RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MOOREBANK INTERMODAL PRECINCT EAST

Annual Noise Review - May 2024 to May 2025

15 June 2025

The Trust Company (Australia) Limited (ACN 000 000 993) As Trustee of The Moorebank Industrial Warehouse Trust (ABN 51 402 161 047) c/- ESR Developments (Australia) Pty Ltd

TM306-24-02F03 MPE Annual Review 2025 (r2).docx

40 YEARS 1982-2022 ACOUSTIC ENGINEERING EXCELLENCE

Sydney Melbourne Brisbane Gold Coast Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

Document details

Detail	Reference
Doc reference:	TM306-24-02F03 MPE Annual Review 2025 (r2).docx
Prepared for:	The Trust Company (Australia) Limited (ACN 000 000 993) As Trustee of The Moorebank Industrial Warehouse Trust (ABN 51 402 161 047) c/- ESR Developments (Australia) Pty Ltd
Address:	Level 15, 124 Walker Street North Sydney, NSW, 2060
Attention:	[redacted] (Tactical Group)

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
04.06.2025	Initial issue - Draft	0	1	[redacted]		
15.06.2025	Final	-	2			

File Path: R:\AssocSydProjects\TM301-TM350\TM306 ale Moorebank Intermodal Terminal (LOGOS)\Task24 MPE Monitoring\1 Docs\Report 3 2025 Annual Review\TM306-24-02F03 MPE Annual Review 2025 (r2).docx

Contents

List of tables

List of figures

1 Introduction

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the Moorebank Precinct East (MPE) Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193). The Trust Company (Australia) Limited (ACN 000 000 993) As Trustee of The Moorebank Industrial Warehouse Trust (ABN 51 402 161 047), care of ESR Developments (Australia) Pty Ltd (ESR), is now the proponent for the MPE projects.

This **Annual Noise Review** report **for Year 5 Operations (May 2024 to May 2025)** has been prepared to address the requirements of Condition of Consent (CoC) B90 of SSD 7628 as follows:

> *For the duration of operation, the Applicant must:*
>
> *a) continue to implement all reasonable and feasible best practice noise mitigation measures;*
>
> *b) continue to investigate ways to reduce noise generated by the development, including maximum noise levels which may result in sleep disturbance; and*
>
> *c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review to the satisfaction of the Secretary.*

Table 1 provides a summary of the noise-related Approval Conditions and how these are addressed in this Annual Noise Review.

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

Appendix B contains a copy of the reports referred to in this report that are not publicly available on the SIMTA website.

2 Compliance Matrix

Table 1 provides a summary of the Approval Conditions which relate to operational noise emission monitoring for Year 5 operations, and a discussion of the operational noise monitoring results. Where required, additional information is provided in later sections of this report or the appendices.

Table 2-1 Compliance matrix

Condition ID	Condition	Comments on compliance	Reference for further information
SSD 6766			
G7	The Applicant shall install and maintain a rail noise monitoring system on the rail link at the commencement of operation to continuously monitor the noise from rail operations on the rail link. The system shall capture the noise from each individual train passby noise generation event, and include information to identify: a) Time and date of freight train passbys; b) Imagery or video to enable identification of the rolling stock during day and night; c) $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ from rail operations; and d) $L_{AF(max)}$ and SEL of individual train passbys, measured in accordance with ISO3095; or e) Other alternative information as agreed with, or required by, the Secretary. The results from the noise monitoring system, shall be publicly accessible from a website maintained by the Applicant. The noise results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances (i.e. a system malfunction) have occurred. The $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ results from each day shall be available on the website within 24 hours of the period ending. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for rail noise monitoring, including details of any alternative options considered and reasons for these being dismissed. The rail noise monitoring system shall not operate until the Secretary has approved the proposed monitoring location. The Applicant shall provide an annual report to the Secretary with the results of monitoring for a period of 5 years, or as otherwise agreed with the Secretary, from the commencement of operation of the IMEX terminal. The Secretary shall consider the need for further reporting following a review of the results for year 5.	The commencement of IMT operations occurred in May 2020. The new rail link was commissioned in November 2019. A description of the noise monitoring systems are provided in Section 5 and capture the information required by this approval. A Functional and Performance Specification for the permanent noise monitoring system and angle of attack monitoring system was prepared for approval by the Secretary before the rail link commissioning. A summary of the noise monitoring results for Year 5 operations is provided in Section 5.1.	https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf https://moorebanknoisemonitor-emsbk.trackiq.net/NoiseMonitor/ Section 5

Condition ID	Condition	Comments on compliance	Reference for further information
G7A	The applicant shall install and maintain a wayside angle of attack monitoring system on the rail link at the commencement of operation to continuously monitor the angle of attack to the rail of rolling stock wheels. The system shall capture the angle of attack from a wheel on each axle of every train, and include information to identify: a) Time and date of each axle passby; and b) The identification number of each item of rolling stock. The results from the angle of attack monitoring system shall be: • accessible by train operators from a website maintained by the Applicant. Angle of attack results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances have occurred. • included in a six-monthly report to the Secretary. The report should at least identify the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for angle of attack monitoring, the format of the information to be accessible to operators and the format of the public report. The angle of attack monitoring system shall not operate until the Secretary has approved the proposed monitoring location and reporting arrangements.	An Angle of Attack (AoA) monitoring system was installed on the new rail link in May 2020. The monitoring system captures the AoA of each axle passby and compares the measured values with the acceptable value in the applicable Asset Standards Authority minimum operating standard. The AoA values for each axle are available to operators in accordance with the approval condition. A Functional and Performance Specification for the permanent noise monitoring system and angle of attack monitoring system was prepared for approval by the Secretary before the rail link commissioning. A summary of the AoA noise monitoring results of the Year 5 operations is provided in Section 6.1. For Year 5 operations, the monitoring identified 40 trains out of 3,343 events where the maximum AoA value exceeded the alarm level (representing 1.2% of passbys). Three of the 40 passby events with AoA alarm levels resulted in elevated noise levels at the permanent noise monitoring location. Exceedances of the AoA alarm levels were viewed as one-off instances, occurring irregularly.	Section 6
G8	The following measures must be implemented during operation: a) The use of automatic rail lubrication equipment in accordance with ASA Standard T HR TR 00111 ST Rail Lubrication and top of rail friction modifiers, where required; and b) Measures to ensure the rail cross sectional profile is maintained in accordance with ETN–01-02 Rail Grinding Manual for Plain Track to ensure the correct wheel / rail contact position and hence to encourage proper rolling stock steering.	Two rail friction modifier systems were installed on the rail link on 22 November 2019 per ASA Standard. These are positioned on the MIMT North Track at Chainage 39.739 km and the MIMT South Track at Chainage 39.860 km. Monthly track inspections and maintenance is undertaken by Qube's maintenance contractor, Taylor Rail, to ensure alignment with maintenance standards. Rail grinding has been performed so that the rail profile is consistent with maintenance standards.	FCMM 3B

<table>
<tr><th>Condition ID</th><th>Condition</th><th>Comments on compliance</th><th>Reference for further information</th></tr>
<tr><td>SSD 7628</td><td></td><td></td><td></td></tr>
<tr><td>B79</td><td>The permitted hours of warehouse and distribution operation as detailed in Table 4.
Table 4: Hours of Operation
Activity | Day | Time
Operation | Monday to Sunday | 24 hours</td><td>MPE operates 24 hours per day, 365 days per year, consistent with the permitted hours of operation.</td><td>n/a</td></tr>
<tr><td>B80</td><td>B80. Noise generated by operation of the development inclusive of MPE Stage 1 operations must not exceed the noise limits in Table 5.
Table 5: Noise Limits dB(A)
Location (residential receivers) | Day (LAeq(15min)) | Evening (LAeq(15min)) | Night (LAeq(15min)) | Night (LA1(1min))
Casula | 35 dB | 35 dB | 35 dB | 52 dB
Wattle Grove (NCA 2) | 35 dB | 35 dB | 35 dB | 52 dB
Glenfield (NCA 4) | 35 dB | 35 dB | 35 dB | 52 dB
Notes:
To determine compliance with the LAeq,15 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 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy must also be applied to the measured noise levels where applicable.
To determine compliance with the LA1,1 minute 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 11 of the NSW Industrial Noise Policy).
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.</td><td>This condition specifies the operational noise limits for MPE operations.
However, when undertaking any compliance assessment, it is noted that the SSD 7628 B80 noise limit table states "…inclusive of MPE Stage 1 operations" therefore was intended to apply to the cumulative noise emissions of noise generating activities in SSD 6766 and SSD 7628. However, MPE Stage 1, has specific noise limits included in SSD 6766, approved as part of L&EC Proceedings (No 2017/81889) which are higher than these levels. This requirement presents a consistency issue, as the requirement is inconsistent with the EIS derived noise limits in accordance with NSW EPA policy, the expected noise emission performance from MPE, and previous approvals. As part of Modification 1 to SSD 7709 (MPW Stage 2), which identifies cumulative noise limits for MPW + MPE, EPA agreed there was an inconsistency issue. Following which, it was agreed that MPW + MPE should achieve the cumulative noise limits in SSD 7709 B131.</td><td>Section 3 – Warehouse noise monitoring
Section 7 - Noise monitoring in response to complaints</td></tr>
</table>

Condition ID	Condition	Comments on compliance	Reference for further information
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 Plan must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.	Warehouse noise monitoring is required to be undertaken following the occupation of each warehouse. Noise monitoring of warehouse mechanical plant and other noisy equipment was performed on two occasions during the 2024-2025 review period for MPE Warehouse E6. A summary of this noise monitoring is provided in Section 3. For the 2024-2025 review period, for all monitored warehouses, the warehouse mechanical plant and equipment noise emission levels achieved the overall noise levels presented in Table 5 of CoC B80 during all time periods. An outcome from this monitoring is that further acoustic mitigation measures are currently being installed for warehouse E7 to assist ESR with managing the cumulative noise emissions from the Moorebank Intermodal Precinct (MIP).	Section 3
B88	To ensure the operational noise impacts are appropriately managed, the following measures apply: a) use of best practice plant; and b) preparation of a risk assessment to determine if non-tonal reversing alarms can be fitted as a condition of site entry. Alternatively, site design may include traffic flow that does not require or precludes reversing of vehicles.	A range of best practice plant / measures have been implemented during previous monitoring periods, and continue to operate with these during the 2024-2025 noise monitoring period. These include: 1. The use of electric cranes with broadband movement alarms for all rail loading and container stacking, with reach stackers now only required for truck loading and combi-lifts and straddle carriers used for warehouse container movements. 2. 'Quackers' or broadband reversing alarms were fitted to all reach stackers and combi-lifts. 3. IMEX staff briefings were undertaken, reminding staff and drivers of noise management obligations and will be ongoing as part of regular reminders. The risk assessment relating to the use of non-tonal reversing alarms is addressed in the Table 2-3 B88 of the ONVMP. Further measures are identified in the F5A management plan, which include both mitigation and management measures, including container handling and truck operations and are being implemented as part of operations.	Operational Noise and Vibration Management Plan (Rev 013, 24/01/2023) (ONVMP) https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/09/ONVMP_V13_clean_compiled_Redacted-compressed.pdf F5A Management Plan Moorebank Intermodal Precinct– East Precinct (Rev 08, 22/11/2023) https://moorebankintermodalprecinct.com.au/wp-content/uploads/2024/08/Condition-F5A-MP_-Rev8_Redacted10.pdf Section 7 and 8

Condition ID	Condition	Comments on compliance	Reference for further information
B90	For the duration of operation, the Applicant must: a) continue to implement all reasonable and feasible best practice noise mitigation measures; b) continue to investigate ways to reduce noise generated by the development, including maximum noise levels which may result in sleep disturbance; and c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review to the satisfaction of the Secretary.	The following additional best practice plant / measures are continuing to be implemented within the current reporting period, including through the F5A management plan for the IMEX terminal: 1. The use of electric cranes commenced so that all rail loading and container stacking is performed by the electric cranes, with reach stackers now only required for truck loading. 2. 'Quackers' or broadband reversing alarms were fitted to all reach stackers and combi lifts. 3. IMEX staff briefings were undertaken, reminding staff and drivers of noise management obligations and will be ongoing as part of regular reminders. The permanent rail noise monitoring results (Section 5) for Year 5 operations indicate similar passby noise levels to Year 4 operations and increased L_{Aeq} noise levels consistent with the rail link usage. The AoA monitoring data for train axles is reviewed by operators to identify wagons that may require maintenance to improve steering performance. An outcome from the Warehouse E7 B85 warehouse mechanical plant noise monitoring was that, even though noise levels were below the B80 noise limits, further acoustic mitigation measures were recommended and are currently being installed for a fan at warehouse E7 as noise levels were identified as louder than expected (Section 3) to assist ESR with managing the cumulative noise emissions from the MIP. Noise monitoring being undertaken for Moorebank Precinct West (MPW) is also being used to provide feedback on MPE noise emissions as the MPW noise requirements are cumulative of MPE, to assist with reviewing the effectiveness of ongoing noise management.	Sections 3, 4, 5, 6, 7 and 8 F5A Management Plan Moorebank Intermodal Precinct– East Precinct (Rev 08, 22/11/2023) https://moorebankintermodalprecinct.com.au/wp-content/uploads/2024/08/Condition-F5A-MP_-Rev8_Redacted10.pdf
Final Compilation of Mitigation Measures (FCMM) for MPE Stage 1 and Stage 2			
Stage 2 2D	In the event of any noise or vibration related complaint or adverse comment from the community, noise and ground vibration levels (as relevant) would be investigated. Remedial action would be implemented where feasible and reasonable. The procedures for managing complaints would be provided within the Community Information and Awareness Strategy.	11 noise complaints were received during the period of 30 April 2024 to 1 May 2025. Of these 11 complaints, 3 did not relate to operations, and were either related to construction noise or non-MIP noise. These complaints were investigated and responses including advising the relevant MIP teams for further investigation, or noise mitigation strategies currently being implemented were communicated to the complaints.	Section 7

Condition ID	Condition	Comments on compliance	Reference for further information
Operational Noise and Vibration Management Plan – Section 4.1.1 Summary of Monitoring Requirements			
Table 4.1 Rail noise monitoring	Continuous rail noise monitoring will be undertaken from the commencement of operations of the IMEX terminal. The monitoring system will capture the following information: • Noise from each train passby • Time and date of each train passby • Imagery or video recording to identify rolling stock • $L_{AF(max)}$ and Sound Exposure Level (SEL) of individual train passbys, measured in accordance with ISO 3095:2013 • $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ noise levels for each 24-hour period, which will be calculated based on the number of train passbys during the day and night periods and the corresponding SEL noise levels, consistent with the procedure in Clause 3.4.1.1 of the Rail Infrastructure Noise Guideline (EPA, 2013). • Other information as required by the Secretary	Refer comments related to SSD 6766 G7	SSD 6766 G7
Wayside Angle of Attack Monitoring	Continuous wayside angle of attack monitoring will be undertaken from the commencement of operations of the IMEX terminal. The monitoring system will capture the following information: • Angle of attack from a wheel on each axle of every train • Time and date of each axle passby • Identification number of each item of rolling stock	Refer comments related to SSD 6766 G7A	SSD 6766 G7A
Brake Squeal Noise	Continuous (unattended monitoring system) from the commencement of operations of the IMEX terminal – to assess potential noise impacts of rail link at western receivers	Refer comments related to SSD 6766 G7. The permanent noise monitoring system is positioned at a location on the rail link where it can capture noise levels associated with curve brake squeal should this occur.	SSD 6766 G7
Operational Noise Monitoring	Noise monitoring to compare actual noise performance of the MIP East Precinct against the noise management levels will be undertaken as follows: • Regular performance monitoring • Within 12 months of the commencement of operation of the IMEX terminal and Warehouse 1 Precinct • Within 12 months of occupation of the first warehouse, 50% occupation of the site and 100% occupation of the site, or as otherwise agreed by the Secretary • For a minimum of 12 months following occupation of the entire site	Sections 3, 4, 5, 6 and 7	Sections 3, 4, 5, 6 and 7

Condition ID	Condition	Comments on compliance	Reference for further information
Operational Noise Monitoring	Attended noise monitoring will be undertaken to determine compliance against the noise management levels upon receipt of a noise complaint	Noise complaints received during the 2024-2025 review period relating to operational noise referenced container handling activities, and general concerns about MIP noise generating activities (Section 7). Noise monitoring (attended and unattended) being undertaken for Moorebank Precinct West (MPW) has been used to provide feedback on MPE noise emissions as the MPW noise requirements are cumulative of MPE, to assist with reviewing the effectiveness of ongoing noise management. This included recommendations for managing container handling activity noise.	Section 7
Noise Assessment of Mechanical Plant and other equipment	Conducted for the freight village and each warehouse for a period of 1 week after construction and submitted to secretary within 2 weeks of occupation. Compliance against the noise management levels.	Refer comments related to SSD 7628 B85	SSD 7628 B85
Continuous Unattended Noise Monitoring	Continuous noise monitoring will be conducted at the following locations for a period of twelve months following the occupation of the entire site: • CM1: 10 Talbot Court, Wattle Grove • CM2: 24 Glenelg Court, Wattle Grove North • CM3: 14 Dunmore Crescent, Casula • CM4: 26 Goodenough Street, Glenfield	Refer comments related to SSD 7628 B64 (refer Section 4)	SSD 7628 B64 Section 4

3 Warehouse mechanical plant and other noisy equipment noise monitoring

Warehouse mechanical plant and other noisy equipment noise monitoring is required following the occupation of each warehouse in accordance with SSD 7628 CoC B85.

Noise monitoring of warehouse mechanical plant and other noisy equipment was performed on two occasions during the 2024-2025 review period to address SSD 7628 CoC B85 and the MPE Operational Noise and Vibration Management Plan (Rev 013, 24/01/2023) (ONVMP) requirements. A summary of the monitoring periods and reporting is provided in Table 3-1.

Table 3-1 Summary of CoC B85 warehouse mechanical plant and other noisy equipment noise monitoring

Noise monitoring period	Warehouse	Report reference
14 May - 24 May 2024	E7 (Mainfreight)	TM306-05F02 E7 Warehouse B85 Operational Noise Monitoring (r1)
28 March – 11 April 2025	E6A (QUBE) / E6B (CEVA)	TM306-05F03 E6 Warehouse B85 Operational Noise Monitoring (r1)

For warehouse operations, the SSD 7628 CoC B80 operational noise limits during the daytime, evening and night-time periods are 35 dB(A) $L_{Aeq(15minute}$ at the nearest residential receivers. This level of 35 dB(A) $L_{Aeq(15minute)}$ is below the existing ambient noise levels in the nearby residential areas, which are controlled by road traffic noise, rail traffic noise and other natural sources.

During each monitoring period noise measurement at the nearby residential areas were also undertaken and confirmed warehouse mechanical plant noise emissions were not audible and quantifiable within the residential areas.

As it was not possible to quantify the noise contribution from industrial noise sources at the nearest residential receivers, the procedure in the *Noise Policy for Industry* (NPfI) was followed to assess compliance. During each measurement campaign, a combination of on-site noise measurements, intermediate locations between the warehouse and residences, unattended noise monitoring, in combination with the use of a calibrated noise model, were used to quantify the warehouse mechanical plant noise levels associated with reasonable worst-case operations at the nearby residential receivers for comparison against the noise requirements.

This approach is consistent with Section 7.1.1 of the NPfI to review the performance of an industrial operation that is co-located with separate but noise-generating industrial sites impacting the same receiver.

Table 3-2 summaries the outcomes for the two assessments undertaken during the 2024-2025 review period.

Table 3-2 Summary of CoC B85 warehouse mechanical plant and other noisy equipment noise monitoring outcomes

Warehouse	Outcome summary
WH7 (Mainfreight)	Warehouse mechanical plant and equipment noise emission levels achieve the overall noise levels presented in Table 5 of CoC B80 during all time periods. However, to assist ESR with managing the cumulative noise emissions from the MIP further acoustic mitigation measures are currently being installed as it was identified during the monitoring that one was operating at noise levels louder than would be expected to manage cumulative noise emissions from the warehouse. Following these mitigation measures, noise level contributions are expected to further reduce at nearby residences from those presented in the assessment. This will be confirmed through monitoring following the implementation of these acoustic mitigation measures.
WH6A (QUBE) / WH6B (CEVA)	Warehouse mechanical plant and equipment noise emission levels achieve the overall noise levels presented in Table 5 of CoC B80 during all time periods.

For the 2024-2025 review period, for all monitored warehouses, the warehouse mechanical plant and equipment noise emission levels achieve the overall noise levels presented in Table 5 of CoC B80 during all time periods.

4 Continuous noise monitoring in residential areas

Continuous noise monitoring at sensitive receivers is required to be undertaken at sensitive receivers in accordance with the approval conditions for MPE Stage 2 (SSD 7628 CoC B64).

The primary purpose of the permanent noise monitoring systems is to measure construction-related noise in accordance with the requirements of SSD 7628 Condition B64. Whilst this condition relates to construction noise, the noise monitoring results can also be utilised for operational noise reviews/assessments and to investigate noise complaints (if required).

Details of the continuous noise monitoring and measurement locations (CM1 to CM4) are provided in Section 3.1.1 (Figure 3-1) of the MPE ONVMP (Rev 13, 24/01/2023). The measurement systems comprise four Envirosuite permanent noise monitors. The monitoring locations are:

- CM1: 10 Talbot Court, Wattle Grove
- CM2: 24 Glenelg Court, Wattle Grove North
- CM3: 14 Dunmore Crescent, Casula
- CM4: 26 Goodenough Street, Glenfield

During November 2024 the noise monitoring equipment of these monitoring terminals was upgraded with new sound level meters and shade cloth implemented to minimise any downtime in the case that the unit temperature limits are exceeded.

The monitor at location CM2 was offline for a period from 19/08/2024 to 10/09/2024. This was due to the power disconnection at their property. All other monitoring locations were fully operational during the period.

This noise monitoring is ongoing.

5 Continuous rail link noise monitoring

The commencement of the Moorebank Import/Export Terminal (IMEX) operations occurred in May 2020. The new rail link was commissioned earlier in November 2019. In conjunction with the rail link commissioning, a temporary rail noise monitoring system (RNMS) was established to quantify the passby noise levels in accordance with the requirements of SSD6766 Condition G7.

The temporary RNMS was positioned at a location near one of the small radius curves and where freight trains are likely to be braking. The microphone of the RNMS monitoring system was positioned on the western side of rail link at a distance of 10.5 m from the near track centreline (Up track) and 15.5 m from the far track centreline (Down track).

The temporary RNMS was operational between 1 November 2019 and 8 July 2020. During this period, procurement of a permanent noise monitoring system occurred, compliant with the requirements of the *Functional and Performance Specification for Permanent Noise Monitor and Proposed Noise and AoA Monitoring Locations*. This functional specification provided justification supporting the appropriateness of the proposed monitoring location and was approved by the Secretary.

The permanent noise monitoring system was commissioned on 9 July 2020 at the same location as the temporary RNMS. The permanent system incorporates two microphones, one adjacent to each track, at a distance of 7.5 m from the track centreline. Noise measurement results of all passbys are provided here[1].

Below is a summary of the noise monitoring results for Year 5 operations.

5.1 Year 5 rail operations noise monitoring report

This report covers rail movements between 1 May 2024 and 1 May 2025. A summary of the key statistics are provided below:

- Number of days in monitoring period - 365 days.
- Number of valid train passby events – 2,269 (day), 1,074 (night), 3,343 (day + night)
- Number of days that included one or more train events – 359, representing 98% of days
- Number of nights that included one or more train events – 350, representing 96% of nights

For each train passby, the noise monitoring system recorded the L_{AFmax} and SEL[2] noise levels at a measurement distance of 7.5 m from the track centreline. The SEL noise levels are utilised to calculate the $L_{Aeq(15hour)}$ daytime and $L_{Aeq(9hour)}$ noise levels each day. A summary of the measured $L_{Aeq(15hour)}$ daytime

[1] Available https://moorebanknoisemonitor-emsbk.trackiq.net/NoiseMonitor/

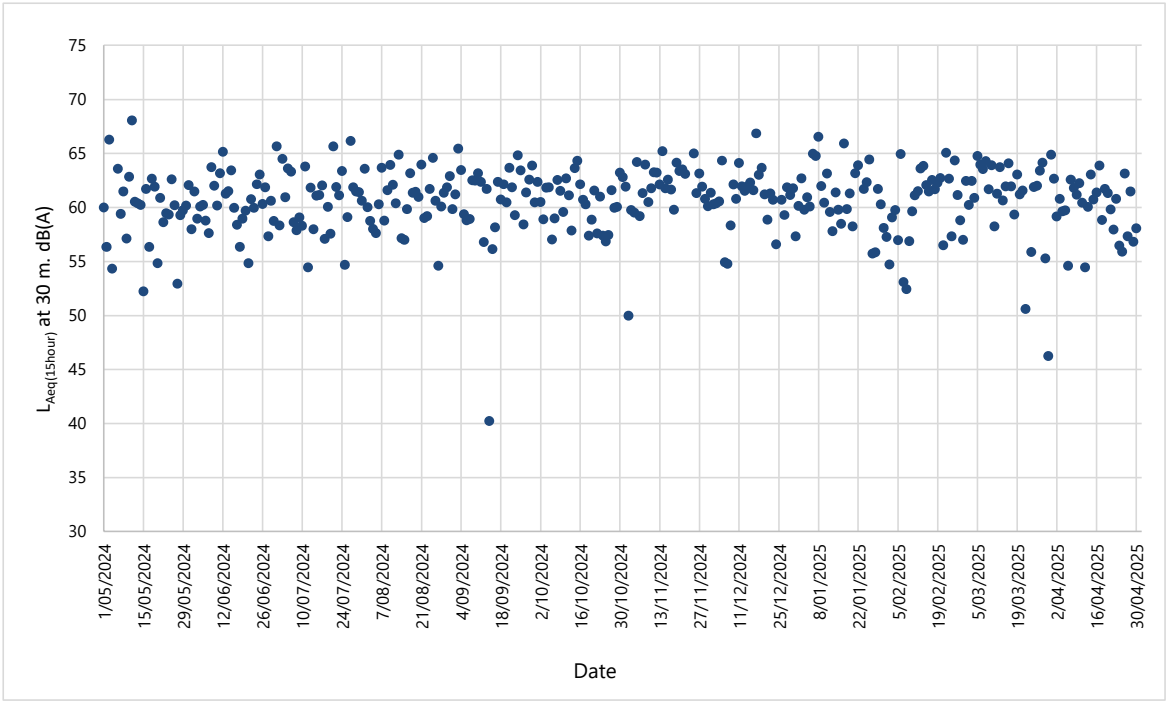
[2] SEL represents the single-event Sound Exposure Level of the train passby. This represents the total noise energy of the train passby event, normalised to a measurement interval of one second. The SEL is expressed as a dB(A) noise level.

noise levels, normalised to a measurement distance of 30 m is provided in Figure 5-1. The corresponding noise levels for the night-time period are provided in Figure 5-2.

It is noted that the nearest residential receiver (Glenfield Farm) is approximately 400 m from the rail link at the closest point and approximately 850 m from the noise monitoring system. The noise levels at Glenfield Farm are estimated to be approximately 14 dB(A) or more below the values in Figure 5-1 and Figure 5-2.

