

# MOOREBANK LOGISTIC PARK - PRECINCT EAST

## Warehouse 4A Operational Compliance Measurements

6 April 2021

Qube Property Management Services Pty Ltd c/- Tactical Group

TL116-09F02 Warehouse 4A Ops (r1)

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## Contents

1	Introduction	5
1.1	Warehouse operations description – WH4A	6
1.1.1	Location	6
1.1.2	Operational activities and facilities and hours of operation	6
1.2	Nearby sensitive receivers	6
2	Summary of noise objectives	9
2.1	Compliance assessment noise requirements	9
2.2	Operational noise limits	9
2.3	Discussion of assessment noise limits	10
3	Measurement methodology and results	12
3.1	Compliance measurement methodology	12
3.2	Instrumentation	13
3.3	Receiver unattended noise measurement results	13
3.3.1	Meteorological conditions	17
3.4	On-site attended operational activity noise measurement results	17
3.5	Unattended noise measurements	18
3.6	Modelled operational scenarios	19
3.6.1	Observed operations for modelling	19
3.6.1.1	Loading and Unloading operations (WH4A north)	19
3.6.1.2	Qube container handling operational area (WH4A south)	20
3.6.2	Assessment noise source levels	20
3.6.3	Reasonable worst-case intrusiveness scenarios (15-minute period)	21
3.7	Modelling methodology	23
3.7.1	Overview of noise modelling	23
3.7.2	General modelling assumptions	23
3.7.3	Model validation	24
3.8	Noise compliance assessment	25
4	Conclusion	27
APPENDIX A	Glossary of terminology	28
APPENDIX B	Logger location 1 – WH4A - North side	30
APPENDIX C	Logger location 2 – WH4A – South side	31

## List of tables

Table 1	Noise sensitive receivers and approximate distance from MPE WH4A	7
Table 2	SSD 7628 CoC B80 noise limits, dB(A)	10
Table 3	Noise measurement equipment	13

Table 4	Permanent noise monitoring stations	13
Table 5	Receiver permanent noise monitoring locations	14
Table 6	Summary of permanent noise monitoring results at the nearest sensitive residential receivers	16
Table 7	On-site attended noise measurement results	18
Table 8	Assessment noise source levels	21
Table 9	Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios	23
Table 10	Comparison between measured and modelled noise levels	24
Table 11	Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A north	25
Table 12	Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A south	26

## List of figures

Figure 1	Warehouse location WH4A, MPE precinct and the nearest residential receiver catchments	8
Figure 2	Residential receiver noise monitoring locations NMT01 to NMT04	15
Figure 3	Unattended noise logger locations and main noise generation areas (imagery: Nearmap, 2021)	19

# 1 Introduction

Renzo Tonin & Associates was engaged by Tactical on behalf of Qube Property Management Services Pty Ltd (QUBE) to undertake an operational noise compliance assessment of the warehouse operations carried out by Warehouse 4A (WH4A) within the Moorebank Precinct East (MPE), located within the Moorebank Logistics Park (MLP) at Moorebank, NSW.

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the MPE Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10\_0193). Warehouse operations, including the site that is operated by WH4A fall under the area and activities approved as part of SSD 7628.

This report has been prepared to address the operational noise monitoring requirements outlined in the MPE Operational Noise and Vibration Management Plan<sup>1</sup> (MPE ONVMP) required for the warehouse operations carried out by WH4A. Specifically, this report has been prepared to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628, as detailed in Section 3.2.2 of the MPE ONVMP.

Appendix A contains a glossary of acoustic terms used in this report.

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<sup>1</sup> Arcadis & Renzo Tonin & Associates, Operational Noise and Vibration Management Plan for Moorebank Logistics Park – East Precinct, Revision 012, dated 27/3/2020, available [https://simta.com.au/wordpress/wp-content/uploads/2020/04/ONVMP\\_V12\\_redacted.pdf](https://simta.com.au/wordpress/wp-content/uploads/2020/04/ONVMP_V12_redacted.pdf), accessed 25/3/2021

## 1.1 Warehouse operations description – WH4A

### 1.1.1 Location

The MLP is located approximately 27 kilometres south-west of the Sydney Central Business District and approximately 26 kilometres west of Port Botany, within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, as shown in Figure 1.

### 1.1.2 Operational activities and facilities and hours of operation

Operational activities at WH4A include storage and distribution activities at the position shown in Figure 1. The day to day activities include:

- Receipt and despatch of containers from and to the IMEX terminal
- Loading and unloading of containers
- Storage of products
- Despatching and receiving product to commercial customers using internal equipment such as forklifts
- Internal product moving and loading activities, including use of forklifts
- General office administrative and support functions.

The despatch activities mostly occur from the south side of WH4A, typically between the hours of 9:00am and 6:00pm, however the busiest period of noise-generating activities typically occurs around 9:00am to 11:00am. There are no activities that typically occur during the night period (10:00pm to 7:00am) within the site. The noise-generating vehicle movements associated with the general deliveries and commercial customer activities mostly occur from the northern side of the warehouse. The southern side of the warehouse is the designated area where containers from the IMEX terminal or other sources are transported to and stored for unloading to within the warehouse. These two main areas are shown in Figure 3.

## 1.2 Nearby sensitive receivers

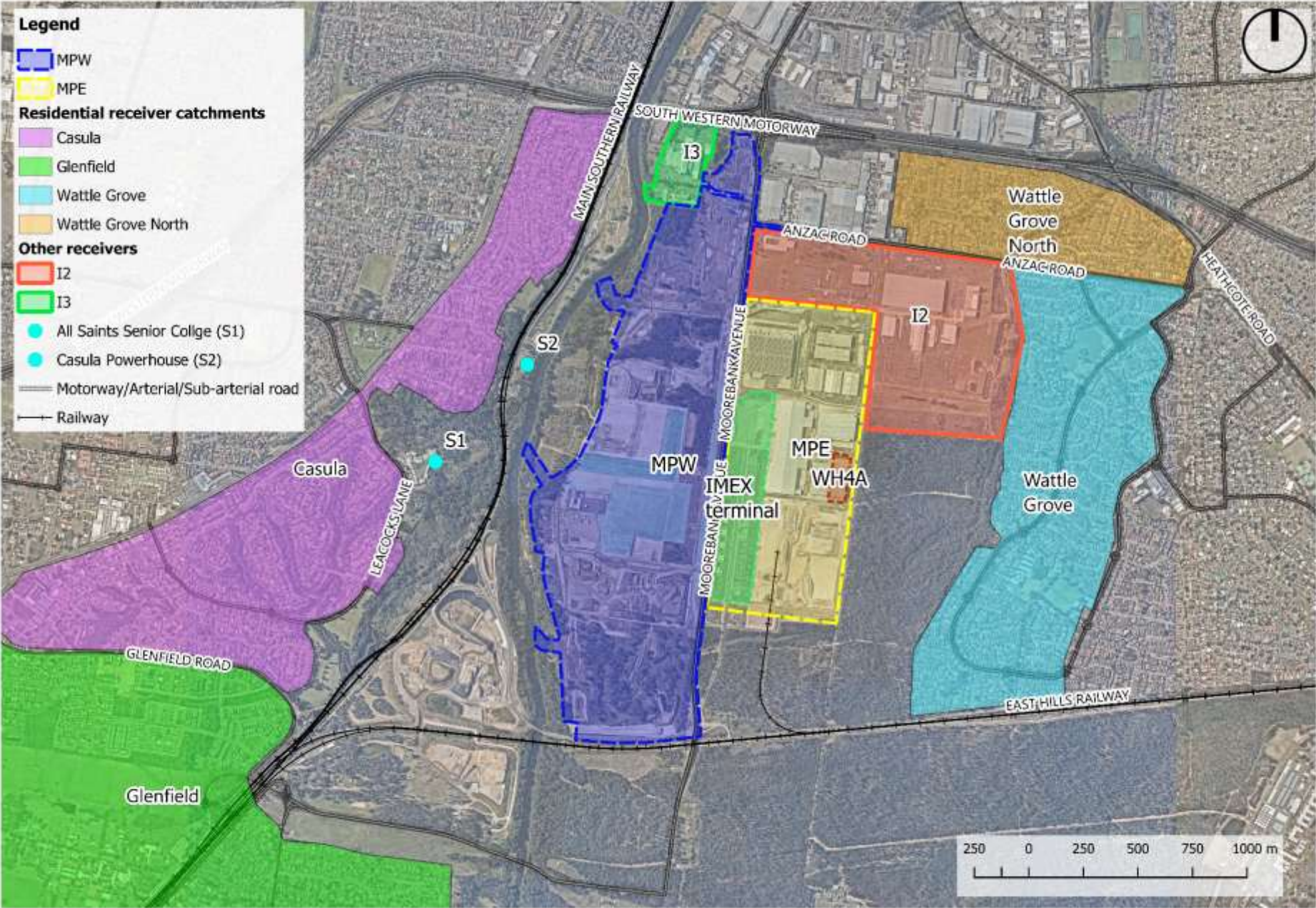
The potentially most affected residential receivers in the vicinity of the MPE, when noise intensive activities at the WH4A are occurring, are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. A summary of the approximate distance to the nearest residential receiver in the surround noise catchment areas (NCAs) is provided in Table 1. The locations of the NCAs or receivers, are shown in Figure 1.

**Table 1 Noise sensitive receivers and approximate distance from MPE WH4A**

Sensitive receiver (Noise Catchment Area (NCA) or Receiver ID)	Receiver type	Approximate distance from MPE precinct WH4A, metres
Wattle Grove (NCA 1)	Residential	800
Wattle Grove North (NCA 2)		1,060
Casula (NCA 3)		1,530
Glenfield (NCA 4)		2,530
All Saints Senior College (S1)	Educational	1,720
Casula Powerhouse (S2)		1,380
Defence Joint Logistics Unit (DJLU) (I2)	Industrial	600
ABB (I3)		1,260



Figure 1 Warehouse location WH4A, MPE precinct and the nearest residential receiver catchments





## 2 Summary of noise objectives

### 2.1 Compliance assessment noise requirements

The management of operational noise emission from warehouse activities within MPE Stage 2 is outlined in the MPE ONVMP. Specifically, this report has been prepared to address the requirements of CoC B85 in SSD 7628, as detailed in Section 4.1.1 of the MPE ONVMP.

This report includes noise monitoring performed to address the requirements in CoC B85, as detailed in Table 4-1 in Section 4.1.1 of the MPE ONVMP.

The requirements of CoC B85 state:

*B85 The Applicant must carry out noise monitoring of mechanical plant and other noisy equipment for a minimum period of one week where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plant must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.*

CoC B85 requires that the monitored noise levels be compared against the predicted levels reviewed in accordance with CoC B84.

The noise impacts from warehouse operations were assessed as part of the EIS noise and vibration impact assessment (MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016 (MPE Stage 2 N&V assessment)). The individual noise impacts of warehouse operations were not quantified as part of the EIS. As such, noise level predictions for the warehouse activities are not available for verification with CoC B85.

As per Table 4-1 in Section 4.1.1 of the MPE ONVMP, Table 3-20 and Table 3-21 of the MPE ONVMP detail the predicted  $L_{Aeq\ 15\ minute}$  intrusiveness and  $L_{Amax}$  sleep disturbance noise limit levels respectively for the overall MPE operations (not for individual warehouses).

As such, for the purposes of addressing CoC B85, instead of comparing the facility noise emission against the noise level predicted in accordance with CoC B84, this report aims to assess the noise levels from the mechanical plant and other noisy equipment that operate within the facility directly against the noise limits presented in Table 5 of condition B80.

### 2.2 Operational noise limits

The operational noise limits applicable for the warehouse operations within MPE are presented in Table 5 of SSD 7628 CoC B80 and are reproduced in Table 2. These noise limits are as per Table 3-5 of

the MPE ONVMP. The noise limits are applicable not only to all operational noise sources approved under SSD 7628, but are inclusive of operations as part of MPE Stage 1, approval SSD 6766.

The  $L_{Aeq(15 \text{ minute})}$  criteria are applicable during the day, evening and night-time periods and the  $L_{A1(1 \text{ minute})}$  sleep disturbance noise limits at residential receivers are applicable during the night-time period.

The noise limits are applicable under prevailing meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

**Table 2 SSD 7628 CoC B80 noise limits, dB(A)**

Sensitive receiver	Day <sup>1</sup>	Evening <sup>1</sup>	Night <sup>1</sup>	Night <sup>1</sup>
	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{A1(1 \text{ min})}$
Wattle Grove (NCA 1)	35	35	35	52
Wattle Grove North (NCA 2)	35	35	35	52
Casula (NCA 3)	35	35	35	52
Glenfield (NCA 4)	35	35	35	52

Notes:

1. In accordance with the INP, day is the period from 7:00 am to 6:00 pm Monday to Saturday; or 8:00 am to 6:00 pm on Sundays and public holidays; evening is the period from 6:00 pm to 10:00 pm; and night is the remaining periods.
2. To determine compliance with the  $L_{Aeq, 15 \text{ minute}}$  noise limits, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 Noise Policy for Industry - NPfI). The modification factors in Section 4 of the INP must also be applied to the measured noise levels where applicable.
3. To determine compliance with the  $L_{A1}$  noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the NPfI).
4. The noise emission limits identified above apply under meteorological conditions of:
  - (i) wind speeds of up to 3 m/s at 10 metres above ground level; or
  - (ii) 'F' atmospheric stability class.

