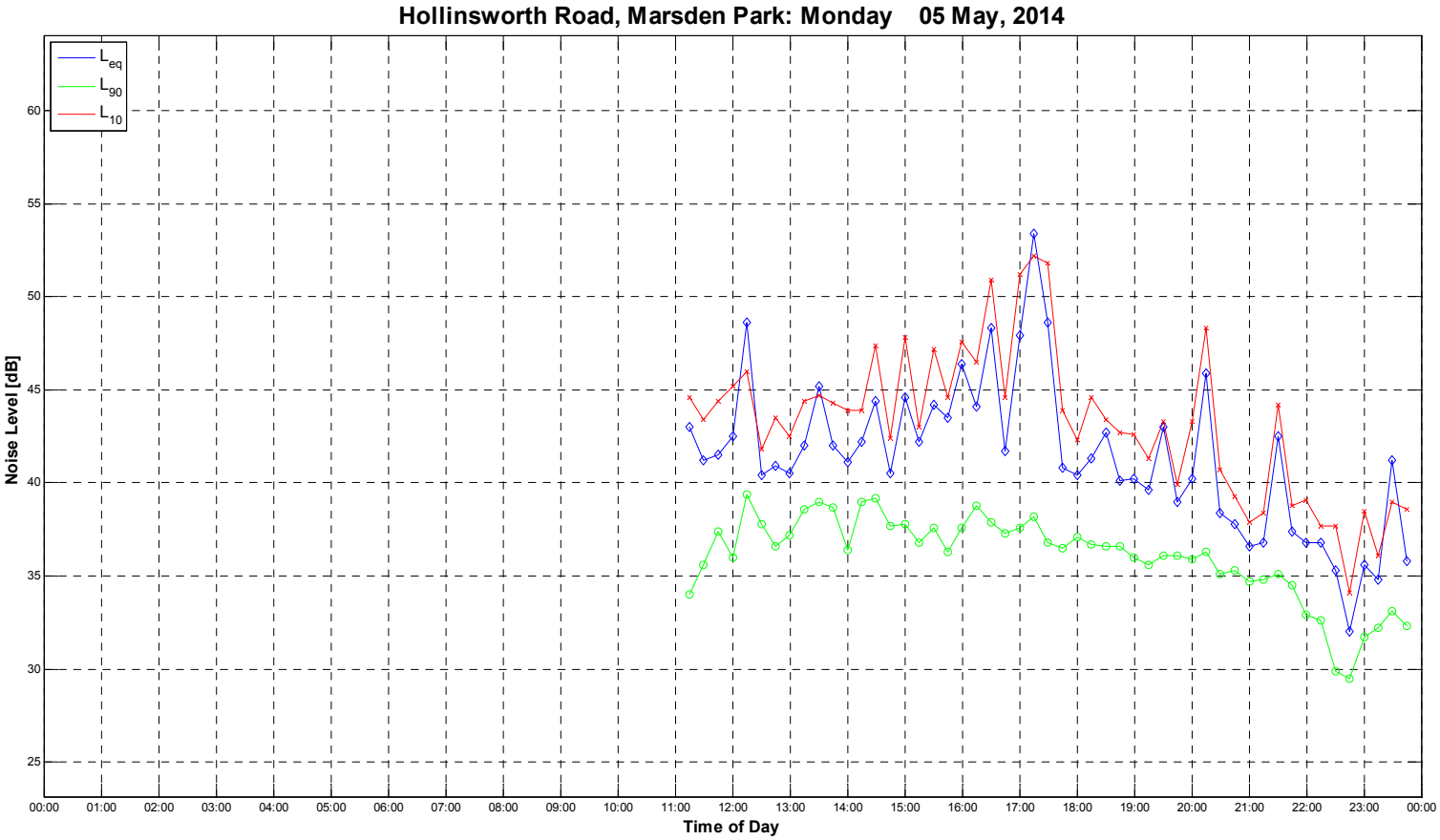
The assessment of noise impacts on neighbouring properties indicates that the proposed development will comply with the Industrial noise Policy acoustic requirements.