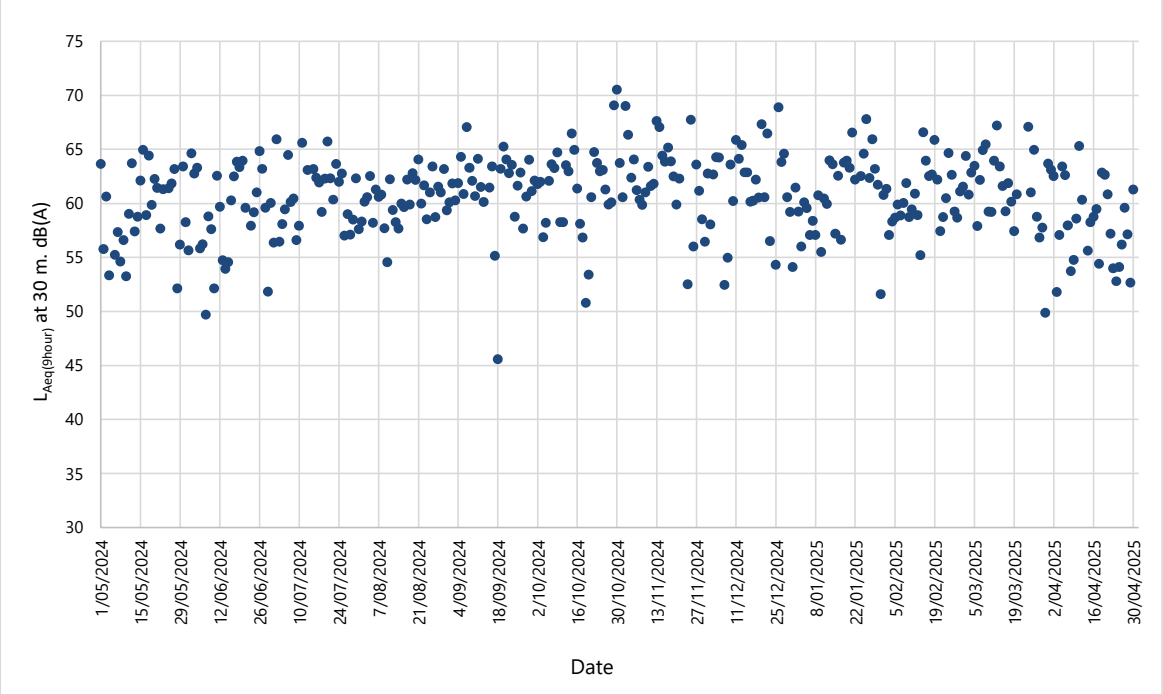
Based on the results in Figure 5-1 and Figure 5-2, the measured $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ noise levels appear to be approximately 3 dB(A) higher during daytime and 2 dB(A) higher at night compared to Year 4 noise monitoring results (see Reference 3). This increase is primarily attributed to greater rail link usage between Year 4 and Year 5 (i.e. additional train services) and may also be influenced by an increase in the average length of train consists.

Figure 5-1 Measured $L_{Aeq(15hour)}$ daytime noise levels at 30 m from track centreline



[3] Moorebank Intermodal Terminal Annual Noise Review – July 2024, Renzo Tonin & Associates Report TL116-05F23 Annual Review May 2024 (r4) dated 17 July 2024.

Figure 5-2 Measured $L_{Aeq(9hour)}$ night-time noise levels at 30 m from track centreline



A summary of the measured L_{AFmax} daytime noise levels at a measurement distance of 7.5 m is provided in Figure 5-3. The corresponding noise levels for the night-time period are provided in Figure 5-4.

Figure 5-3 Measured L_{AFmax} daytime noise levels at 7.5 m from track centreline

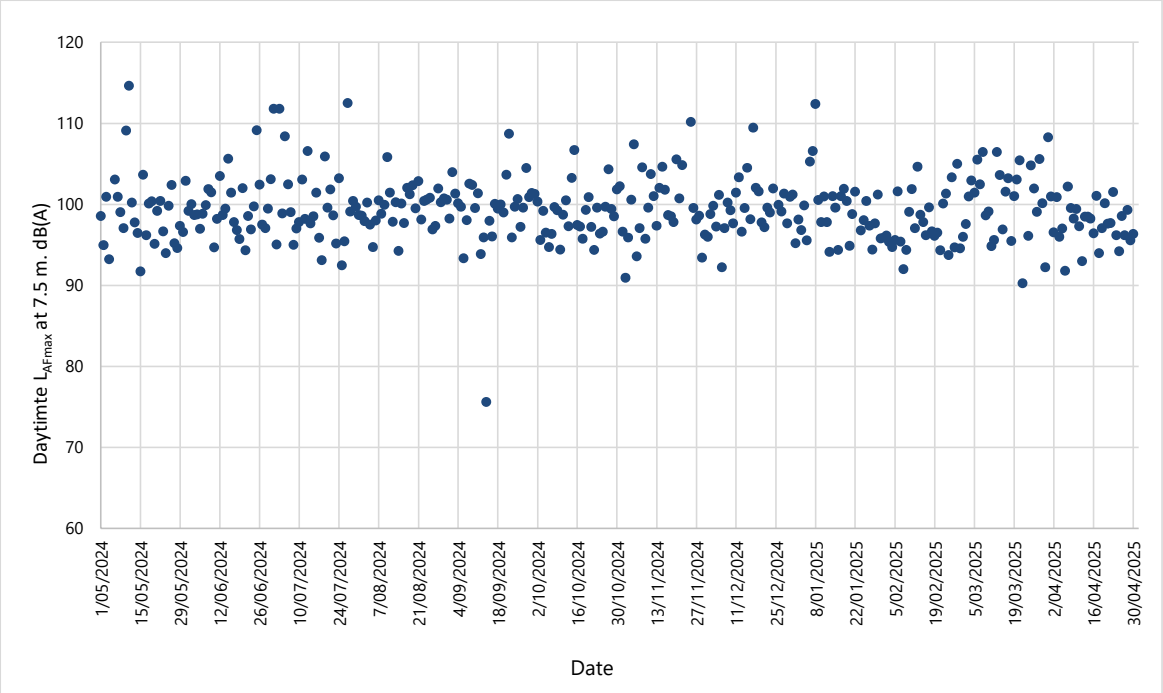
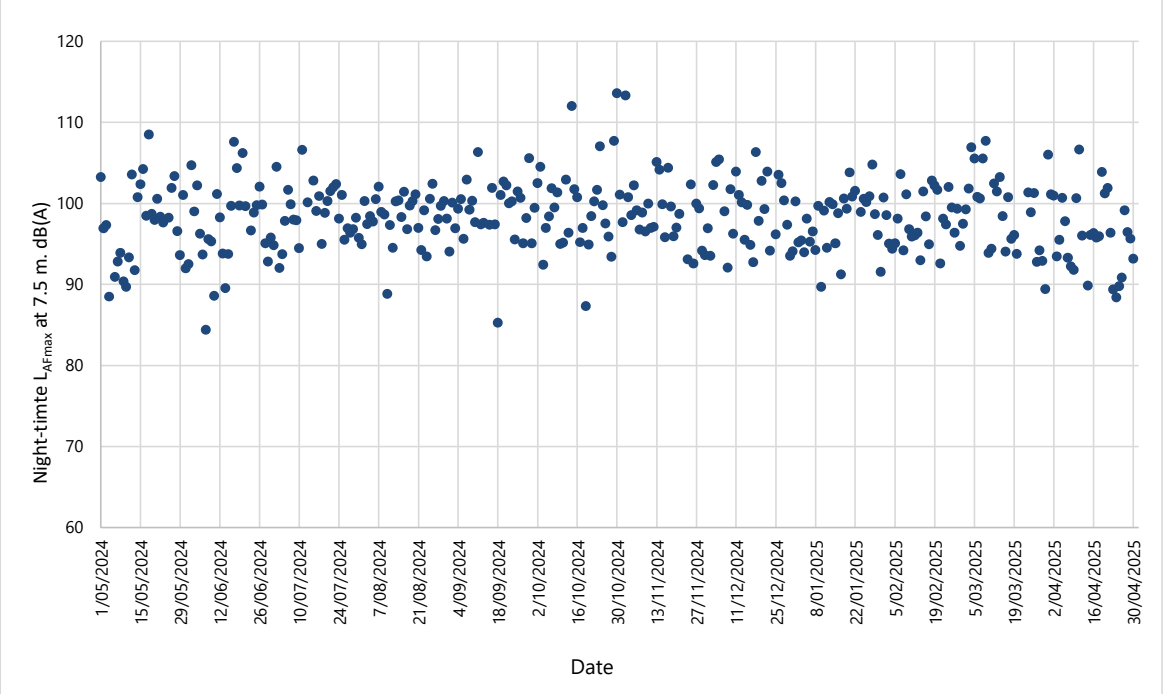


Figure 5-4 Measured L_{AFmax} night-time noise levels at 7.5 m from track centreline



Based on the results in Figure 5-3 and Figure 5-4, there does not appear to be any obvious trend in the measured L_{AFmax} noise levels during the monitoring period. The maximum noise levels are consistent with the Year 4 noise monitoring results (see Reference 3).

6 Rail link angle of attack (AoA) monitoring

The performance of wagon bogies and their ability to negotiate small radius curves without generating curve squeal, is assessed in terms of the angle of attack (AoA) of the wheelset. Acceptable AoA values are defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST[4] and are a function of the curve radius and wheel base.

An AoA measurement system was installed on the rail link and partially commissioned on 13 May 2020. The system was fully commissioned on 9 July 2020 at the same time as the permanent noise monitoring system. The AoA system is installed on the eastern track.

Justification supporting the appropriateness of the proposed monitoring location is provided in the *Functional and Performance Specification for Permanent Noise Monitor and Proposed Noise and AoA Monitoring Locations*[5], and was approved by the Secretary.

AoA measurement data for Year 5 operations is available in the following six monthly report:

- Moorebank Intermodal Terminal - Six Monthly Review of AoA – November 2024 (rail movements between 1 May 2024 and 1 November 2024) – Refer Section B.1.
- Moorebank Intermodal Terminal - Six Monthly Review of AoA – May 2025 (rail movements between 1 November 2024 and 1 May 2025) – Refer Section B.2.

In accordance with the requirements of the SSD 6766 Condition G7A, the AoA of a wheel of each axle of each train is captured by the measurement system. This data is accessible by train operators on a website maintained by QUBE.

Below is a summary of the noise monitoring results for the two 6-montly AoA monitoring periods (during Year 5 operations).

6.1 Year 5 rail operations AoA monitoring

A summary of the key statistics are provided below:

- 1 May 2024 and 1 May 2025
    - Number of valid train passby events – 3343
    - Number of train passby events where the measure AoA values on one or more axles were above the acceptable level defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST – 40, representing less than 1% of passbys.

[4] Transport for NSW Asset Standards Authority T HR RS 00400 ST *RSU 400 Series – Minimum Operating Standards for Rolling Stock – Freight Vehicle Specific Interface Requirements* Version 2.0 dated 24 August 2017

[5] Renzo Tonin & Associates Report TJ741-04F04 AoA and Functional Spec for Permanent Noise Monitor (r8)

A summary of the maximum AoA value measured for each train is provided in Figure 6-1. The results show that the maximum AoA value is typically less than 12 mrad, except for 19 train passbys that had maximum AoA value greater than the established alarm level.

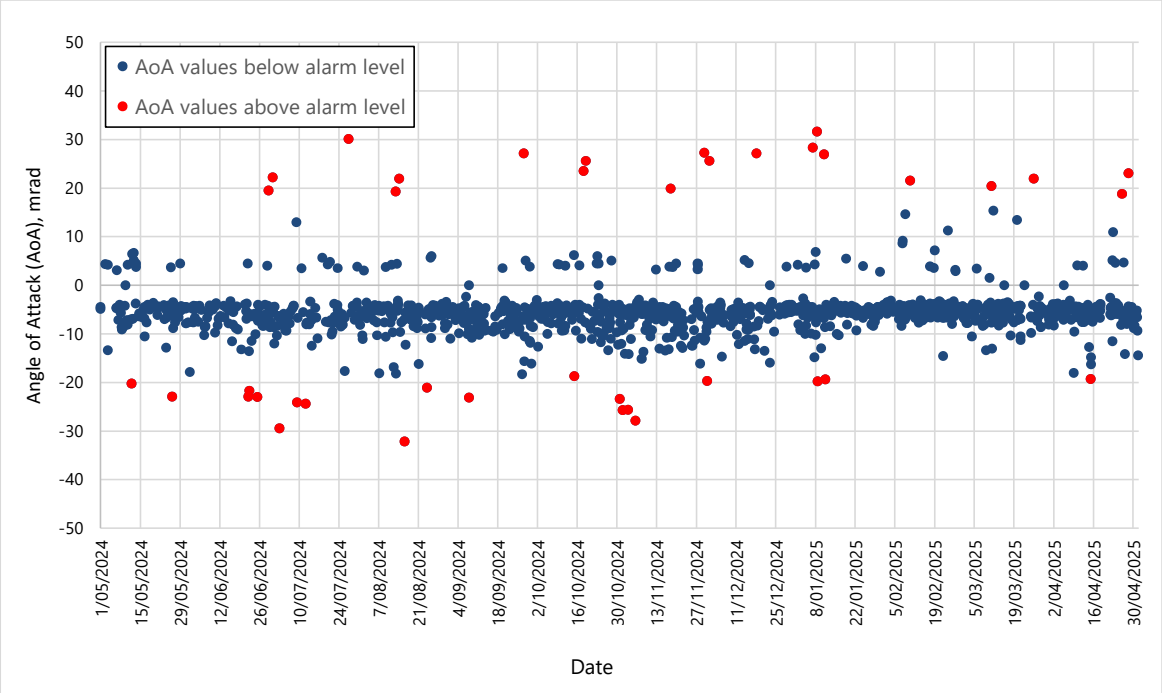
A detailed review of the Angle of Attack (AoA) exceedances identified three wagons that repeatedly triggered AoA alarms. Wagon CQMY 003013 and CQMY 003058, each exceeded the AoA alarm threshold on four occasions. Wagon CQMY 003099 triggered the AoA alarm on two occasions.

It is the same Wagon ID (CQMY 003099) that exceeded the AoA alarm level on ten occasions during 1 May 2024 and 1 November 2024. The owner of Wagon ID (CQMY 003099) was notified of the exceedances and were in the process of determining the required rectification works. Following rectification works undertaken during November 2024 this wagon has not been identified as exceeding the AoA alarm level.

As of 04/06/2025, the owner of these two further wagons had been notified of the exceedances and were in the process of determining the required rectification works.

Three of the 40 passby events with AoA alarm levels resulted in elevated noise levels at the permanent noise monitoring location [i.e. where the calculated $L_{Aeq(9hour)}$ noise levels at 30 m were above 60 dB(A)]. Exceedances of the AoA alarm levels were viewed as one-off instances, occurring irregularly.

Figure 6-1 Maximum AoA value for each train - 1 May 2024 to 1 May 2025



7 Noise monitoring in response to complaints

In the current reporting period, there were 11 complaints relating to noise levels that were reported by residents. Of these 11 complaints, 3 did not relate to operations, and were either related to construction noise or non-MIP noise.

The complaints referenced container handling activities, and general concerns about MIP noise generating activities. These complaints were received generally during mid-2024. Some complaint periods were confirmed to correlate with periods when Holsworthy Military Area activities were being undertaken. Complaints during 2025 have generally related to concerns regarding overnight construction activities. There was also a complaint about general MIP noise generating activities, and noise from an adjacent industrial site.

Responses to container handling noise complaints have included advising the QUBE team to undertake further investigation and sharing the noise mitigation strategies developed by the project with the complaints that are being implemented.

The number of operational noise-related complaints (confirmed construction or non-MIP complaints excluded) each month is summarised in the below table, for the period between 30 April 2024 to 1 May 2025. The number of noise complaints were highest in June 2024.

Period	Number of operational noise-related complaints
May 2024	1
June 2024	4
July 2024	0
August 2024	1
September 2024	0
October 2024	0
November 2024	0
December 2024	0
January 2025	0
February 2025	0
March 2025	0
April 2025	2

No specific noise monitoring for complaints was undertaken during the period between 30 April 2024 to 1 May 2025. Noise monitoring (attended and unattended) was undertaken for Moorebank Precinct West (MPW). This has been used to provide feedback on MPE noise emissions as the MPW noise requirements are cumulative of MPE, to assist with reviewing the effectiveness of ongoing noise management. This included recommendations for managing container handling activity noise.

8 Other noise-related tasks

8.1 Other relevant consent monitoring

Noise monitoring was undertaken during February 2025 for Moorebank Precinct West (MPW) to address SSD 7709 CoC B140A. As the MPW noise requirements are cumulative this monitoring also considered MPE noise emissions.

The noise monitoring surveys determined that the noise emissions from MIP operations were less than the SSD 7709 Conditions of Consent (CoC) $L_{Aeq15min}$ noise limits at all surrounding receiver locations, and that typically, the maximum noise levels from MIP operations were generally compliant with the L_{Amax} noise, however, a number of periods were identified where the L_{Amax} noise levels were above the L_{Amax} noise limit for residences in Casula, which were on occasions from MPE activities.

As such, mitigation and management measure recommendations were included to address this noise and further improve noise performance from the MIP noise emissions. The implementation of these measures are under investigation.

8.2 Moorebank Cumulative Noise Management

Planning work is continuing for the management of cumulative noise from the Moorebank Intermodal Precinct (MIP). This work currently aims to manage cumulative noise emissions from the various noise generating components (eg. warehouse and IMEX operations), to manage overall cumulative noise emissions against the applicable consent requirements.

9 Conclusion

This **Annual Noise Review** report **for Year 5 Operations** has been prepared to address the requirements of Approval Condition B90 of SSD 7628.

The following operational noise monitoring has been performed in accordance the Approval Conditions in SSD 6766 and 7628:

- Continuous rail noise and angle of attack (AoA) monitoring on the rail link to monitoring rail traffic noise and to assist in identifying potential high noise events (e.g. excessive locomotive noise, brake squeal or curve squeal).
- Warehouse mechanical equipment noise monitoring and reporting was undertaken for MPE Warehouse E6 and E7 during periods when valid data could be obtained. For the 2024-2025 review period, for all monitored warehouses, the warehouse mechanical plant and equipment noise emission levels achieved the overall noise limits presented in SSD 7628 CoC B80 during all time periods.

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.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
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.
AoA	Angle of Attack - As the wheels on a bogie negotiate a tight curve, the leading wheelset typically presents an Angle-of-Attack (AoA) to the rail. The AoA of a leading wheelset with good steering performance can be calculated from AoA = wheelbase (m) / curve radius (m). AoA is normally measured in milliradian (mrad).
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
ASA	Asset Standards Authority
Assessment period	The time period in which an assessment is made. e.g. Day 7am-10pm & Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
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. 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 LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard

CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"		
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our environment:		
	threshold of hearing	0 dB	The faintest sound we can hear, defined as 20 micro Pascal
		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
	threshold of pain	130 dB	
		140 dB	Military jet take-off at 25m away
dB(A)	A-weighted decibel. 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 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. The dB(C) level is not widely used but has some applications.		
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.		
DIN	German Standard		
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999		
ENMM	Environmental Noise Management Manual, Roads and Maritime Services (Transport for NSW)		
EPA	Environment Protection Authority		
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.		
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.		
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.		
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.		

Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
IGANRIP	Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects, NSW DEC 2007
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.
INP	NSW Industrial Noise Policy, EPA 1999
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.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
$L_{10(1hour)}$	The L_{10} level measured over a 1 hour period.
$L_{10(18hour)}$	The arithmetic average of the $L_{10(1hour)}$ levels for the 18 hour period between 6am and 12 midnight on a normal working day.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L_{90} noise level expressed in units of dB(A).
L_{Aeq} or L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the L_{Aeq}.
$L_{Aeq(1hour)}$	The L_{Aeq} noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted L_{eq} during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
$L_{Aeq(8hour)}$	The L_{Aeq} noise level for the period 10pm to 6am.
$L_{Aeq(9hour)}$	The L_{Aeq} noise level for the period 10pm to 7am.
$L_{Aeq(15hour)}$	The L_{Aeq} noise level for the period 7am to 10pm.
$L_{Aeq\ (24hour)}$	The L_{Aeq} noise level during a 24 hour period, usually from midnight to midnight.
L_{max}	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the L_{Amax}.
L_{min}	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the L_{Amin}.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.

Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
MPE	Moorebank Precinct East
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
NCG	Noise Criteria Guideline, Roads and Maritime Services (Transport for NSW)
NMG	Noise Mitigation Guideline, Roads and Maritime Services (Transport for NSW)
Noise	Unwanted sound
Pre-construction	Work in respect of the proposed project that includes design, survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing ancillary facilities such as site compounds, or other relevant activities determined to have minimal environmental impact (e.g. minor access roads).
Reflection	Sound wave reflected from a solid object obscuring its path.
RING	Rail Infrastructure Noise Guideline, NSW, May 2013
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
Sabine	A measure of the total acoustic absorption provided by a material. It is the product of the Absorption Coefficient (alpha) and the surface area of the material (m2). For example, a material with alpha = 0.65 and a surface area of 8.2m2 would have 0.65 x 8.2 = 5.33 Sabine. Sabine is usually calculated for each individual octave band (or third-octave).
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 Leq 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 by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
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 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 of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.

SSFL	Southern Sydney Freight Line
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.
Wheelbase	The wheelbase is the distance between the centres of the front and rear wheels on a 2-axle bogie.

APPENDIX B Detailed noise monitoring/ assessment/ management reports

B.1 Angle of Attack Monitoring Report - 1 May 2024 and 1 November 2024

Renzo Tonin Report TL116-05D24 AoA Report November 2024 (r2)

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MOOREBANK INTERMODAL TERMINAL

Six Monthly Review of AoA - November 2024

17 December 2024

Tactical Group

TL116-05D24 AoA Report November 2024 (r2)

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

Sydney Melbourne Brisbane Gold Coast Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

aaac Association of Australian Acoustical Consultants

Document details

Detail	Reference
Doc reference:	TL116-05D24 AoA Report November 2024 (r2)
Prepared for:	Tactical Group
Address:	Level 15, 124 Walker Street North Sydney, NSW, 2060
Attention:	[redacted]

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
22.11.2024	First Issue	0	1	[redacted]		
17.12.2024	Final Report addressing the comments	-	2			

File Path: R:\AssocSydProjects\TL101-TL150\TL116 cw Moorebank IMT Temporary Noise Monitoring\Task 5 - cw Operation Compliance Monitoring\1 Docs\Report 24 2024-11 AoA\TL116-05D24 AoA Report November 2024 (r2).docx

Contents

List of tables

List of figures

1 Introduction

1.1 Project overview

Renzo Tonin & Associates (RTA) was engaged by The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust, to provide a report that addresses the requirements of Approval Condition G7A of SSD 6766.

The Sydney Intermodal Terminal Alliance (SIMTA) received the initial approval for the construction and operation of Stages 1 and 2 of the Moorebank Precinct East (MPE) Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193). The Trust Company (Australia) Limited is now the proponent for the MPE projects.

This report has been prepared to address the requirements of Approval Condition G7A of SSD 6766, which requires the submission of a six-monthly report to the Secretary, which identifies the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance.

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

2 Compliance Matrix

Table 1 provides a summary of the Approval Conditions which relate to this report.

Table 1 Compliance matrix

Condition ID	Condition	Comments on compliance	Reference for further information
SSD 6766			
G7	The Applicant shall install and maintain a rail noise monitoring system on the rail link at the commencement of operation to continuously monitor the noise from rail operations on the rail link. The system shall capture the noise from each individual train passby noise generation event, and include information to identify: a) Time and date of freight train passbys; b) Imagery or video to enable identification of the rolling stock during day and night; c) $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ from rail operations; and d) $L_{AF(max)}$ and SEL of individual train passbys, measured in accordance with ISO3095; or e) Other alternative information as agreed with, or required by, the Secretary. The results from the noise monitoring system, shall be publicly accessible from a website maintained by the Applicant. The noise results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances (i.e a system malfunction) have occurred. The $L_{Aeq(15hour)}$ and $L_{Aeq(9hr)}$ results from each day shall be available on the website within 24 hours of the period ending. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for rail noise monitoring, including details of any alternative options considered and reasons for these being dismissed. The rail noise monitoring system shall not operate until the Secretary has approved the proposed monitoring location. The Applicant shall provide an annual report to the Secretary with the results of monitoring for a period of 5 years, or as otherwise agreed with the Secretary, from the commencement of operation of the IMEX terminal. The Secretary shall consider the need for further reporting following a review of the results for year 5.	This condition is not directly related to this report. It is referenced herein on the basis that noise levels from the rail noise monitoring system provides information that may correlate with the Angle of Attack measurement results.	https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf https://moorebanknoisemonitor-emsbk.trackiq.net/NoiseMonitor/

Condition ID	Condition	Comments on compliance	Reference for further information
G7A	The applicant shall install and maintain a wayside angle of attack monitoring system on the rail link at the commencement of operation to continuously monitor the angle of attack to the rail of rolling stock wheels. The system shall capture the angle of attack from a wheel on each axle of every train, and include information to identify: a) Time and date of each axle passby; and b) The identification number of each item of rolling stock. The results from the angle of attack monitoring system shall be: • accessible by train operators from a website maintained by the Applicant. Angle of attack results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances have occurred. • included in a six-monthly report to the Secretary. The report should at least identify the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for angle of attack monitoring, the format of the information to be accessible to operators and the format of the public report. The angle of attack monitoring system shall not operate until the Secretary has approved the proposed monitoring location and reporting arrangements.	An Angle of Attack (AoA) monitoring system was installed on the new rail link in May 2020. The monitoring system captures the AoA of each axle passby and compares the measured values with the acceptable value in the applicable Asset Standards Authority minimum operating standard. The AoA values for each axle are available to operators in accordance with the approval condition. A Functional and Performance Specification for the permanent noise monitoring system and angle of attack monitoring system was prepared for approval by the Secretary before the rail link commissioning. A summary of the AoA noise monitoring results for the current six month period is provided in Section 3.1. The monitoring identified 22 train passbys where the maximum AoA value exceeded the ASA standard alarm level during the 6-month monitoring period. One of these AoA exceedance events caused elevated noise levels above $L_{Aeq(9hour)}$ 60 dB(A) at the permanent noise monitoring location.	Section 3

3 Rail link angle of attack (AoA) monitoring

The performance of wagon bogies and their ability to negotiate small radius curves without generating curve squeal, is assessed in terms of the angle of attack (AoA) of the wheelset. Acceptable AoA values are defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST[1] and are a function of the curve radius and wheelbase.

An AoA measurement system was installed on the rail link and partially commissioned on 13 May 2020. The system was fully commissioned on 9 July 2020 at the same time as the permanent noise monitoring system. The AoA system is installed on the eastern track.

Justification supporting the appropriateness of the proposed monitoring location is provided in the *Functional and Performance Specification for Permanent Noise Monitor and Proposed Noise and AoA Monitoring Locations*[2], and was approved by the Secretary.

This report provides a summary of the AoA measurement data for the period between 1 May 2024 and 1 November 2024. In accordance with the requirements of the SSD 6766 Condition G7A, the AoA of a wheel of each axle of each train is captured by the measurement system. This data is accessible by train operators on a website maintained by QUBE.

Below is a summary of the monitoring results.

3.1 AoA monitoring results for current six-month period

This report covers rail movements between 1 May 2024 and 1 November 2024. A summary of the key statistics is provided below:

- Number of valid train passby events – **545**
- Number of train passby events where the measure AoA values on one or more axles were above the acceptable level defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST – **22** (representing 4% of passbys).

A summary of the maximum AoA value measured for each train is provided in Figure 1. The results show that the maximum AoA value is typically less than 10 mrad. 22 train passbys had maximum AoA values greater than the established alarm level of approximately 19 mrad.

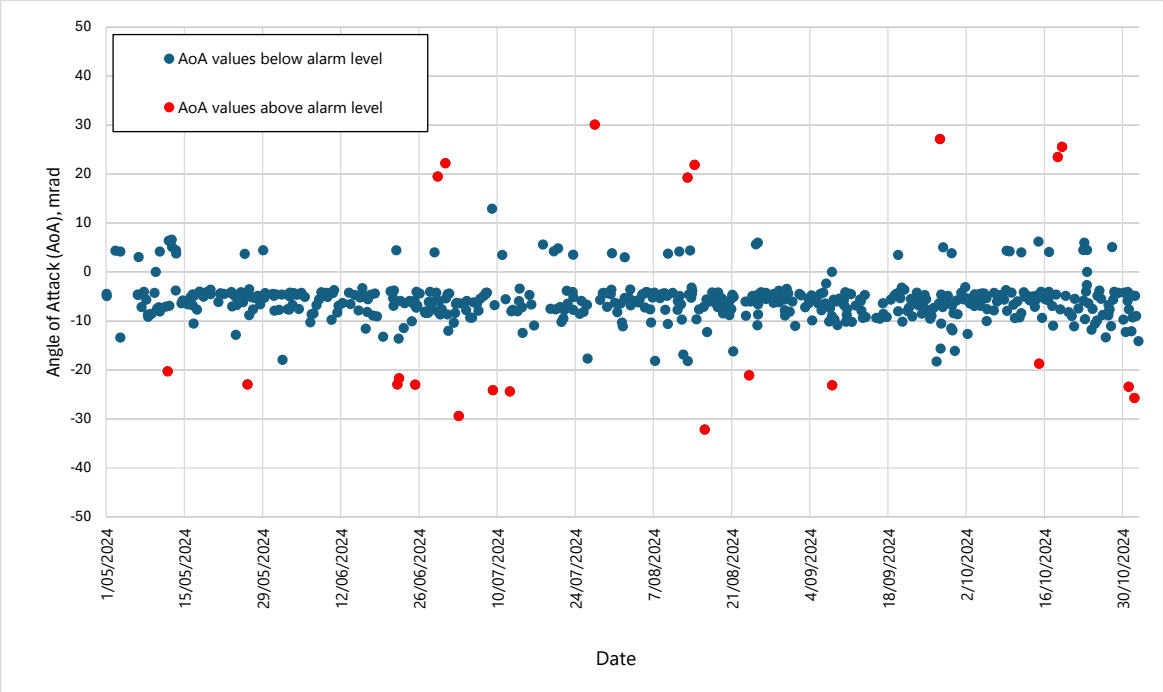
[1] Transport for NSW Asset Standards Authority T HR RS 00400 ST *RSU 400 Series – Minimum Operating Standards for Rolling Stock – Freight Vehicle Specific Interface Requirements* Version 2.0 dated 24 August 2017

[2] Renzo Tonin & Associates Report TJ741-04F04 AoA and Functional Spec for Permanent Noise Monitor (r8) – available https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf

A detailed review of the AoA exceedances identified that Wagon ID CQMY 003099 exceeded the AoA alarm level on ten occasions. The owner of this wagon has been notified of these exceedances and is in the process of determining the required rectification works. It is the same Wagon ID (CQMY 003099) that exceeded the AoA alarm level on seven occasions during 1 May 2023 and 31 October 2023.