## 2.3 Discussion of assessment noise limits

As noted in Section 2.2, the noise limits detailed in SSD 7628 CoC B80 are applicable not only to all operational noise sources approved under SSD 7628, but are also inclusive of operations as part of the MPE Stage 1 approval for SSD 6766. Importantly, when assessing compliance with the noise limits, the most affected residential receiver for any individual operations will not necessarily be at the same location. Additionally, it is unlikely that the reasonable worst-case noise levels from any individual operations would also occur in the same 15-minute period.

As part of the recent modification application for SSD 7709 Moorebank Precinct West (MPW) – Stage 2, MOD 1 - Building height increase, which was approved 24 December 2020, a review of the applicable operational noise requirements across Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) was undertaken (Renzo Tonin & Associates document reference TJ741-11F05 (r4), dated 30 June 2020). The review identified that there are number of approval conditions that are applicable across both the MPW and MPE sites for operational noise, and that in the application of these approvals to the site activities, it became apparent that the operational noise requirements were not consistent across the MPE and MPW sites.

Additionally, the review identified that the operational noise limits across MPE and MPW were set substantially below both the noise criteria and the predicted noise levels (even with feasible and reasonable mitigation measures) established during the environmental assessment stages and considering the cumulative operational noise levels from all MPE and MPW operations.

The review recommended that an overall approach for cumulative operational noise management of the Moorebank intermodal terminal precinct (for East and West precinct) for a “whole of complex” approach be adopted, and that consistent noise management objectives for the Moorebank intermodal terminal precinct’s operational noise be adopted to cover all operations within MPE and MPW. Appropriate and achievable noise management objectives consistent with EPA’s noise policies were also developed in the review.

Following the modification application for SSD 7709 (MOD 1), the submission received from the NSW Environment Protection Authority (NSW EPA) noted the following:

*However, the current noise limits are set below the predicted noise levels and are not based on the Project Specific Noise Levels (PSNL) derived under the then-applicable Industrial Noise Policy 2000 (now superseded by the Noise Policy for Industry 2017).... The EPA considers that the resulting noise limits are not achievable for MPW, nor are they achievable for the cumulative MPW and MPE sites.*

Also Liverpool City Council included in their submission:

*Council considers that site regulation in regard to noise management may be assisted by adopting a precinct approach consistent with the NSW EPA’s Noise Policy for Industry (2017).... Whilst it is acknowledged that current criteria in the Approval may be impracticable, it will be necessary for the Department to consider applying suitable noise limits that are achievable and capable of protecting the amenity and wellbeing of sensitive receivers.*

As such, this operational compliance assessment does not include further quantification of cumulative noise levels, and demonstrates that WH4A operations can achieve the noise limits set out in SSD 7628 CoC B80 in isolation during reasonable worst-case operations.

It is recommended that noise levels from this assessment achieve the required noise limits set out in Table 5 of SSD 7628 CoC B80, and that the site specific noise levels should be considered as part of the operational noise management applicable to the overall Moorebank intermodal terminal precinct.

## 3 Measurement methodology and results

### 3.1 Compliance measurement methodology

The Noise Policy for Industry (NPfI) provides guidance in Chapter 7 for monitoring the performance of a noise-generating industrial facility. In Section 7.1.1, the NPfI provides guidance as to how to review noise emissions of a site where the existing ambient noise levels are already high, resulting in the direct quantification of the noise under investigation not being possible via noise measurements at the receiver location. Additionally, the NPfI provides guidance about using noise modelling to review the performance of an industrial operation that is co-located with separate but noise-generating industrial sites impacting the same receiver. To satisfy the requirements of CoC B85, the following noise monitoring and assessment steps have been undertaken:

1. Review of permanent noise monitoring at nearby residential receivers during periods when noise intensive activities were taking place within the WH4A facility to determine if noise levels would allow for quantification of operational noise emissions, by checking if operational noise emissions are audible, distinguishable and quantifiable at the receiver locations during periods of noise intensive on-site activities (Section 3.3).
2. On-site attended monitoring of noise-generating activities to quantify noise emission levels of mechanical plant and other noise-generating activities as part of typical warehouse operations (Section 3.4).
3. Unattended noise monitoring at the WH4A facility for a period of one week, with concurrent video, to identify the reasonable worst-case operational scenarios and periods for each major noise-generating area (Section 3.5).

The review of unattended noise monitoring data measurements in Section 3.3 established that the existing ambient noise levels at the nearest receivers were high and controlled by noise sources outside of MPE in addition to a number of industrial noise-generating facilities being co-located. As such, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations was not possible. Noise emissions from the WH4A have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, in order to quantify the industrial noise emissions from WH4A operations.

The following steps were undertaken to assess the noise level contributions at the nearby sensitive receivers:

1. Review observations of warehouse operations, in addition to the noise monitoring results and associated video, to then determine the reasonable worst-case operational scenarios.
2. Setup and calibrate the noise model for the reasonable worst-case operational scenarios.
3. Calculate the operational noise levels from the warehouse operations to all nearby receivers and determine the noise level contribution at the property with the highest noise levels within each NCA.

### 3.2 Instrumentation

A range of noise monitoring equipment was used to undertake the compliance noise monitoring. A summary of measurement equipment and calibration dates is provided in Table 3.

All of the noise monitoring equipment are Class 1 instruments, with calibration certificates current at the time of the measurements. Before and after each series of attended measurements, the calibration of the sound level meters were verified using a reference calibration of 94 dB at 1 kHz. The difference between pre- and post-calibration levels was within 0.5 dB for all measurements.

**Table 3 Noise measurement equipment**

Monitoring location/ purpose	Equipment	Serial No	Last date calibrated
On-site attended noise measurements	NTi XL2	A2A-16217-E0	05/07/2019
Unattended on-site noise measurements (WH4A North)	NTi XL2	A2A-08520-E0	14/03/2019
Unattended on-site noise measurements (WH4A South)	NTi XL2	A2A-07815-E0	23/12/2020
Field calibration	B&K 4231	3016756	27/11/2020

Four Envirosuite permanent noise monitors are set up at nearest representative residential locations in the community and are labelled NMT01 to NMT04 in Figure 2.

**Table 4 Permanent noise monitoring stations**

Monitoring location	Description	Equipment	Serial No	Last Date Calibrated
NMT01	Permanent noise monitor	B&K 2250	3025394	12/03/2019
NMT02	Permanent noise monitor	B&K 2250	3025271	12/03/2019
NMT03	Permanent noise monitor	B&K 2250	3025351	12/03/2019
NMT04	Permanent noise monitor	B&K 2250	3025317	12/03/2019

### 3.3 Receiver unattended noise measurement results

As detailed in Section 1.2, the residential receivers nearest to WH4A are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North.

As the most intensive period of operational activities at WH4A typically occurs during the daytime period from 9:00 am, noise monitoring data from the permanent noise monitoring stations have been reviewed for the period between 9:00 am and 11:00 am on 3 March 2021, during which onsite noise intensive activities were confirmed to be taking place. The permanent noise monitoring stations were configured to record audio and undertaken short-term statistical noise measurements. During this measurement period, concurrent unattended noise measurements were undertaken on-site of noise generating activities (see Section 3.4). This assisted to confirm that noise intensive activities were occurring on-site during the reviewed period of permanent noise monitoring data and noise recordings.

A summary of the monitoring locations and the approximate distance to the WH4A is provided in Table 5. These locations along with the noise catchment areas (NCAs) are presented in Figure 2.

**Table 5 Receiver permanent noise monitoring locations**

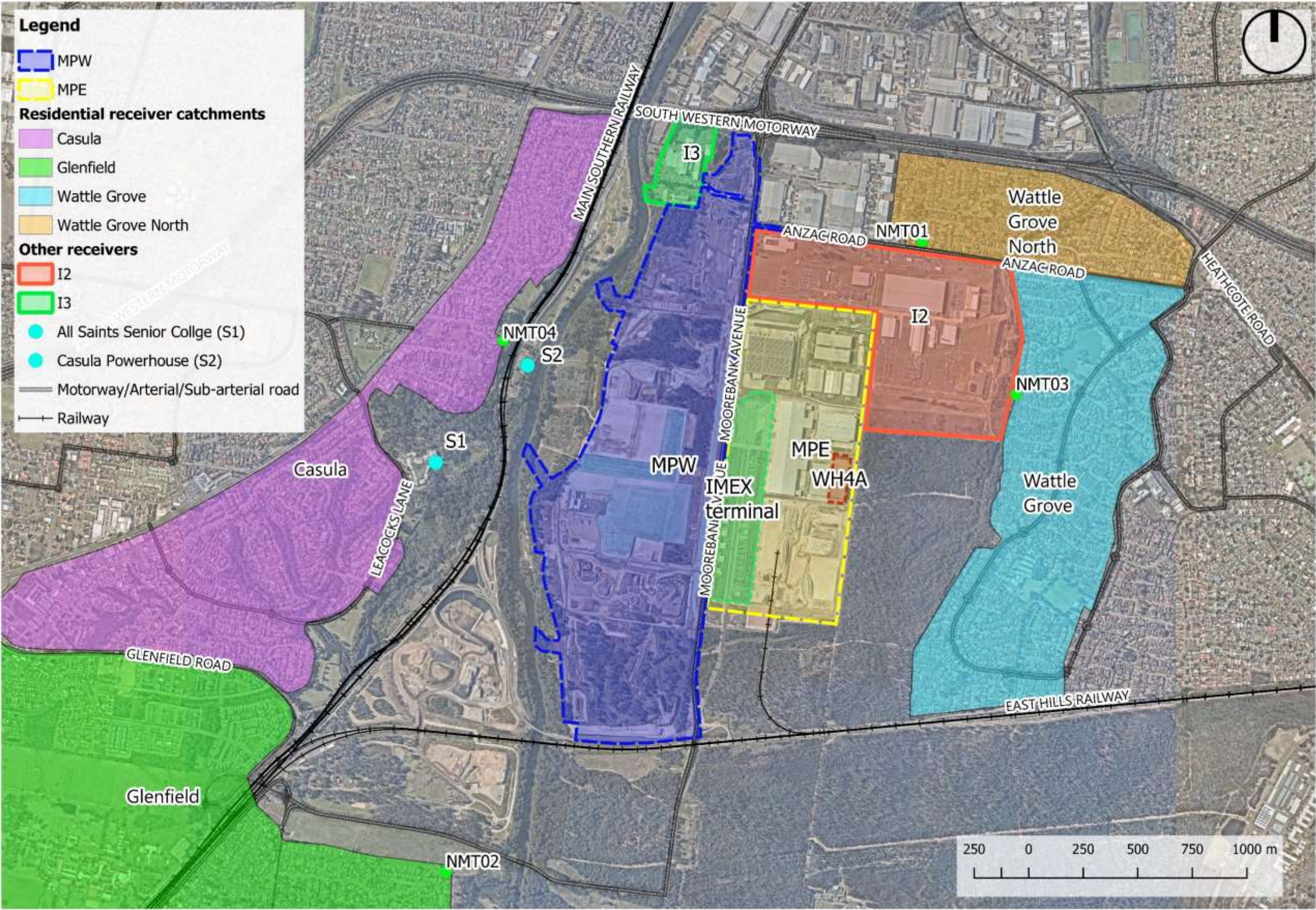
Monitoring location ID	Monitoring location (applicable NCA) (see Figure 2)	Approximate distance (m) from WH4A
NMT01	22 Glenelg Court, Wattle Grove (Wattle Grove North – NCA2)	1000
NMT02	26 Goodenough Street, Glenfield (Glenfield – NCA4)	2,400
NMT03	31 Martindale Court, Wattle Grove (Wattle Grove – NCA1)	815
NMT04	14 Dunmore Crescent, Casula (Casula – NCA3)	1,600

The results of the permanent noise monitoring results on 3 March 2021 are presented in Table 6.

The ambient noise levels during the reviewed monitoring period were greater than 48 dB(A)  $L_{Aeq\ 15\ minute}$  at all monitoring locations, with corresponding background noise levels no less than 37 dB(A)  $L_{A90\ 15\ minute}$  at all monitoring locations. Sample reviewed audio could not clearly distinguish noise levels corresponding to concurrent onsite activities. As such, given that noise levels are expected to be below the overall noise limit of 35 dB(A)  $L_{Aeq\ 15\ minute}$ , were not audible and/or distinguishable at nearby receivers because of high ambient noise levels, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations would not be possible via direct measurement in the presence of the ambient noise level environment. As such, it is appropriate to use the alternative methodology of modelling to determine compliance as detailed in Section 7.1.1 of the NPfI.