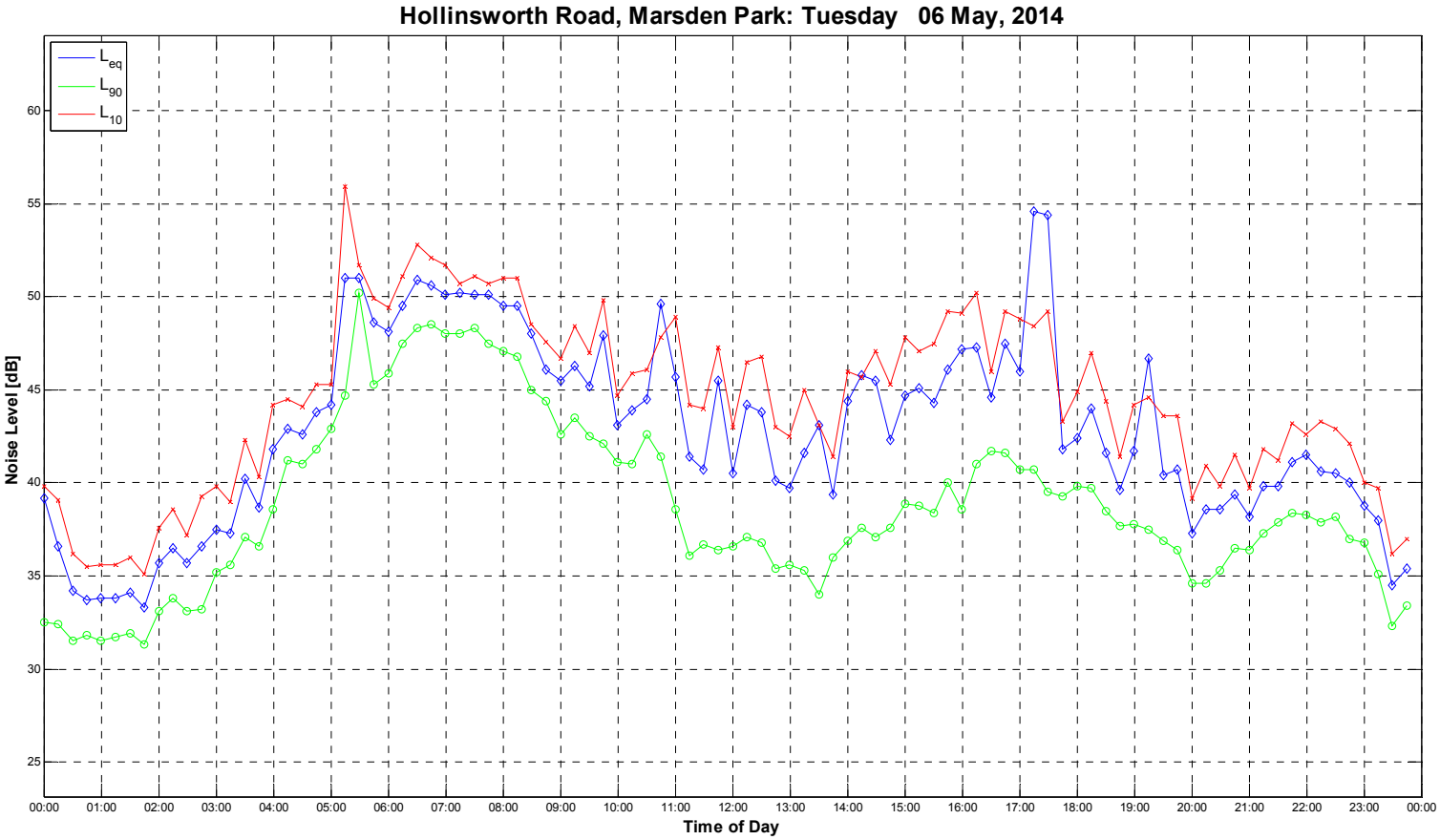
We trust this information is satisfactory. Please contact us should you have any further queries.