One of the 22 passby events with AoA alarm levels resulted in elevated noise levels at the permanent noise monitoring location [i.e. where the calculated $L_{Aeq(9hour)}$ noise levels at 30 m were above 60 dB(A)].

Figure 1 Maximum AoA value for each train passby



4 Conclusion

This report has been prepared to address the requirements of Approval Condition G7A of SSD 6766, which requires the submission of a six-monthly report to the Secretary, which identifies the number of train passbys and wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance.

For rail movements between 1 May 2024 and 1 November 2024, 22 train passbys had maximum AoA values greater than the established alarm level of approximately 19 mrad. Wagon ID CQMY 003099 exceeded the AoA alarm level on ten occasions. The owner of this wagon has been notified of these exceedances and is in the process of determining the required rectification works.

One of 22 train passby events with AoA alarm levels caused elevated noise levels at the permanent noise monitoring location [i.e. where the calculated $L_{Aeq(9hour)}$ noise levels at 30 m were above 60 dB(A)].

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.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
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.
AoA	Angle of Attack - As the wheels on a bogie negotiate a tight curve, the leading wheelset typically presents an Angle-of-Attack (AoA) to the rail. The AoA of a leading wheelset with good steering performance can be calculated from AoA = wheelbase (m) / curve radius (m). AoA is normally measured in milliradian (mrad).
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
ASA	Asset Standards Authority
Assessment period	The time period in which an assessment is made. e.g. Day 7am-10pm & Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
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. 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 LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard

CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"		
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our environment:		
	threshold of hearing	0 dB	The faintest sound we can hear, defined as 20 micro Pascal
		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
	threshold of pain	130 dB	
		140 dB	Military jet take-off at 25m away
dB(A)	A-weighted decibel. 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 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. The dB(C) level is not widely used but has some applications.		
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.		
DIN	German Standard		
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999		
ENMM	Environmental Noise Management Manual, Roads and Maritime Services (Transport for NSW)		
EPA	Environment Protection Authority		
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.		
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.		
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.		
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.		

Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
IGANRIP	Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects, NSW DEC 2007
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.
INP	NSW Industrial Noise Policy, EPA 1999
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.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L10(1hr)	The L10 level measured over a 1 hour period.
L10(18hr)	The arithmetic average of the L10(1hr) levels for the 18 hour period between 6am and 12 midnight on a normal working day.
L90	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).
LAeq or Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the LAeq.
LAeq(1hr)	The LAeq noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted Leq during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
LAeq(8hr)	The LAeq noise level for the period 10pm to 6am.
LAeq(9hr)	The LAeq noise level for the period 10pm to 7am.
LAeq(15hr)	The LAeq noise level for the period 7am to 10pm.
LAeq (24hr)	The LAeq noise level during a 24 hour period, usually from midnight to midnight.
Lmax	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmax.
Lmin	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the LAmin.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.

Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
MPE	Moorebank Precinct East
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
NCG	Noise Criteria Guideline, Roads and Maritime Services (Transport for NSW)
NMG	Noise Mitigation Guideline, Roads and Maritime Services (Transport for NSW)
Noise	Unwanted sound
Pre-construction	Work in respect of the proposed project that includes design, survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing ancillary facilities such as site compounds, or other relevant activities determined to have minimal environmental impact (e.g. minor access roads).
Reflection	Sound wave reflected from a solid object obscuring its path.
RING	Rail Infrastructure Noise Guideline, NSW, May 2013
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
Sabine	A measure of the total acoustic absorption provided by a material. It is the product of the Absorption Coefficient (alpha) and the surface area of the material (m2). For example, a material with alpha = 0.65 and a surface area of 8.2m2 would have 0.65 x 8.2 = 5.33 Sabine. Sabine is usually calculated for each individual octave band (or third-octave).
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 Leq 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 by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
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 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 of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.

SSFL	Southern Sydney Freight Line
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.
Wheelbase	The wheelbase is the distance between the centres of the front and rear wheels on a 2-axle bogie.

B.2 Angle of Attack Monitoring Report - 1 November 2024 and 1 May 2025

Renzo Tonin Report TM306-24-02F02 AoA Report May 2025 (r0)

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MOOREBANK INTERMODAL TERMINAL

Six Monthly Review of AoA - May 2025

4 June 2025

The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust

TM306-24-02F02 AoA Report May 2025 (r0).docx

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

Sydney Melbourne Brisbane Gold Coast Canberra Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

aaac Association of Australian Acoustical Consultants

Document details

Detail	Reference
Doc reference:	TM306-24-02F02 AoA Report May 2025 (r0).docx
Prepared for:	The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust
Address:	Level 15, 124 Walker Street North Sydney, NSW, 2060
Attention:	[redacted]

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
04.06.2025	First Issue	0	1	[redacted]		

File Path: R:\AssocSydProjects\TM301-TM350\TM306 ale Moorebank Intermodal Terminal (LOGOS)\Task24 MPE Monitoring\1 Docs\Report 2 2025-05 AoA\TM306-24-02F02 AoA Report May 2025 (r0).docx

Important Disclaimers:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian/New Zealand Standard AS/NZS ISO 9001.

This document is issued subject to review and authorisation by the suitably qualified and experienced person named in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

External cladding disclaimer: No claims are made and no liability is accepted in respect of any external wall and/or roof systems (eg facade / cladding materials, insulation etc) that are: (a) not compliant with or do not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes; or (b) installed, applied, specified or utilised in such a manner that is not compliant with or does not conform to any relevant non-acoustic legislation, regulation, standard, instructions or Building Codes.

Contents

List of tables

List of figures

1 Introduction

1.1 Project overview

Renzo Tonin & Associates (RTA) was engaged by The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust, to provide a report that addresses the requirements of Approval Condition G7A of SSD 6766.

The Sydney Intermodal Terminal Alliance (SIMTA) received the initial approval for the construction and operation of Stages 1 and 2 of the Moorebank Precinct East (MPE) Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193). The Trust Company (Australia) Limited is now the proponent for the MPE projects.

This report has been prepared to address the requirements of Approval Condition G7A of SSD 6766, which requires the submission of a six-monthly report to the Secretary, which identifies the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance.

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

2 Compliance Matrix

Table 1 provides a summary of the Approval Conditions which relate to this report.

Table 1 Compliance matrix

Condition ID	Condition	Comments on compliance	Reference for further information
SSD 6766			
G7	The Applicant shall install and maintain a rail noise monitoring system on the rail link at the commencement of operation to continuously monitor the noise from rail operations on the rail link. The system shall capture the noise from each individual train passby noise generation event, and include information to identify: a) Time and date of freight train passbys; b) Imagery or video to enable identification of the rolling stock during day and night; c) $L_{Aeq(15hour)}$ and $L_{Aeq(9hour)}$ from rail operations; and d) $L_{AF(max)}$ and SEL of individual train passbys, measured in accordance with ISO3095; or e) Other alternative information as agreed with, or required by, the Secretary. The results from the noise monitoring system, shall be publicly accessible from a website maintained by the Applicant. The noise results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances (i.e a system malfunction) have occurred. The $L_{Aeq(15hour)}$ and $L_{Aeq(9hr)}$ results from each day shall be available on the website within 24 hours of the period ending. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for rail noise monitoring, including details of any alternative options considered and reasons for these being dismissed. The rail noise monitoring system shall not operate until the Secretary has approved the proposed monitoring location. The Applicant shall provide an annual report to the Secretary with the results of monitoring for a period of 5 years, or as otherwise agreed with the Secretary, from the commencement of operation of the IMEX terminal. The Secretary shall consider the need for further reporting following a review of the results for year 5.	This condition is not directly related to this report. It is referenced herein on the basis that noise levels from the rail noise monitoring system provides information that may correlate with the Angle of Attack measurement results.	https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf https://moorebanknoisemonitor-emsbk.trackiq.net/NoiseMonitor/

Condition ID	Condition	Comments on compliance	Reference for further information
G7A	The applicant shall install and maintain a wayside angle of attack monitoring system on the rail link at the commencement of operation to continuously monitor the angle of attack to the rail of rolling stock wheels. The system shall capture the angle of attack from a wheel on each axle of every train, and include information to identify: a) Time and date of each axle passby; and b) The identification number of each item of rolling stock. The results from the angle of attack monitoring system shall be: • accessible by train operators from a website maintained by the Applicant. Angle of attack results from each train shall be available on the website within 24 hours of it passing the monitor, unless unforeseen circumstances have occurred. • included in a six-monthly report to the Secretary. The report should at least identify the number of wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance. Prior to the commencement of operation, the Applicant shall submit for the approval of the Secretary, justification supporting the appropriateness of the location for angle of attack monitoring, the format of the information to be accessible to operators and the format of the public report. The angle of attack monitoring system shall not operate until the Secretary has approved the proposed monitoring location and reporting arrangements.	An Angle of Attack (AoA) monitoring system was installed on the new rail link in May 2020. The monitoring system captures the AoA of each axle passby and compares the measured values with the acceptable value in the applicable Asset Standards Authority minimum operating standard. The AoA values for each axle are available to operators in accordance with the approval condition. A Functional and Performance Specification for the permanent noise monitoring system and angle of attack monitoring system was prepared for approval by the Secretary before the rail link commissioning. A summary of the AoA noise monitoring results for the current six month period is provided in Section 3.1. The monitoring identified 19 train passbys where the maximum AoA value exceeded the ASA standard alarm level during the 6-month monitoring period. Two of these AoA exceedance events caused elevated noise levels above $L_{Aeq(9hour)}$ 60 dB(A) at the permanent noise monitoring location.	Section 3

3 Rail link angle of attack (AoA) monitoring

The performance of wagon bogies and their ability to negotiate small radius curves without generating curve squeal, is assessed in terms of the angle of attack (AoA) of the wheelset. Acceptable AoA values are defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST[1] and are a function of the curve radius and wheelbase.

An AoA measurement system was installed on the rail link and partially commissioned on 13 May 2020. The system was fully commissioned on 9 July 2020 at the same time as the permanent noise monitoring system. The AoA system is installed on the eastern track.

Justification supporting the appropriateness of the proposed monitoring location is provided in the *Functional and Performance Specification for Permanent Noise Monitor and Proposed Noise and AoA Monitoring Locations*[2], and was approved by the Secretary.

This report provides a summary of the AoA measurement data for the period between 1 November 2024 and 1 May 2025. In accordance with the requirements of the SSD 6766 Condition G7A, the AoA of a wheel of each axle of each train is captured by the measurement system. This data is accessible by train operators on a website maintained by QUBE.

Below is a summary of the monitoring results.

3.1 AoA monitoring results for current six-month period

This report covers rail movements between 1 November 2024 and 1 May 2025. A summary of the key statistics is provided below:

- Number of valid train passby events – **695**
- Number of train passby events where the measure AoA values on one or more axles were above the acceptable level defined in Section 2.7.1 of Asset Standards Authority Standard T HR RS 00400 ST – **19** (representing 3% of passbys).

A summary of the maximum AoA value measured for each train is provided in Figure 1.

The results show that the maximum AoA value is typically less than 12 mrad, except for 19 train passbys that had maximum AoA value greater than the established alarm level of approximately 19 mrad. A detailed review of the Angle of Attack (AoA) exceedances identified three wagons that repeatedly triggered AoA alarms.

---

[1] Transport for NSW Asset Standards Authority T HR RS 00400 ST *RSU 400 Series – Minimum Operating Standards for Rolling Stock – Freight Vehicle Specific Interface Requirements* Version 2.0 dated 24 August 2017

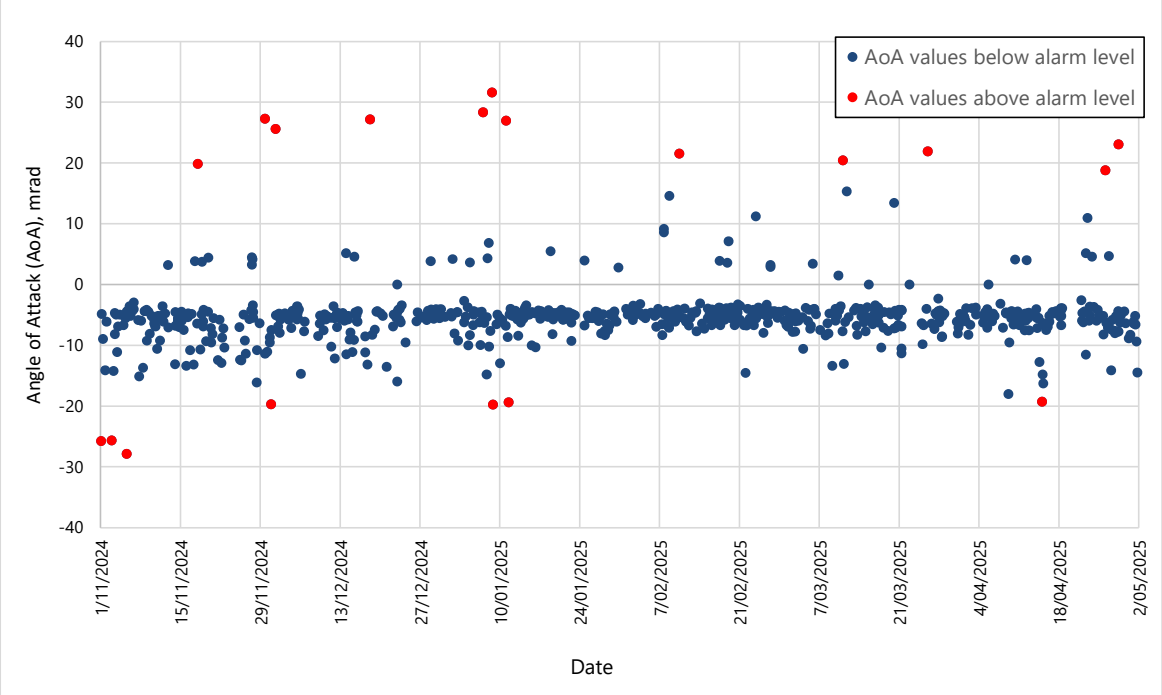
[2] Renzo Tonin & Associates Report TJ741-04F04 AoA and Functional Spec for Permanent Noise Monitor (r8) – available https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/04/TJ741-04F04-AoA-and-Functional-Spec-for-Permanent-Noise-Monitor-r9_redacted.pdf

A detailed review of the AoA exceedances identified three wagons that repeatedly triggered AoA alarms. Wagon CQMY 003013 and CQMY 003058, each exceeded the AoA alarm threshold on four occasions. Wagon CQMY 003099 triggered the AoA alarm on two occasions. It is the same Wagon ID (CQMY 003099) that previously exceeded the AoA alarm level on ten occasions, during 1 May 2024 and 1 November 2024.

The owner of these three wagons (CQMY 003013, CQMY 003058 and CQMY 003099) have been notified of the exceedances and are in the process of determining the required rectification works.

Two of the 19 passby events with AoA alarm levels resulted in elevated noise levels at the permanent noise monitoring location [i.e. where the calculated $L_{Aeq(9hour)}$ noise levels at 30 m were above 60 dB(A)]. Exceedances of the AoA alarm levels were viewed as one-off instances, occurring irregularly.

Figure 1 Maximum AoA value for each train passby



4 Conclusion

This report has been prepared to address the requirements of Approval Condition G7A of SSD 6766, which requires the submission of a six-monthly report to the Secretary, which identifies the number of train passbys and wagons with wheels that exceed the ASA standard angle of attack and the action taken by operators to improve steering performance.

For rail movements between 1 November 2024 and 1 May 2025, 19 train passbys had maximum AoA values greater than the established alarm level of approximately 19 mrad. Wagon CQMY 003013 and CQMY 003058, each exceeded the AoA alarm threshold on four occasions. Wagon CQMY 003099 triggered the AoA alarm on two occasions. The owner of these wagons have been notified of these exceedances and are in the process of determining the required rectification works.

Two of 19 train passby events with AoA alarm levels caused elevated noise levels at the permanent noise monitoring location [i.e. where the calculated $L_{Aeq(9hour)}$ noise levels at 30 m were above 60 dB(A)]. Exceedances of the AoA alarm levels were viewed as one-off instances, occurring irregularly.

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.

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
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.
AoA	Angle of Attack - As the wheels on a bogie negotiate a tight curve, the leading wheelset typically presents an Angle-of-Attack (AoA) to the rail. The AoA of a leading wheelset with good steering performance can be calculated from AoA = wheelbase (m) / curve radius (m). AoA is normally measured in milliradian (mrad).
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
ASA	Asset Standards Authority
Assessment period	The time period in which an assessment is made. e.g. Day 7am-10pm & Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
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. 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 LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard

CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"		
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our environment:		
	threshold of hearing	0 dB	The faintest sound we can hear, defined as 20 micro Pascal
		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
	threshold of pain	130 dB	
		140 dB	Military jet take-off at 25m away
dB(A)	A-weighted decibel. 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 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. The dB(C) level is not widely used but has some applications.		
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.		
DIN	German Standard		
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999		
ENMM	Environmental Noise Management Manual, Roads and Maritime Services (Transport for NSW)		
EPA	Environment Protection Authority		
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.		
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.		
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.		
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.		

Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.
Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
IGANRIP	Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects, NSW DEC 2007
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.
INP	NSW Industrial Noise Policy, EPA 1999
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.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
$L_{10(1hr)}$	The L_{10} level measured over a 1 hour period.
$L_{10(18hr)}$	The arithmetic average of the $L_{10(1hr)}$ levels for the 18 hour period between 6am and 12 midnight on a normal working day.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L_{90} noise level expressed in units of dB(A).
L_{Aeq} or L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the L_{Aeq}.
$L_{Aeq(1hr)}$	The L_{Aeq} noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted Leq during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
$L_{Aeq(8hr)}$	The L_{Aeq} noise level for the period 10pm to 6am.
$L_{Aeq(9hr)}$	The L_{Aeq} noise level for the period 10pm to 7am.
$L_{Aeq(15hr)}$	The L_{Aeq} noise level for the period 7am to 10pm.
$L_{Aeq\ (24hr)}$	The L_{Aeq} noise level during a 24 hour period, usually from midnight to midnight.
L_{max}	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the L_{Amax}.
L_{min}	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the L_{Amin}.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.

Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
MPE	Moorebank Precinct East
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
NCG	Noise Criteria Guideline, Roads and Maritime Services (Transport for NSW)
NMG	Noise Mitigation Guideline, Roads and Maritime Services (Transport for NSW)
Noise	Unwanted sound
Pre-construction	Work in respect of the proposed project that includes design, survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing ancillary facilities such as site compounds, or other relevant activities determined to have minimal environmental impact (e.g. minor access roads).
Reflection	Sound wave reflected from a solid object obscuring its path.
RING	Rail Infrastructure Noise Guideline, NSW, May 2013
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
Sabine	A measure of the total acoustic absorption provided by a material. It is the product of the Absorption Coefficient (alpha) and the surface area of the material (m2). For example, a material with alpha = 0.65 and a surface area of 8.2m2 would have 0.65 x 8.2 = 5.33 Sabine. Sabine is usually calculated for each individual octave band (or third-octave).
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 Leq 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 by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
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 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 of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.

SSFL	Southern Sydney Freight Line
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source itself. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.
Wheelbase	The wheelbase is the distance between the centres of the front and rear wheels on a 2-axle bogie.

B.3 Warehouse E7 CoC B85 Noise Monitoring Report

Renzo Tonin & Associates Report TM306-05F02 E7 Warehouse B85 Operational Noise Monitoring (r1)

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MOOREBANK INTERMODAL PRECINCT EAST

Monitoring Report for Mechanical Plant (SSD 7628 B85) - Warehouse E7

24 January 2025

The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust c/- Tactical Group

TM306-05F02 E7 Warehouse B85 Operational Noise Monitoring (r1).docx

40 YEARS 1982 - 2022 ACOUSTIC ENGINEERING EXCELLENCE

Sydney Melbourne Brisbane Gold Coast Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

Document details

Detail	Reference
Doc reference:	TM306-05F02 E7 Warehouse B85 Operational Noise Monitoring (r1).docx
Prepared for:	The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust c/- Tactical Group
Attention:	[redacted]

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
24.01.2025	Initial issue (draft)	0	1	[redacted]		

File Path: R:\AssocSydProjects\TM301-TM350\TM306 ale Moorebank Intermodal Terminal (LOGOS)\Task5 Monitoring\1 Docs\04 MPE E7\TM306-05F02 E7 Warehouse B85 Operational Noise Monitoring (r1).docx

Contents

List of tables

List of figures

1 Introduction

1.1 Monitoring report purpose

Renzo Tonin & Associates was engaged by Logos Investment Management (Logos) on behalf of The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust to undertake noise monitoring of the warehouse mechanical plant and other noisy equipment to satisfy the State Significant Development (SSD) 7628 B85 consent condition (CoC) for Warehouse E7. Warehouse E7 is located within the Moorebank Precinct East (MPE), which forms part of the Moorebank Intermodal Precinct (MIP) at Moorebank, NSW. Warehouse E7 is currently tenanted by the third party logistics provider Mainfreight.

During the May 2024 SSD 7628 B85 noise monitoring, it was identified that one of the fans (Dangerous Good exhaust fan) was operating at noise levels louder than would be expected to manage cumulative noise emissions from the warehouse.

Accordingly, further acoustic mitigation measures were investigated and are currently being implemented to reduce the noise emissions from this fan. As such, the operational noise emissions were not operating as per typical and a valid representation of final noise levels could not be measured. This report has been prepared with the temporary operational noise emissions from the fan, and as such, the noise levels in this report do not reflect the final noise emission levels. However, the final noise levels are expected to be lower once the acoustic mitigation works are complete. Once the works are complete, noise measurements will be undertaken to confirm noise emission levels. This report will then be updated to reflect these final operational noise levels so that valid operational noise emissions could be quantified.

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stage 2 of the MPE development, State Significant Development (SSD) 7628. The approval includes 300,000m^2 GFA of warehousing. These warehouse operations, including the site that is operated by Mainfreight (Warehouse E7), fall under the area and activities approved as part of SSD 7628.

Specifically, this report has been prepared to address the noise emissions from the fixed mechanical plant and equipment of the warehouse that operate as part of typical warehouse operations in accordance CoC B85 of SSD 7628, and as detailed in the MPE Operational Noise and Vibration Management Plan[1] (MPE ONVMP).

SSD 7628 Consent Condition B85 requires noise monitoring of valid data for comparison against the mechanical plant and equipment noise levels predicted in the SSD 7628 Consent Condition B84 assessment prepared by Pulse White Noise Acoustics (PWNA) (*LOGOS MPE 6 & 7 – Acoustic Design*

[1] Arcadis & Renzo Tonin & Associates, Operational Noise and Vibration Management Plan for Moorebank Logistics Park – East Precinct, Revision 013, dated 24/01/2023, reference PREC-QPMS-EN-PLN-0008, available https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/09/ONVMP_V13_clean_compiled_Redacted-compressed.pdf, accessed 21/07/2024

Report, Report number: *220518 - LOGOS MPE 6&7 - Acoustic Design Report – R5*, 28 March 2023) (B84 assessment).

This report is technical in nature and uses acoustic terminology throughout. APPENDIX A contains a glossary of acoustic terms used in this report.

1.2 Warehouse operations description – Warehouse E7 (Tenant: Mainfreight)

1.2.1 Location

The MIP 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 MIP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, as shown in Figure 1.

1.2.2 Operational activities and facilities and hours of operation

Warehouse E7 is tenanted by Mainfreight, a third party logistics provider. The key components of Warehouse E7 and the various day to day activities that occur are as follows:

- Warehouse separated into two sections (7A and 7B) with an internal dividing wall:
  - Temperature controlled warehouse storage facility (Warehouse 7A – eastern side)
  - Ambient temperature warehouse (Warehouse 7B – western side)
- Storage of goods
- Warehouse (7A/7B) northern side:
  - Despatching and receiving truck movements in and out of the facility. Typically via sideloading with forklifts on the hardstand at the on-grade docks. For recessed loading docks, this is typically for container trucks, where containers are unloaded typically is via forklift via the rear from within the warehouse space.
  - Forklift (electric and gas) operations on hardstand
- Warehouse (7A/7B) southern side:
  - Receipt and despatch of containers from the MPE IMEX terminal
  - Internal packing and unpacking of containers
- General office administrative and support functions, two offices, one for Warehouse 7A and one for Warehouse 7B.

Mainfreight's warehouse and distribution observed activities typically occur 4:00am to 5:00pm Monday to Friday, with the mechanical plant and equipment operating 24 hours per day, 7 days per week. The truck despatch and receiving activities occur on the northern and southern side of the warehouse including both at-grade and in recessed loading docks. Additionally, on the southern side of the warehouse containers from the IMEX terminal are transported to and from via reach stacker or combilift and stored for unloading from within the warehouse along the southern side of the warehouse.

1.2.3 Mechanical plant and other noisy equipment

The following fixed mechanical plant and equipment operate as part of typical warehouse operations, which are further detailed in Section 5.1.

- **Warehouse 7A (warehouse east)**
  - Package units for maintaining a consistent temperature within Warehouse 7A.
  - Dangerous good (DG) area fan
  - Smoke exhaust fans (do not form part of typical operations, and were observed not to operate during normal operations)
  - Office area air-conditioning plant and equipment
  - Office area fans
  - Office area refrigeration compressors
  - Mechanical plant for dock office, including air-conditioning plant and intake/discharge openings.
- **Warehouse 7B (warehouse west)**
  - Office area air-conditioning plant and equipment
  - Office area fans
  - Mechanical plant for dock office, including air-conditioning plant and intake/discharge openings.

