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MOOREBANK INTERMODAL TERMINAL PRECINCT

Operational noise management

30 June 2020

Qube Holdings Limited & Woolworths Group Pty Ltd

TJ741-11F05 (r4) Moorebank Noise Management Precinct - Requirements review.docx

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Executive summary

Renzo Tonin & Associates (RT&A) was engaged by Qube Holdings Ltd and Woolworths Group Pty Ltd (Woolworths) to provide a review of the operational noise requirements for the Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) in accordance with SSD 7709 consent as part of the modification application for the MPW Woolworths JN & JR site.

There are a number of approval conditions that are applicable across both the MPW and MPE sites. In the application of these approvals to site activities it has become apparent the requirements are not consistent across the MPE and MPW sites and do not allow for clear management as an overall noise generating development, as would be perceived by nearby receivers during adverse meteorological conditions.

In addition, the detailed assessment undertaken for the first proposed MPW development [SSD 7709 MOD 1] for the Woolworths JN & JR site has demonstrated that practical (achievable) noise levels, with the implementation of all feasible and reasonable mitigation measures, are similar to the noise levels predicted in the EIS and are unlikely to achieve the noise limits set in the conditions of approval. The conditions of approval pertaining to SSD 7709 established noise limits which are set substantially more stringent than the noise criteria derived in the EIS, despite the criteria being derived in accordance with the NSW EPA noise policies.

As such, this report reviews the relevant project documentation, relevant project data, and recommends noise limits that would be applicable for the Moorebank Noise Management Precinct and are consistent with the objectives of the NSW EPA Noise Policy for Industry (NPfI), in particular Section 2.8 Noise management precincts. These recommended noise limits would seek to amend the operational noise limits established within Table 4 of Condition B131 in SSD 7709 to establish noise management objectives for the Moorebank Noise Management Precinct which are consistent across MPE and MPW, are consistent with EPA's noise policy for managing noise impacts on the community, are appropriate and are achievable.

The Moorebank Noise Management Precinct will allow for a much clearer, more effective, more consistent and flexible approach for managing and mitigating noise emissions across the MPW and MPE precincts and allow them to be *"utilised in a cost-effective and efficient manner"* (Section 2.8 Noise management precincts, NPfI).

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1 Introduction

1.1 Overview

Renzo Tonin & Associates (RT&A) was engaged by Qube Holdings Limited and Woolworths Group Pty Ltd (Woolworths) to provide a review of the operational noise requirements for the Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) in regards to considerations for managing cumulative operational noise.

There are a number of approval conditions that are applicable across these sites. In the application of these approvals to the site activities it has become apparent the requirements are not consistent across the MPE and MPW sites and do not allow for clear management as an overall noise generating development, as would be perceived by nearby receivers. In addition, the detailed assessment undertaken for the first proposed MPW development for the Woolworths JN & JR site has demonstrated that the approval requirements are not consistent with the noise objectives derived and presented in the EIS, and as a result are not consistent with the overall development proposed and approved during the environmental approvals stages. Even with all feasible and reasonable mitigation measures implemented, the operations are unlikely to achieve the approval noise limits.

The entity responsible for overseeing the noise emissions across the MPE and MPW sites, is in the process of developing an approach for managing the cumulative noise requirements from both sites, which is the intent of the most recent update to the MPW Concept approval (SSD 5066), which includes conditions E28 "*Cumulative Impacts*" and E29 "*Interaction between MPW and MPE sites*".

As such, this report aims to review the project environmental approvals documentation, relevant project data, and based upon these propose noise management objectives that would be applicable across both the MPW and MPE sites allowing for the Responsible entity to manage noise emissions as a single precinct. This approach would be consistent with the objectives of the NSW Noise Policy for Industry (NPfI), in particular Section 2.8 Noise management precincts. This approach would allow for a clearer, effective, consistent and flexible approach for managing and mitigating noise emissions across the MPW and MPE precincts to allow them to be *"utilised in a cost-effective and efficient manner"* (Section 2.8 Noise management precincts, NPfI).