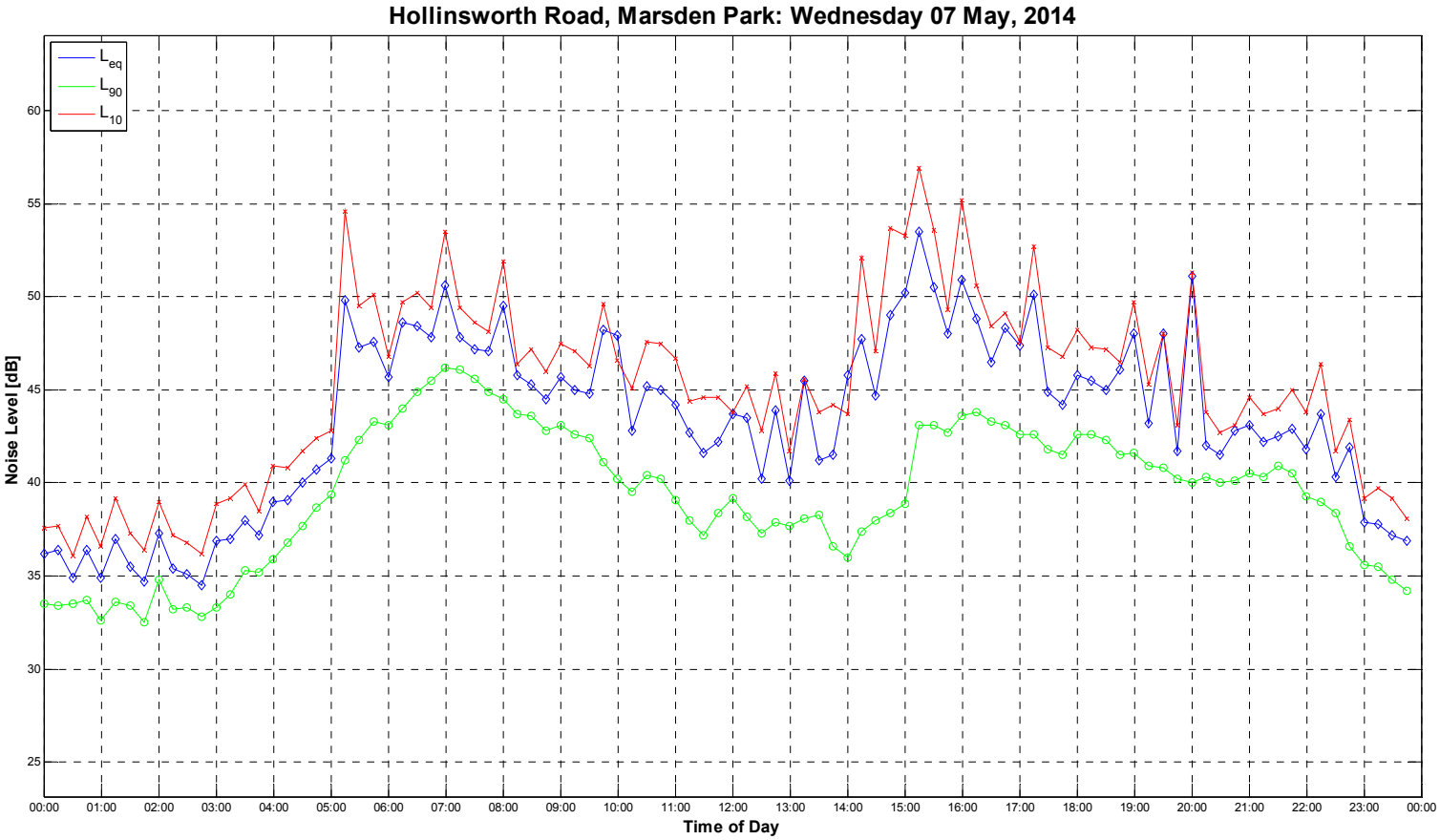
Yours faithfully,