2 Nearby sensitive receivers

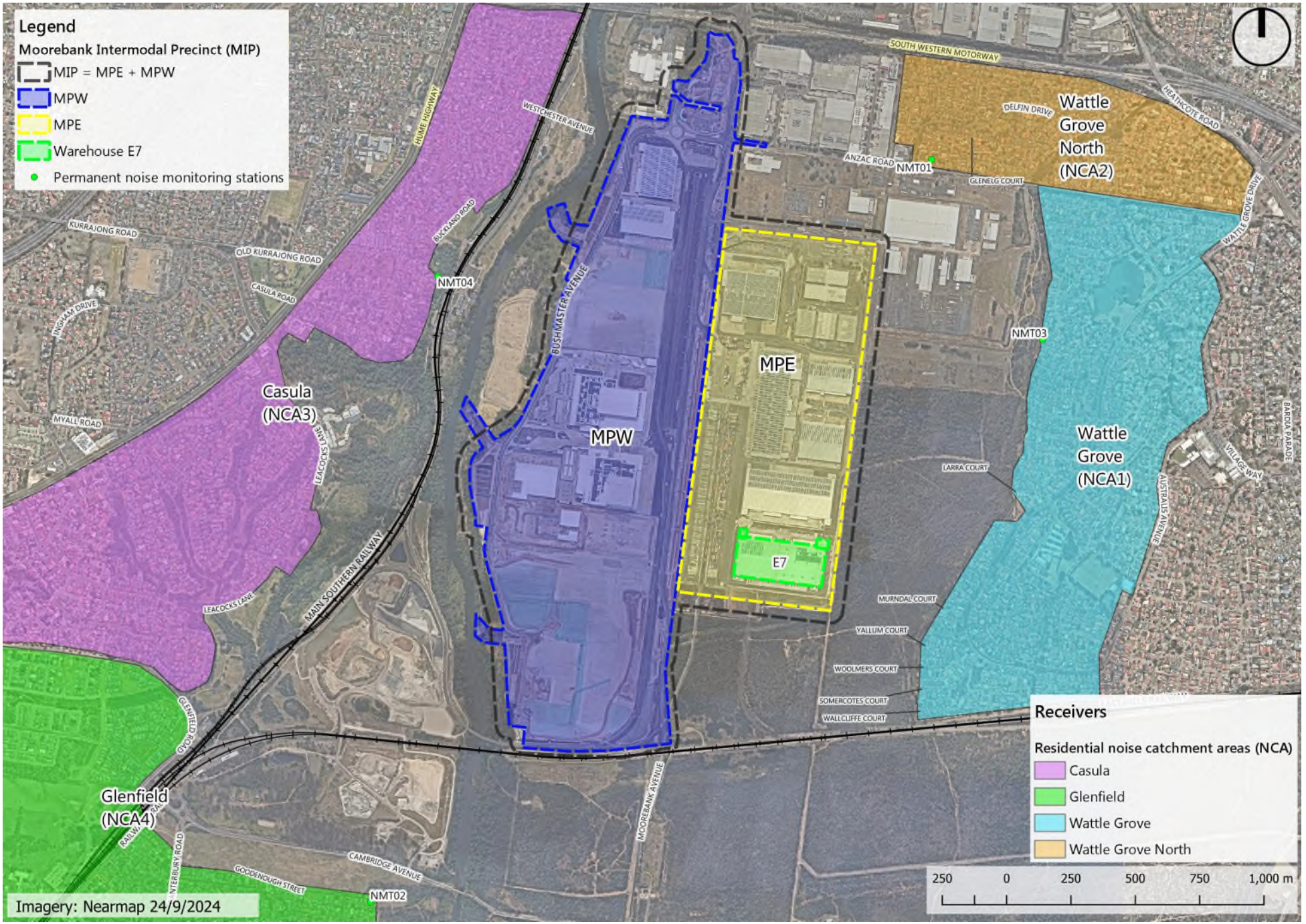
The potentially affected residential receivers nearby to Warehouse E7 around MPE are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. The closest and potentially most affected residential receivers are located within Wattle Grove.

A summary of the approximate distance to the nearest residential receivers in the surrounding area are provided in Table 1, as identified in SSD 7628 CoC B80. The locations of the residential noise catchment areas (NCAs) are shown in Figure 1.

Table 1 Noise sensitive receivers and approximate distance from MPE Warehouse E7

Noise Catchment Area (NCA)	Receiver type	Approximate distance from Warehouse E7, metres
Wattle Grove (NCA1)	Residential	440
Wattle Grove North (NCA2)		1,490
Casula (NCA3)		1,440
Glenfield (NCA4)		1,860

Figure 1 Warehouse E7 location, MIP, MPE and MPW precincts



3 Summary of noise objectives

This report has been prepared to address the noise emissions from the fixed mechanical plant and equipment of the warehouse that operate as part of typical warehouse operations in accordance CoC B85 of SSD 7628, and as detailed in the MPE ONVMP.

CoC B85 requires that the monitored noise levels be compared against the predicted levels reviewed in accordance with CoC B84. The CoC B84 noise assessment, is required to demonstrate that the plant and equipment has been selected to meet the overall noise limits specified in SSD 7628 CoC B80 (Table 5). As such, the following section outlines the requirements for both CoC B85 and the overall CoC B80 (Table 5) noise limits.

3.1 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 below. 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 $L_{Aeq(15\ minute)}$ criteria are applicable during the day, evening and night-time periods and the $L_{A1\ (1\ minute)}$ sleep disturbance noise limits 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 [1] $L_{Aeq,\ 15\ minute}$	Evening [1] $L_{Aeq,\ 15\ minute}$	Night [1] $L_{Aeq,\ 15\ minute}$	Night [1] $L_{A1\ (1\ min)}$
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 $L_{Aeq,15\ minute}$ 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.

3.2 Discussion of assessment noise limits

As noted in Section 3.1, 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 these 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 SSD 7709 Moorebank Precinct West (MPW) – Stage 2 Modification 1 (SSD 7709 MOD 1) submitted July 2020, a review of the applicable operational noise requirements across Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) was undertaken (Renzo Tonin and Associates document reference *TJ741-11F05 (r4),* dated 30 June 2020). The review identified that there are a 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 for the cumulative operational noise levels from all MPE and MPW operations.

As such, the review recommended that an overall approach for cumulative operational noise management of the MIP (for East and West precincts) 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.

Additionally, 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.

SSD 7709 MOD 1 was approved 24 December 2021, along with the revised cumulative noise goals for the overall MIP (MPW & MPE). However, these have not then been adjusted as part of the relevant MPE approvals (SSD 6766 and SSD 7628). Noting the above regulator comments, it is appropriate to assume that the overall MIP (MPW & MPE) operational noise emissions should be managed consistent with the SSD 7709 MOD 1 update, and this will likely be incorporated into a future modification of in SSD 7628.

However, independent of this, as the updates have not yet occurred, this assessment has been done against the existing SSD 7628 noise limit requirements, without further considerations of cumulative MIP noise emissions. These comments have been included for important context relating to cumulative noise considerations.

3.3 CoC B85 assessment noise requirements

3.3.1 Requirements

The management of operational noise emissions from warehouse mechanical plant and equipment 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.

An assessment of mechanical plant and equipment noise levels was prepared by Pulse White Noise Acoustics (PWNA) (*LOGOS MPE 6 & 7 – Acoustic Design Report*, Report number: *220518 - LOGOS MPE 6&7 - Acoustic Design Report – R5*, 28 March 2023) (B84 assessment). However, this report did not provide specific warehouse predicted noise levels for all nearby noise sensitive receivers for verification under CoC B85. Instead, the report identified that noise emissions have been designed to achieve the overall noise levels presented in Table 5 of CoC B80 of 35 dB(A) $L_{Aeq\ 15minute}$, during all time periods.

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 levels respectively for the overall MPE operations at the Environmental Assessment stage. Although these are for the overall MPE operations and not for an individual

warehouse, they can be used as reference for consistency verification CoC B85 as per the monitoring requirements detailed in Table 4-1 in Section 4.1.1 of the MPE ONVMP.

Additionally, it is understood that Warehouse E7 has incorporated noise mitigation measures, to achieve noise levels being adopted by Logos that are lower than those required by CoC B80 to assist with their overall management of cumulative noise emissions.

It should also be noted that the monitoring is to be undertaken *"… for a minimum period of one week where valid data is collected*". As such, it is important that operations are representative of typical operations for the monitored data to be valid. This is of note for this assessment, as the monitored noise levels were determined to not be representative of the future operational noise emissions, as further noise mitigation measures are being implemented, and so the results presented in this report represent interim noise emissions.

3.3.2 Noise monitoring timing

It is understood that the Warehouse E7 was occupied November 2023, with warehouse operations commencing and starting to ramp up during late 2023/early 2024.

However, during this initial operations period construction works were still being undertaken and were underway until April 2024. During this time period the tenant warehouse operations were still ramping up to typical levels. As such, monitoring of valid noise data could not be conducted. As such, the earliest period when valid noise monitoring data could be collected was from May 2024. Noise monitoring was then undertaken mid-May 2024, due to a two week delay to allow for appropriate weather conditions during the monitoring period.

It is noted that the Mainfreight facility had ramped up operations to around 70% capacity at the time of the noise monitoring. The assessment herein has been performed to assess the potential noise impact of current operations as the key operational noise sources were running at suitable capacity (eg. temperature controlled mechanical plant/equipment).

During the May 2024 noise monitoring period, it was identified that one of the fans (Dangerous Good exhaust fan) was operating at noise levels louder than would be expected for managing cumulative noise emissions from the warehouse. Accordingly, further acoustic mitigation measures were investigated and are currently being implemented to reduce the noise emissions from this fan.

This report presents the mechanical plant and equipment noise emissions during this interim time period while further mitigation measures are being implemented. Following the completion of these works, final noise monitoring will be undertaken to confirm the final valid mechanical plant and equipment noise emissions.

4 Measurement methodology and results

4.1 Noise monitoring approach

The NSW Environment Protection Authority's (EPA) *Noise Policy for Industry* (NPfI) provides guidance in Chapter 7 for monitoring the performance of a noise-generating industrial facility. NPfI Section 7.1.1 provides guidance as to how to review noise emissions, which includes direct measurement at a receiver location, direct measurement at alternative or intermediate location/s, unattended monitoring and modelling, in order or preferred to least preferred. It notes that this range of compliance assessment techniques may be used individually, or in combination, to provide a means of determining compliance with a noise limit. At times, the best available compliance assessment methodology will only allow for a balance-of-probabilities type determination of compliance, and repeat assessment may be needed. It also makes clear that "*A noise limit applies to the noise from a particular development/activity and not to general ambient noise. Therefore it is often necessary to use techniques to attempt to separate the noise from a facility versus noise from other sources*."

For the CoC B85 Warehouse E7 assessment, the following points were considered:

- A site inspection undertaken on 21 March 2024, identified that at the residences in the closest residences in Wattle Grove operational noise emissions were not audible or distinguishable in the direction of the Warehouse E7.
- The Warehouse E7 mechanical plant were expected to be more than 10 dB below the existing noise levels, measured at the surrounding NCAs by RTA during previous MIP noise monitoring, and based upon a review of the Wattle Grove permanent noise monitoring station data prior to the commencement of Warehouse E7 operations for the quietest night period (3:00am to 5:00am). This previous attended noise monitoring found the existing ambient noise levels to typically be greater than 40 dB(A) $L_{Aeq15min}$, and controlled by noise sources outside of MIP, such as road traffic noise (ie. M5 and Hume Highway road traffic noise).
- Access to intermediate locations between Wattle Grove residences and Warehouse E7 was possible.
- A number of co-located warehouse and industrial operations, including the IMEX terminal, operate co-currently within the MIP, in particular across MPE.
- Noise source locations are both roof mounted and ground level mounted.

Noting the above points, and that the existing ambient noise levels are already high at receivers compared with the expected noise emission levels at receivers, quantification of the noise under investigation via direct noise measurement of operational noise emissions from the warehouse mechanical plant and equipment operations is not possible at the residential receiver locations or easily accomplished at intermediate locations because of poor signal-to-noise. The NPfI also 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, similar to the Warehouse E7 within the MIP situation.

As such, the CoC B85 noise monitoring has used a combination of on-site and intermediate location attended noise measurements, unattended monitoring, and noise modelling to quantify the noise emission performance of the warehouse mechanical plant and equipment.

4.2 Compliance measurement methodology

The noise monitoring undertaken to satisfy the requirements of CoC B85 has included the following noise monitoring and assessment steps.

4.2.1 Noise monitoring

The following noise monitoring was undertaken:

1. **Unattended noise monitoring** nearby to the key mechanical plant items for a period of 10 days, to confirm the noise levels of the mechanical plant when operations occurred.

2. **On-site attended measurement** of all mechanical plant and other noisy equipment items to quantify noise emission levels of mechanical plant and equipment that operate as part of the Warehouse E7 operations (Section 5.2.3).

3. **Receiver and intermediate attended measurements** to confirm that the mechanical plant and other noisy equipment items were not quantifiable at the nearest critical receiver locations (Wattle Grove), and/or assist with contribution estimations of noise emissions levels, and provide noise monitor data to aid with confirming the performance of the noise model used to determine noise emission estimations at receivers. For the estimate warehouse mechanical noise contribution at the intermediate and receiver locations, where noise in the direction Warehouse E7 is not audible, it is assumed that the warehouse mechanical noise contribution is at least 10dB(A) below the corresponding measured L_{A90} or L_{Amin} 15minute noise level as appropriate.

4.2.2 Data analysis and assessment

Following the noise monitoring, the following steps were undertaken to assess the noise level contributions at the nearby sensitive receivers:

1. **Noise source analysis** - Review the mechanical plant and equipment attended measurement data, analyse results and quantify noise source levels from all the fixed mechanical plant and equipment for Warehouse E7.

2. **Noise model setup and performance review** - Setup and calibrate the noise model for individual mechanical plant items, including the temperature control roof mounted package units, main office mechanical plant and equipment as well as the dock office mechanical equipment for the assessment of reasonable worst-case noise operations.

3. **Noise emission quantification** - Calculate the fixed mechanical plant and equipment noise levels from the Warehouse E7 operations to all nearby surrounding receivers and determine the noise level contribution at the property with the highest noise levels within each NCA.

4.3 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 measurements, the calibration of the sound level meters was 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	Monitoring period used (2024)	Equipment (RTA ref.)	Serial number	Last date calibrated
On-site attended noise measurements	17/5/2024	NTi XL2 (RTA07-008)	A2A-08520-E0	18/08/2023
On-site attended noise measurements	17/5/2024	NTi XL2 (RTA07-009)	A2A-09356-E0	24/07/2023
On-site attended noise measurements	24/5/2024	NTi XL2 (XL2-A)	A2A-20889-E0	26/10/2023
On-site attended noise measurements	24/5/2024	NTi XL2 (RTA06-010)	A2A-05811-E0	28/02/2023
Unattended on-site noise measurements (E7 Roof)	14/5/2024 - 24/5/2024	NTi XL2 (RTA07-021)	A2A-13529-E0	31/01/2024
Unattended on-site noise measurements (South-east corner)[1]	14/5/2024 - 24/5/2024[1]	NTi XL2 (RTA07-018)	A2A-12693-E0	17/07/2023
Field calibration	14/5/2024	B&K 4231	2545601	15/01/2024
Field calibration	14/5/2024	B&K 4231	3009707	16/01/2024
Field calibration	17/5/2024	B&K 4231	2545601	15/01/2024
Field calibration	24/5/2024	B&K 4231	2677710	15/01/2024

Notes: 1. Only used in Section 6.2, and so only short period data has been used.

4.4 Meteorological conditions

Meteorological conditions during the period of noise measurement surveys have been reviewed to determine the prevailing wind and temperature inversion conditions were appropriate. For a period of the monitoring, data from the MIP meteorological data monitoring station adjacent to Bushmaster Avenue, established in accordance with SSD 7709 (MPW Stage 2) CoC A54, has been sourced and reviewed.

During the attended noise measurement periods at Warehouse E7 and the nearby receivers, the weather conditions were as detailed in Table 4.

Table 4 Attended noise measurement surveys weather observations

Date / Time period	Air temperature, °C	Relative humidity, %	Average wind speed (at 10 m above ground level), m/s	Wind direction, degrees and Cardinal	Cloud cover	Rain
17/5/2024 3:30AM – 6:00AM Receivers/ Intermediate monitoring	12 to 13	96	Up to 1 m/s	Ranged from SW to WNW	Clear skies throughout	None
17/5/2024 6:00AM – 3:00PM Onsite monitoring	12 to 41	45 to 96	Up to 2 m/s	Generally ranged from WSW to N	Clear skies throughout	None

The noise limits in SSD 7628 are applicable for wind speeds up to 3 m/s (10.8 km/h) at 10 metres above ground level. This meteorological station data was used to exclude weather affected data (wind (greater than 5m/s) or rain) in the unattended noise monitoring presented in APPENDIX B in accordance with the NPfI.

5 Monitoring and analysis

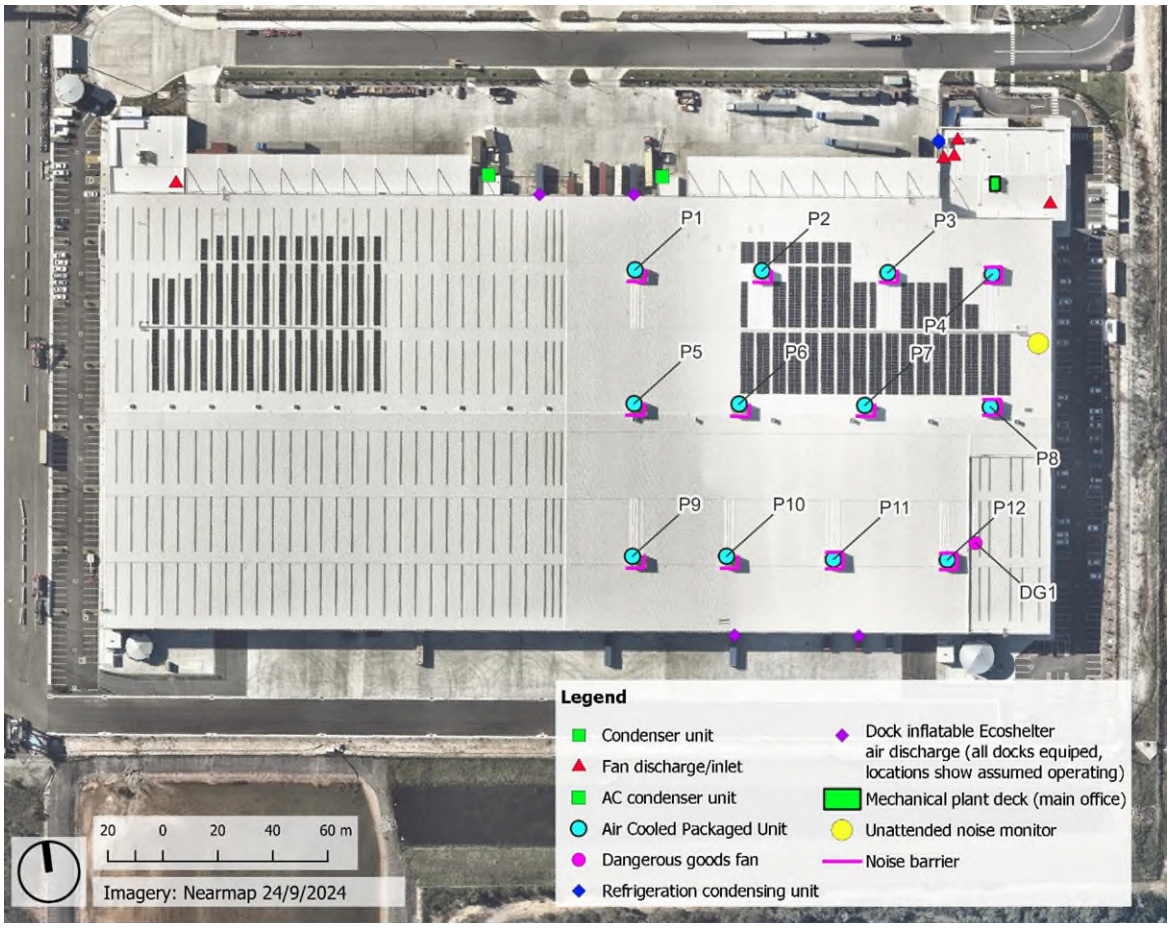
5.1 Key mechanical plant and equipment noise sources

Based on as-built construction information, site inspections, site personal observations, attended and unattended noise measurements, the main sources for the mechanical plant and equipment are as follows:

- Roof mounted air cooled package units
- Dangerous good ventilation fan
- Mechanical plant deck for main office
- Mechanical plant for dock office, including internal mechanical plant and equipment intake/discharge openings
- Discharge opening for the dock inflatable shelter

The relevant locations of the key noise generating mechanical plant noise items are presented in Figure 2.

Figure 2 Key mechanical plant noise source locations and unattended noise monitor location



5.2 Noise monitoring

5.2.1 Receiver noise monitoring

Noise monitoring was undertaken at the receiver locations shown in Figure 3 to aid with confirming the likely noise contribution levels at the nearest residential receivers from the warehouse in each of the surrounding NCAs. The location of these measurements is presented in Figure 3. A summary of the measured noise levels are provided in Table 5, with further details for each of the measurements provided in APPENDIX B.

Table 5 also presents total statistical noise levels measured during the attended noise survey and estimated noise contributions from Warehouse E7 based on short-term audible noise measured at the attended measurement locations that could be attributed as coming from Warehouse E7 operations.

Figure 3 Key receiver noise monitoring locations

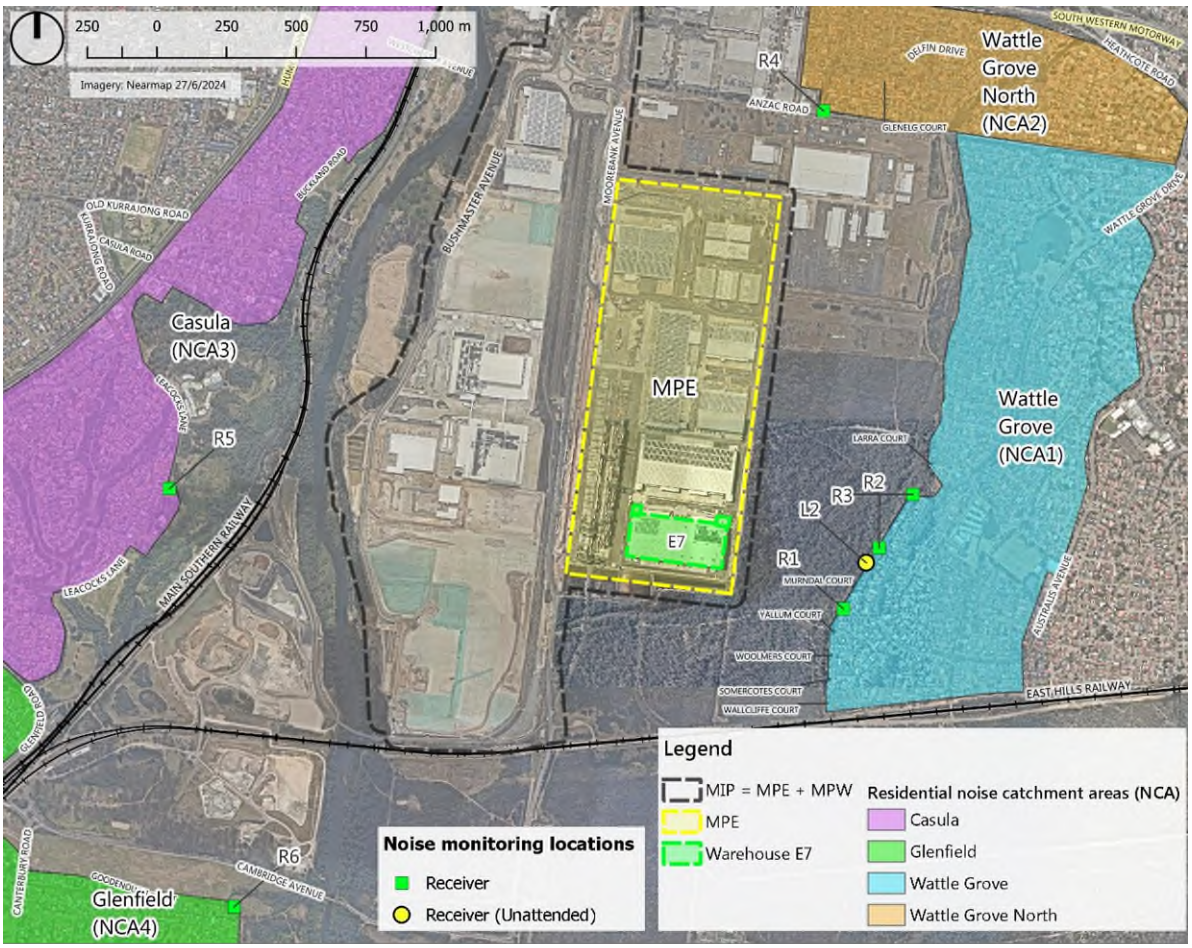


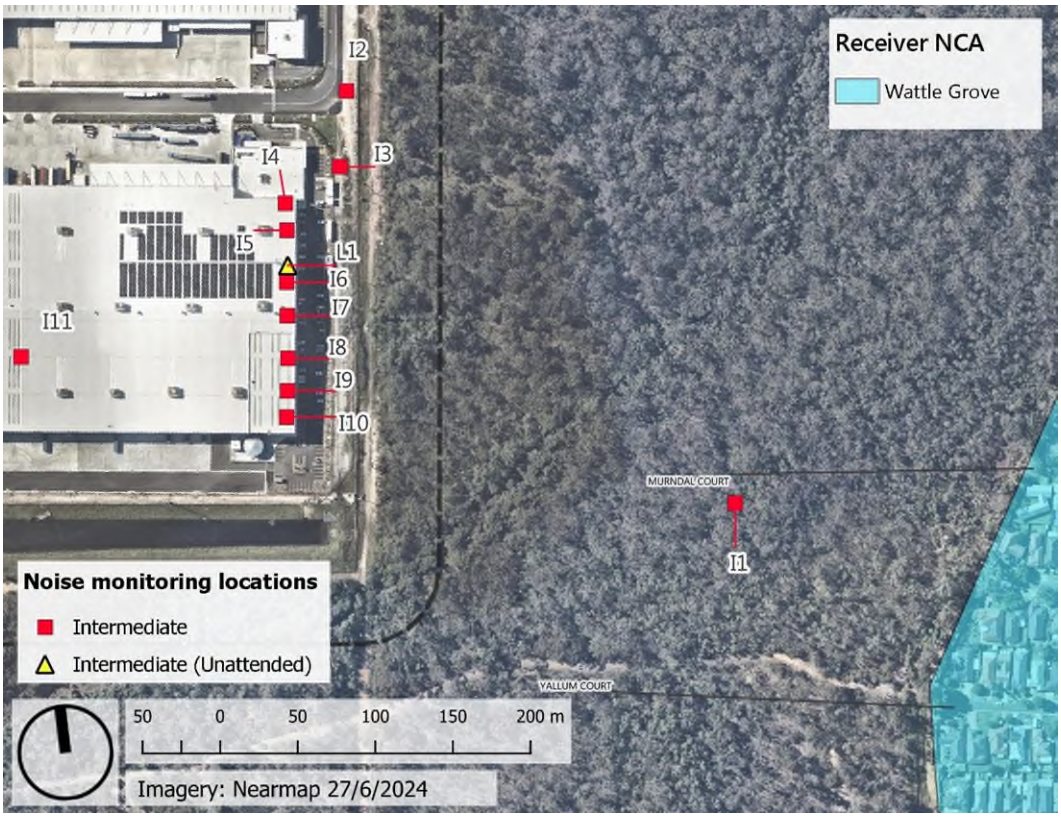
Table 5 Receiver attended noise measurement results (17 May 2024)

ID	Location	Time	Measured noise levels (15-minute), dB(A)				Estimated warehouse contribution, $L_{Aeq,\ 15minute}$, dB(A)
			L_{AFmax}	L_{Aeq}	L_{A90}	L_{AFmin}	
R1	16 Corryton Court, Wattle Grove	4:08am	62	46	44	42	< 32
R2	52 Corryton Court, Wattle Grove	5:07am	59	45	43	42	< 32
R3	82 Corryton Court, Wattle Grove	5:33am	59	47	45	44	< 34
R4	30 Goodenough Street, Glenfield	4:08am	56	50	46	44	< 34
R5	73A Leacocks Lane, Casula	4:41am	76	54	44	42	< 32
R6	39 Glenelg Court, Wattle Grove	5:09am	86	66	46	44	< 34

5.2.2 Intermediate noise monitoring

As it was not possible to confidently quantify warehouse noise emissions at the receiver locations through the receiver monitoring, intermediate measurements were undertaken between the receivers and the warehouse, in addition to boundary locations around the warehouse. Noise monitoring was undertaken at the intermediate locations shown in Figure 4. Accessible locations between the source and the receiver location were selected, where the signal-to-noise from the warehouse noise sources would be higher than at the residential receiver locations. Additionally, intermediate locations on or near the site boundary (including the warehouse roof) were selected to take into account substantial shielding from the warehouse structure. These locations were selected to assist with determining the likely contribution from the warehouse at these intermediate locations to aid with reviewing the performance of the compliance noise modelling.

Figure 4 Key intermediate noise monitoring locations



A summary of the measured noise levels at the intermediate monitoring locations are provided Table 6 with further measurement details for location I1 provided in APPENDIX B.