Figure 2 Residential receiver noise monitoring locations NMT01 to NMT04





**Table 6 Summary of permanent noise monitoring results at the nearest sensitive residential receivers**

Measurement period	Measured noise level (15 minute), dB(A)			
	L <sub>Amax</sub>	L <sub>A1</sub>	L <sub>Aeq</sub>	L <sub>90</sub>
NMT01 (22 Glenelg Court, Wattle Grove)				
03/Mar/21 09:00:00 09:15:00	75	67	55	44
03/Mar/21 09:15:00 09:30:00	64	60	53	43
03/Mar/21 09:30:00 09:45:00	80	61	53	41
03/Mar/21 09:45:00 10:00:00	69	61	53	43
03/Mar/21 10:00:00 10:15:00	64	60	52	44
03/Mar/21 10:15:00 10:30:00	68	60	52	46
03/Mar/21 10:30:00 10:45:00	65	60	52	47
03/Mar/21 10:45:00 11:00:00	74	60	53	47
NMT02 (26 Goodenough Street, Glenfield)				
3 March 2021 9:00 to 11:00	Not available due to maintenance and calibration.			
NMT03 (31 Martindale Court, Wattle Grove)				
03/Mar/21 09:00:00 09:15:00	84	68	56	37
03/Mar/21 09:15:00 09:30:00	87	72	61	39
03/Mar/21 09:30:00 09:45:00	82	65	56	43
03/Mar/21 09:45:00 10:00:00	73	63	54	43
03/Mar/21 10:00:00 10:15:00	68	57	50	43
03/Mar/21 10:15:00 10:30:00	73	63	51	43
03/Mar/21 10:30:00 10:45:00	85	55	52	44
03/Mar/21 10:45:00 11:00:00	63	54	48	44
NMT04 (14 Dunmore Crescent, Casula)				
03/Mar/21 09:00:00 09:15:00	73	65	54	48
03/Mar/21 09:15:00 09:30:00	77	64	55	49
03/Mar/21 09:30:00 09:45:00	68	64	53	49
03/Mar/21 09:45:00 10:00:00	66	63	53	46
03/Mar/21 10:00:00 10:15:00	71	67	55	46
03/Mar/21 10:15:00 10:30:00	74	64	53	45
03/Mar/21 10:30:00 10:45:00	70	66	55	47
03/Mar/21 10:45:00 11:00:00	77	73	60	48

### 3.3.1 Meteorological conditions

Meteorological conditions for the review period of the permanent noise monitoring station data has been reviewed to ensure they were acceptable in accordance with the NPfl. Data from the MLP meteorological data monitoring station adjacent to Moorebank Avenue, within the MPE site, established in accordance with CoC A54 SSD 7709 has been reviewed. The meteorological conditions experienced during receiver permanent noise monitoring on 3 March 2021 are summarised below:

- During the measurement period at the facility, the equivalent average wind speed was 1.6 m/s and generally from the SSW. All other measurements were not impacted by excessive wind during any of the measurement periods.
- No rain occurred during any of the measurement periods.
- The temperature during the measurement period ranged between 32°C and 35°C, and the cloud conditions were generally clear skies with a few scattered clouds.

### 3.4 On-site attended operational activity noise measurement results

In order to quantify the noise emissions from on-site activities for the purposes of determining compliance noise levels, attended noise measurements of individual operational items and typical operations were undertaken at WH4A on 2 March, 9 March and 16 March 2021. These noise levels have been used to assist in establishing the source noise levels in the noise model.

During all measurements, the specific noise source being measured was the dominant source. Observations were made of the on-site operations, which have then been reviewed to model 'reasonable' worst-case operational scenarios over the assessment periods. Critical on-site attended measurement results are summarised in Table 7.

The main noise generating activities observed were being undertaken within the warehouse, including forklift operations and noise generated from warehouse internal activities.

**Table 7 On-site attended noise measurement results**

Activity noise sources	Date	Time	Measurement duration (t), sec	Measurement distance (m)	Measured noise levels, dB(A)	
					L <sub>Aeq(t)</sub>	L <sub>AFmax</sub>
Internal warehouse noise levels (noise breakout)						
Internal noise level at loading dock door (internal sources include forklifts)	2/3/2021	2:30pm	300	At external roller doors	62	80
Forklift						
Forklift 1.5-2 Tonnes, passby	2/3/2021	1:40pm	10	10	62	65
Curtain side trailer truck <sup>1</sup>						
Truck pass-by	3/3/2021	6:00am	10	6	74	78
Truck Idling	3/3/2021	7:00am	60	20	65	67
Mechanical plant						
Office air condenser unit <sup>2</sup>	2/3/2021	1:00pm	300	1	50	51

Note:

1. Attended measurement results for Curtain side trailer trucks were obtained at WH5, as the same type of truck was operated as part of the WH4A activities.
2. 1 out of 12 condenser units were operating at time of measurement.

### 3.5 Unattended noise measurements

Unattended noise measurements were undertaken over the period between 2 March and 8 March 2021 at locations adjacent to WH4A on both side of the warehouse. Two main areas of noise-generating operations were identified across the warehouse site, one on the northern side of the warehouse and one on the southern side. The location of the unattended noise loggers is shown in Figure 3. These were selected so that they would capture noise from the main noise-generating areas as part of the typical warehouse operations. A camera unit was setup on the northern side boundary fence at WH4A north to assist in gaining a comprehensive understanding of the site operations and vehicle movements.

The purpose of the noise logging at the selected locations was for the following:

- Determine the noise emissions from the facility at a fixed location close enough to quantify on-site sources.
- Determine the long-term background noise levels when operations were not taking place at the site.
- A source for analysis to determine the duration and nature of the different on-site activities through correlation with the Facility activity data.
- Source of validation for the noise model calibration process.

Detailed unattended noise monitoring results are provided in APPENDIX B for WH4A North and APPENDIX C for WH4A South. The noise model was validated using the unattended noise logger results through comparison against reference activity periods, refer to Section 3.7.3 for noise model calibration.

**Figure 3 Unattended noise logger locations and main noise generation areas** (imagery: Nearmap, 2021)

### 3.6 Modelled operational scenarios

#### 3.6.1 Observed operations for modelling

Based upon the on-site attended measurements presented in Section 3.4, the video recording for the facility over the unattended monitoring period presented in Section 3.5, and discussions with WH4A personnel, 'reasonable' worst-case operational assessment scenarios were established and modelled to satisfy the assessment periods under SSD 7628.

The following section details the key observations of each of the noise-generating activities that take place across the warehouse operations.

##### 3.6.1.1 Loading and Unloading operations (WH4A north)

The following data related to delivery truck operations was based upon site observations during the attended measurements on 9 March and 16 March 2020, in addition the unattended noise level and audio data recordings during periods when internal truck movements on the hardstand and forklift operations were clearly distinguishable between 2 March and 8 March.

- It was observed during the attended measurements and verified with unattended measurement data, that internal truck movements on the hardstand were typically Curtain Side Trailer Trucks, and that a typical 'in-and-out' cycle time in the facility was on median 20 minutes, with each loading cycle taking approximately 10-15 minutes.
- It was observed during the attended noise measurements that the internal truck movements on the hardstand in the WH4A north despatching area move at a relative low speed of approximately 10 km/h.
- Loading and unloading of containers from Container Crane Trucks occurred outside of the warehouse on the WH4A north. Based on a review of the video and unattended noise data, these operations occurred once per week and are therefore not considered as a typical operation for north WH4A.
- Unloading of products from delivery trucks typically occur within the warehouse, with the warehouse doors open. It was observed that a truck would be loaded or unloaded in the external despatch area using a forklift.

#### **3.6.1.2 Qube container handling operational area (WH4A south)**

- It was observed that one combi-lift would be used to move containers to and from the southern hardstand of the WH4A site boundary, to and from, the MLP terminal area. Using the unattended measurements and concurrent video recordings during the monitoring, it was observed that the duration of the combi-lift loading/unloading operations was less than 10 minutes, and operate continuously when handling containers.
- Impact noise events associated with grabbing and dropping of containers would occur when the combi-lift gripper contacted individual containers. Air brake events associated with combi-lift operation would occur during handling operations. This sound power level is adopted in the modelling of potential sleep disturbance events.
- Movements of containers within the WH4A south area can occur at any time throughout the daytime period. It was observed that movements typically started from approximately 7:00am. Only three container movements during the monitoring week were observed in the video recordings, and only one container movement would occur during any one day.

### **3.6.2 Assessment noise source levels**

Source levels for the key noise-generating activities on-site have been established based upon the attended noise measurements (Section 3.4) and unattended noise measurements (Section 3.5) during periods of typical operation. The sound power level inputs presented in Table 8 were used in the operational noise compliance modelling, and adjusted for the duration and frequency of operations (Section 3.6.3).



**Table 8 Assessment noise source levels**

Site items / operation	Individual activity sound power level (SWL) ( $L_{Aeq}$ , dB(A))
<b>WH4A North</b>	
Container Crane Trucks (slow speed manoeuvring within the site boundary)	99
Container movement noise events ( $L_{AFmax}$ )	107
Container movement noise events ( $L_{Aeq}$ ) <sup>4</sup>	79 $L_{Aeq, 15min}$
Curtain Side Trailer Truck moving with speed less than 20km/h	102
Air brake release ( $L_{AFmax}$ )	117
<b>WH4A South</b>	
Container combi-lift (moving container activity)	103
Container gripping & drop ( $L_{Amax}$ )	108
Container gripping & drop ( $L_{Aeq}$ ) <sup>4</sup>	81 $L_{Aeq, 15min}$
<b>Internal noise breakout</b>	
Internal noise breakout via roof <sup>1</sup>	74
External roller doors <sup>5</sup>	76
<b>Mechanical Plant</b>	
Air condenser unit <sup>2</sup>	70
<b>Other noise sources</b>	
Curtain Side Trailer Truck moving on internal roads within MLP, outside of the WH4A site (typical speed on internal roads of 20 km/h)	102

Notes:

1. Attended measurement shows breakout via WH4A warehouse roof during loading and unloading operations Internal noise levels included internal noise intensive periods when forklifts were in use.
2. Air condenser units are located on the east façades of the warehouse.
3. Internal noise levels controlled by forklift operations within the warehouse.
4. One event assumed in the 15-minute interval.
5. Sound power level for each roller door.

### 3.6.3 Reasonable worst-case intrusiveness scenarios (15-minute period)

As the noise limits in CoC B80 are set at 35 dB(A)  $L_{Aeq, 15 \text{ minute}}$  for the day, evening and night periods, specific separation of noise intensive periods for each of these time periods has not been undertaken. Instead, it is noted that there are two main areas of noise generation as part of typical warehouse operations, as presented in Figure 3.

In order to assess the operational noise emissions from the warehouse, the 'reasonable' worst-case operations for each of the two main areas of noise generation have been developed, along with the corresponding activities in the other noise-generating areas, in order to review a representative snapshot of activities from the warehouse operations. Each of the assessment scenarios have been developed from an analysis of the video movement data or attended on-site observations over during the one-week period, in addition to the information detailed in Section 3.6.1. It is noted that the peak

periods of noise generating activities for each of the two main areas (northern side of the warehouse and southern side of the warehouse) did not occur concurrently.

A representative scenario has been established to assess a 'reasonable' worst-case scenario for the northern side of the warehouse, which is the WH4A north. A total of three container movements were observed on the video data to occur over the period of one week. The duration of each container delivery operation was approximately 10 minutes or less. During the periods when containers were being moved within WH4A south (Qube container operation area), warehouse roller doors remained closed on the south side of WH4A.

The WH4A north activities were observed to commence from 9:00am, with a peak period of noise intensive activities around the 9:00am to 11:00am.

Periods representing the 'reasonable' worst-case operations, for each the northern side of the warehouse and southern side of the warehouse, based upon these peak periods of noise intensive activities have been used to assess operational noise emissions. Table 9 details the two 'reasonable' worst-case scenarios (15-minute period), covering the noise intensive periods for the two main areas of noise generation across the site.

As required by CoC B85, all significant noise-generating equipment has been included the assessment modelling, including the key noise-generating mechanical plant. It is noted that the noise contribution from the mechanical plant items serving the office area are included in the modelling, however, they generate minimal contribution to the overall noise levels from site operations, which are controlled by other on-site activities such as truck departures, arrivals and warehouse internal loading and unloading activities. The roof mounted smoke ventilation fans were not operating during typically activities on-site.