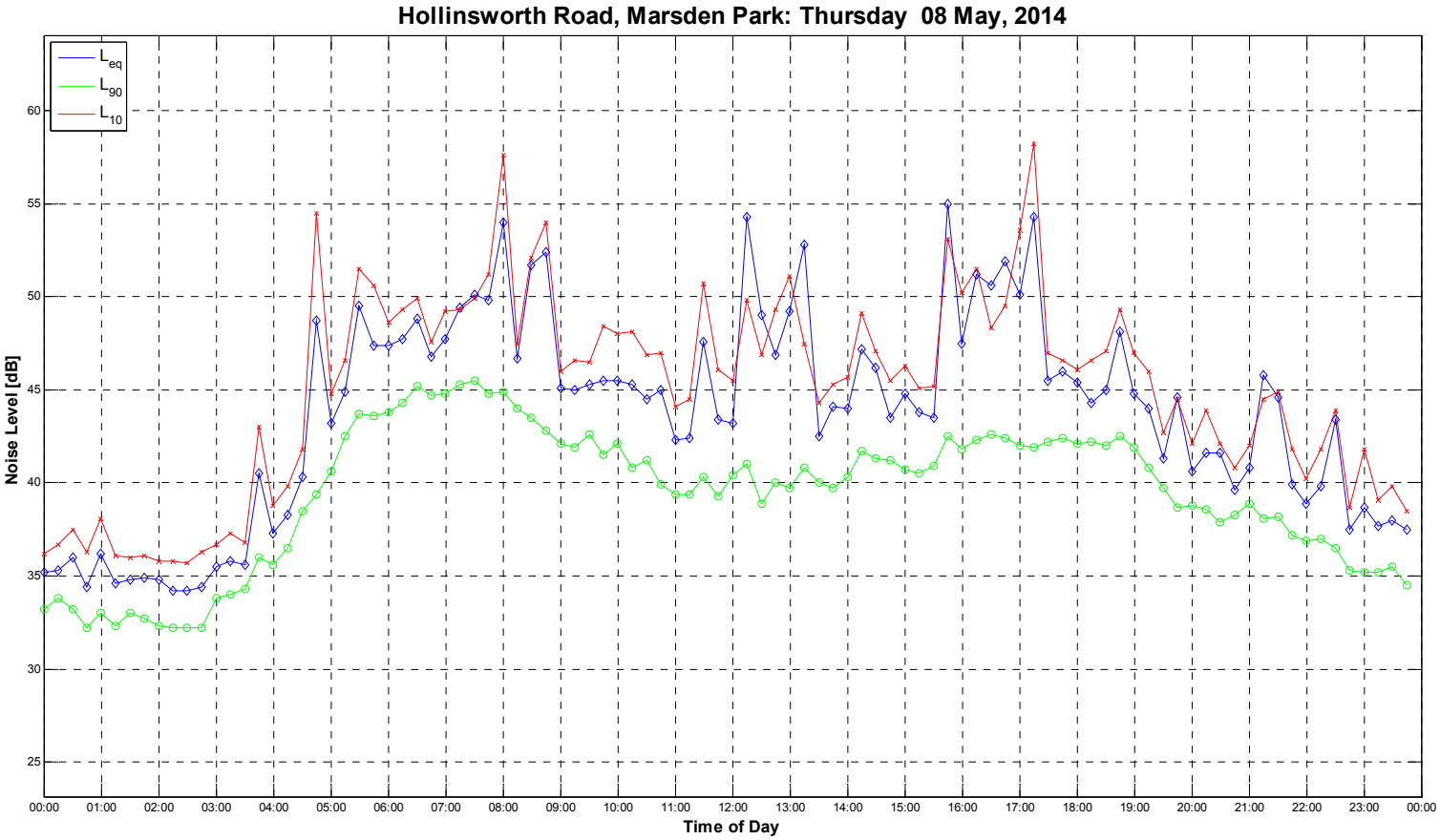
Acoustic Logic Consultancy Pty Ltd
Remi Larmandieu