Table 6 Intermediate noise measurement results (17 May 2024)

ID	Location / Comment	Time	Measured noise levels, dB(A)				Estimated warehouse contribution, $L_{Aeq, 15min}$, dB(A)	Key noise sources contributing to steady state noise levels
			L_{AFmax}	L_{Aeq}	L_{A90}	L_{AFmin}		
I1	Defence area intermediate location (east of Project)	4:37am	63	52	45	42	< 32	Distant road traffic [~42-46 dB(A)] and natural sources (frogs). Full details in APPENDIX B.
I2	MPE fence line east	3:39am	52	46	45	43	38 - 40	Office mechanical just audible, frogs and distant traffic
I3	Ground (east) adjacent to office carpark	3:34am	50	47	46	45	43	Office mechanical audible, crickets and distant traffic
I4	E7 roof (east)	10:22 am	58	52	51	50	51	Office mechanical, package unit and distant traffic
I5	E7 roof (east)	10:13 am	67	49	48	47	48	Package unit
I6	E7 roof (east)	10:13 am	55	49	48	47	49	DG fan and package unit controlled
I7	E7 roof (east)	10:09 am	56	54	52	52	54	DG fan controlled
I8	E7 Roof (east)	10:09 am	62	59	57	56	59	
I9	E7 roof (east)	10:05 am	63	61	59	58	61	
I10	E7 roof (east)	10:05 am	62	59	57	56	60	
I11	E7 roof (west)	11:23 am	54	49	48	47	44	Package unit, distant traffic, and construction activities
L1	During I1 attended measurement	4:37am	56	51	49	48	48	Location controlled by nearby package units. Background and ambient levels would also have some contribution from traffic on nearby arterials and Moorebank Avenue, in addition to construction activities during the daytime period.
	During I2 attended measurement	3:39am	61	52	50	50	50	
	During package unit monitoring period	9:45 am to 11:45 am	75	50	47	46	47	
	Day	14/5/24 to 23/5/24	-	51	47	-	47	
	Evening		-	51	48	-	48	
	Night		-	50	48	-	48	

5.2.3 Onsite noise measurements

Attended noise measurements of individual mechanical plant and equipment items and typical operations were undertaken at Warehouse E7 on 17 May 2024, in order to quantify the noise emissions from the installed mechanical plant and equipment in operation for input into the calibration modelling (Section 6). These noise levels have been used to develop the CoC B85 operational noise compliance noise model.

During all measurements of mechanical plant and equipment, the specific noise source being measured was the dominant noise source. All plant and equipment items were switched on and forced into a typical operational state for the purposes of undertaking the attended noise measurements. Observations were made of the on-site specific mechanical plant item during operations to ensure they were in typical operation.

Results from the on-site attended measurements of the critical mechanical plant and equipment are summarised in Table 7. The locations the key noise generating mechanical plant noise items are presented in Figure 2.

Table 7 On-site attended mechanical plant noise measurement results (17 May 2024)

ID	Activity noise sources	Time	Measurement duration (t), min	Measurement distance (m)	Measured noise levels, dB(A)		
					L_{AFmax}	L_{Aeq}	L_{A90}
	Roof mounted temperature control package units (locations see Figure 2)						
S1	Typical operation at 10m (north side) (P3)	10:47 AM	1:01	10	59	54	50
S2	Typical operation at 15m (north side) (P3)	10:50 AM	1:00	15	58	54	51
S3	Typical operation at 10m (west side) (P5)	11:30 AM	1:00	10	56	54	53
S4	Typical operation at 10m (north side) (P5)	11:36 AM	1:02	10	61	57	57
S5	Typical operation at 10m (west side) (P6)	11:44 AM	1:02	10	56	50	49
S6	Typical operation at 10m (north side) (P6)	11:40 AM	1:00	10	59	51	51
S7	Typical operation at 10m (P7)	11:49 AM	1:00	10	61	56	55
S8	Typical operation at 10m (P9)	11:49 AM	1:20	10	59	56	55
S9	Typical operation at 10m (P10)	11:55 AM	1:01	10	53	51	51
S10	Typical operation at 10m (P11)	11:55 AM	1:00	10	53	50	50
S11	Background noise level (roof west)[1]	11:36 AM	10:04	-	63	48	45
	Dangerous goods fan						
S12	DG fan	9:51 AM	1:00	19	65	63	62
S13	DG fan	9:59 AM	1:00	18	67	64	63
S14	DG fan	9:55 AM	1:01	21	63	60	60
S15	DG fan	9:58 AM	1:02	19	67	63	62
	Office 7A roof						
S17	Office (7A) exhaust fan (east)	1:33 PM	2:03	5	74	66	66
S18	Office (7A) exhaust fan (west)	2:00 PM	1:00	2	-	-	68
	Hardstand and dock offices						
S19	Refrigeration compressor unit (Office 7A)	1:41 PM	30 sec	4	61	54	53
S20	Dock inflatable EcoShelter air discharge	1:54 PM	30 sec	40	64	54	53

Notes: 1. Background (L_{A90}) controlled by distant traffic noise (ie. Moorebank Ave, M5 and Hume Highway) with some construction contribution. The ambient noise levels (LAeq) were contributed to by construction activities and IMEX terminal operations.

5.2.4 Unattended noise measurements

During the attended noise survey in Section 5.1, it was observed that the roof mounted package unit and the dangerous good fan could operate continuously as part of typical operations, and were considered to be the main noise sources for the Warehouse E7 mechanical plant noise emissions.

To confirm that the attended noise levels measured as part of the attended noise surveys presented in Sections 5.2.1, 5.2.2 and 5.2.3 represented the levels as part of normal operations and did not substantially change over time, a minimum one week period of unattended noise monitoring was undertaken as required by CoC B85.

The unattended noise monitoring was undertaken over the period between 14 May to 24 May 2024. The unattended noise monitor was located so that noise contributions from mechanical plant would dominate the monitored noise levels. The unattended monitoring location is shown in Figure 4.

The monitoring data confirmed minimal variation, and the attended monitoring periods were appropriate to estimate noise levels for day, evening and night periods.

Detailed results from the unattended noise monitoring are provided in APPENDIX C.

5.3 Mechanical plant and equipment noise source levels

Based upon the attended and unattended noise monitoring presented in the above sections, the following noise source levels for the key typical operating mechanical plant and equipment have been established based upon periods of typical operation. These have been based upon either direct measurement, or supplier data that has been confirmed through monitoring of cumulative noise levels (ie. condenser units on mechanical deck).

Based upon noise monitoring presented in Section 5.2, the sound power level inputs presented in Table 8 were used in the CoC B85 operational noise compliance modelling detailed in Section 6 for the key noise source locations shown in Figure 2.

Table 8 CoC B85 operational noise compliance noise source levels

Site items / operation	Individual item sound power level (SWL) ($L_{Aeq,t}$), dB(A)	Comment
Warehouse roof		
Roof mounted temperature control package units (P1 to P12)	76 - 84	Based upon the range of attended measurements (Installed unit: Temperzone OPA 1307RKTM01-ENG) Qty - 12 units. Units were observed to operate at different sound powers during the same period.
Dangerous goods fan	95	Based upon the range of attended measurements (Installed unit: CFM Airsystems MAV100006DEX)

Site items / operation	Individual item sound power level (SWL) ($L_{Aeq,t}$), dB(A)	Comment
Office 7A roof[1]		
Office condenser units (4 units) - Vertical discharge units	74	Office roof access not available. Based upon manufacture type (Daikan) and unit observations.
Office condenser unit (1 unit) - Horizontal discharge unit	73	Office roof access not available. Based upon manufacture type (Daikan) and unit observations. Assumed same as dock office condenser unit.
Office (7A) exhaust fan (east)	88	Key office roof eastern noise source. Office roof access not possible. Based upon the attended measurements from side of building on raised pole, and assuming the identified key fan is the dominant noise source.
Office (7A) exhaust fan (west)	82	Key office roof western noise source. Office roof access not possible. Based upon the attended measurements from side of building on raised pole, and assuming the identified key fan is the dominant noise source.
Office 7B roof[1]		
Office (7B) exhaust fan (west)	82	Office roof access not available. Not clearly audible from ground level. Assumed same as office (7A) exhaust fan (west).
Hardstand and dock offices		
Refrigeration condensing unit (adjacent to Office 7A)	74	Installed unit: Patton PCCS225. Qty - Two units. Intermittent operations of one or two units.
Dock office east - Air conditioning condenser unit (CU-7.1.DO) - Horizontal discharge single fan unit (Daikan)	73	Installed unit: Daikan RZQ180MY1. Dock office air conditioning units were not operational, and measurement access not possible. The measured sound power level based upon the installed unit manufacturer sound power levels. Supplier level = Lw 62dB(A)
Dock office west - Air conditioning condenser unit (CU-7.2.DO) - Horizontal discharge single fan unit (Daikan)	73	Installed unit: Daikan RZQ180MY1. Dock office air conditioning units were not operational, and measurement access not possible. The measured sound power level based upon the installed unit manufacturer sound power levels.
Dock inflatable EcoShelter air discharge	91	On average, two docks had the inflatable Ecoshelter running during any one 15-minute period, for both the north (recessed) and southern docks. This has been included in the calibration modelling

Notes:
1. As the office roof areas (7A and 7B) were not accessible. Measurements were made of where mechanical sources were audible, and these fans were quantified and modelled. Other office roof sources were not dominant, based upon observations from warehouse roof levels for cumulative measured noise levels when in operation, and so it was appropriate to model just the key dominant sources.
2. Based upon highest measured levels from multiple attended measurements and unattended noise monitoring.

6 CoC B85 operational noise modelling and assessment

As detailed in Section 4, it was not possible to directly measure or estimate the warehouse mechanical plant and equipment noise levels at nearby receivers without implementing a range of different noise measurement and noise modelling techniques. As such, this assessment has used a combination of on-site attended noise measurements and unattended monitoring presented in Section 5, and noise modelling described below. These techniques were used in combination to assess the noise emissions of the Warehouse E7 mechanical plant and equipment.

6.1 General modelling assumptions and methods

Modelling and assessment of warehouse noise emissions was determined by modelling the noise sources, receiver locations, existing built structures and topographical features, using CadnaA (version 2024. The noise predictions are based on the CONCAWE noise prediction algorithms, noting that the nearby critical noise sensitive receivers are greater 100 metres from the site. The CONCAWE environmental noise prediction method is an appropriate method for predicting the noise propagation in these circumstances. The performance of the noise model used is reviewed in Section 6.2.

The noise prediction model considers:

- Location of all noise sources.
- Height of sources and receivers referenced to digital ground contours both onsite and outside the warehouse and MIP areas.
- Noise source levels of individual mechanical plant and equipment. All fixed mechanical plant and equipment noise sources associated with Warehouse E7 (Mainfreight) operations have been included.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- 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 mechanical plant and equipment and their duration and frequency of operation as part of the 'reasonable' worst-case operational scenarios are described in Section 6.3.

6.2 Noise model performance

To confirm the suitability of the noise model for assessing the CoC B85 noise emissions, the noise model has been reviewed against onsite and receiver/intermediate concurrent noise measurements. The review of the noise model performance uses a combination of noise monitoring at the warehouse, and

warehouse boundary where noise source locations and levels could be measured, combined with concurrent intermediate noise measurements towards the key residential receivers in Wattle Grove. This was part of the measurements presented in Section 5.2.2.

The performance of the model has two parts. The first being at the boundary of the site, to confirm the onsite sound power levels are appropriate. The second confirming the propagation assumptions between the site and the receivers. As the mechanical plant and equipment were not audible at the receiver, other onsite noise events (ie. container handling activities) have been used to confirm the noise model performance. Where noise events were audible and quantifiable at both monitoring locations, these have been used for the review.

Shown in Figure 5 are the monitoring locations along with the location of the onsite activity noise event locations. The validation scenario that was modelled along with the predicted outcomes are presented in Table 9. Based on this validation, the noise model is considered suitable for modelling and assessing noise emissions.

Figure 5 Noise model performance review noise monitoring locations

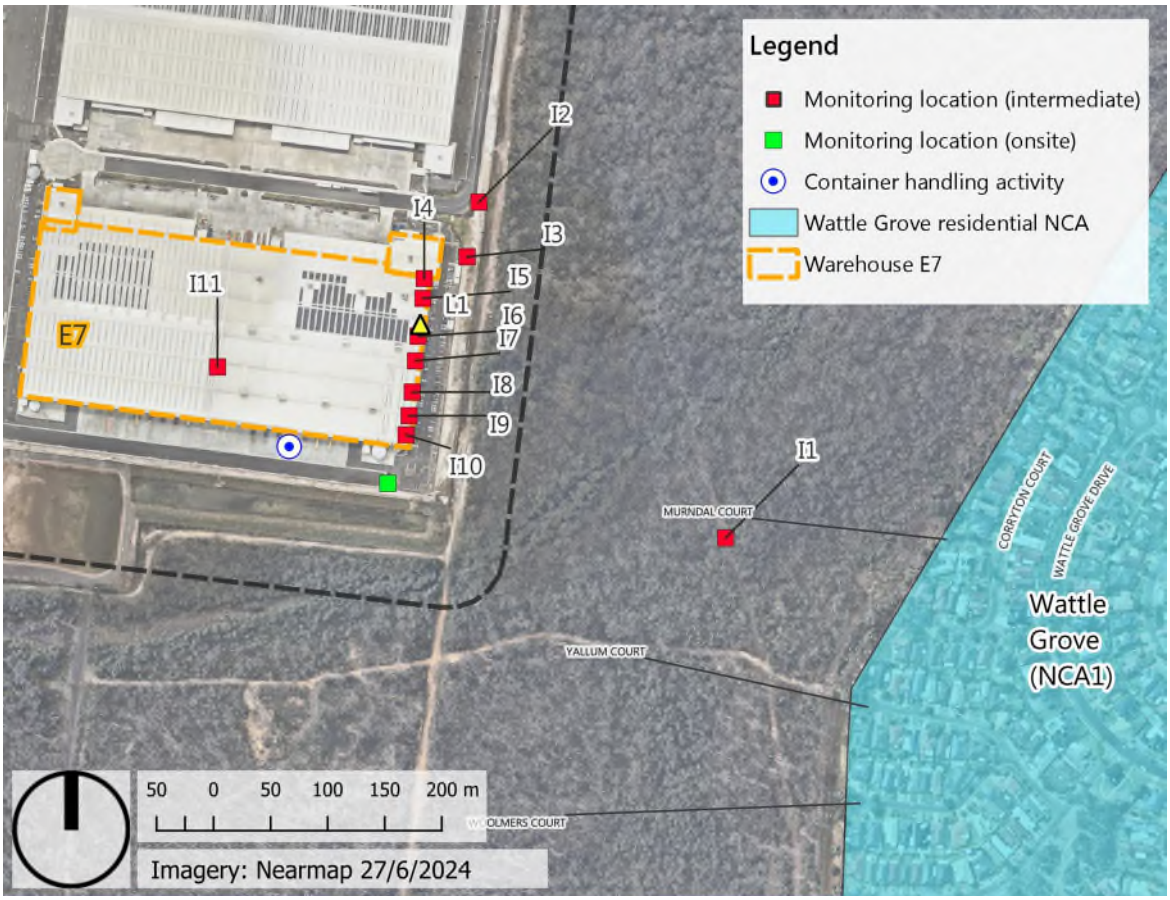


Table 9 Comparison between measured and modelled noise levels – Between site and receiver

ID	Noise event	Monitoring location	Prevailing meteorological conditions[1]	Measurement time	Estimated site contribution noise level, dB(A) L_{Amax}	Model predicted noise level, dB(A) L_{Amax}	Difference, dB
SN1	Container handling on southern side of warehouse	Onsite	Wind – 0.25 m/s Direction – 259 degrees Humidity – 96%	4:50 am 17/05/2024	74	74[3]	0
		I1 (Defence land)	Temperature - 12°C Stability Class F (based upon the NPfI sigma-theta method)[2]		52	53	1

Notes:
1. Meteorological data based upon the MIP meteorological data monitoring station adjacent to Bushmaster Avenue, along western boundary of MPW.
2. Night time stability class, based upon NPfI Fact Sheet D1.4 '*Use of sigma-theta data*'
3. Modelled with CONCAWE for consistency, however, CONCAWE is typically not valid under 100m.

While the modelled scenarios were based upon the measured source levels presented in Section 5.3, the cumulative noise levels at the boundary of the site have been reviewed in Table 10 to confirm they have been suitably quantified. Based on this validation, the noise model is considered suitable for modelling and assessing noise emissions.

Table 10 Comparison between measured and modelled noise levels - Roof intermediate monitoring locations (17/5/2024)

Location	Measured contribution noise level, dB(A) $L_{eq,T}$	Model predicted noise level, dB(A) $L_{eq,T}$	Difference, dB
I1	< 32	31	-1
I2	38 - 40	41	1
I3	43	44	1
I4	51	49	-2
I5	48	47	-1
I6	49	49	0
I7	54	52	-2
I8	59	59	0
I9	61	59	-2
I10	60	56	-2
I11	44	49	1
L1	47 - 50[1]	48	0

Notes:
1. Range based upon unattended monitor measured levels both during the attended monitoring periods on 17/5/2024, in addition to the range experienced over the unattended monitoring period from 14/5/2024 to 24/5/2024.

6.3 Assessment operational scenarios

All key measurable noise-generating mechanical plant and equipment that operate as part of typical operations have been included in the assessment modelling as required by CoC B85. These are listed in Table 8. The locations of these sources are shown in Figure 2.

The roof mounted package units and dangerous good fan are the main mechanical plant and equipment noise sources for Warehouse E7 operations for the reasonable worst case intrusive scenario (15-minute period) assessment. All office mechanical plant and equipment identified in Section 5.3 have been assumed to operate during all assessment periods, although these plant items typically only operate when the office is in use and dock shelter use happens sporadically.

6.4 Noise compliance assessment

Mechanical plant and equipment operational noise levels are presented in Table 11. The noise levels have been modelled to each of the surrounding residential receiver noise catchments with all nearby residences assessed, and the highest residential receiver noise level in each catchment area reported in Table 11. These noise levels represent the reasonable worst-case operational scenario (15-minute period) from typical mechanical plant and equipment operations of the warehouse.

The modelling incorporated the worst-case prevailing meteorological conditions, as required by CoC B85, which are wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

The mechanical plant and equipment noise sources are steady-state or quasi-steady-state. Therefore, there is unlikely to be significant variation between $L_{Aeq,15min}$ values and $L_{A1,\ 1minute}$ values, and no significant peak noise events are expected. As such, by achieving the night period $L_{Aeq\ (15\text{-}minute)}$ requirements, the noise emissions will achieve the $L_{A1,\ 1minute,}$ sleep arousal screening level requirements of 52 dB(A) $L_{A1,\ 1minute}$.

The results in Table 11 show that the predicted CoC B85 operational compliance noise levels are below the SSD 7628 CoC B80 noise limits. Furthermore, although the B84 assessment report did not provide specific warehouse predicted noise levels for all nearby noise sensitive receivers for verification under CoC B85, noise emissions are aiming to achieve appropriate noise levels below the SSD 7628 CoC B80 noise limits to assist Logos with managing the cumulative noise emissions from the MIP.

As such, it can be concluded that the E7 mechanical plant and equipment noise emissions achieve these requirements, such that they have been selected and installed to achieve the overall noise limits specified in SSD 7628 Table 5 (CoC B80).

The final noise emissions (to be confirmed) will also continue to do so as the final emission levels are expected to be lower than the levels in Table 11 following these rectification works.

Table 11 CoC B85 operational noise levels – Mechanical plant and equipment - Warehouse E7

NCA	Operational compliance assessment noise levels[1,2,3] $L_{Aeq,\ 15\ minute}$			SSD 7628 CoC B80 noise limits $L_{Aeq,\ 15\ minute}$		
	Day	Evening	Night	Day	Evening	Night
Wattle Grove (NCA 1)	33[4]	33[4]	32[4]	35	35	35
Wattle Grove North (NCA 2)	< 20	< 20	< 20	35	35	35
Casula (NCA 3)	< 20	< 20	< 20	35	35	35
Glenfield (NCA 4)	< 20	< 20	< 20	35	35	35

Notes

1. Modelling meteorological were as follows, consistent with the range applicable for the B131 noise limits:
   a. Day/Evening - Winds speeds of 3m/s at 10 meters above ground level (all directions)
   b. Night - Atmospheric stability category F (with no wind).
2. Modelling based upon average temperature and humidity conditions during the monitoring period.
3. For estimated levels less than 20 dB(A) LAeq, 15minute, "< 20dB(A)" is presented.
4. As per Section 1.1, the monitoring identified that mechanical noise emissions were operating at noise levels louder than would be expected in order to manage cumulative noise emissions from the warehouse. Accordingly, further mitigation measures have been investigated and are being implemented so that the final valid noise levels could be monitored. Acoustic mitigation construction works are currently being undertaken to reduce the noise emissions from this fan. As such, the noise levels in this report do not reflect the final noise emission levels. However, the final emission levels are expected to be lower than these levels following these rectification works and so will remain below the required noise levels.

7 Conclusion

Renzo Tonin & Associates was engaged by Logos Investment Management (Logos) on behalf of The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust to undertake noise monitoring of the warehouse mechanical plant and other noisy equipment to satisfy the State Significant Development (SSD) 7628 B85 consent condition (CoC) for the Warehouse E7. Warehouse E7 is located within the Moorebank Precinct East (MPE), which forms part of the Moorebank Intermodal Precinct (MIP) at Moorebank, NSW. Warehouse E7 is currently tenanted by the third party logistics provider Mainfreight.

This report has been prepared to address the noise emissions from the fixed mechanical plant and equipment of the warehouse that operate as part of typical warehouse operations in accordance CoC B85 of SSD 7628, and as detailed in the MPE ONVMP. CoC B85 requires noise monitoring of actual mechanical plant and other noisy equipment operations for a minimum period of one week where valid data is collected following the commencement of operations of each warehouse within MPE. The CoC B84 noise assessment report did not provide specific warehouse predicted noise levels for all nearby noise sensitive receivers for verification under CoC B85. As such, this report has been prepared to confirm that the actual mechanical plant and other noisy equipment operations achieve the overall noise levels presented in Table 5 of CoC B80 of 35 dB(A) $L_{Aeq\ 15minute}$, during all time periods.

SSD 7628 Consent Condition B85 requires noise monitoring of valid data for comparison against the above noise requirements. During the May 2024 SSD 7628 B85 noise monitoring, it was identified that one of the fans (Dangerous Good exhaust fan) was operating at noise levels louder than would be expected to manage cumulative noise emissions from the warehouse. Acoustic mitigation construction works are currently being undertaken to reduce the noise emissions from this fan. As such, the noise levels in this report do not reflect the final noise emission levels. However, the final emission levels are expected to be lower than these levels following the works. After the works are completed, noise measurements will be undertaken to confirm the noise emission levels. This report will then be updated to reflect these final operational noise levels so that valid operational noise emissions can be quantified.

The NSW EPA *Noise Policy for Industry* (NPfI) provides guidance for monitoring the performance of a noise-generating industrial facility, which includes direct measurement at a receiver location, direct measurement at alternative or intermediate location/s, unattended monitoring and modelling. As the existing ambient noise levels are already high at residences nearby to Warehouse E7 compared with the expected noise emission levels, a combination of on-site, intermediate and receiver attended noise measurements, unattended monitoring, and noise modelling have been used to quantify the noise emission performance of the warehouse mechanical plant and equipment.

Unattended noise monitoring was conducted on the warehouse roof nearby to the key noise generating mechanical plant items over the period of 14 May to 24 May 2024. In addition, attended noise measurements were undertaken on 17 May 2024. The aim of the measurements was to quantify fixed mechanical plant and equipment operational noise levels on-site, to develop a noise model and estimate the noise emission levels at nearby residences.

The monitoring data was analysed to confirm the warehouse mechanical plant and equipment noise source levels. These were used to then develop a noise model for the warehouse. The noise model was reviewed against onsite, intermediate and receiver concurrent noise measurements to confirm its suitability to assessing the CoC B85 noise emissions.

This assessment concluded that the warehouse mechanical plant and equipment noise emission levels achieve the overall noise levels presented in Table 5 of CoC B80 of 35 dB(A) $L_{Aeq\ 15minute}$, during all time periods a required by CoC B84 and CoC B85.

Following the implementation of further acoustic mitigation measures currently underway, the final emission levels are expected to be lower than the levels in Table 11 and so will maintain the outcome of this report.

Notwithstanding this, after the rectification works are completed, noise measurements will be undertaken to confirm the noise emission levels. This report will then be updated to reflect these final operational noise levels so that valid operational noise emissions could be quantified.

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]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment:
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.

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
threshold of pain	130 dB	
	140 dB	Military jet take-off at 25m away

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_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	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_{eq}	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 Leq 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 Noise monitoring survey information

Table 12 Attended noise monitoring results (receivers) (monitoring locations shown in Figure 3)

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
R1	Wattle Grove (adjacent to 16 Corryton Court) 4:08am – 4:23am 17 May 2024	Wind – 0 m/s Direction – n/a Humidity – 96% Temperature - 13°C Stability Class G[2]	62	50	47	46	44	42	*Warehouse E7 related noise emissions:* Warehouse E7 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 32 dBA [*inaudible at 42 dB(A)*] L_{Amax} = < 32 dBA [*inaudible at 42 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~43-44 dB(A)] and natural sources (frogs). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by distant road traffic [~43-45 dB(A)] (W to NNW), train operations noise [just audible ~35-38 dB(A)], train movement noise [~47-51 dB(A)] and natural sources [frogs ~46-48 dB(A)]. **High noise events** – Distant train horn on main line (~62 dB(A)) (NW) and industrial activities.
R2	Wattle Grove (adjacent to 52 Corryton Court) 5:07am – 5:22am 17 May 2024	Wind – 0 m/s Direction – n/a Humidity – 96% Temperature - 12°C Stability Class D to F[2]	59	53	47	45	43	42	*Warehouse E7 related noise emissions:* Warehouse E7 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 32 dBA [*inaudible at 42 dB(A)*] L_{Amax} = < 32 dBA [*inaudible at 42 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~43-46 dB(A)] and natural sources (frogs). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by distant road traffic [~43-46 dB(A)] (W to NW), local road traffic passbys [~46-49 dB(A)], terminal operations [~37-40 dB(A)], and natural sources [frogs ~44-46 dB(A), birds ~47 dB(A)]. **High noise events** – birds/possums [up to 59 dB(A)] and local road loud car passbys [up to ~59 dB(A)] and industrial activities.

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
R3	Wattle Grove (adjacent to 82 Corryton Court) 5:33am – 5:49am 17 May 2024	Wind – 0.3 m/s Direction – W Humidity – 96% Temperature - 12°C Stability Class D to F[2]	59	50	48	47	45	44	*Warehouse E7 related noise emissions:* Warehouse E7 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 34 dBA [*inaudible at 44 dB(A)*] L_{Amax} = < 34 dBA [*inaudible at 44 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~45-47 dB(A)] and natural sources (frogs). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by local road traffic passbys [~46-48 dB(A)], natural sources [frogs ~46-63 dB(A)], distant light plane [~49dB(A)] and distant road traffic [~42-46 dB(A)] (WSW to NNW), terminal operations [~37-43 dB(A)], distant train movement noise [~54-55 dB(A)] (SW) and **High noise events** – mainline train horn [up to 59 dB(A)] (N) and industrial activities.
R4	30 Goodenough Street, Glenfield 4:08am – 4:23am 17 May 2024	Wind – 0 m/s Direction – n/a Humidity – 96% Temperature - 12°C Stability Class G[2]	56	55	52	50	46	44	*Warehouse E7 related noise emissions:* Warehouse E7 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 34 dBA [*inaudible at 44 dB(A)*] L_{Amax} = < 34 dBA [*inaudible at 44 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~44-46 dB(A)] and natural sources (crickets). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by Cambridge Ave road traffic passbys [~50-55 dB(A)], natural sources [frogs ~46-63 dB(A)], distant rail traffic [~48-54 dB(A)] **High noise events** – mainline train horn [up to 59 dB(A)] (N) and industrial activities.
R5	73A Leacocks Lane, Casula 4:41am – 4:56am 17 May 2024	Wind – 0.3 m/s Direction – W Humidity – 96% Temperature - 11°C Stability Class D to F[2]	76	69	50	54	44	42	*Warehouse E7 related noise emissions:* Warehouse E7 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 32 dBA [*inaudible at 42 dB(A)*] L_{Amax} = < 32 dBA [*inaudible at 42 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic (M5) [~41-45 dB(A)] and natural sources (birds, crickets). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by Hume Highway/M5 road traffic [~44-50 dB(A)], local vehicle passbys [up to ~71-76 dB(A)], natural sources [possum/bats ~45-54 dB(A)], distant rail [~45-49 dB(A)] **High noise events** – local vehicle passbys [up to ~71-76 dB(A)], natural sources [possum/bats ~53-54 dB(A)].