**Table 9 Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios**

Activity	WH4A South 15-minute assessment period (Qube container area)	WH4A South 15-minute assessment period
<b>WH4A South 15-minute noise intensive period (with container handling taking place)</b>		
Departure	One Combi-lift departure from WH4A south (Qube container operational area) loaded with 1 container.	No activity
Arrival	One Combi-lift arrival at WH4A south (Qube container operational area) loaded with 1 container.	No activity
On-site operations	Container operations: a) Placing one container down	<i>Noise breakout via open warehouse doors.</i> All loading activity are occurring inside the warehouse with warehouse doors open, one noise generating activities occurring concurrently. a) Forklift movements
<b>WH4A North 15-minute noise intensive period</b>		
Departure	No activity	One Curtain Side Truck departure from WH4A north.
Arrival	No activity	Two Curtain Side Truck arrive at WH4A north, engine off after parking.
On-site operations	No activity	<i>Noise breakout via open warehouse doors.</i> Loading and unloading activities are occurring outside the warehouse with warehouse doors open, one noise generating activity occurring at the time. a) Forklift movements
<b>Mechanical plant (All scenarios)</b>		
Warehouse office air conditioning condenser (12 out of 12 units operating)		

## 3.7 Modelling methodology

### 3.7.1 Overview of noise modelling

Since ambient noise levels were well above the project noise limit at the nearest residential receivers, and it was not possible to directly measure or estimate the warehouse noise contribution directly, computer noise modelling was used to calculate the operational noise levels from warehouse operations at the nearby noise sensitive receivers.

### 3.7.2 General modelling assumptions

Modelling and assessment of warehouse noise emissions were determined by modelling the noise sources, receiver locations, existing built structures and topographical features, using CadnaA (version 2020).

The modelling incorporated the worst-case prevailing meteorological conditions, as required by CoC B80, which are wind speeds of up to 3 m/s at 10 metres above ground level for the assessed activities for daytime activities.

The noise predictions are based on the CONCAWE noise prediction algorithms, noting that the nearby noise sensitive receivers are greater 100 metres from the subject site. The CONCAWE environmental noise prediction method is an appropriate method for predicting noise propagation in these circumstances.

The noise prediction model considers:

- Location of noise sources on-site sensitive receiver locations
- Height of noise sources and receivers referenced to digital ground contours within the site and outside the site area
- Noise source levels of individual plant, equipment and internal building noise levels, modelled as either point, line or area noise sources. All noise sources associated with the WH4A operations within the MPE boundary have been included in the noise modelling, including the truck movements outside of the WH4A footprint, along internal MPE roads.
- Separation distances between sources and receivers
- Ground type between sources and receivers (mixed soft/ hard)
- Attenuation from buildings and built structures and topography (natural and purpose built)
- Atmospheric losses and assessment meteorological conditions.

The modelled activities and assumptions for the to the equipment operating and the duration and frequency of operation as part of the 'reasonable' worst-case operational scenarios are described in Section 3.6.3.

### 3.7.3 Model validation

Following the development of each of the representative modelling scenarios, the noise model outputs were compared against a reference time period of the onsite unattended noise measurement results for the period during which similar activities to the reasonable' worst-case operational scenario were taking place. Validation of the reasonable worst-case on-site activities was undertaken to check the final representative modelling inputs against a period of measured activities. The results of this process are presented in Table 10.

**Table 10 Comparison between measured and modelled noise levels**

Time period	Logger	Measured noise levels LAeq,15minute (dBA)	Predicted noise levels LAeq,15minute (dBA)	Difference, dB(A)
10:45 am to 11:00 am 3 March 2021 <sup>1</sup>	WH4A North	62	62	< 1
2:50 pm to 3:05 pm 3 March 2021 <sup>2</sup>	WH4A South	65	64	1

Notes: 1. Noise generating activities within the facility were as per Table 9 "4A North 15-minute noise intensive period"  
2. Noise generating activities within the facility were as per Table 9 "4A South 15-minute noise intensive period (With container handling taking place)"

The predicted noise levels are within the modelling tolerance of 1 dB(A). The results from the validation of the model demonstrate that it is suitable for determining the compliance noise levels at the nearby receivers for this assessment.

### 3.8 Noise compliance assessment

Predicted operational compliance noise levels are presented in Table 11 and Table 12 for the two reasonable worst-case operational assessment scenarios. The noise levels have been predicted to each of the surrounding residential receiver noise catchments. The highest residential receiver noise level in each catchment area are reported. This is not necessarily the same receiver location for each assessment scenario.

The results in Table 11 and Table 12 show that the predicted noise levels for the  $L_{Aeq}$  (15-minute) assessments comply with the overall operational noise limits presented in Table 2.

As the noise levels from the site operations were not audible at the nearby noise sensitive receivers, the noise levels would not be perceived as particularly annoying at the nearby receiver locations as per the NPfI (i.e. if the resulting noise level at a receiver location is tonal, low frequency or is intermittent at night). As such, no adjustments in accordance with Fact Sheet C of the NPfI are required.

During the 7 days monitoring period, only one combi-lift activity at WH4A south was observed during the night period (10:00pm to 7:00am). As such, this is not considered a typical operation for the south WH4A.  $L_{A1}$  (1-minute) noise predictions have been performed for this scenario to assess the potential for sleep disturbance impacts (see Table 2 for the relevant assessment criteria). The results in Table 11 and Table 12 show that the predicted  $L_{A1}$  (1-minute) noise levels comply with the sleep disturbance noise limits.

**Table 11 Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A north**

Noise catchment area/ receiver location	$L_{Aeq}$ (15-minute)		Compliance	$L_{A1}$ (1-minute)		Compliance
	Noise limits	Predicted noise levels		Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	27	Yes	52	34	Yes
Wattle Grove North (NCA 2)	35	< 20	Yes	52	< 20	Yes
Casula (NCA 3)	35	20	Yes	52	< 20	Yes
Glenfield (NCA 4)	35	< 20	Yes	58	< 20	Yes
All Saints Senior College (S1)	45 <sup>1</sup>	< 20	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 <sup>1</sup>	21	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 <sup>1</sup>	31	Yes	-	N/A	N/A
ABB (I3)	70 <sup>1</sup>	< 20	Yes	-	N/A	N/A

Note: 1. Noise limits for these receivers are only applicable when the receiver is in use

**Table 12 Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A south**

Noise catchment area/ receiver location	L <sub>Aeq</sub> (15-minute)		Compliance	L <sub>A1</sub> (1-minute)		Compliance
	Noise limits	Predicted noise levels		Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	28	Yes	52	40	Yes
Wattle Grove North (NCA 2)	35	< 20	Yes	52	< 20	Yes
Casula (NCA 3)	35	< 20	Yes	52	29	Yes
Glenfield (NCA 4)	35	< 20	Yes	58	26	Yes
All Saints Senior College (S1)	45 <sup>1</sup>	< 20	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 <sup>1</sup>	< 20	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 <sup>1</sup>	20	Yes	-	N/A	N/A
ABB (I3)	70 <sup>1</sup>	< 20	Yes	-	N/A	N/A

Note: 1. Noise limits for these receivers are only applicable when the receiver is in use

The highest modelled noise levels at nearby residential receivers for the WH4A North 15-minute noise intensive period is predicted to be 27 dB(A) L<sub>Aeq,15minute</sub> at Wattle Grove. For WH4A north, the highest modelled noise level at nearby residential receivers from container unloading activities is predicted to be 28 dB(A) L<sub>Aeq,15minute</sub> at Wattle Grove (NCA 1).

The noise levels from the two noise generation areas have not been directly combined as part of the assessment, as they did not occur concurrently. The video data showed that container deliveries to WH4A south only occurred three times within the one-week period, each of 10 minutes or less. As such, this would not be considered a typical operation. As such, the modelled noise levels for the 'reasonable' worst case WH4A North 15-minute noise assessment period will only occur occasionally. It is not expected that peak activities at WH4A north and WH4A south will occur concurrently. In the very unlikely event that peak activities at WH4A north and WH4A south occur concurrently, the resulting noise levels at Wattle Grove (NCA 1) would be 30 dB(A) L<sub>Aeq,15minute</sub>.



## 4 Conclusion

The noise assessment has been undertaken to address the operational noise requirements for the WH4A within the Moorebank Precinct East in accordance with the *Operational Noise and Vibration Management Plan, Moorebank Logistics Park – East Precinct* (dated 27 March 2019, Revision 12) (MPE ONVMP), more specifically to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628.

A review of noise measurements at the nearest residential receivers during period of peak onsite activities determined that site activities were not audible and distinguishable at nearby receivers because of high ambient noise levels from road traffic, rail traffic and construction noise. For this reason, guidance from the NSW EPA Noise Policy for Industry (NPfI) Chapter 7 has been followed in order to use an alternative approach to determine compliance, and compare the site noise emissions with the noise limits.

A combination of on-site and off-site measurements were performed, between 2 March and 16 March 2021. The aim of the measurements was to quantify on-site operational noise levels from the WH4A facility, in order to then predict back to the nearby receivers. Using this approach, noise emissions from the warehouse facility operations have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, to predict the operational noise levels at the nearest sensitive receivers.

Two 'reasonable' worst-case assessment scenarios were established based upon on site unattended noise monitoring and video recordings, in addition to discussions with WH4A personnel and observations made during on-site attended noise measurements. These were used to develop the current 'reasonable' worst case noise intensive periods that occur onsite. These were separated into two main areas of activities, one on the northern side of the warehouse and one on the southern side.

As required by CoC B85, all significant noise-generating equipment was included the assessment modelling, including the key noise-generating mechanical plant. The noise contribution from the mechanical plant items serving the warehouse and office area generate minimal contribution to the overall noise levels from site operations, which are generally controlled by other on-site activities such as truck departures, arrivals and internal warehouse loading and unloading activities.

The model was developed, and validated against the on-site unattended noise monitoring data, during periods with similar operational activities. Using the calibrated noise model, noise levels were predicted to all nearby noise sensitive receiver locations, including the residential receivers in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. Noise levels were assessed assuming the worst-case prevailing meteorological conditions were present, as required by CoC B80.

The outcome of the compliance noise monitoring and modelling demonstrated that the mechanical plant and other noisy equipment that operate as part of the WH4A operations achieve the noise limits presented SSD 7628 CoC B80.

## APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																								
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																								
Assessment period	The period in a day over which assessments are made.																																								
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																								
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																								
Decibel [dB]	<p>The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment:</p> <table><tr><td rowspan="2">threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td>10 dB</td><td>Human breathing</td></tr><tr><td rowspan="2">almost silent</td><td>20 dB</td><td></td></tr><tr><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td rowspan="2">generally quiet</td><td>40 dB</td><td>Library</td></tr><tr><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td rowspan="2">moderately loud</td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td rowspan="2">loud</td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td rowspan="2">very loud</td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td rowspan="2">extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>			threshold of hearing	0 dB	The faintest sound we can hear	10 dB	Human breathing	almost silent	20 dB		30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library	50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time	70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home	90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
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extremely loud	120 dB	Jet plane take-off at 100m away																																							
	130 dB																																								
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dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																								
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																								

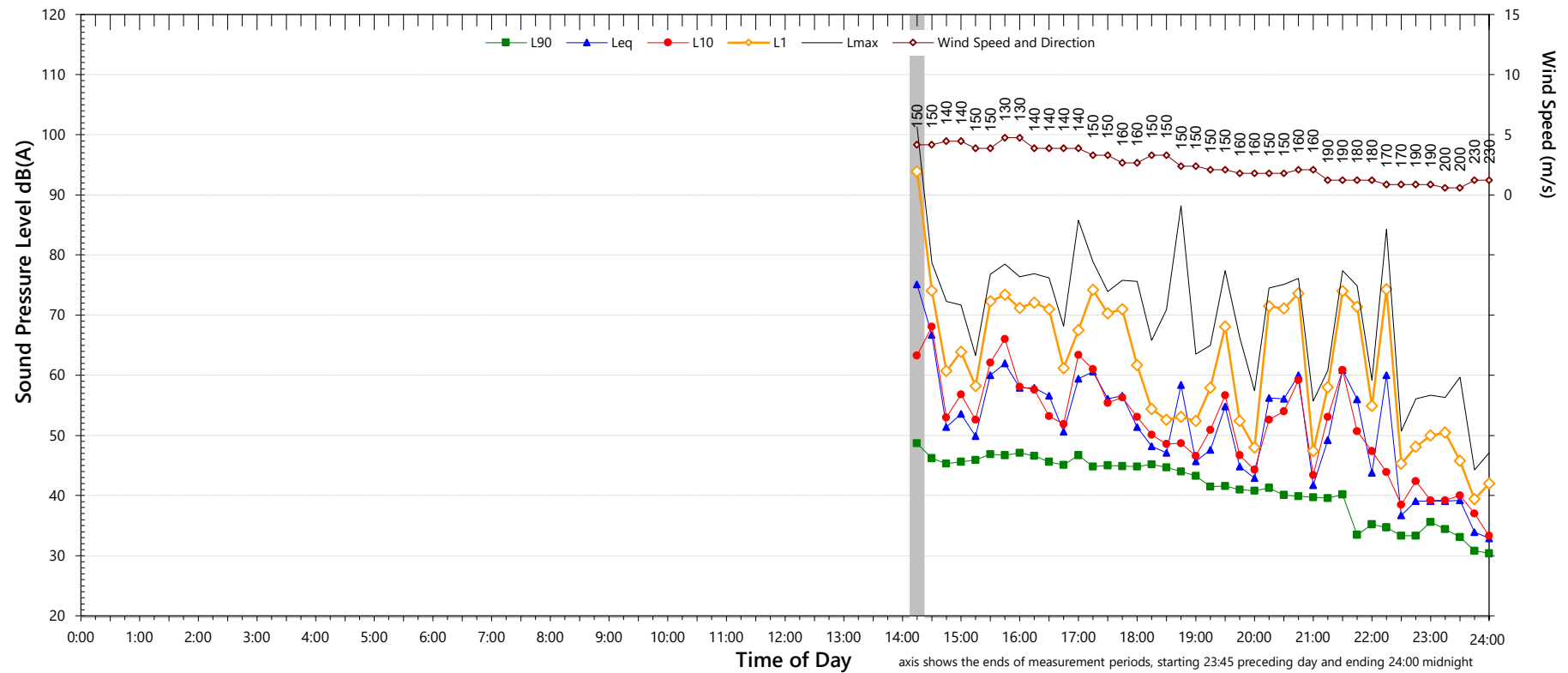
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L <sub>Max</sub>	The maximum sound pressure level measured over a given period.
L <sub>Min</sub>	The minimum sound pressure level measured over a given period.
L <sub>1</sub>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L <sub>10</sub>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L <sub>90</sub>	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L <sub>eq</sub>	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L <sub>eq</sub> sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