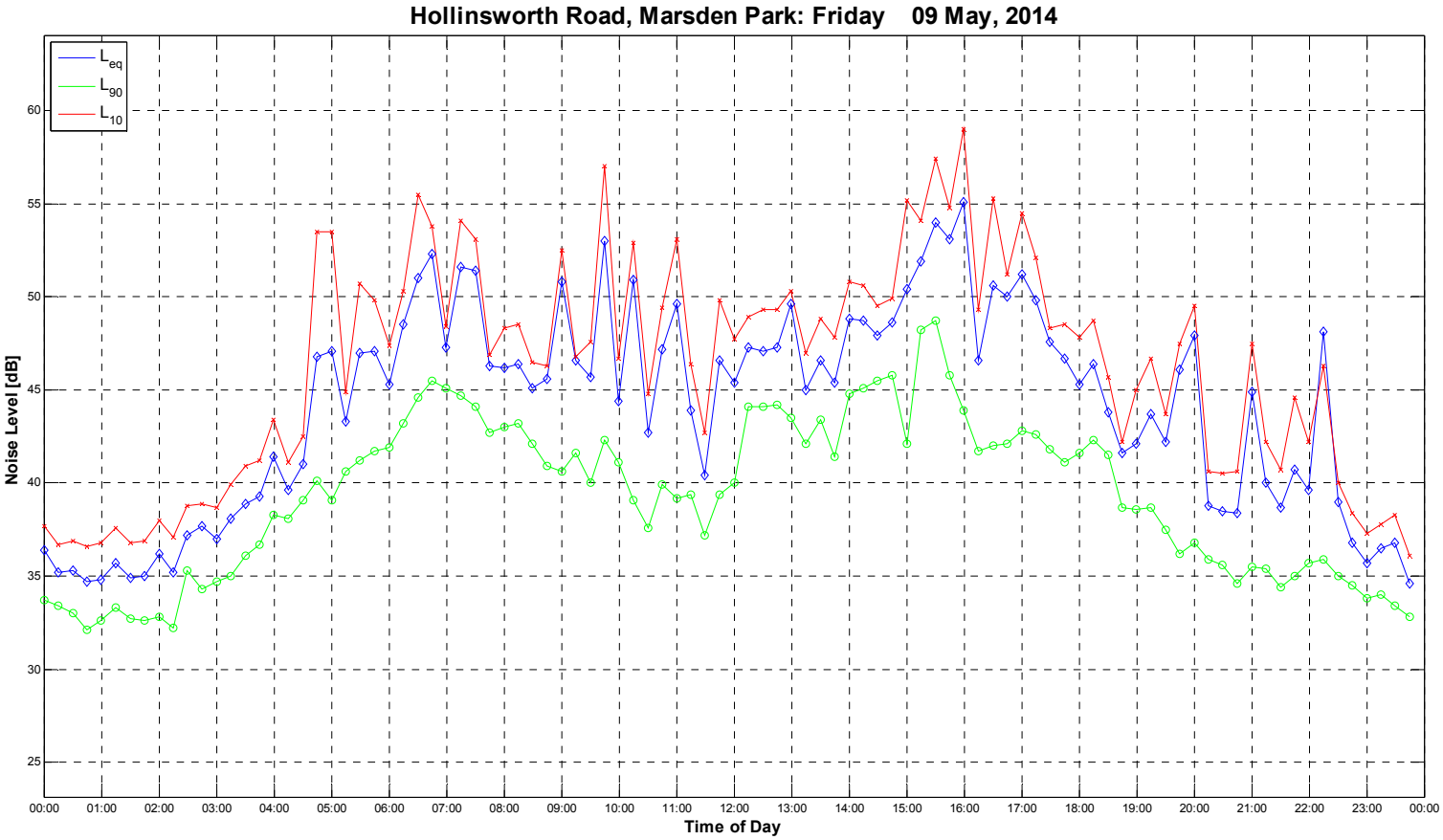
APPENDIX 1: NOISE LOGGING DATA

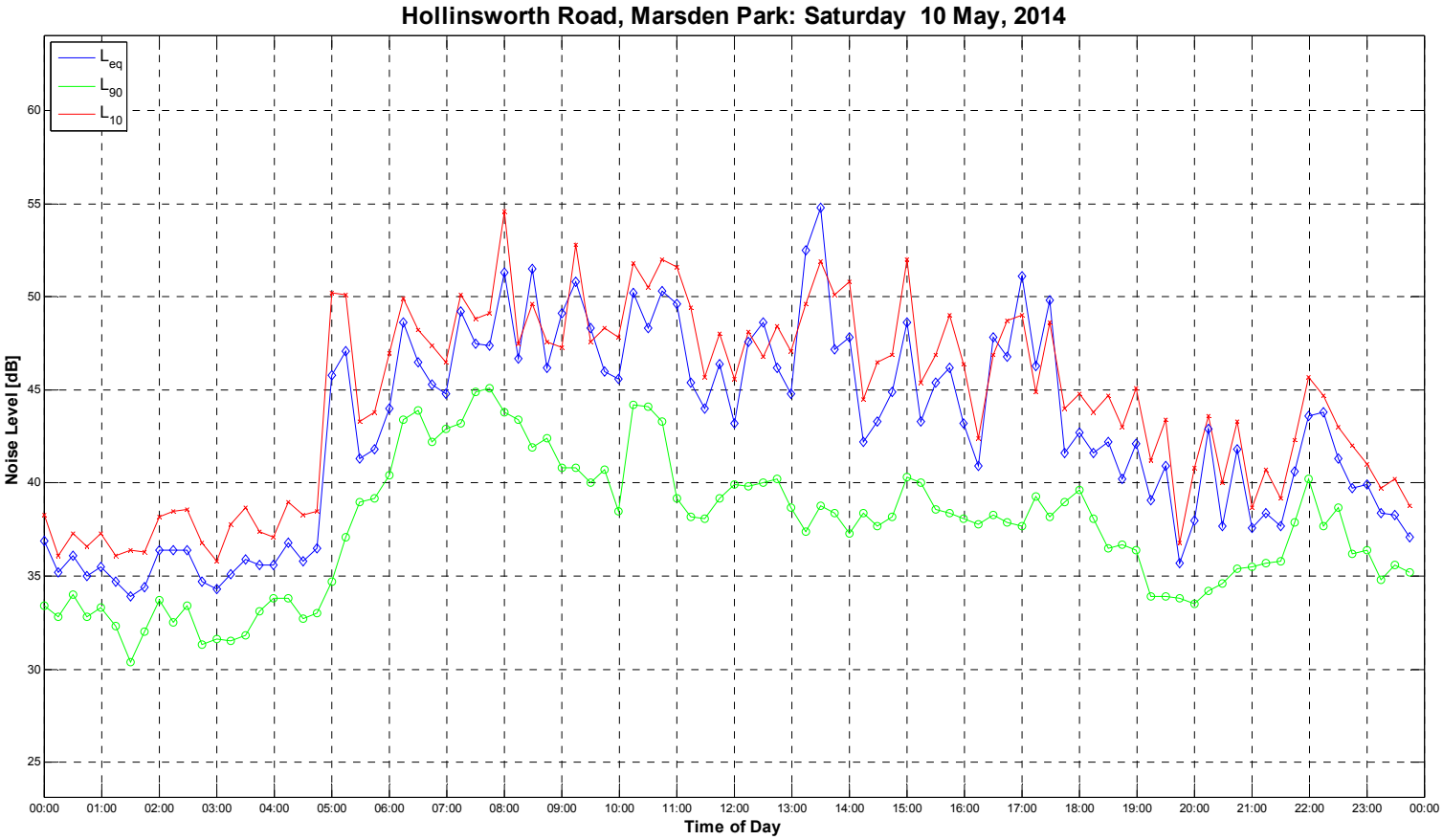

Hollinsworth Road, Marsden Park: Monday 05 May, 2014
L_eq
L_90
L_10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day