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
R6	39 Glenelg Court, Wattle Grove (or Anzac Road) 5:09am – 5:24am 17 May 2024	Wind – 0 m/s Direction – n/a Humidity – 96% Temperature - 12°C Stability Class E to G[2]	86	78	72	66	46	44	*Warehouse E7 related noise emissions:* Warehouse E7 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 34 dBA [*inaudible at 44 dB(A)*] L_{Amax} = < 34 dBA [*inaudible at 44 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~45-47 dB(A)] and natural sources (crickets). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed local vehicle passbys on Anzac Road [up to ~72-79 dB(A)], natural sources (crickets) and industrial activities. **High noise events** – local vehicle passbys [up to ~71-76 dB(A)] and industrial activities.

Notes:
1. Meteorological data based upon the MIP meteorological data monitoring station adjacent to Bushmaster Avenue, in between Casula.
2. Night time stability class, based upon NPfI Fact Sheet D1.4 '*Use of sigma-theta data*'

Table 13 Attended noise monitoring results (intermediate) (monitoring locations shown in Figure 4)

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
I1	Defence area intermediate location (east of Project) "Boot Land" 4:37am – 4:53am 17 May 2024	Wind – 0.4 m/s (*still at monitoring location*) Direction – WSW Humidity – 96% Temperature - 12°C Stability Class D[2]	63	61	58	52	45	42	*Warehouse E7 related noise emissions:* Warehouse E7 were not clearly audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 32 dBA [*inaudible at 42 dB(A)*] L_{Amax} = < 32 dBA [*inaudible at 42 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~42-46 dB(A)] and natural sources (frogs). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed primarily by natural sources [frogs ~46-63 dB(A)] and distant road traffic [~42-46 dB(A)] (W to NNW), terminal operations [~37-43 dB(A)] and distant train movement noise [~52-54 dB(A)] (SW). **High noise events** – terminal operations (~ 48-51 dB(A)) and natural sources [frogs up to 61 dB(A)].

Notes:
1. Meteorological data based upon the MIP meteorological data monitoring station adjacent to Bushmaster Avenue, in between Casula.
2. Night time stability class, based upon NPfI Fact Sheet D1.4 '*Use of sigma-theta data*'

APPENDIX C Logger location – Warehouse E7 roof

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

sydney@renzotonin.com.au
www.renzotonin.com.au

Dates of Survey: 14/05/2024 - 25/05/2024
Monitoring ID: L1
Address: Moorebank Intermodal Precinct (MIP) Warehouse E7 (Mainfreight Logistics)
Description: Warehouse E7 roof (east)

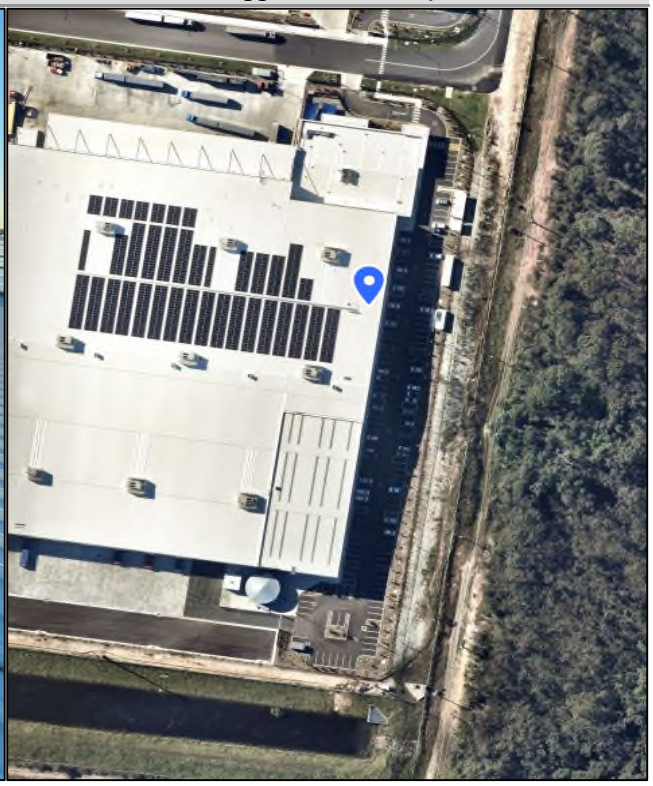
Background & Ambient Noise Monitoring Results						
	L_{A90} Background Noise Levels			L_{Aeq} Ambient Noise Levels		
	Day[1]	Evening[2]	Night[3]	Day[1]	Evening[2]	Night[3]
Representative Week[4]	**47**	**48**	**48**	**51**	**51**	**50**

Notes:

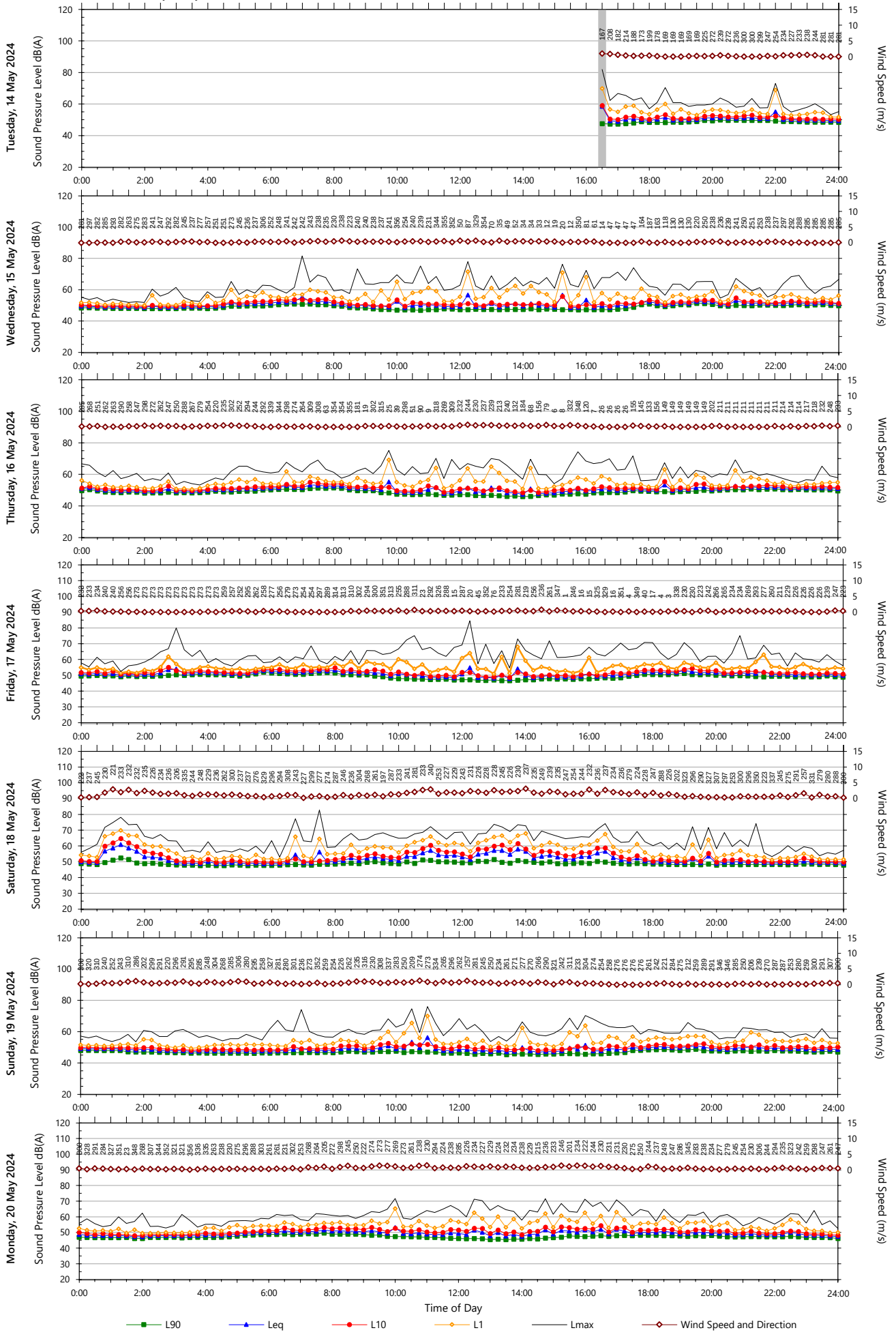
1. Day: 7.00am to 6.00pm Monday to Saturday and 8.00am to 6.00pm Sundays & Public Holidays
2. Evening: 6.00pm to 10.00pm Monday to Sunday & Public Holidays
3. Night: 10.00pm to 5.00am Monday to Sunday & Public Holidays
4. Rating Background Level (RBL) for LA90 and logarithmic average for LAeq

Logger location photograph

Logger location map



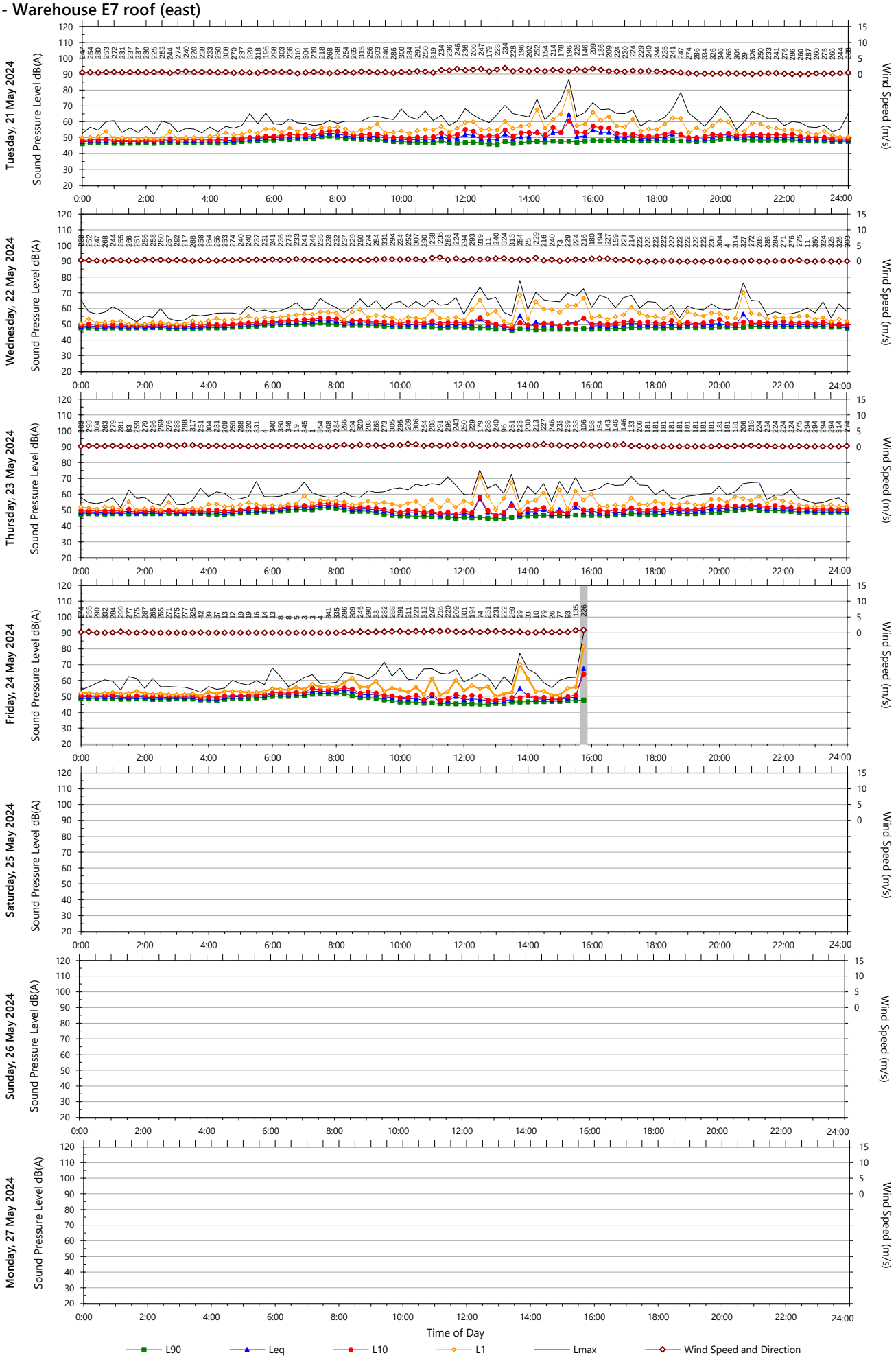
Unattended Monitoring Results - Location: Moorebank Intermodal Precinct (MIP) Warehouse E7 (Mainfreight Logistics) - Warehouse E7 roof (east)



Data File: 2024-05-14_SLM_001_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r46)

Unattended Monitoring Results - Location: Moorebank Intermodal Precinct (MIP) Warehouse E7 (Mainfreight Logistics) - Warehouse E7 roof (east)



Data File: 2024-05-14_SLM_001_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r46)

B.4 Warehouse E6 CoC B85 Noise Monitoring Report

Renzo Tonin & Associates Report TM306-05F03 E6 Warehouse B85 Operational Noise Monitoring (r1)

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

MOOREBANK INTERMODAL PRECINCT EAST

Monitoring Report for Mechanical Plant (SSD 7628 B85) - Warehouse E6

11 May 2025

The Trust Company (Australia) Limited (ACN 000 000 993) As Trustee of The Moorebank Industrial Warehouse Trust (ABN 51 402 161 047) c/- ESR Developments (Australia) Pty Ltd

TM306-05F03 E6 Warehouse B85 Operational Noise Monitoring (r1)

40 YEARS 1982 - 2022 ACOUSTIC ENGINEERING EXCELLENCE

Sydney Melbourne Brisbane Gold Coast Kuwait Singapore
Renzo Tonin & Associates ABN 29 117 462 861
Level 1/418A Elizabeth St SURRY HILLS NSW 2010 | PO Box 877 STRAWBERRY HILLS NSW 2012
P (02) 8218 0500 F (02) 8218 0501 sydney@renzotonin.com.au www.renzotonin.com.au

Document details

Detail	Reference
Doc reference:	TM306-05F03 E6 Warehouse B85 Operational Noise Monitoring (r1)
Prepared for:	The Trust Company (Australia) Limited (ACN 000 000 993) As Trustee of The Moorebank Industrial Warehouse Trust (ABN 51 402 161 047) c/- ESR Developments (Australia) Pty Ltd
Attention:	[redacted]

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
11.05.2025	Initial issue (draft)	0	1	[redacted]		

File Path: \\192.168.168.249\data\AssocSydProjects\TM301-TM350\TM306 ale Moorebank Intermodal Terminal (LOGOS)\Task5 Monitoring\1 Docs\05 MPE E6\TM306-05F03 E6 Warehouse B85 Operational Noise Monitoring (r1).docx

Contents

List of tables

List of figures

1 Introduction

1.1 Monitoring report purpose

Renzo Tonin & Associates was engaged by ESR Developments (Australia) Pty Ltd (ESR) on behalf of The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust to undertake noise monitoring of the warehouse mechanical plant and other noisy equipment to satisfy the State Significant Development (SSD) 7628 B85 consent condition (CoC) for Warehouse E6.

The Moorebank Intermodal Precinct (MIP) 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 MIP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, as shown in Figure 1. Warehouse E6 is located within the Moorebank Precinct East (MPE).

Warehouse E6 is separated into E6A (western warehouse), and E6B (eastern) warehouse. The western warehouse (E6B) is currently tenanted by the Qube Holdings Logistics (Qube), while the eastern warehouse (E6A) is currently tenanted by Ceva Logistics (Ceva).

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stage 2 of the MPE development, State Significant Development (SSD) 7628. The approval includes 300,000m^2 GFA of warehousing. These warehouse operations, including Warehouse E6, fall under the area and activities approved as part of SSD 7628.

Specifically, this report has been prepared to address the noise emissions from the fixed mechanical plant and equipment of the warehouse that operate as part of typical warehouse operations in accordance SSD 7628 CoC B85 of, and as detailed in the MPE Operational Noise and Vibration Management Plan[1] (MPE ONVMP).

SSD 7628 Consent Condition B85 requires noise monitoring of valid data for comparison against the mechanical plant and equipment noise levels predicted in the SSD 7628 Consent Condition B84 assessment prepared by Pulse White Noise Acoustics (PWNA) (*LOGOS MPE 6 & 7 – Acoustic Design Report*, Report number: *220518 - LOGOS MPE 6&7 - Acoustic Design Report – R5*, 28 March 2023) (B84 assessment).

This report is technical in nature and uses acoustic terminology throughout. APPENDIX A contains a glossary of acoustic terms used in this report.

[1] Arcadis & Renzo Tonin & Associates, Operational Noise and Vibration Management Plan for Moorebank Logistics Park – East Precinct, Revision 013, dated 24/01/2023, reference PREC-QPMS-EN-PLN-0008, available https://moorebankintermodalprecinct.com.au/wp-content/uploads/2023/09/ONVMP_V13_clean_compiled_Redacted-compressed.pdf, accessed 21/07/2024

1.2 Warehouse operations description – Warehouse E6 (Tenant: E6B (Qube) & E6A (Ceva)

1.2.1 Operational activities and facilities and hours of operation

Warehouse E6 is tenanted by both Qube (E6B) and Ceva (E6A). The warehouses are separated into two sections (E6A and E6B) with an internal dividing wall. The key activities of these warehouse tenant are:

- **Ceva (E6A)** - A car carrier/transportation and storage facility
- **Qube (E6B)** - Ambient temperature storage and distribution warehouse

Qube (E6B) warehouse and distribution observed activities typically occur 4:00am to 12:00am Monday to Friday, with the mechanical plant and equipment operating 24 hours per day, 7 days per week. The truck despatch and receiving activities occur on the southern side of the warehouse including both at-grade and in recessed loading docks. Additionally, on the northern side of the warehouse (including both E6A/B) containers from the IMEX terminal are transported to and from via reach stacker or straddle carrier operation and stored for unloading along the northern side of the warehouse.

Ceva (E6A) typical hours of operations have been advised as substantially variable. The Ceva trucks (car carriers) are understood to operate infrequency, with an expected frequency of 2 trucks per fortnight in/out of the facility. The warehouse main office and associated mechanical plant and equipment are not being used by this warehouse tenant.

The key noise generating components of Warehouse E6 and the various day to day activities that occur are as follows:

- **Warehouse (E6A/6B) northern side docks/hardstand:**
  - Receipt and despatch of containers from the MPE IMEX terminal
  - Internal packing and unpacking of containers from internal
- **Qube (E6B) southern side docks/hardstand:**
  - Despatching and receiving truck movements in and out of the facility. Typically, via sideloading with forklifts on the hardstand at the on-grade docks. For recessed loading docks, this is typically for container trucks, where containers are unloaded typically is via forklift via the rear from within the warehouse space.
  - Forklift (electric/internal and gas/external) operations on hardstand.
- **Ceva (E6A) southern side docks/hardstand:**
  - Typical car carrier truck loading/unloading activities with Ceva car carrier/truck loading/unloading cars and movements on the hardstand at the on-grade docks in and out of the facility.
  - Typical car unloading activity occurs via truck back drop ladder and the truck driver driving cars out (unloading) of the truck on the hardstand at the on-grade docks and then driving/parking into the warehouse for storage.

    - Typical car loading activity occurs via the truck driver driving cars from the warehouse on the hardstand via the on-grade docks, and then driving cars into the truck via truck back drop ladder (on the hardstand) and parking the cars on truck stand/s.
- **Warehouse (E6B) offices:** General office administrative and support functions.
- **Warehouse (E6A) offices:** Ceva is not using the main office as part of warehouse operations. Noting this, it has been excluded from this assessment as it does not form an operational noise source.

1.2.2 Mechanical plant and other noisy equipment

The following fixed mechanical plant and equipment operate as part of typical warehouse operations, which are further detailed in Section 5.1.

- **Qube (E6B) (west)**
    - Smoke exhaust fans (do not form part of typical operations)
    - Main office rooftop mechanical plant/equipment (including air-conditioning/condenser units)
    - Office area ground floor mechanical plant and equipment (east)
    - Office area mechanical plant/louvers affixed to the office wall (east)
    - Mechanical plant for dock office, including rooftop plant/equipment and on ground air-conditioning plant (1 x condenser unit)
- **Ceva (E6A) (east)**
    - Mechanical plant for dock office, including rooftop and air-conditioning plant/condenser/s.
    - Main office rooftop mechanical plant/equipment are installed but are not used as part of tenant operations and have been excluded form this assessment.

2 Nearby sensitive receivers

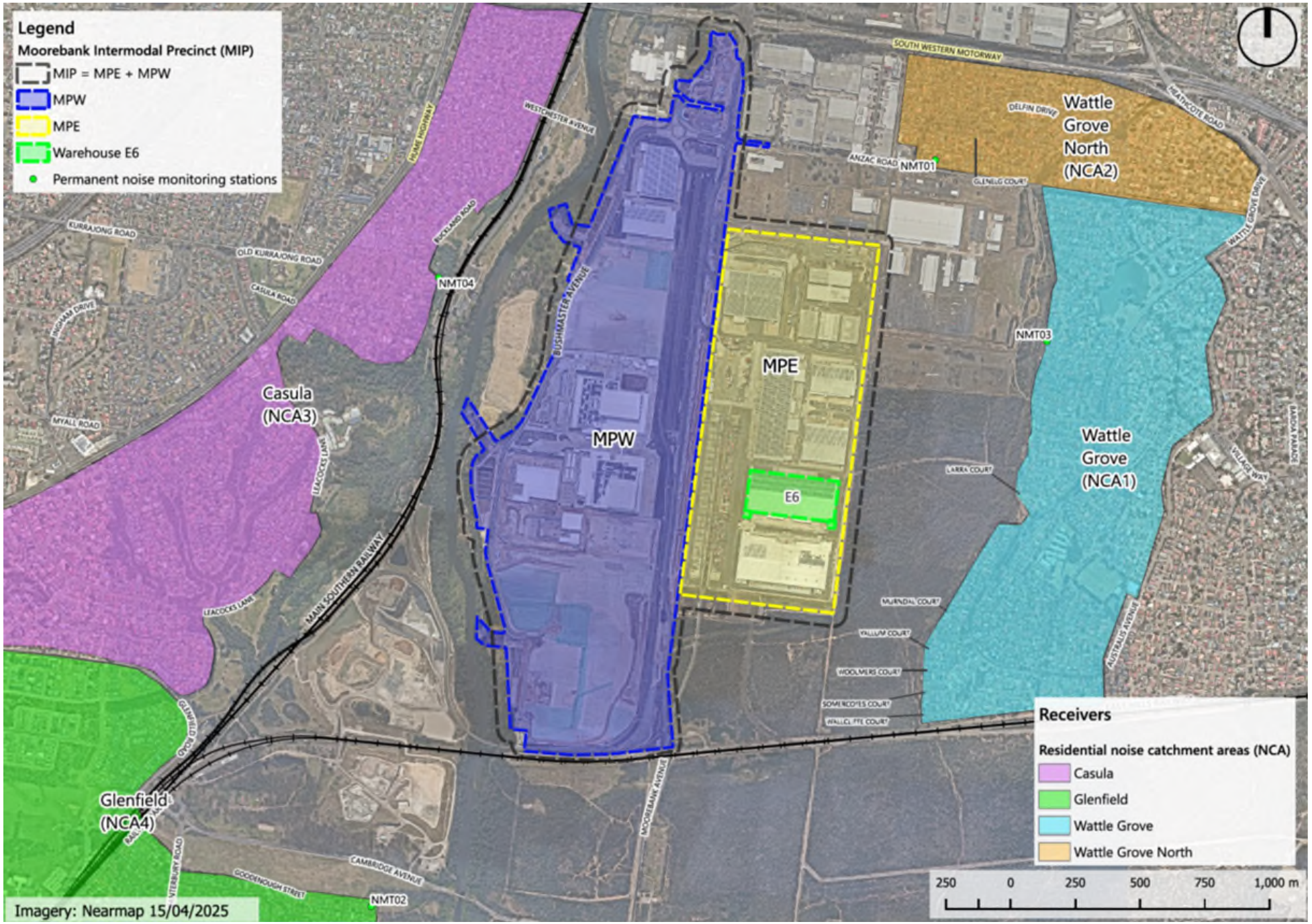
The potentially affected residential receivers nearby to Warehouse E6 around MPE are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. The closest and potentially most affected residential receivers are located within Wattle Grove.

A summary of the approximate distance to the nearest residential receivers in the surrounding area are provided in Table 1, as identified in SSD 7628 CoC B80. The locations of the residential noise catchment areas (NCAs) are shown in Figure 1.

Table 1 Noise sensitive receivers and approximate distance from MPE Warehouse E6

Noise Catchment Area (NCA)	Receiver type	Approximate distance from Warehouse E6, metres
Wattle Grove (NCA1)	Residential	540
Wattle Grove North (NCA2)		1,250
Casula (NCA3)		1,360
Glenfield (NCA4)		2,050

Figure 1 Warehouse E6 location, MIP, MPE and MPW precincts



3 Summary of noise objectives

This report has been prepared to address the noise emissions from the fixed mechanical plant and equipment of the warehouse that operate as part of typical warehouse operations in accordance CoC B85 of SSD 7628, and as detailed in the MPE ONVMP.

CoC B85 requires that the monitored noise levels be compared against the predicted levels reviewed in accordance with CoC B84. The CoC B84 noise assessment, is required to demonstrate that the plant and equipment has been selected to meet the overall noise limits specified in SSD 7628 CoC B80 (Table 5). As such, the following section outlines the requirements for both CoC B85 and the overall CoC B80 (Table 5) noise limits.

3.1 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 below. 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 $L_{Aeq(15\ minute)}$ criteria are applicable during the day, evening and night-time periods and the $L_{A1\ (1\ minute)}$ sleep disturbance noise limits 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 [1] $L_{Aeq,\ 15\ minute}$	Evening [1] $L_{Aeq,\ 15\ minute}$	Night [1] $L_{Aeq,\ 15\ minute}$	Night [1] $L_{A1\ (1\ min)}$
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 $L_{Aeq,15\ minute}$ 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.

3.2 Discussion of assessment noise limits

As noted in Section 3.1, 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 these 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 SSD 7709 Moorebank Precinct West (MPW) – Stage 2 Modification 1 (SSD 7709 MOD 1) submitted July 2020, a review of the applicable operational noise requirements across Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) was undertaken (Renzo Tonin and Associates document reference *TJ741-11F05 (r4),* dated 30 June 2020). The review identified that there are a 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 for the cumulative operational noise levels from all MPE and MPW operations.

As such, the review recommended that an overall approach for cumulative operational noise management of the MIP (for East and West precincts) 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.

Additionally, 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.

SSD 7709 MOD 1 was approved 24 December 2021, along with the revised cumulative noise goals for the overall MIP (MPW & MPE). However, these have not then been adjusted as part of the relevant MPE approvals (SSD 6766 and SSD 7628). Noting the above regulator comments, it is appropriate to assume that the overall MIP (MPW & MPE) operational noise emissions should be managed consistent with the SSD 7709 MOD 1 update, and this will likely be incorporated into a future modification of in SSD 7628.

However, independent of this, as the updates have not yet occurred, this assessment has been done against the existing SSD 7628 noise limit requirements, without further considerations of cumulative MIP noise emissions. These comments have been included for important context relating to cumulative noise considerations.

3.3 CoC B85 assessment noise requirements

3.3.1 Requirements

The management of operational noise emissions from warehouse mechanical plant and equipment 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.

An assessment of mechanical plant and equipment noise levels was prepared by Pulse White Noise Acoustics (PWNA) (*LOGOS MPE 6 & 7 – Acoustic Design Report*, Report number: *220518 - LOGOS MPE 6&7 - Acoustic Design Report – R5*, 28 March 2023) (B84 assessment). However, this report did not provide specific warehouse predicted noise levels for all nearby noise sensitive receivers for verification under CoC B85 or separate warehouse E6 and E7. Instead, the report identified that noise emissions have been designed to achieve the overall noise levels presented in Table 5 of CoC B80 of 35 dB(A) $L_{Aeq\ 15minute}$, during all time periods.