## **APPENDIX B**      **Logger location 1 – WH4A - North side**

# Unattended Noise Monitoring Results

WH4A - North

Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	-	37	30
L <sub>Aeq</sub>	-	55	47

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	78	to	84
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	15	to	30

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	-	50
L <sub>Aeq</sub> 1hr upper 10 percentile	-	55
L <sub>Aeq</sub> 1hr lower 10 percentile	-	37

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Data File: 2021-03-02\_SLM\_000\_123\_Rpt\_Report.txt

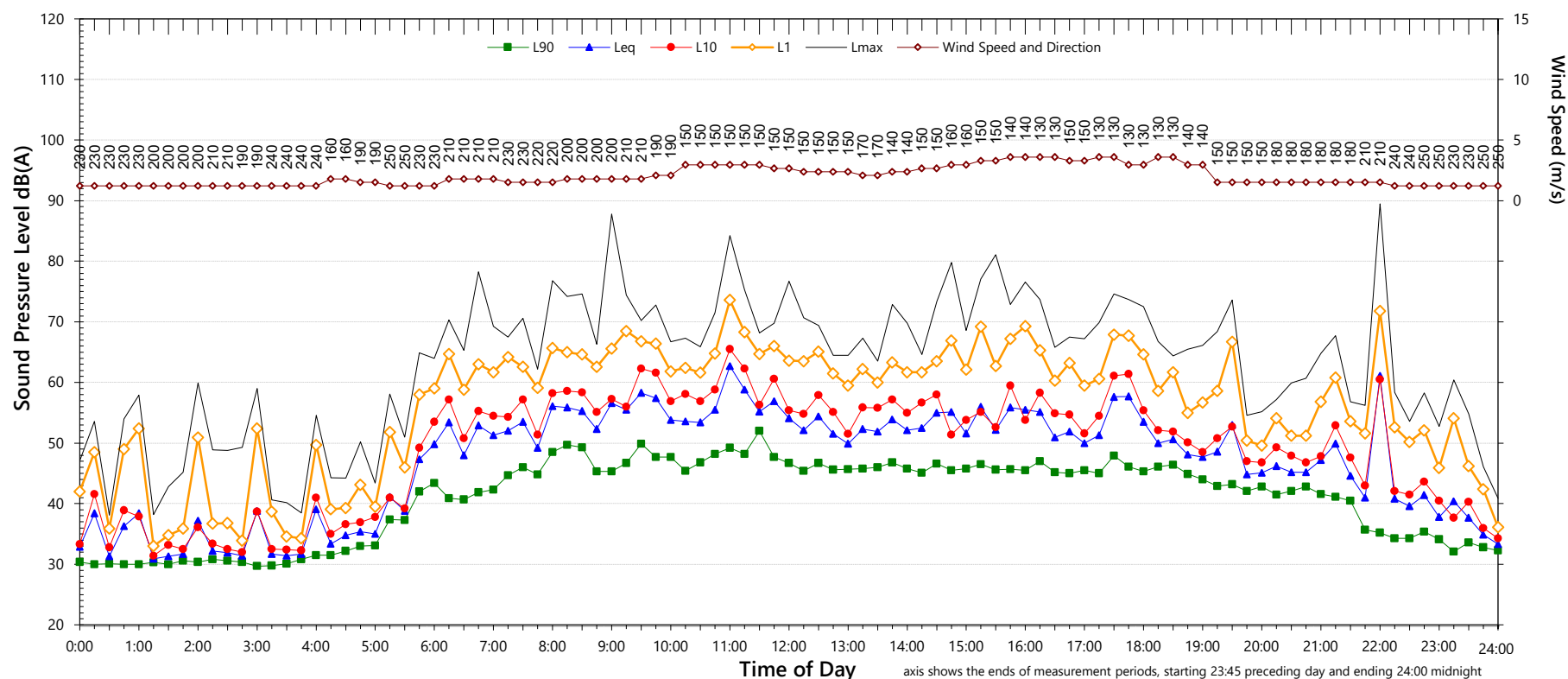
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

# Unattended Noise Monitoring Results

WH4A - North

Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	45	38	33
L <sub>Aeq</sub>	55	52	47

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	73	to	76
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	17	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night <sup>5</sup> 10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	57	50
L <sub>Aeq</sub> 1hr upper 10 percentile	59	56
L <sub>Aeq</sub> 1hr lower 10 percentile	52	40

Data File: 2021-03-02\_SLM\_000\_123\_Rpt\_Report.txt

WH4A - North (r0)

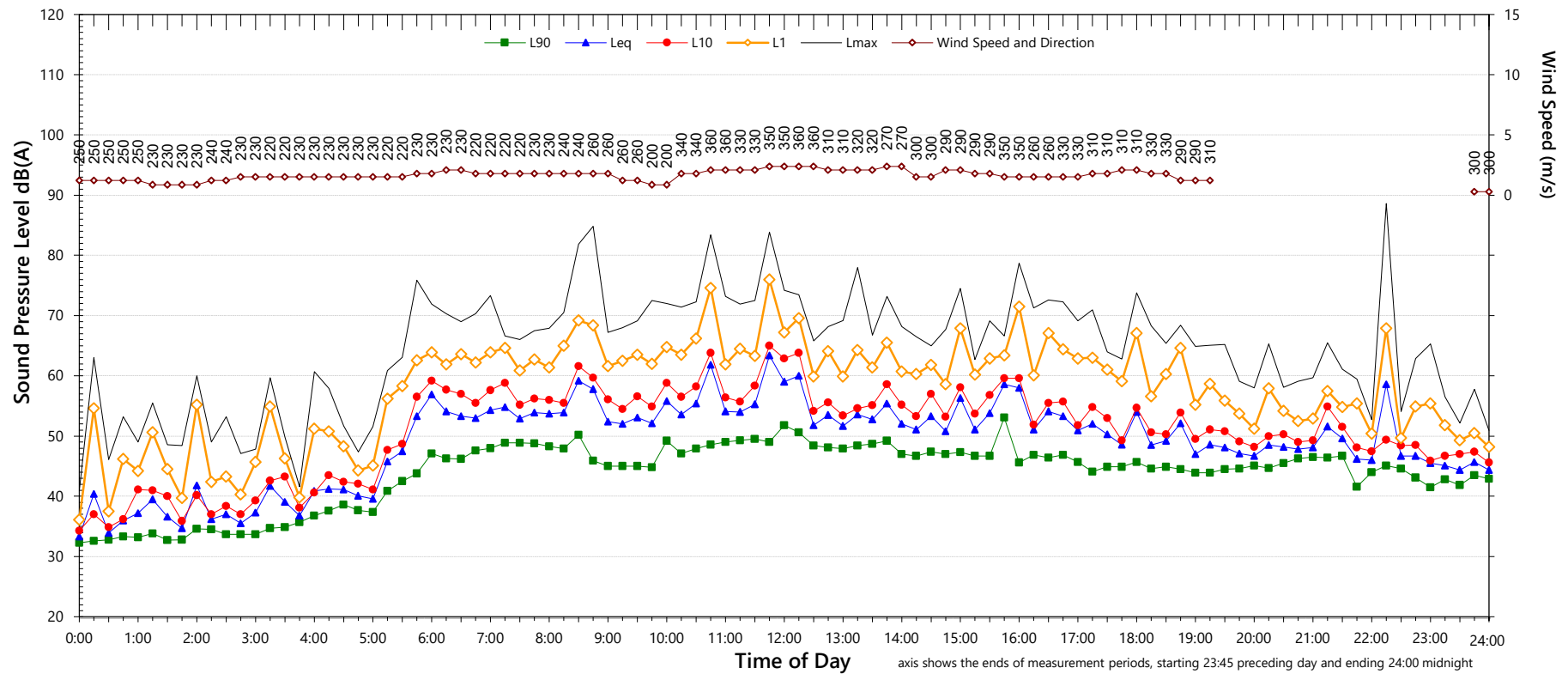
QTE-26 Logger Graphs Program (r36)



# Unattended Noise Monitoring Results

WH4A - North

Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	45	44	39
L <sub>Aeq</sub>	56	49	49

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	65	to	89
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	15	to	35

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	57	51
L <sub>Aeq</sub> 1hr upper 10 percentile	60	56
L <sub>Aeq</sub> 1hr lower 10 percentile	51	45

Data File: 2021-03-02\_SLM\_000\_123\_Rpt\_Report.txt

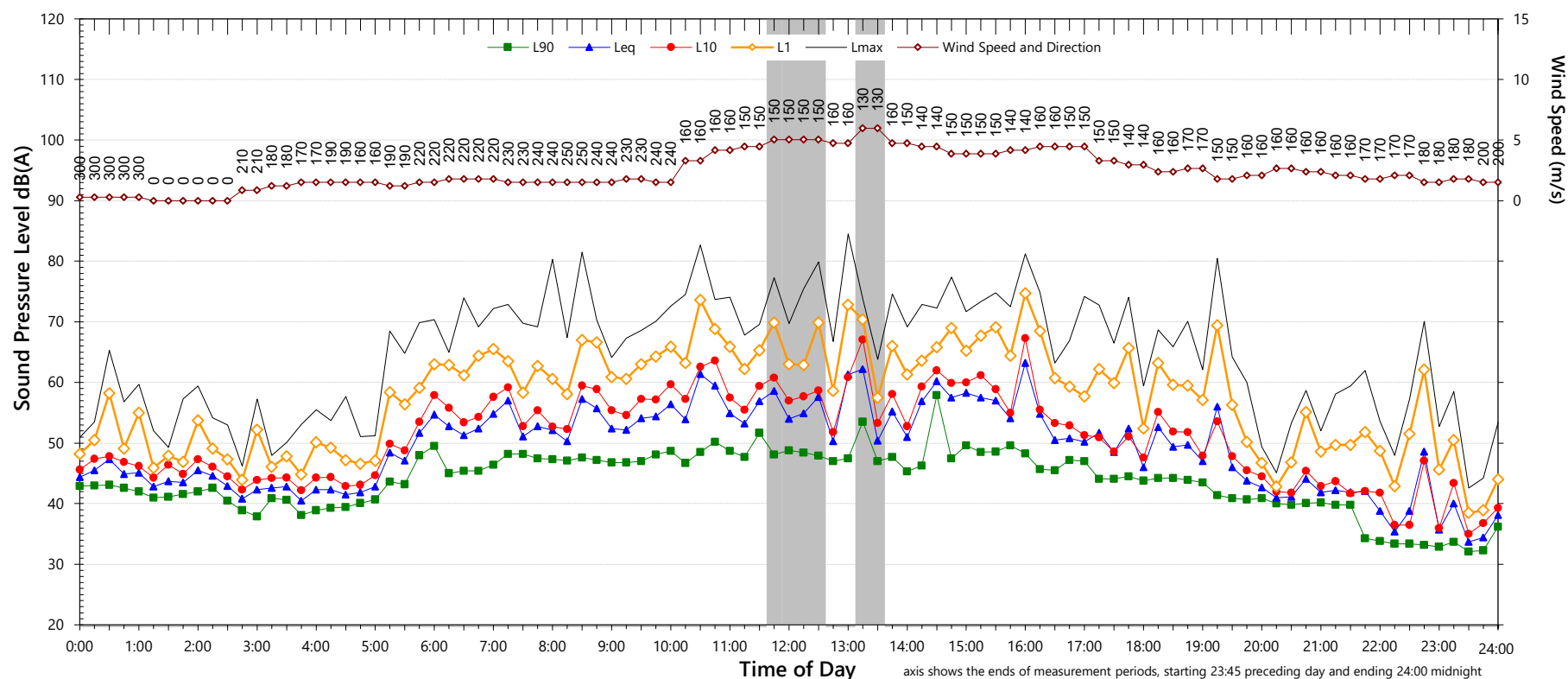
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