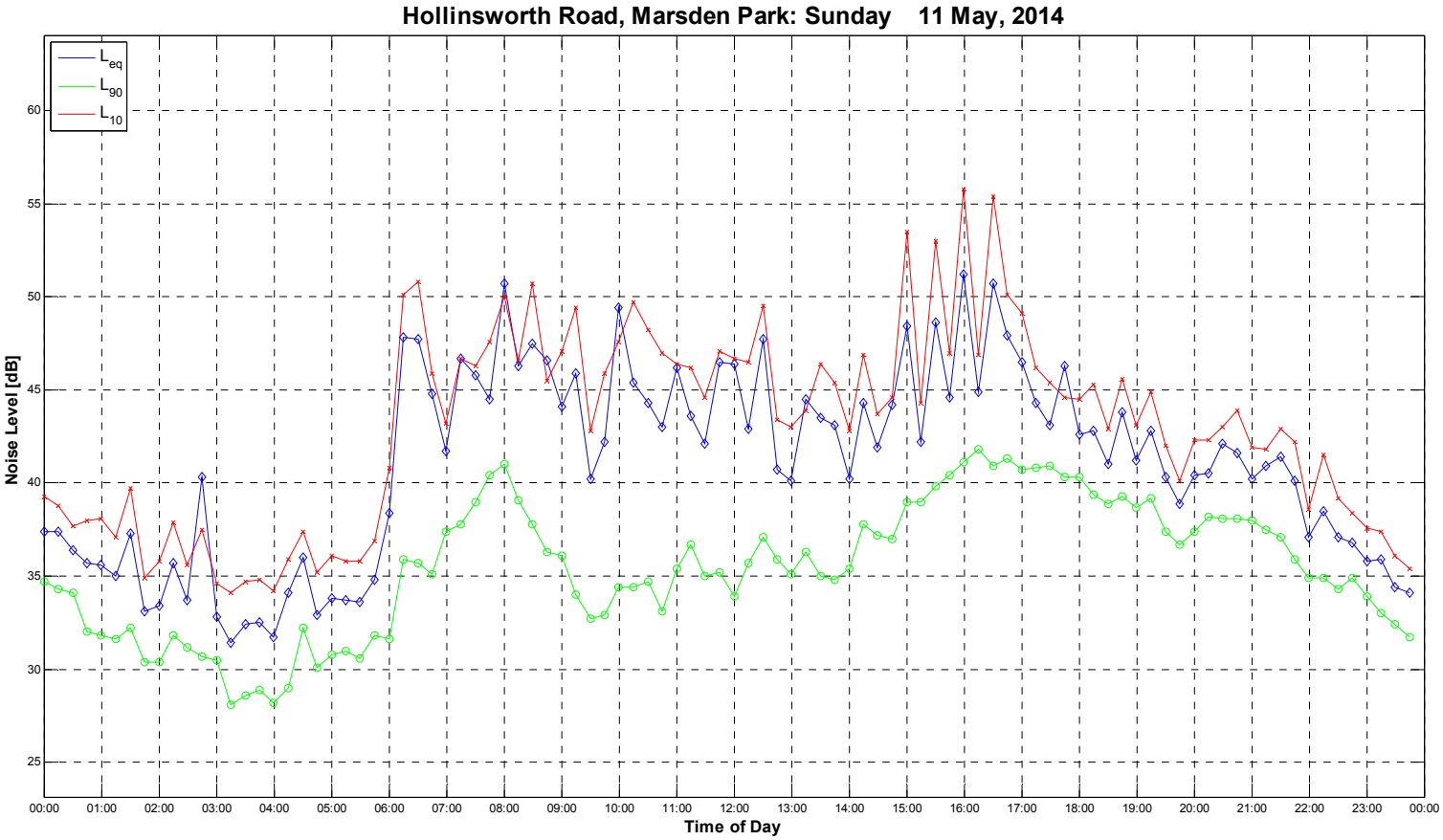

Hollinsworth Road, Marsden Park: Tuesday 06 May, 2014
L_eq
L_90
L_10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day