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 levels respectively for the overall MPE operations at the Environmental

Assessment stage. Although these are for the overall MPE operations and not for an individual warehouse, they can be used as reference for consistency verification CoC B85 as per the monitoring requirements detailed in Table 4-1 in Section 4.1.1 of the MPE ONVMP.

It should also be noted that the monitoring is to be undertaken "*… for a minimum period of one week where valid data is collected*". As such, it is important that operations are representative of typical operations for the monitored data to be valid. This is of note for this assessment, as the monitored noise levels were determined to be representative of the future operational noise emissions, specifically regarding Warehouse E6B (Qube) operations. However, it is understood that the main office mechanical plant and equipment associated with the Warehouse 6A (Ceva) is currently not operational and hence excluded from this assessment. Warehouse E6B (Qube) main office mechanical plant and equipment is currently operational and hence included/assessed in this assessment.

3.3.2 Noise monitoring timing

It is understood that the Warehouse E6 commenced operations from January 2025.

During this time period the tenant warehouse operations were still ramping up to typical levels. As such, monitoring of valid noise data could not be conducted initially following operations. As such, the earliest period when valid noise monitoring data could be collected was from March 2025. Noise monitoring was then undertaken end of March 2025, due to a two-week delay to allow for appropriate weather conditions during the monitoring period.

It is noted that the warehouse E6A/B facilities had ramped up operations to approximately full capacity at the time of the noise monitoring. The assessment herein has been performed to assess the potential noise impact of current operations as the key operational noise sources were running at suitable capacity (eg. main office mechanical plant/equipment).

This report presents the mechanical plant and equipment noise emissions and assessment in accordance with the requirements of CoC B85 in SSD 7628, as detailed in Section 4.1.1 of the MPE ONVMP.

4 Measurement methodology and results

4.1 Noise monitoring approach

The NSW Environment Protection Authority's (EPA) *Noise Policy for Industry* (NPfI) provides guidance in Chapter 7 for monitoring the performance of a noise-generating industrial facility. NPfI Section 7.1.1 provides guidance as to how to review noise emissions, which includes direct measurement at a receiver location, direct measurement at alternative or intermediate location/s, unattended monitoring and modelling, in order or preferred to least preferred. It notes that this range of compliance assessment techniques may be used individually, or in combination, to provide a means of determining compliance with a noise limit. At times, the best available compliance assessment methodology will only allow for a balance-of-probabilities type determination of compliance, and repeat assessment may be needed. It also makes clear that "*A noise limit applies to the noise from a particular development/activity and not to general ambient noise. Therefore it is often necessary to use techniques to attempt to separate the noise from a facility versus noise from other sources*."

For the CoC B85 Warehouse E6 assessment, the following points were considered:

- A site inspection undertaken on 28 February 2025, identified that at the residences in the closest residences in Wattle Grove operational noise emissions were not audible or distinguishable in the direction of the Warehouse E6 during daytime operations.
- The Warehouse E6 mechanical plant were expected to be more than 10 dB below the existing noise levels, measured at the surrounding NCAs by RTA during previous MIP noise monitoring. This previous attended noise monitoring found the existing ambient noise levels to typically be greater than 40 dB(A) $L_{Aeq15min}$, and controlled by noise sources outside of MIP, such as road traffic noise (ie. M5 and Hume Highway road traffic noise).
- Access to Wattle Grove residences and Warehouse E6 was possible during the attended monitoring period, however access to a suitable intermediate location between the Wattle Grove residences and Warehouse E6 was note very limited.
- A number of co-located noise generating warehouse and industrial operations, including the IMEX terminal, operate co-currently within the MIP, in particular across MPE.
- Noise source locations are both roof mounted and ground level mounted.

Noting the above points, and that the existing ambient noise levels are already high at receivers compared with the expected noise emission levels at receivers, quantification of the noise under investigation via direct noise measurement of operational noise emissions from the warehouse mechanical plant and equipment operations is not possible at the residential receiver locations because of poor signal-to-noise ratio. The NPfI also 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, similar to the Warehouse E6 within the MIP situation.

As such, the CoC B85 noise monitoring has used a combination of on-site and intermediate location attended noise measurements, unattended monitoring, and noise modelling to quantify the noise emission performance of the warehouse mechanical plant and equipment.

4.2 Compliance measurement methodology

The noise monitoring undertaken to satisfy the requirements of CoC B85 has included the following noise monitoring and assessment steps.

4.2.1 Noise monitoring

The following noise monitoring was undertaken:

1. **Unattended noise monitoring** nearby to the key mechanical plant items for a period of 10 days, to confirm the noise levels of the mechanical plant when operations occurred.

2. **On-site attended measurement** of all mechanical plant and other noisy equipment items to quantify noise emission levels of mechanical plant and equipment that operate as part of the Warehouse E6 operations (Section 5.2.3).

3. **Receiver and intermediate attended measurements** to confirm that the mechanical plant and other noisy equipment items were not quantifiable at the nearest critical receiver locations (Wattle Grove), and/or assist with contribution estimations of noise emissions levels, and provide noise monitor data to aid with confirming the performance of the noise model used to determine noise emission estimations at receivers. For the estimate warehouse mechanical noise contribution at the intermediate and receiver locations, where noise in the direction Warehouse E6 is not audible, it is assumed that the warehouse mechanical noise contribution is at least 10 dB(A) below the corresponding measured L_{A90} or L_{Amin} 15minute noise level as appropriate.

4.2.2 Data analysis and assessment

Following the noise monitoring, the following steps were undertaken to assess the noise level contributions at the nearby sensitive receivers:

1. **Noise source analysis** - Review the mechanical plant and equipment attended measurement data, analyse results and quantify noise source levels from all the fixed mechanical plant and equipment for Warehouse E6.

2. **Noise model setup and performance review** - Setup and calibrate the noise model for individual mechanical plant items, including the rooftop main office mechanical plant and equipment as well as the dock office mechanical equipment for the assessment of reasonable worst-case noise operations.

3. **Noise emission quantification** - Calculate the fixed mechanical plant and equipment noise levels from the Warehouse E6 operations to all nearby surrounding receivers and determine the noise level contribution at the property with the highest noise levels within each NCA.

4.3 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 measurements, the calibration of the sound level meters was 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	Monitoring period used	Equipment (RTA ref.)	Serial number	Last date calibrated
On-site attended noise measurements	28/3/2025, 3/4/2025	NTi XL2 (XL2-B)	A2A- 16217 -E0	04/08/2023
On-site attended noise measurements	3/4/2025	NTi XL2 (XL2-A)	A2A-12270-E0	09/12/2024
Unattended on-site noise measurements (E6 (B) Office Roof)	28/3/2025 - 11/4/2025	NTi XL2 (RTA07-052)	A2A-17457-E0	17/07/2023
Unattended receiver measurements (nearby to Wattle Grove Residences)[1]	28/3/2025 - 11/4/2025	NTi XL2 (RTA07-043)	A2A-20131-E0	28/02/2024
Field calibration	28/3/2025, 3/4/2025, 11/4/2025	NTi XL2 (XL2-B)	3009707	18/12/2024
Field calibration	3/4/2025	NTi XL2 (XL2-A)	2677710	06/01/2025

Notes: 1. Unattended noise monitor was installed within defence bushland between E6 and Wattle Grove Residences nearby to 76 Corryton Court, Wattle Grove.

4.4 Meteorological conditions

Meteorological conditions during the period of noise measurement surveys have been reviewed to determine the prevailing wind and temperature inversion conditions were appropriate. For a period of the monitoring, data from the MIP meteorological data monitoring station adjacent to Bushmaster Avenue, established in accordance with SSD 7709 (MPW Stage 2) CoC A54, has been sourced and reviewed.

During the attended noise measurement periods at Warehouse E6 and the nearby receivers, the weather conditions were as detailed in Table 4.

Table 4 Attended noise measurement surveys weather observations

Date / Time period	Air temperature, °C	Relative humidity, %	Average wind speed (at 10 m above ground level), m/s	Wind direction, degrees and Cardinal	Cloud cover	Rain
3/4/2025 3:30AM – 6:00AM Receivers/ Intermediate monitoring	12 to 14	95 to 96	Up to 0.3 m/s	Ranged from SW to W	Clear skies throughout	None
3/4/2025 6:00AM – 2:00PM Onsite monitoring	12 to 41	26 to 96	0 to 3.5 m/s	Generally ranged from SW to NW	Clear skies throughout	None

Notes: 1. During the attended monitoring, a handheld anemometer was used, and confirmed wind speeds at the sound level meter were not above 5m/s, as required by the NPfI.

The noise limits in SSD 7628 are applicable for wind speeds up to 3 m/s (10.8 km/h) at 10 metres above ground level. This meteorological station data was used to exclude weather affected data (wind (greater than 5m/s) or rain) in the unattended noise monitoring presented in APPENDIX B in accordance with the NPfI.

5 Monitoring and analysis

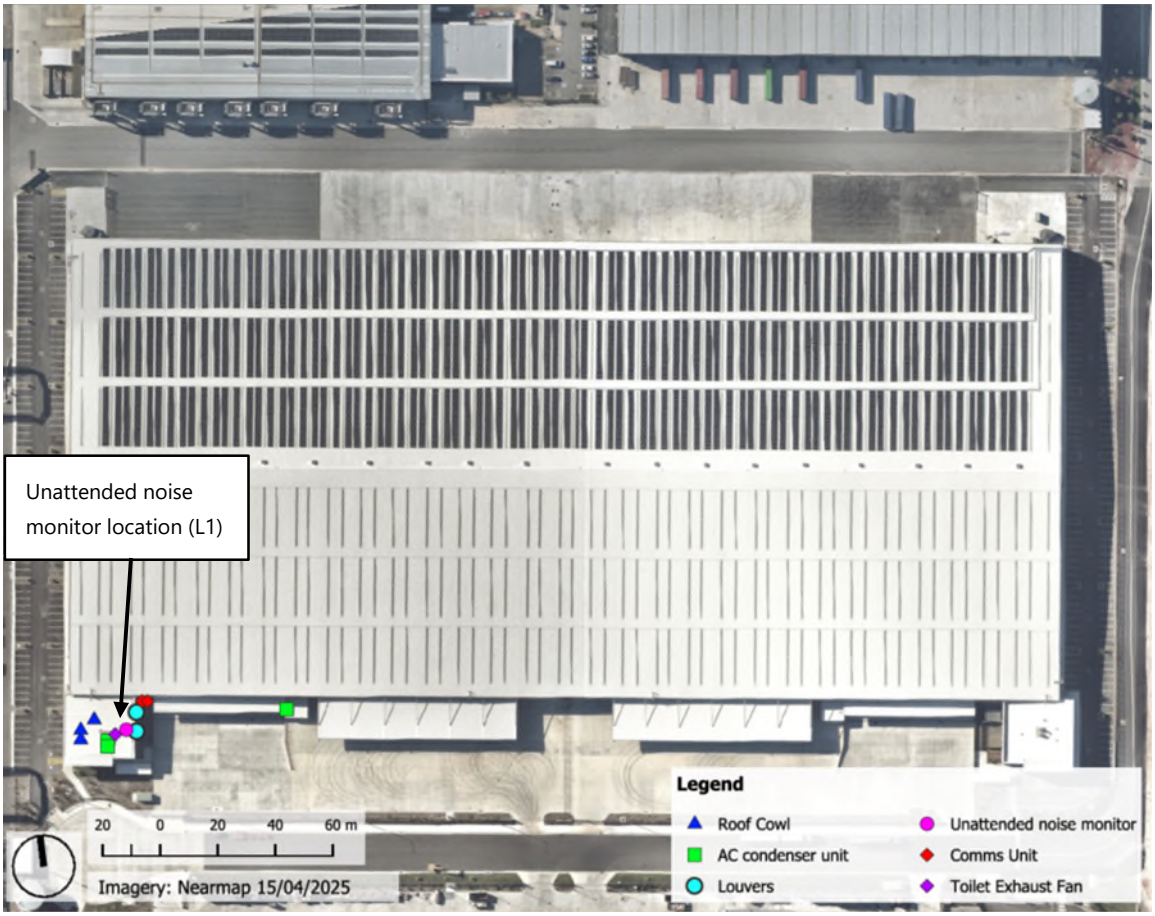
5.1 Key mechanical plant and equipment noise sources

Based on as-built construction information, site inspections, site personal observations, attended and unattended noise measurements, the main sources for the mechanical plant and equipment are as follows:

- Main office (E6B) rooftop mechanical plant and equipment
- Mechanical plant deck on main office (E6B) roof with 2 condenser units installed
- Toilet Exhaust Fan (TEF) on main office (E6B) roof adjacent to condensers
- Main office (E6B) ground area (east) mechanical plant (2 x COMMS units)
- Main office (E6B) area mechanical plant/louvers affixed to the office wall (east)
- Mechanical plant for dock office (E6A and E6B), including rooftop plant/equipment and on ground air-conditioning plant (1 x condenser unit)

The ridgeline smoke exhaust fans do not operate as part of normal operations and only operate in emergencies or during testing, and so do not form part of the assessment. The relevant locations of the key noise generating mechanical plant items are presented in Figure 2.

Figure 2 Key mechanical plant noise source locations and unattended noise monitor location (L1)



5.2 Noise monitoring

5.2.1 Receiver noise monitoring

Noise monitoring was undertaken at the receiver locations shown in Figure 3 to aid with confirming the likely mechanical noise contribution levels at the nearest residential receivers from the warehouse in each of the surrounding NCAs. The location of these measurements is presented in Figure 3. A summary of the measured noise levels are provided in Table 5, with further details for each of the measurements provided in APPENDIX B.

Table 5 also presents total statistical noise levels measured during the attended noise survey and estimated noise contributions from Warehouse E6 based on short-term audible noise measured at the attended measurement locations that could be attributed as coming from Warehouse E6 operations.

Figure 3 Key receiver noise monitoring locations

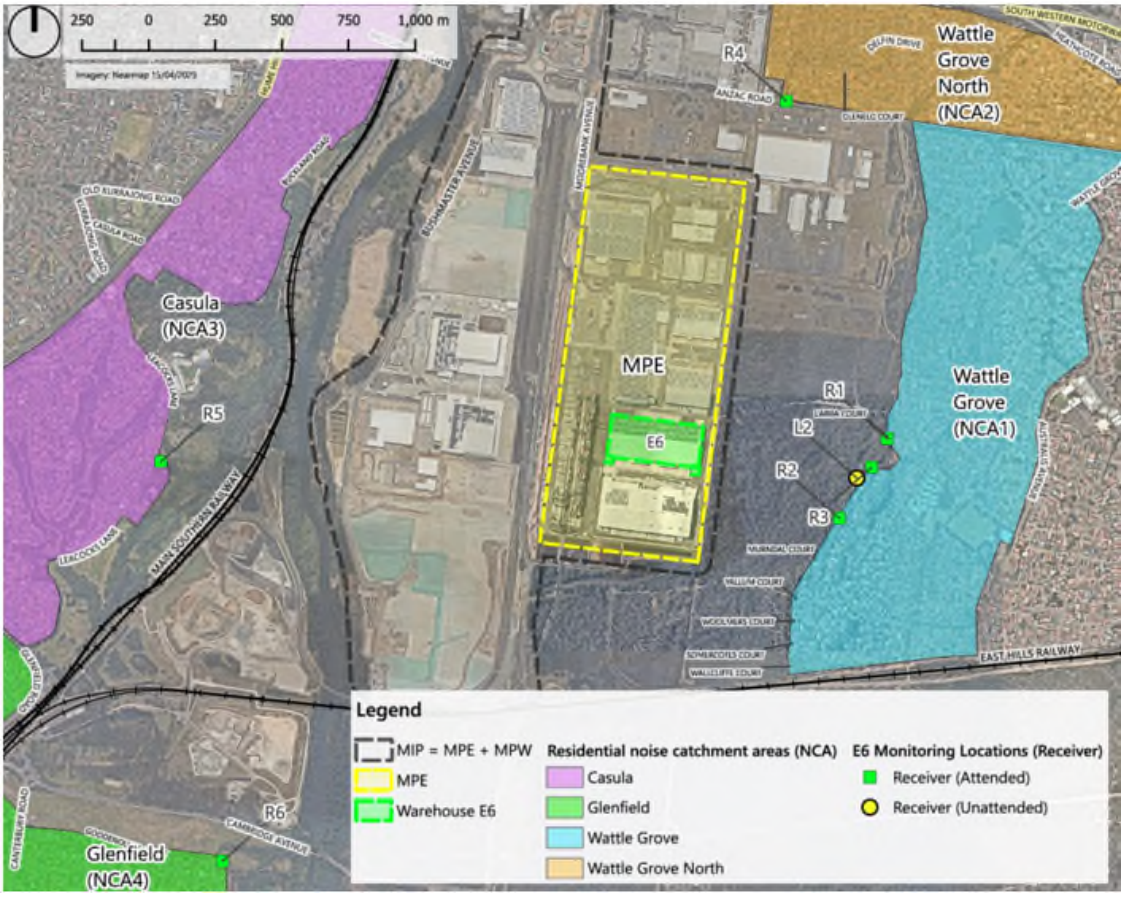


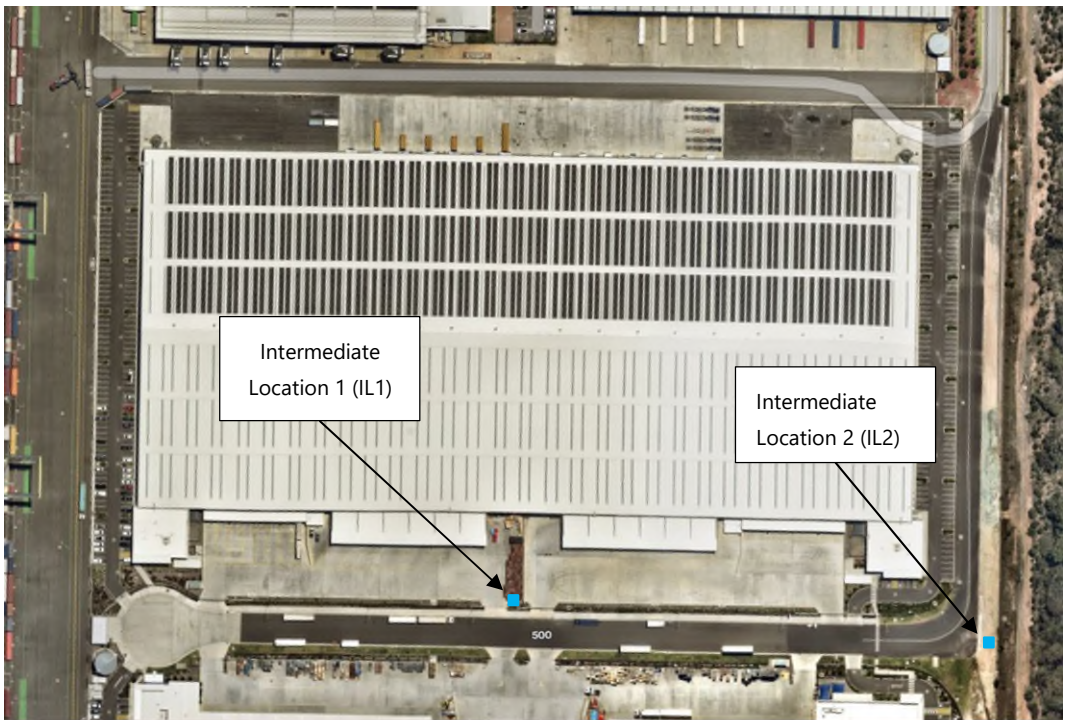
Table 5 Receiver attended noise measurement results (3 April 2025)

ID	Location	Start time	Measured noise levels (15-minute), dB(A)				Estimated warehouse mechanical contribution, $L_{Aeq, 15minute}$, dB(A)
			L_{AFmax}	L_{Aeq}	L_{A90}	L_{AFmin}	
R1	15 Larra Court, Wattle Grove	4:06am	57	43	40	39	< 30
R2	52 Corryton Court, Wattle Grove	4:57am	52	43	41	40	< 31
R3	82 Corryton Court, Wattle Grove	4:33am	70	45	43	41	< 33
R4	30 Goodenough Street, Glenfield	5:04am	71	53	47	44	< 37
R5	73A Leacocks Lane, Casula	4:31am	69	53	43	41	< 33
R6	39 Glenelg Court, Wattle Grove	4:02am	82	59	44	43	< 34

5.2.2 Intermediate noise monitoring

As it was not possible to confidently quantify warehouse noise emissions at the receiver locations through the receiver monitoring, intermediate measurements were undertaken between the receivers and the warehouse, in addition to boundary locations around the warehouse. Noise monitoring was undertaken at the intermediate location shown in Figure 4. Accessible locations between the source and the receiver location/s were selected, where the signal-to-noise from the warehouse noise sources would be higher than at the residential receiver locations. These intermediate monitoring locations were selected to assist with determining the likely contribution from the warehouse at these intermediate locations and to aid with reviewing the compliance noise modelling and likely upper bound of noise emissions.

Figure 4 Key intermediate noise monitoring locations



A summary of the measured noise levels at the intermediate monitoring locations are provided Table 6 with further measurement details provided in APPENDIX B.

Table 6 Concurrent intermediate noise measurement results (3 April 2025)

ID	Location / Comment	Start time	Measured 15-minute noise levels, dB(A)				Estimated warehouse contribution, $L_{Aeq, 15min}$, dB(A)	Key noise sources contributing to steady state noise levels
			L_{AFmax}	L_{Aeq}	L_{A90}	L_{AFmin}		
IL1	Warehouse E6-B Qube boundary towards south-east	10:05am	77	60	52	48	< 42	Nearby parking and E7 activities, and occasional IMEX noise events. Main office mechanical plant was inaudible. Full details in APPENDIX B.
IL2	MPE fence line east (corner of Marcus Place/Trajan Street)	10:05am	72	54	44	42	< 34	Distant road traffic and birds [~44 dB(A)]. Local truck movements/idle towards east of E6. IMEX and E7 activities. Main office mechanical plant was inaudible. Full details in APPENDIX B
L2 (Unattended noise monitor)[1]	During I1 and I2 attended measurement	10:05am	56	51	49	48	<39	Unattended noise monitor (within defence bushland).

Notes: 1. Unattended noise monitor data was installed within defence bushland between E6 and Wattle Grove Residences nearby to 76 Corryton Court, Wattle Grove.

5.2.3 Onsite noise measurements

Attended noise measurements of individual mechanical plant and equipment items and typical operations were undertaken at Warehouse E6 on 3 April 2025, in order to quantify the noise emissions from the installed mechanical plant and equipment in operation for input into the calibration modelling (Section 6). These noise levels have been used to develop the CoC B85 operational noise compliance noise model.

During all measurements of mechanical plant and equipment, the specific noise source being measured was the dominant noise source. All plant and equipment items were switched on and forced into full capacity for the purposes of undertaking the attended noise measurements. Observations were made of the on-site specific mechanical plant item/s (specifically, critical noise generating plant/equipment i.e. two rooftop condenser units) during operations to ensure they were operating during attended on-site measurements.

Results from the on-site attended measurements of the critical mechanical plant and equipment are summarised in Table 7. The locations the key noise generating mechanical plant noise items are presented in Figure 2.

Table 7 On-site attended mechanical plant noise measurement results (3 April 2025)

ID	Activity noise sources	Time	Measurement duration (t), sec	Measurement distance (m)	Measured noise levels, dB(A)		
					L_{AFmax}	L_{Aeq}	L_{A90}
	Office E6B roof (locations see Figure 2)[1]						
S1	Office (E6B) Condenser Unit 1 + Office (E6B) Condenser Unit 2	12:49 PM	31 sec	6	65	64	63
S2		12:44 PM	31 sec	6	65	63	63
S3	Office (E6B) Toilet Exhaust Fan (TEF)	12:41 PM	47 sec	2	64	60	60
S4	Office (E6B) – Roof Cowl 1	inaudible at 1 metre at 50 dB(A) L_{A90}					
S5	Office (E6B) – Roof Cowl 2						
S6	Office (E6B) – Roof Cowl 3						
	Hardstand and dock offices						
S7	Condenser units/COMMS 1 and 2 (Office E6B)	1:47 PM	18 sec	2.4	55	52	51
S8	Mech louvre (Office E6B - eastern wall)	1:54 PM	40 sec	4	62	52	50
S9	Roof Cowl 1 (Dock Office roof)	inaudible at ground level at 50 dB(A) L_{A90}					
S10	Roof Cowl 2 (Dock Office roof)						

Notes: 1. All plant and equipment items were switched on and forced into full capacity for the purposes of undertaking the attended noise measurements. Monitoring undertaken during steady state operations.

5.2.4 Unattended noise measurements

During the attended noise survey in Section 5.1, it was observed that the rooftop mechanical deck with two condenser units and a toilet exhaust fan (TEF) could operate continuously as part of the typical operations, and were considered to be the main noise sources for the Warehouse E6 mechanical plant noise emissions.

To confirm that the noise emissions from these key mechanical sources represented normal operations and did not substantially change over time, unattended noise monitoring was undertaken to supplement to the attended noise monitoring (Section 5.2.3), this was undertaken for a minimum one week period as required by CoC B85. The unattended noise monitoring was undertaken over the period between 28 March to 11 April 2025. The unattended noise monitor (L1), as shown in Figure 2, as located so that noise contributions from mechanical plant would dominate the monitored noise levels.

The monitoring data confirmed the condenser units only operated occasional, and turned on and off throughout the monitoring period, with some period of reduced load and lower noise levels. The modelling is based upon the maximum measured noise levels. The condenser units typically operated for a period of 1 to 3 hours at a time. Detailed results from the unattended noise monitoring are provided in APPENDIX C.

5.3 Mechanical plant and equipment noise source levels

Based upon the attended and unattended noise monitoring presented in the above sections, the following noise source levels for the key typical operating mechanical plant and equipment have been established based upon periods of typical operation. These have been based upon either direct measurement, or supplier data that has been confirmed through monitoring of cumulative noise levels (ie. condenser units on mechanical deck). Based upon noise monitoring presented in Section 5.2, the sound power level inputs presented in Table 8 were used in the CoC B85 operational noise compliance modelling detailed in Section 6 for the key noise source locations shown in Figure 2.

Table 8 CoC B85 operational noise compliance noise source levels

Site items / operation	Individual item sound power level (SWL) ($L_{Aeq,t}$), dB(A)	Comment
Office E6B (warehouse west) roof[3]		
Office condenser units (2 units) - Vertical discharge units	84	Based upon attended measurements (Unit type Daikan VRV REYQ22BYM/REYQ20BYM) and unit observations. These condenser units observed to be the key dominant noise source for office E6B.
Office (E6B) Toilet Exhaust Fan (TEF)	74	Based upon the attended measurements on office E6B rooftop.
Office (E6B) roof cowl units	48[5]	Office roof cowl units were inaudible. Based upon the attended measurements/observations on main office rooftop. Inaudible at 1m metre at 50 dB(A) $L_{A90.}$
Office 6A (warehouse east) roof[1]		
Office (E6A) rooftop mechanical plant/equipment	n/a[1]	Office (E6A) Ceva main office and associated mechanical plant and equipment is not used as part of typical operations by the tenant.
Hardstand and dock offices		
COMMS units (adjacent to Office E6B)	67[2]	Installed unit: Daikan RXC100AV1A. Two units. Intermittent operations of one or two units.
Dock office (E6B) (warehouse west) - Air conditioning condenser unit (CU-6.2-DO) - Horizontal discharge single fan unit (Daikan)	68[4]	Installed unit: Daikan RZA125CV1. Dock office air conditioning unit was not operational during attended measurements. The sound power level based upon the installed unit manufacturer sound power levels. Supplier level = Lw 68 dB(A)
Dock office (E6A) (warehouse east) - Air conditioning condenser unit (CU-6.1-DO) - Horizontal discharge single fan unit (Daikan)	68[4]	Installed unit: Daikan RZA125CV1. Measurement access was not possible. The sound power level based upon the installed unit manufacturer sound power levels.

Site items / operation	Individual item sound power level (SWL) ($L_{Aeq,t}$), dB(A)	Comment
Mech louvre (Office E6B - eastern wall)	72	Noise level based upon attended measurements conducted onsite (03/05/2025).
Roof Cowl 1 & 2 (Dock Office roof)	48[5]	Noise levels measured at ground level adjacent to dock office. Inaudible at ground level at 50 dB(A) L_{A90}.