# Unattended Noise Monitoring Results

WH4A - North

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	45	37	31
L <sub>Aeq</sub>	56	48	49

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	68	to	88
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	18	to	31

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	57	51
L <sub>Aeq</sub> 1hr upper 10 percentile	61	52
L <sub>Aeq</sub> 1hr lower 10 percentile	48	38

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Data File: 2021-03-02\_SLM\_000\_123\_Rpt\_Report.txt

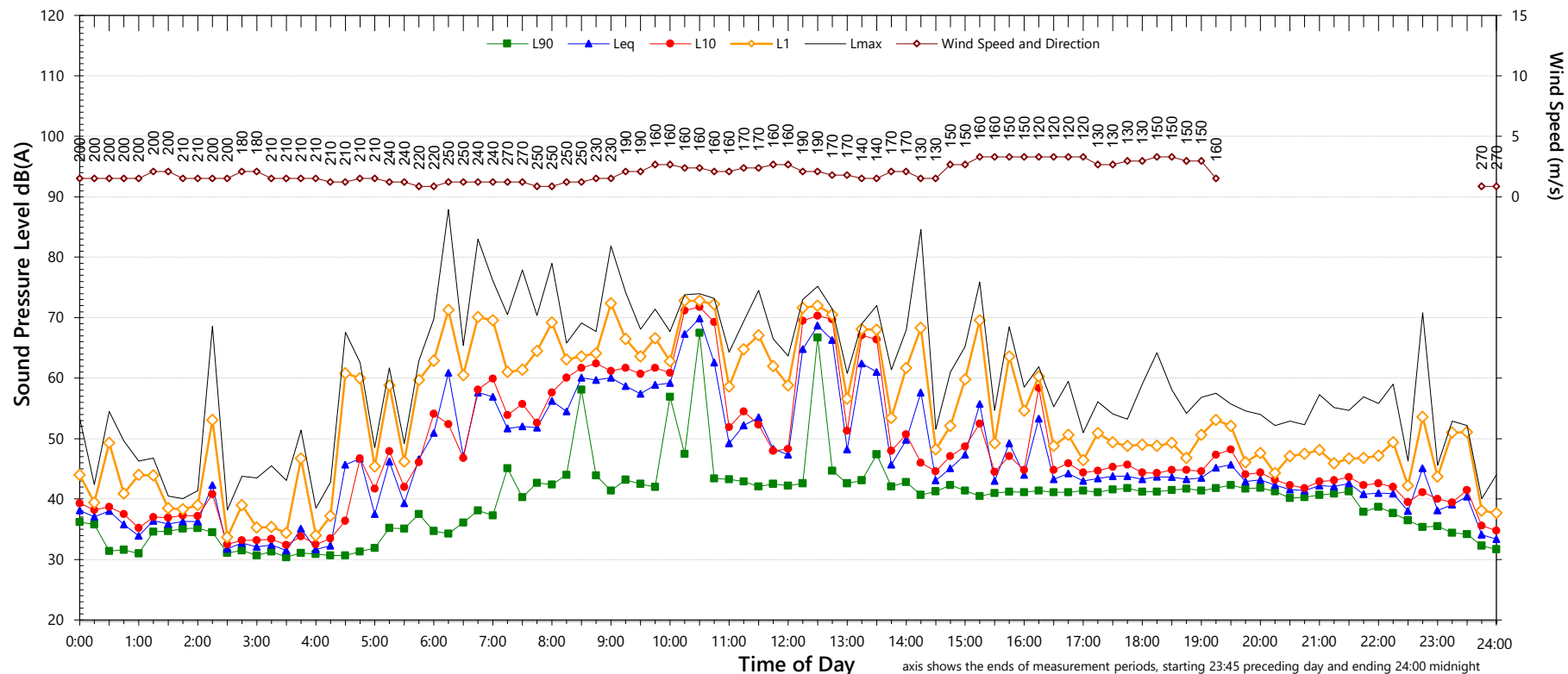
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

# Unattended Noise Monitoring Results

WH4A - North

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	41	39	31
L <sub>Aeq</sub>	60	43	41

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	66	to	77
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	15	to	34

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	61	43
L <sub>Aeq</sub> 1hr upper 10 percentile	66	46
L <sub>Aeq</sub> 1hr lower 10 percentile	45	37

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Data File: 2021-03-02\_SLM\_000\_123\_Rpt\_Report.txt

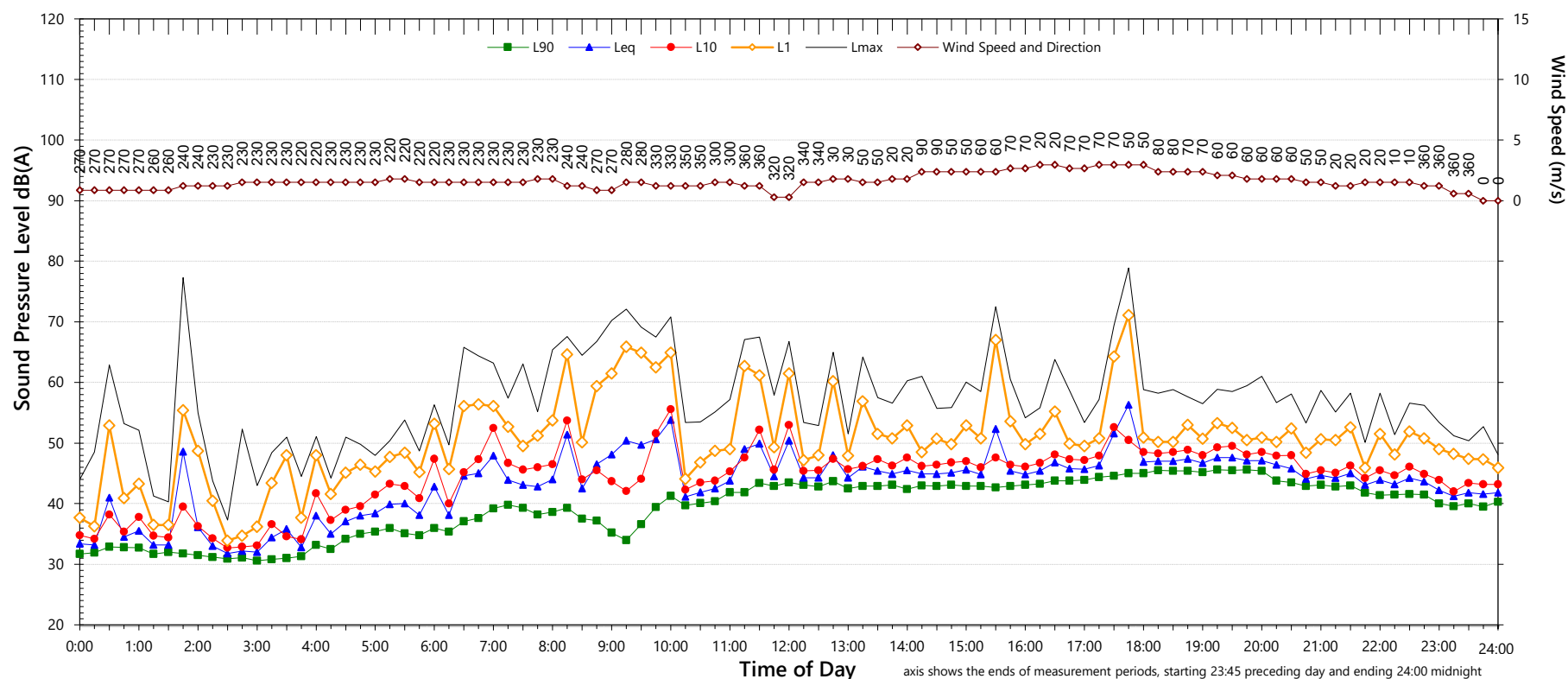
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

# Unattended Noise Monitoring Results

WH4A - North

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4 5</sup>
L <sub>A90</sub> ABL	37	42	39
L <sub>Aeq</sub>	48	46	48

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	67	to	71
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	17	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	50	51
L <sub>Aeq</sub> 1hr upper 10 percentile	53	55
L <sub>Aeq</sub> 1hr lower 10 percentile	46	44

Data File: 2021-03-02\_SLM\_000\_123\_Rpt\_Report.txt

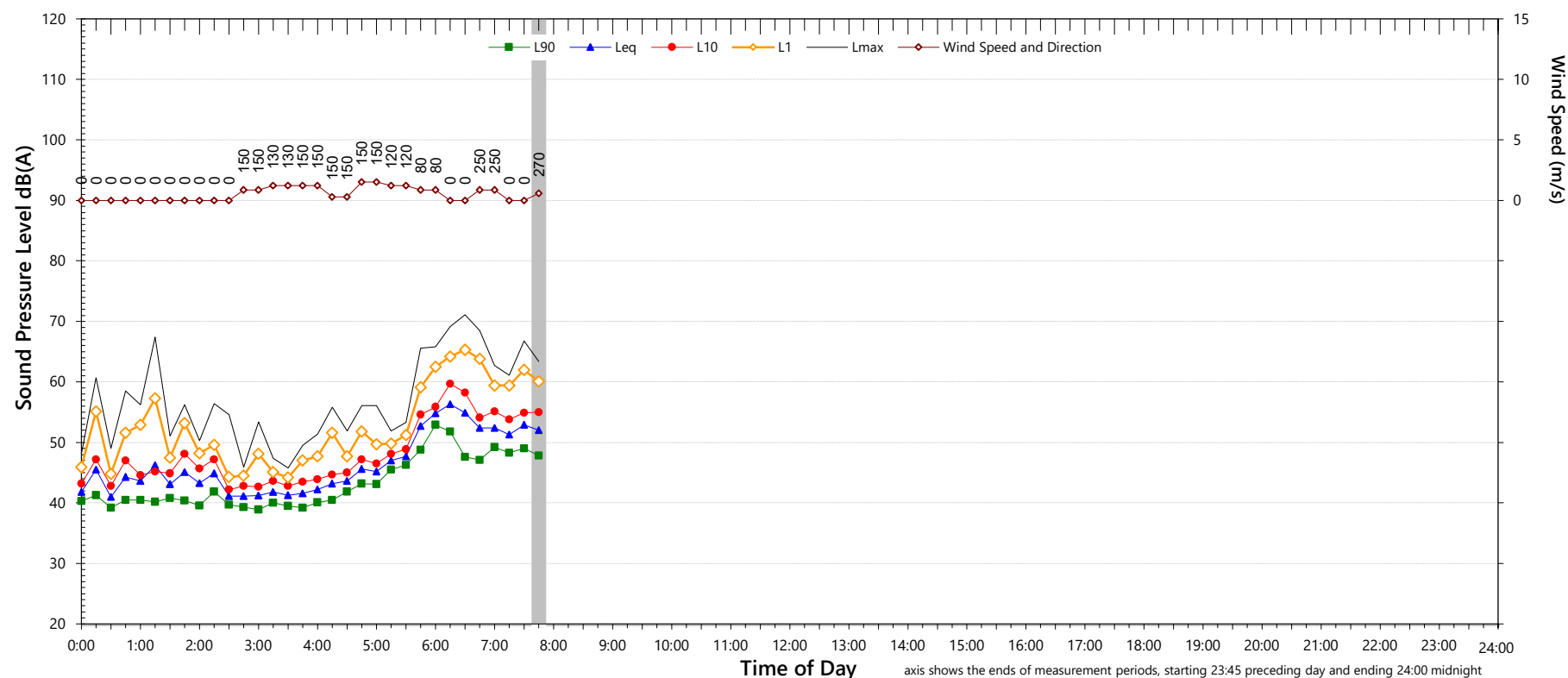
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

# Unattended Noise Monitoring Results

WH4A - North

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4 5</sup>
L <sub>A90</sub> ABL	-	-	-
L <sub>Aeq</sub>	-	-	-

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	-	to	-
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	-	-
L <sub>Aeq</sub> 1hr upper 10 percentile	-	-
L <sub>Aeq</sub> 1hr lower 10 percentile	-	-

Data File: 2021-03-02\_SLM\_000\_123\_Rpt\_Report.txt

WH4A - North (r0)