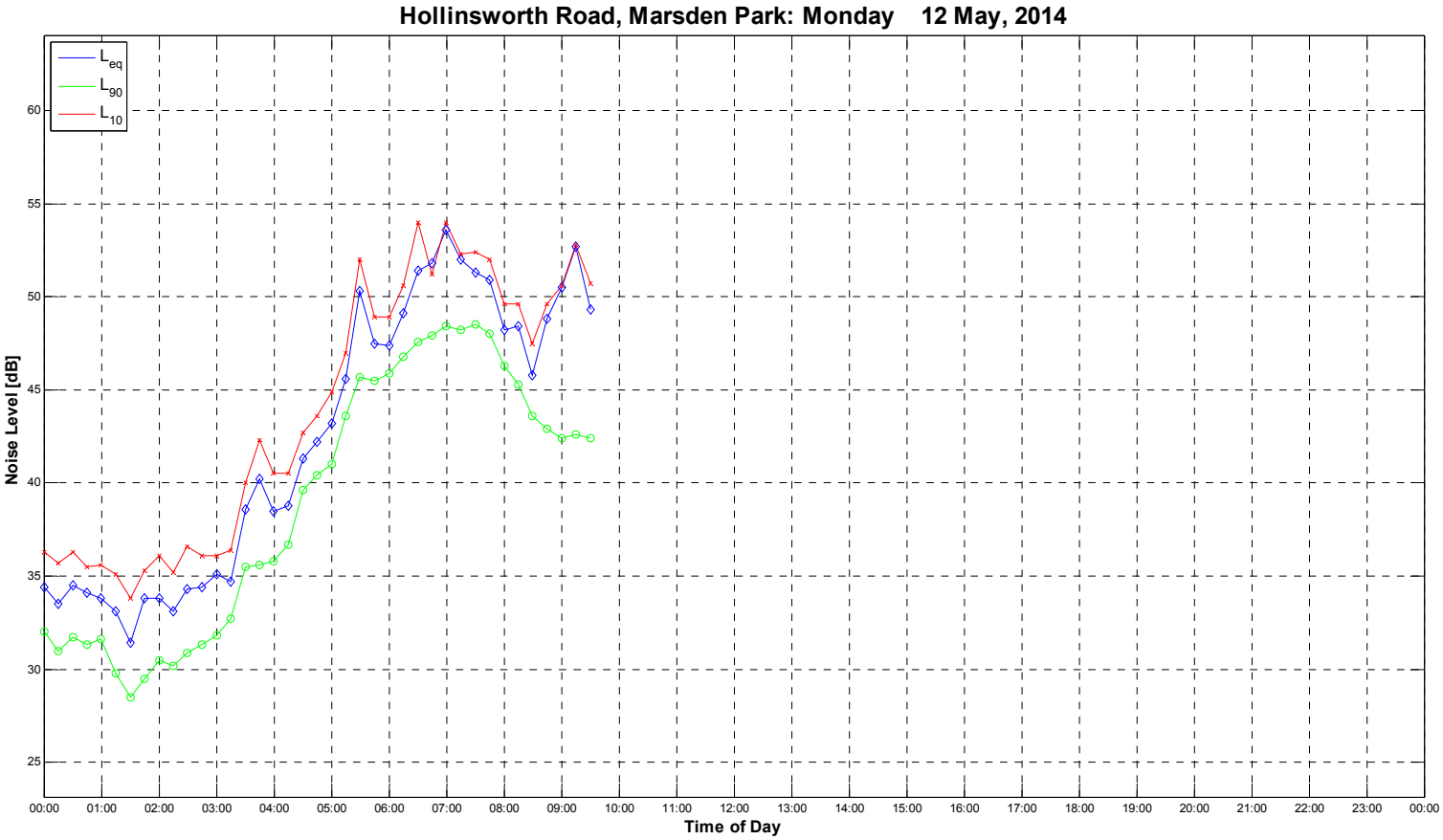

Hollinsworth Road, Marsden Park: Wednesday 07 May, 2014
L_eq
L_90
L_10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day


Hollinsworth Road, Marsden Park: Thursday 08 May, 2014
L_eq
L_90
L_10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day


Hollinsworth Road, Marsden Park: Friday 09 May, 2014
Leq
L90
L10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day


Hollinsworth Road, Marsden Park: Saturday 10 May, 2014
L_eq
L_90
L_10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day


Hollinsworth Road, Marsden Park: Sunday 11 May, 2014
L_eq
L_90
L_10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day


Hollinsworth Road, Marsden Park: Monday 12 May, 2014
L_eq
L_90
L_10
Noise Level [dB]
60
55
50
45
40
35
30
25
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day