Notes:
1. As the main office (E6A) is currently not operational. As such, the office (E6A) associated mechanical plant, and equipment is currently not operational and hence excluded from this assessment.
2. Measurements were made of where mechanical sources were audible, and these fans were quantified and modelled. Other office roof sources were not dominant, based upon observations from warehouse roof levels for cumulative measured noise levels when in operation, and so it was appropriate to model just the key dominant sources.
3. Based upon highest measured levels from multiple attended measurements and unattended noise monitoring.
4. Dock office condenser unit was not operational during attended noise measurements onsite. The sound power level data was obtained from manufacturer provided data for the relevant model number installed onsite.
5. Noise emissions were not audible in a 50 dB(A) LA90 environment, as such noise emission level is assumed to be no higher than 40 dB(A) at 1 metre.

6 CoC B85 operational noise modelling and assessment

As detailed in Section 4, it was not possible to directly measure or estimate the warehouse mechanical plant and equipment noise levels at nearby receivers without implementing a range of different noise measurement and noise modelling techniques. As such, this assessment has used a combination of on-site attended noise measurements and unattended monitoring presented in Section 5, and noise modelling described below. These techniques were used in combination to assess the noise emissions of the Warehouse E6 mechanical plant and equipment.

6.1 General modelling assumptions and methods

Modelling and assessment of warehouse noise emissions was determined by modelling the noise sources, receiver locations, existing built structures and topographical features, using CadnaA (version 2025. The noise predictions are based on the CONCAWE noise prediction algorithms, noting that the nearby critical noise sensitive receivers are greater 100 metres from the site. The CONCAWE environmental noise prediction method is an appropriate method for predicting the noise propagation in these circumstances. The performance of the noise model used is reviewed in Section 6.2.

The noise prediction model considers:

- Location of all noise sources.
- Height of sources and receivers referenced to digital ground contours both onsite and outside the warehouse and MIP areas.
- Noise source levels of individual mechanical plant and equipment. All fixed mechanical plant and equipment operational noise sources associated with Warehouse E6 operations have been included.
- Separation distances between sources and receivers.
- Ground type between sources and receivers.
- 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 operational mechanical plant and equipment and their duration and frequency of operation as part of the 'reasonable' worst-case operational scenarios are described in Section 6.3.

6.2 Noise model performance

The base CadnaA model prepared for the E7 noise monitoring assessment (*TM306-05F02 E7 Warehouse B85 Operational Noise Monitoring (r1),* dated 24 January 2025) (E7 B85 noise monitoring report) was used to develop the compliance monitoring modelling for this assessment.

Section 6.2 of the E7 B85 noise monitoring report demonstrated that through reviewing correlated noise events between onsite noise monitoring and intermediate monitoring locations toward Wattle Grove receivers that the noise model is considered suitable for modelling and assessing noise emissions at nearby receivers. As the assessment is concerned with similar receivers in Wattle Grove, this model performance review is also appropriate for this assessment and demonstrates the base model is suitable.

Similarly, the intermediate monitoring in Section 5.2.2 was further used to confirm the model was predicting as expected. As mechanical plant and equipment levels were inaudible at the intermediate locations, it is assumed they were at least 10 dB(A) below the measured background noise level (L_{A90}). This is confirmed as per Table 9.

Table 9 Comparison between measured and modelled noise levels - Intermediate monitoring locations (3/4/2025)

Location	Measured contribution noise level, dB(A) $L_{eq,T}$	Model predicted noise level, dB(A) $L_{eq,T}$
IL1 (Qube/Ceva boundary SE)	<42 (10 dB(A) below BG)	35
IL2 (Cnr. Marcus Pl/Trajan St)	<34 (10 dB(A) below BG)	31

6.3 Assessment operational scenarios

All key measurable noise-generating mechanical plant and equipment that operate as part of typical operations have been included in the assessment modelling as required by CoC B85. These are listed in Table 8. The locations of these sources are shown in Figure 2.

The office (E6B) rooftop two (2) condenser units and a toilet exhaust fan (TEF) are the main (dominant) mechanical plant and equipment noise sources for Warehouse E6 operations for the reasonable worst case 15-minute scenario assessment. All office mechanical plant and equipment identified in Section 5.3 have been assumed to operate during all assessment periods, although these plant items typically only operate when the office is in use (assessment considered 24 hours a day and 7 days operation).

6.4 Noise compliance assessment

Mechanical plant and equipment operational noise levels are presented in Table 10. The noise levels have been modelled to residential receiver noise catchments surrounding the MIP and the highest residential receiver noise level in each catchment area reported in Table 10. These noise levels represent the reasonable worst-case operational scenario (15-minute period) from typical mechanical plant and equipment operations of the warehouse.

The modelling incorporated the worst-case prevailing meteorological conditions, as required by CoC B85, which are wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

The mechanical plant and equipment noise sources are steady-state or quasi-steady-state. Therefore, there is unlikely to be significant variation between $L_{Aeq,15min}$ values and $L_{A1,\ 1minute}$ values, and no significant peak noise events are expected. As such, by achieving the night period $L_{Aeq\ (15\text{-}minute)}$ requirements, the noise emissions will achieve the $L_{A1,\ 1minute,}$ sleep arousal screening level requirements of 52 dB(A) $L_{A1,\ 1minute}$.

The results in Table 10 show that the predicted CoC B85 operational compliance noise levels are below the SSD 7628 CoC B80 noise limits. Furthermore, although the B84 assessment report did not provide specific warehouse predicted noise levels for all nearby noise sensitive receivers for verification under CoC B85, noise emissions are aiming to achieve appropriate noise levels below the SSD 7628 CoC B80 noise limits to assist ESR with managing the cumulative noise emissions from the MIP.

As such, it can be concluded that the E6 mechanical plant and equipment noise emissions achieve these requirements, such that they have been selected and installed to achieve the overall noise limits specified in SSD 7628 Table 5 (CoC B80).

Table 10 CoC B85 operational noise levels – Mechanical plant and equipment - Warehouse E6

NCA	Operational compliance assessment noise levels[1,2,3] $L_{Aeq,\ 15\ minute}$			SSD 7628 CoC B80 noise limits $L_{Aeq,\ 15\ minute}$		
	Day	Evening	Night	Day	Evening	Night
Wattle Grove (NCA 1)	< 20	< 20	< 20	35	35	35
Wattle Grove North (NCA 2)	< 20	< 20	< 20	35	35	35
Casula (NCA 3)	< 20	< 20	< 20	35	35	35
Glenfield (NCA 4)	< 20	< 20	< 20	35	35	35

Notes
1. Modelling meteorological were as follows, consistent with the range applicable for the B131 noise limits:
   a. Day/Evening - Winds speeds of 3m/s at 10 meters above ground level (all directions)
   b. Night - Atmospheric stability category F (with no wind).
2. Modelling based upon average temperature and humidity conditions during the monitoring period.
3. For estimated levels less than 20 dB(A) LAeq, 15minute, "< 20dB(A)" is presented.

7 Conclusion

Renzo Tonin & Associates was engaged by ESR Developments (Australia) Pty Ltd on behalf of The Trust Company (Australia) Limited (ACN 000 000 993) as trustee of the Moorebank Industrial Warehouse Trust to undertake noise monitoring of the warehouse mechanical plant and other noisy equipment to satisfy the State Significant Development (SSD) 7628 B85 consent condition (CoC) for the Warehouse E6.

Warehouse E6 is located within the Moorebank Precinct East (MPE), which forms part of the Moorebank Intermodal Precinct (MIP) at Moorebank, NSW. Warehouse E6 is separated into E6A (western warehouse), and E6B (eastern) warehouse. The western warehouse (E6B) is currently tenanted by the Qube Holdings Logistics (Qube), while the eastern warehouse (E6A) is currently tenanted by Ceva Logistics (Ceva).

This report has been prepared to address the noise emissions from the fixed mechanical plant and equipment of the warehouse that operate as part of typical warehouse operations in accordance CoC B85 of SSD 7628, and as detailed in the MPE ONVMP. CoC B85 requires noise monitoring of actual mechanical plant and other noisy equipment operations for a minimum period of one week where valid data is collected following the commencement of operations of each warehouse within MPE. The CoC B84 noise assessment report did not provide specific warehouse predicted noise levels for all nearby noise sensitive receivers for verification under CoC B85. As such, this report has been prepared to confirm that the actual mechanical plant and other noisy equipment operations achieve the overall noise levels presented in Table 5 of CoC B80 of 35 dB(A) $L_{Aeq\ 15minute}$, during all time periods.

SSD 7628 Consent Condition B85 requires noise monitoring of valid data for comparison against the above noise requirements. The NSW EPA *Noise Policy for Industry* (NPfI) provides guidance for monitoring the performance of a noise-generating industrial facility, which includes direct measurement at a receiver location, direct measurement at alternative or intermediate location/s, unattended monitoring and modelling. As the existing ambient noise levels are already high at residences nearby to Warehouse E6 compared with the expected noise emission levels, a combination of on-site, intermediate and receiver attended noise measurements, unattended monitoring, and noise modelling have been used to quantify the noise emission performance of the warehouse mechanical plant and equipment.

Unattended noise monitoring was conducted on the warehouse roof nearby to the key noise generating mechanical plant items over the period of 28 March to 11 April 2025. In addition, attended noise measurements were undertaken on 3 April 2025. The aim of the measurements was to quantify fixed mechanical plant and equipment operational noise levels on-site, to develop a compliance noise model and estimate the noise emission levels at nearby residences.

The monitoring data was analysed to confirm the warehouse mechanical plant and equipment noise source levels. These were used to then develop a noise model for the warehouse. The noise model was

reviewed against onsite, intermediate and receiver concurrent noise measurements to confirm its suitability to assessing the CoC B85 noise emissions.

This assessment concluded that the warehouse mechanical plant and equipment noise emission levels achieve the overall noise levels presented in Table 5 of CoC B80 of 35 dB(A) $L_{Aeq\ 15minute}$, during all time periods as required by CoC B84 and CoC B85.

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]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment:

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
threshold of pain	130 dB	
	140 dB	Military jet take-off at 25m away

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 (E63Hz) 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_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	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_{eq}	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 Leq 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 Noise monitoring survey information

Table 11 Attended noise monitoring results (receivers) (monitoring locations shown in Figure 3)

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
R1	Wattle Grove (adjacent to 15 Larra Court) 4:06am – 4:21am 3 April 2025	Wind – nil to 0.3 m/s Direction – WSW Humidity – 95% Temperature - 13°C Stability Class F/G[2]	57	49	44	43	40	39	*Warehouse E6 related noise emissions:* Warehouse E6 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 30 dBA [*inaudible at 40 dB(A)*] L_{Amax} = < 30 dBA [*inaudible at 40 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~40-43 dB(A)] and natural sources (frogs). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by distant road traffic [~40-43 dB(A)] (W to NNW), ambulance noise [just audible ~44-45 dB(A)], train movement noise [~47-49 dB(A)] and natural sources [frogs ~44-47 dB(A)]. **High noise events** – Distant traffic accelerating noise (~47-49 dB(A) (N), distant horn (~49 dB(A)) (N/NW) and industrial activities.
R2	Wattle Grove (adjacent to 52 Corryton Court) 4:57am – 5:12am 3 April 2025	Wind – 0 m/s Direction – n/a Humidity – 95% Temperature - 13°C Stability Class G[2]	52	47	44	43	41	40	*Warehouse E6 related noise emissions:* Warehouse E6 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 31 dBA [*inaudible at 41 dB(A)*] L_{Amax} = < 31 dBA [*inaudible at 41 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~41-44 dB(A)] and natural sources (cicadas). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by distant road traffic [~41-44 dB(A)] (N to NW), local road traffic passbys [~44-46 dB(A)], terminal operation events [~42-49 dB(A)], and natural sources [cicadas ~41-43 dB(A)]. **High noise events** – Motorbike passby at distance [up to 52 dB(A)] and local road loud car passbys [up to ~46-47 dB(A)] and industrial activities.

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
R3	Wattle Grove (adjacent to 82 Corryton Court) 4:33am – 4:48am 3 April 2025	Wind – 0 m/s Direction – n/a Humidity – 96% Temperature - 13°C Stability Class G[2]	70	49	46	45	43	41	*Warehouse E6 related noise emissions:* Warehouse E6 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 33 dBA [*inaudible at 43 dB(A)*] L_{Amax} = < 33 dBA [*inaudible at 43 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~43-45 dB(A)] and natural sources (frogs/cicadas). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by local road traffic passbys [~46-48, up to 50 dB(A)], natural sources [frogs ~43-45 dB(A)] and distant road traffic [~43-45 dB(A)] (N to NW), terminal operation events [~41-44 dB(A)], distant train movement noise [~44-48 dB(A)] (SW) and **High noise events** – Motorbike passby at distance [up to 51 dB(A)] and local road loud car passbys [up to ~48-50 dB(A)] and industrial activities.
R4	30 Goodenough Street, Glenfield 5:04am – 5:19am 3 April 2025	Wind – 0 m/s Direction – n/a Humidity – 95% Temperature - 13°C Stability Class G[2]	71	66	53	53	47	44	*Warehouse E6 related noise emissions:* Warehouse E6 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* LAeq (15minute) = < 37 dBA [inaudible at 47 dB(A)] LAmax = < 37 dBA [inaudible at 47 dB(A)] Other noise source contributions: **Background noise environment** – Background L_{A90} was controlled by distant road traffic [~53-57 dB(A)] and natural sources (cicadas). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by Cambridge Ave road traffic passbys [~53-71 dB(A)], natural sources [cicadas ~43-53 dB(A)], distant rail traffic [~48-54 dB(A)] **High noise events** – Cambridge Avenue vehicle passbys [up to ~65-71 dB(A).
R5	73A Leacocks Lane, Casula 4:31am – 4:46am 3 April 2025	Wind – 0 m/s Direction – n/a Humidity – 96% Temperature - 13°C Stability Class G[2]	69	65	55	53	43	41	Warehouse E6 related noise emissions: Warehouse E6 were not audible/distinguishable. Estimate warehouse mechanical noise contribution: LAeq (15minute) = < 33 dBA [inaudible at 43 dB(A)] LAmax = < 33 dBA [inaudible at 43 dB(A)] Other noise source contributions: **Background noise environment** – Background L_{A90} was controlled by distant road traffic (M5) [~42-45 dB(A)] and natural sources (birds, cicadas). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed to by Hume Highway/M5 road traffic [~40-45 dB(A)], local vehicle passbys [up to ~62-69 dB(A)], natural sources [possum/bats ~45-54 dB(A)], distant rail [~47-53 dB(A)] **High noise events** – local vehicle passbys [up to ~62-69 dB(A)], natural sources [birds, cicadas ~53-54 dB(A)].

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
R6	39 Glenelg Court, Wattle Grove (or Anzac Road) 4:02am – 4:17am 3 April 2025	Wind – 0 m/s Direction – n/a Humidity – 95% Temperature - 13°C Stability Class G[2]	82	72	55	59	44	43	*Warehouse E6 related noise emissions:* Warehouse E6 were not audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 34 dBA [*inaudible at 44 dB(A)*] L_{Amax} = < 34 dBA [*inaudible at 44 dB(A)*] *Other noise source contributions:* **Background noise environment –** Background L_{A90} was controlled by distant road traffic [~44-47 dB(A)] and natural sources (cicadas). **Ambient noise environment** - Ambient L_{Aeq} noise level was contributed local vehicle passbys on Anzac Road [up to ~75-79 dB(A)], natural sources (cicadas) and industrial activities. **High noise events** – local vehicle passbys [up to ~75-82 dB(A)] and industrial activities.

Notes:
1. Meteorological data from the MIP meteorological data monitoring station adjacent to Bushmaster Avenue.
2. Night time stability class, based upon NPfI Fact Sheet D '*Use of sigma-theta data*'

Table 12 Attended noise monitoring results (intermediate monitoring locations shown in Figure 4)

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
IL1	Intermediate Location 1 (IL1) – E6B boundary fence (SE) intermediate location (south-east of Project/E6-B) 10:05am – 10:20am 3 April 2025	Wind – 0.5-1 m/s (calm *at monitoring location*) Direction – W to N Humidity – 55% Temperature - 32°C Stability Class C[2]	77	71	63	60	52	48	*Warehouse E6 related noise emissions:* Warehouse E6 were not clearly audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 42 dB(A) [*inaudible at 52dB(A)*]. L_{Amax} = < 42 dBA [*inaudible at 52 dB(A)*]. *Other noise source contributions:* **Background noise environment –** Background LA90 was controlled by truck parking on local road (ie. truck idle) and E7 hardstand truck idle. **Ambient noise environment** - Ambient LAeq noise level was contributed by local vehicle passbys on Marcus Place and nearby IMEX and E7 activities. **High noise events –** Airplane flyby overhead [(~63-65 dB(A)] and industrial activities.

ID	Location / Time	Prevailing meteorological conditions[1]	Measured noise level, dB(A)						Comments on measured noise levels
			L_{Amax}	L_{A1}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}	
IL2	Intermediate Location 2 (IL2) – Corner Marcus Place & Trajan Street near defence land boundary fence (south-east of Project/E6-A boundary) 10:05am – 10:20am 3 April 2025	Wind – 0.5-1 m/s (calm *at monitoring location*) Direction – W to N Humidity – 55% Temperature - 32°C Stability Class C[2]	72	66	57	54	44	42	*Warehouse E6 related noise emissions:* Warehouse E6 were not clearly audible/distinguishable. *Estimate warehouse mechanical noise contribution:* $L_{Aeq\ (15minute)}$ = < 34 dB(A) [*inaudible at 44dB(A)*]. L_{Amax} = < 34 dBA [*inaudible at 44 dB(A)*]. *Is Other noise source contributions:* **Background noise environment –** Background LA90 was controlled by distant road traffic [~44 dB(A)]. **Ambient noise environment** - Ambient LAeq noise level was contributed local vehicle/trucks passbys on Marcus Place [up to ~63-65 dB(A)] and nearby industrial activities (ie. E7 hardstand trucks). **High noise events –** Airplane flyby overhead [(~63-65 dB(A)], construction vehicle passby [up to ~63-64 dB(A)] and industrial activities.

Notes:
1. Meteorological data from the MIP meteorological data monitoring station adjacent to Bushmaster Avenue.
2. Stability class, based upon NPfI Fact Sheet D '*Use of sigma-theta data*'

APPENDIX C Logger location – Warehouse E6B office roof

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

sydney@renzotonin.com.au
www.renzotonin.com.au

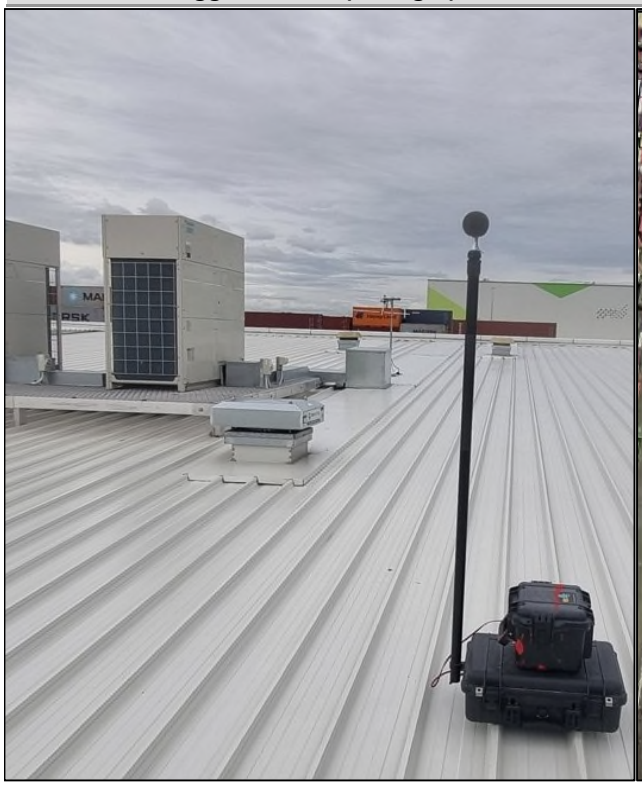
Dates of Survey: 28/03/2025 - 09/04/2025
Monitoring ID: Unattended noise monitor (L1)
Address: 6B Marcus Pl, Moorebank NSW
Description: E6B Main office roof

Background & Ambient Noise Monitoring Results						
	L_{A90} Background Noise Levels			L_{Aeq} Ambient Noise Levels		
	Day[1]	Evening[2]	Night[3]	Day[1]	Evening[2]	Night[3]
Representative Week[4]	49	47	47	56	52	52

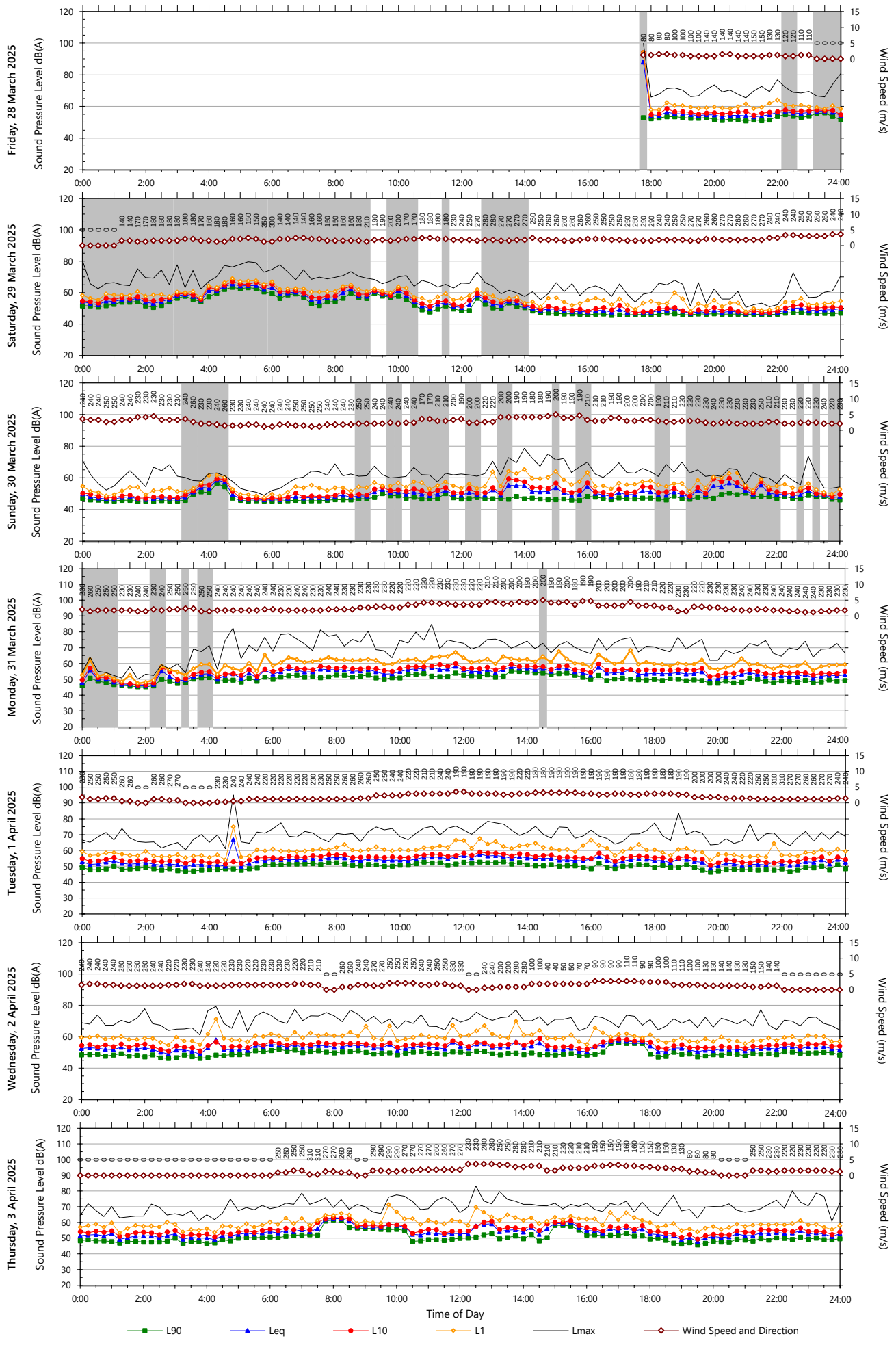
Notes:

1. Day: 7.00am to 6.00pm Monday to Saturday and 8.00am to 6.00pm Sundays & Public Holidays
2. Evening: 6.00pm to 10.00pm Monday to Sunday & Public Holidays
3. Night: 10.00pm to 5.00am Monday to Sunday & Public Holidays
4. Rating Background Level (RBL) for LA90 and logarithmic average for LAeq

Logger location photograph

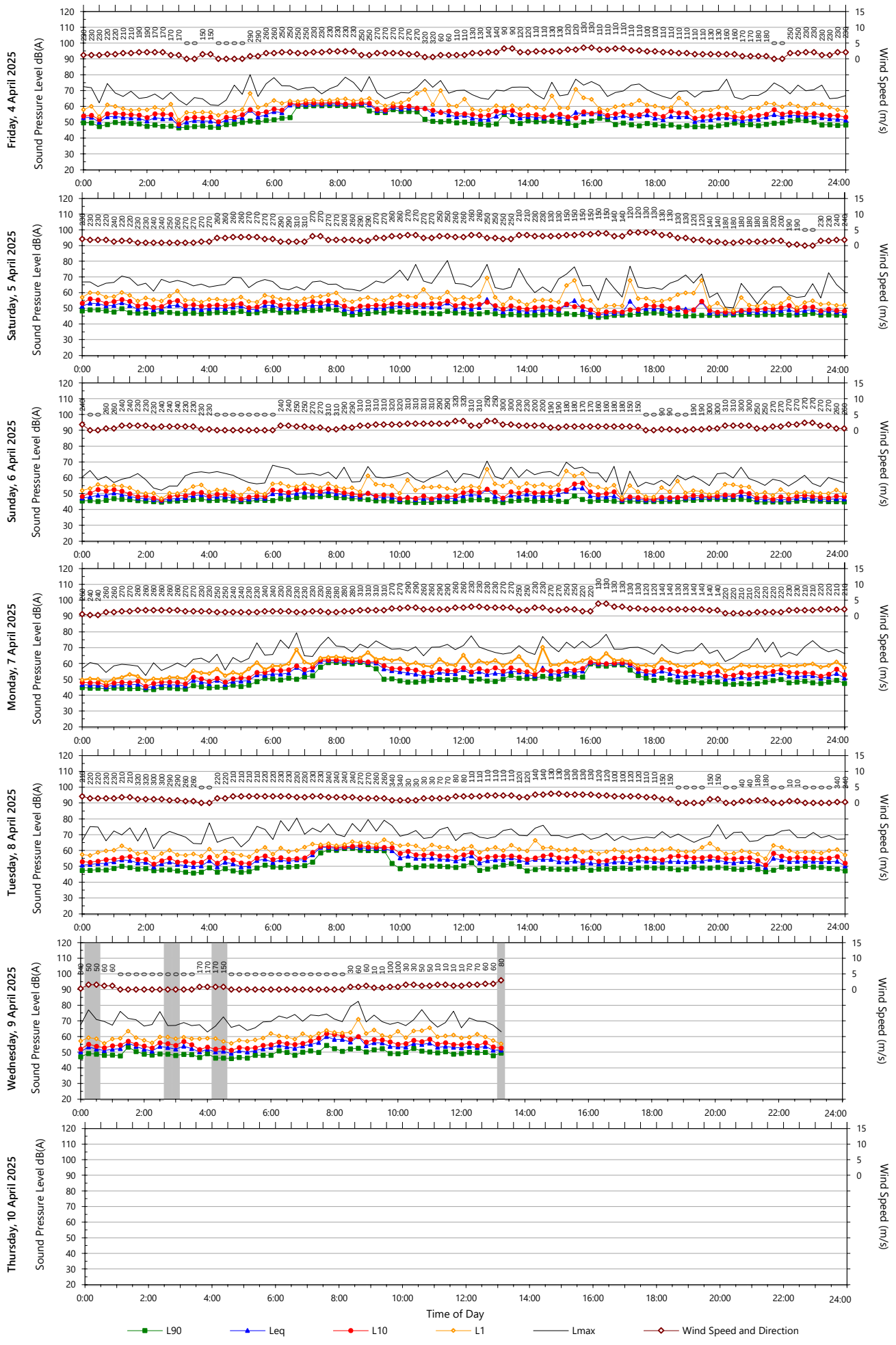


Logger location map



Data File: 2025-03-28_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r47)



Data File: 2025-03-28_SLM_000_123_Rpt_Report.txt

Template: QTE-26 Logger Graphs Program (r47)