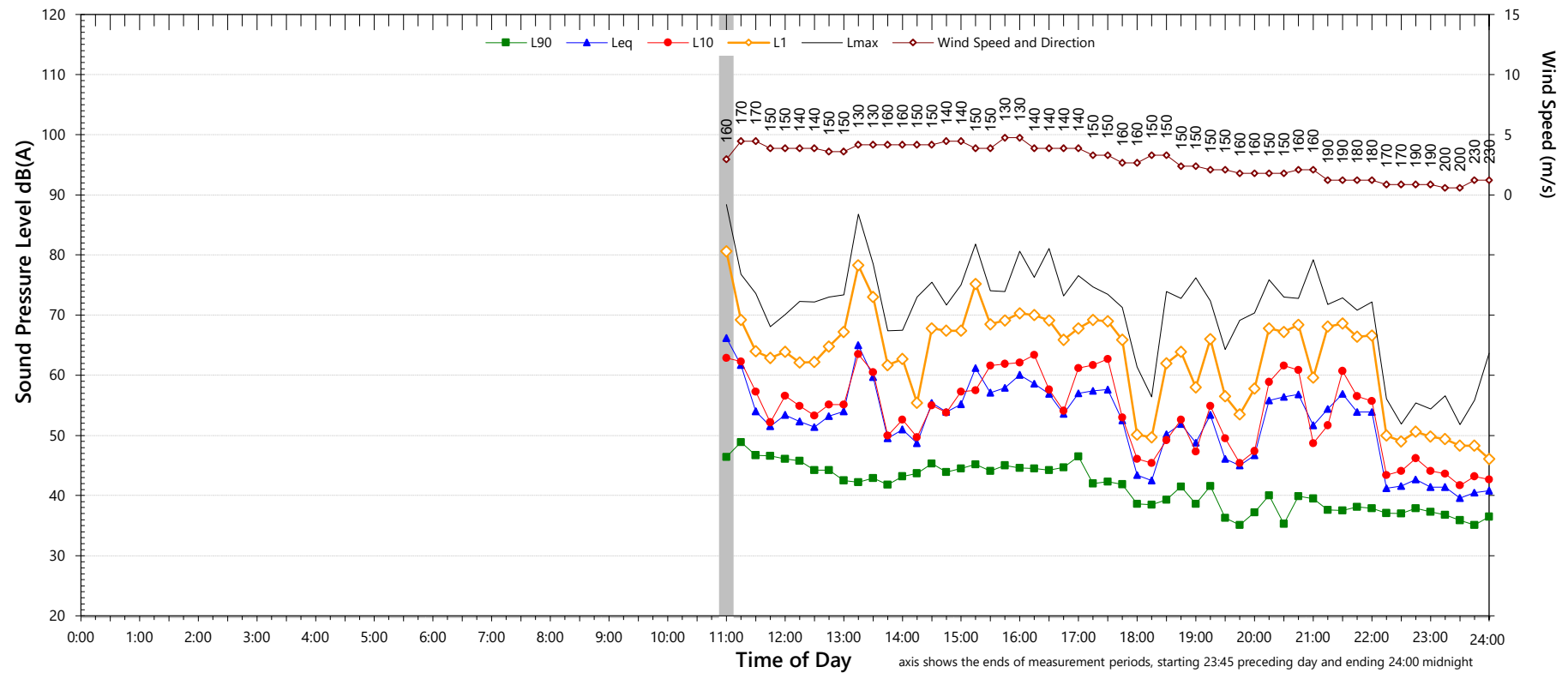
QTE-26 Logger Graphs Program (r36)

## APPENDIX C      **Logger location 2 – WH4A – South side**

# Unattended Noise Monitoring Results

WH4A - South

Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	-	36	32
L <sub>Aeq</sub>	-	53	47

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	81	to	81
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	15	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night <sup>5</sup> 10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	-	49
L <sub>Aeq</sub> 1hr upper 10 percentile	-	50
L <sub>Aeq</sub> 1hr lower 10 percentile	-	40

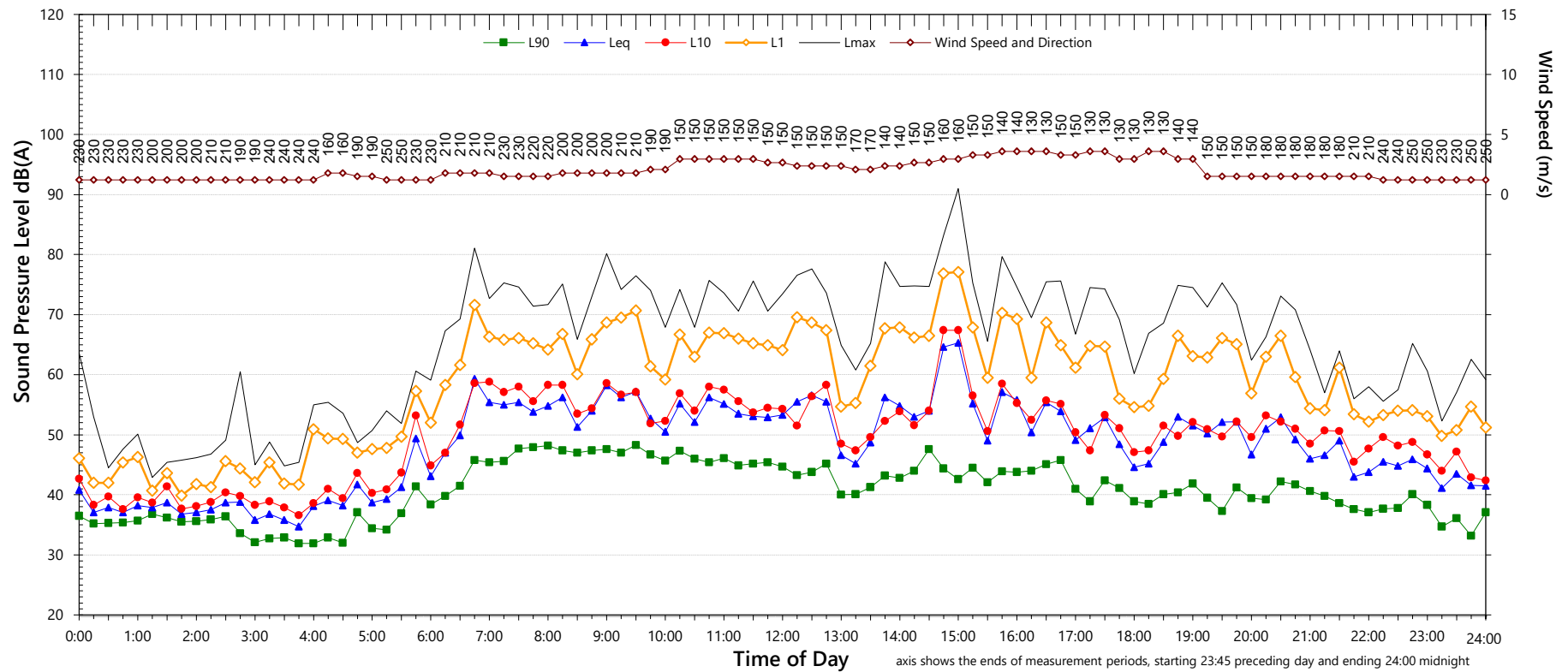
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

# Unattended Noise Monitoring Results

WH4A - South

Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	41	37	35
L <sub>Aeq</sub>	56	50	49

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	65	to	79
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	20	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

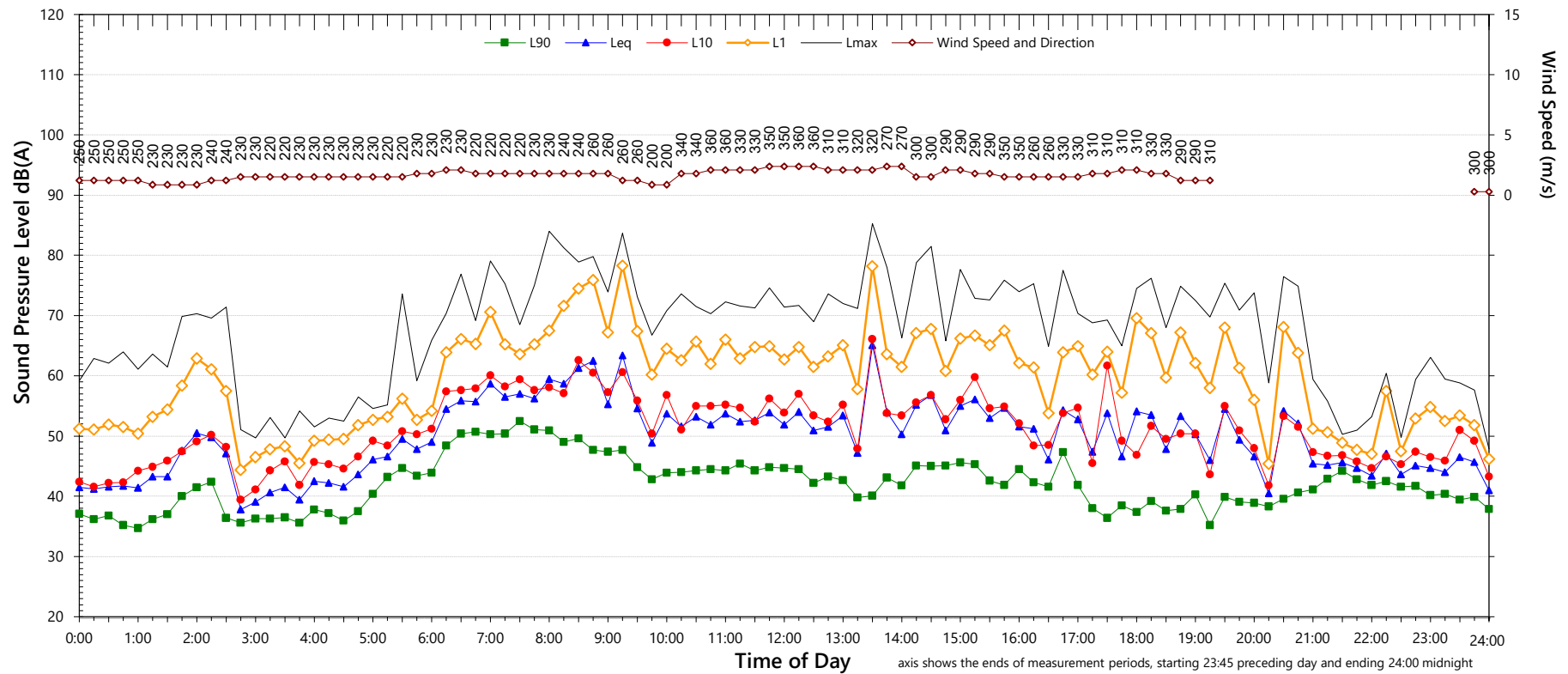
NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night <sup>5</sup> 10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	57	51
L <sub>Aeq</sub> 1hr upper 10 percentile	58	52
L <sub>Aeq</sub> 1hr lower 10 percentile	53	44



# Unattended Noise Monitoring Results

WH4A - South

Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	40	38	37
L <sub>Aeq</sub>	56	50	53

Night Time Maximum Noise Levels		(see note 7)	
L <sub>AFMax</sub> (Range)	70	to	83
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	16	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

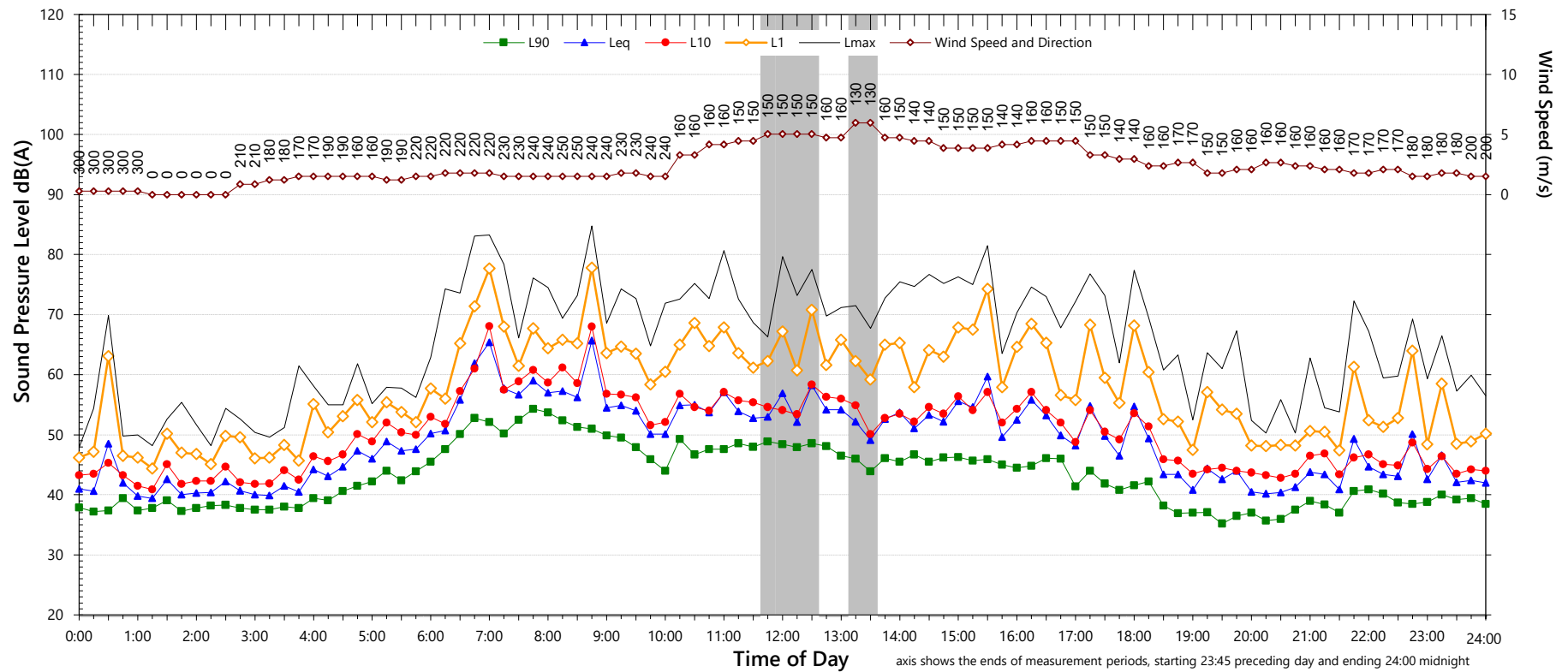
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	58	55
L <sub>Aeq</sub> 1hr upper 10 percentile	62	54
L <sub>Aeq</sub> 1hr lower 10 percentile	53	43

# Unattended Noise Monitoring Results

WH4A - South

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	43	36	36
L <sub>Aeq</sub>	56	44	44

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	67	to	74
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	17	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

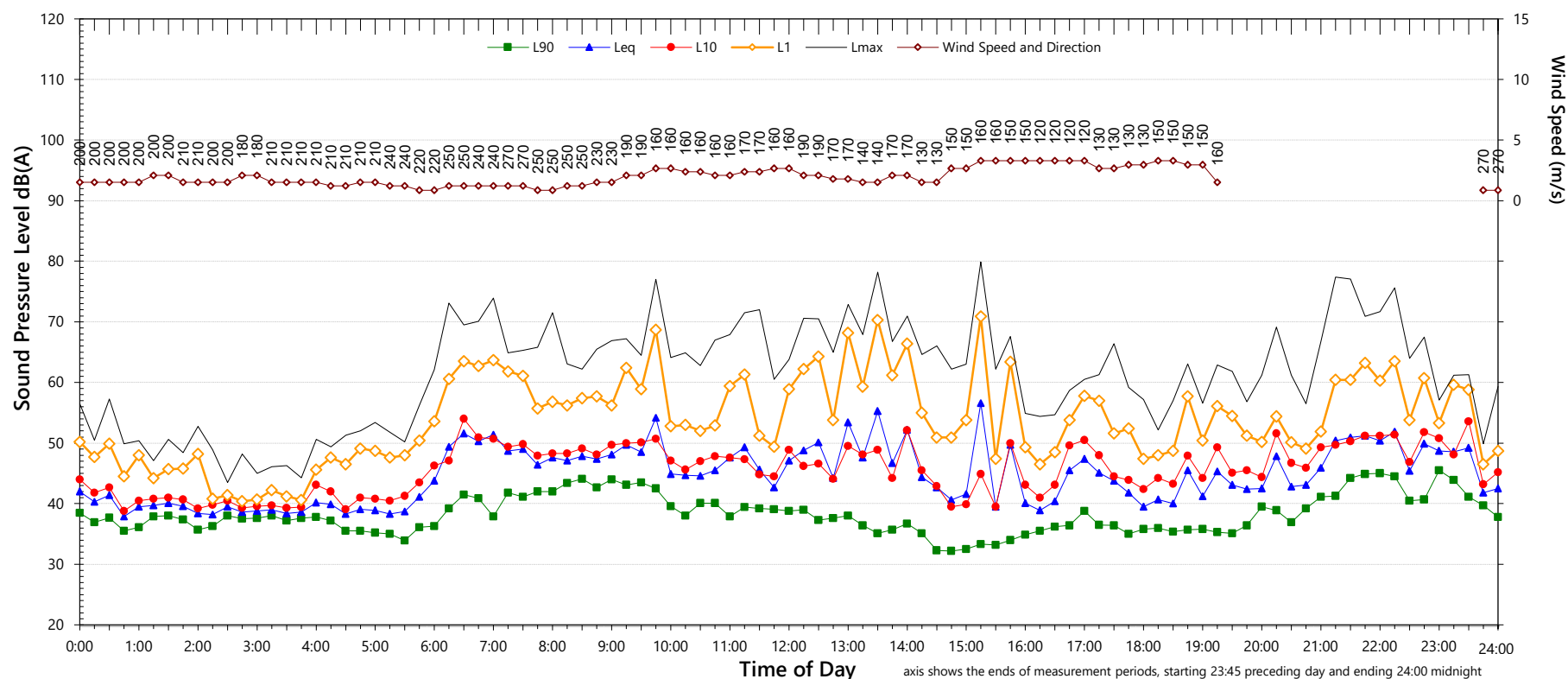
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	57	47
L <sub>Aeq</sub> 1hr upper 10 percentile	59	50
L <sub>Aeq</sub> 1hr lower 10 percentile	47	42

# Unattended Noise Monitoring Results

WH4A - South

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	34	35	34
L <sub>Aeq</sub>	49	47	45

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	65	to	76
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	18	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

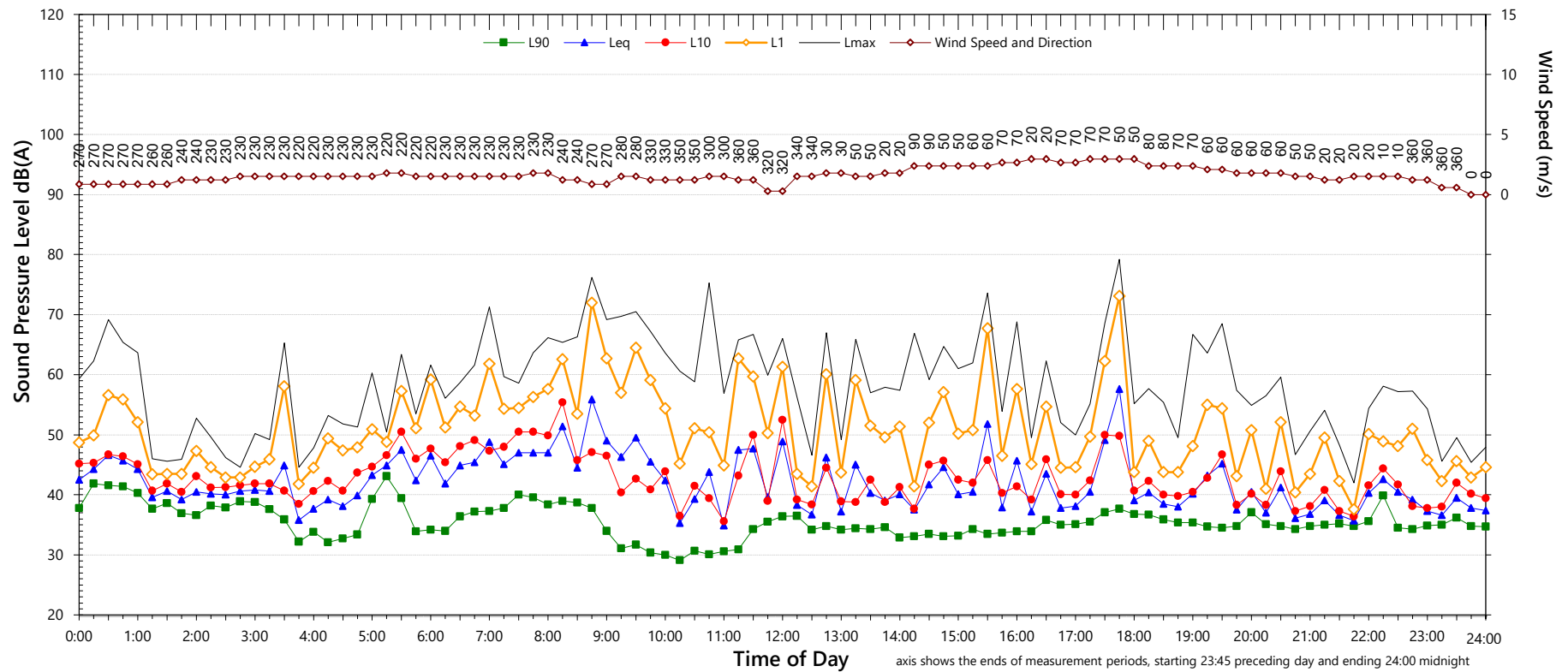
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night <sup>5</sup> 10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	51	48
L <sub>Aeq</sub> 1hr upper 10 percentile	54	50
L <sub>Aeq</sub> 1hr lower 10 percentile	45	43

# Unattended Noise Monitoring Results

WH4A - South

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	31	35	34
L <sub>Aeq</sub>	47	40	46

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	76	to	77
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	16	to	30

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

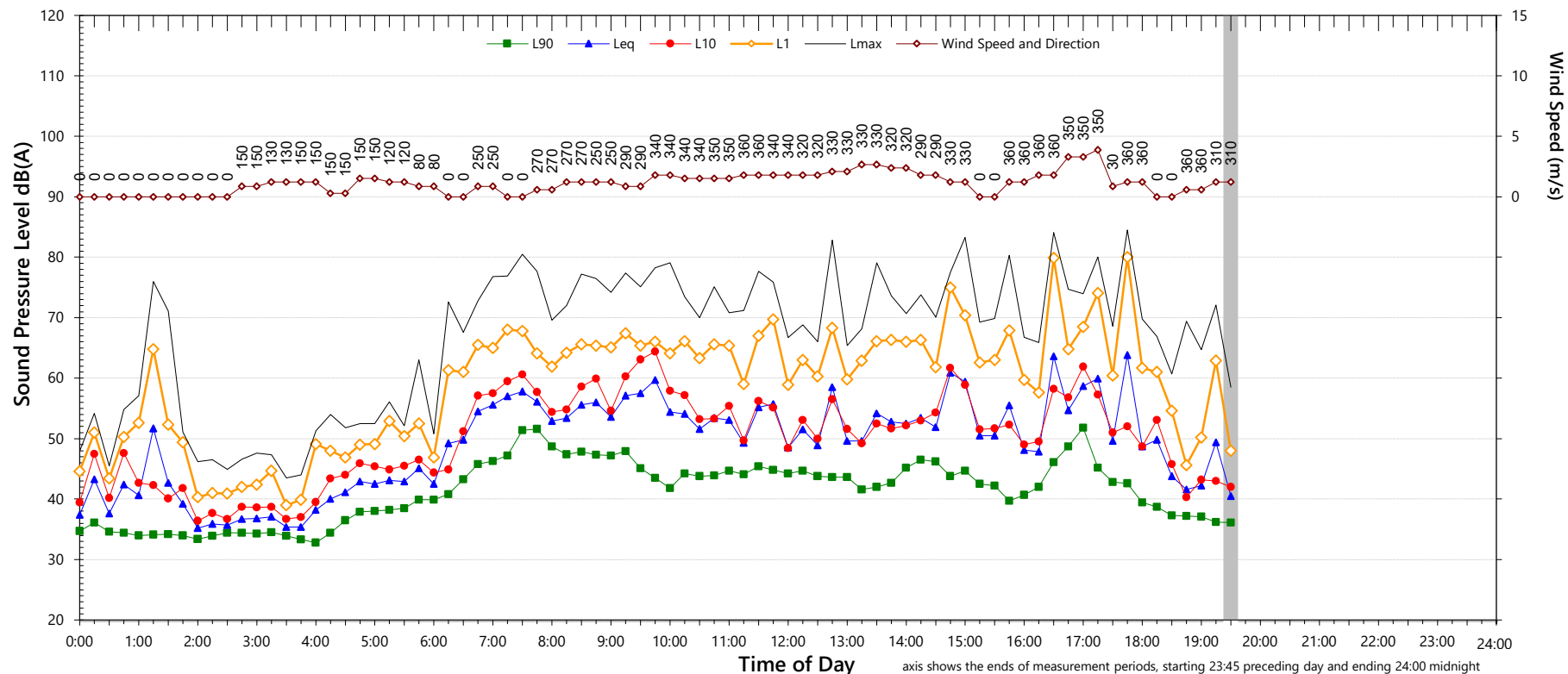
7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	49	48
L <sub>Aeq</sub> 1hr upper 10 percentile	53	50
L <sub>Aeq</sub> 1hr lower 10 percentile	41	39

# Unattended Noise Monitoring Results

WH4A - South

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day <sup>2</sup>	Evening <sup>3</sup>	Night <sup>4,5</sup>
L <sub>A90</sub> ABL	42	-	-
L <sub>Aeq</sub>	56	-	-

Night Time Maximum Noise Levels (see note 7)			
L <sub>AFMax</sub> (Range)	-	to	-
L <sub>AFMax</sub> - L <sub>Aeq</sub> (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L<sub>AFMax</sub> are shown only where L<sub>AFMax</sub> > 65dB(A) and where L<sub>AFMax</sub> - L<sub>Aeq</sub> ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night <sup>5</sup>
	7am-10pm	10pm-7am
L <sub>Aeq</sub> 15 hr and L <sub>Aeq</sub> 9 hr	-	-
L <sub>Aeq</sub> 1hr upper 10 percentile	-	-
L <sub>Aeq</sub> 1hr lower 10 percentile	-	-