1.2 Purpose

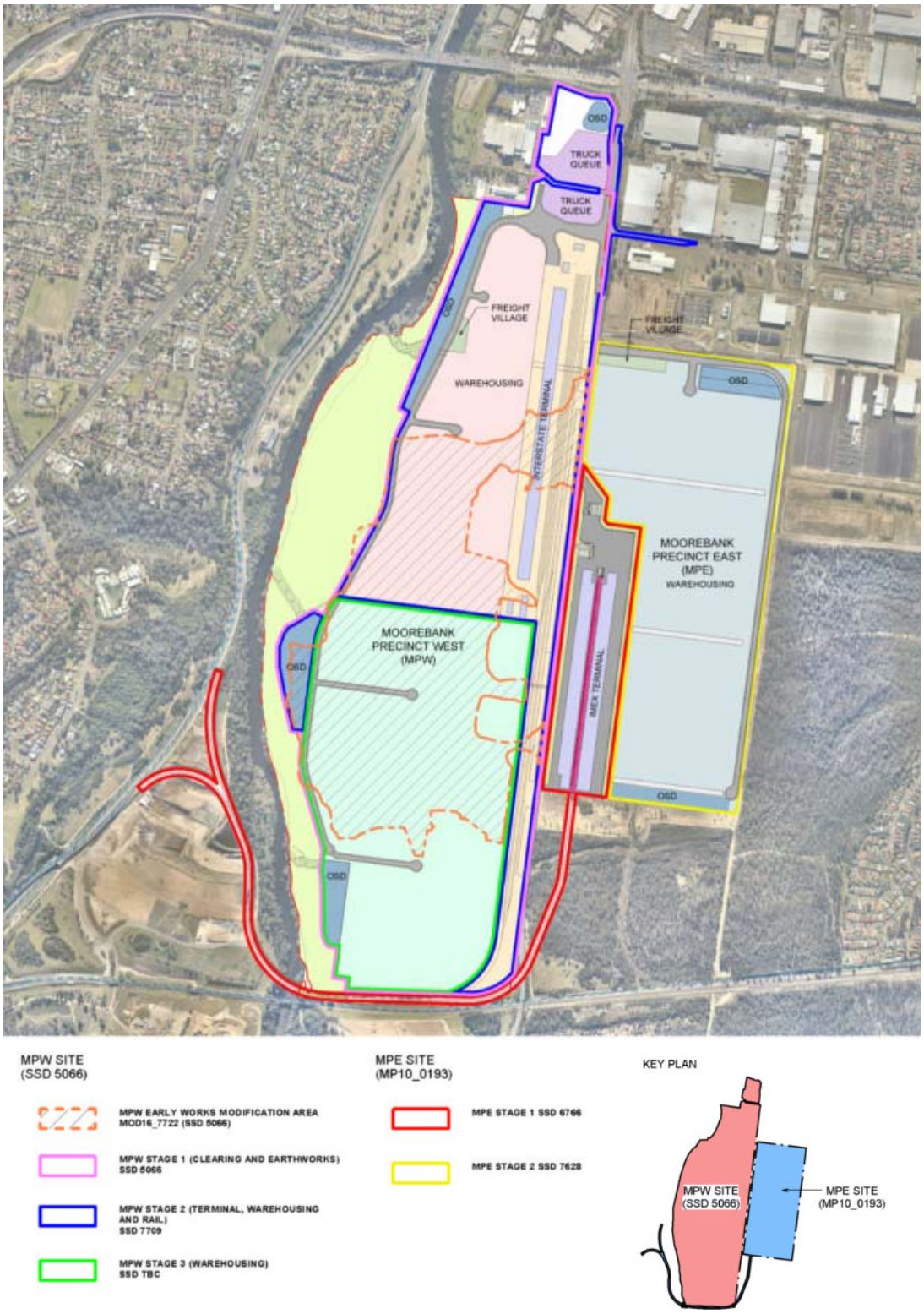
The purpose of this report is to:

- Put forward an overall approach for noise management of the Moorebank intermodal terminal precinct (for East and West precincts) which is consistent, appropriate and achievable.
- Demonstrate the existing condition of approval, which sets noise limits that are more stringent than those established in the environmental impact assessment documentation and are lower than the associated predicted noise levels with feasible and reasonable mitigation,

are below levels derived in accordance with the EPA's noise policies, and so are not practical (achievable) for a "whole of complex" approach.

- Review environmental impact assessment documentation, project documentation and relevant project data, and propose consistent, appropriate, and achievable noise limits for a Moorebank Noise Management Precinct, which would modify Table 4 of Condition B131 in SSD 7709.

Figure 1-1 Moorebank intermodal terminal precinct



The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Review of existing approvals

2.1 Applicable approvals and requirements

The following approvals are currently applicable for the MPW and MPE sites, with consideration of operational noise emissions:

The approvals that are applicable to the MPW site are:

- SSD 5066 MOD 1 (Concept Proposal and Stage 1), dated 30 October 2019
- SSD 7709 (MPW Stage 2), dated 11 November 2019

The approvals that are applicable to the MPE site are:

- SSD 6766 (MPE Stage 1), dated 11 November 2019
- SSD 7628 (MPE Stage 2) (MOD 2), dated 31 January 2020

2.2 Approval operational noise emission requirements

2.2.1 MPW

2.2.1.1 MPW Concept Proposal and Stage 1 SSD 5066 (MOD 1) (30 October 2019)

Replicated below are excerpts from SSD 5506 (MOD 1) condition E28 and E29. There are no numerical noise limits included in SSD 5506 (MOD 1).

Cumulative Impacts

E28. All future Development Applications must provide the timing for construction and operation on both the MPW and MPE sites and provide cumulative assessments for construction and operation on the MPW and MPE sites including, but not limited to:

b) noise and vibration impacts;

Interaction between MPW and MPE sites

E29. Any future Development Application that proposes the use of infrastructure on the MPE site or integration of operations across the MPW and MPE sites must:

a) demonstrate that there will be no overall increase in cumulative construction and operational environmental impacts;

2.2.1.2 MPW Stage 2 SSD 7709 (11 November 2019)

Replicated below are is SSD 7709 condition B131, with the applicable operational noise limits.

Intermodal Terminal Operational Noise Limits

B131. The Applicant must ensure that the noise generated by the overall precinct operations (defined as all activities approved for MPW and MPE) does not exceed the noise limits in **Table 4**.

Table 4: Operational Noise Limits dB(A)

Location (residential receivers)	Day $L_{Aeq,15\ minute}$	Evening $L_{Aeq,15\ minute}$	Night $L_{Aeq,15\ minute}$	Night $L_{A1,\ 1\ minute)}$
Casula	39 dB	35 dB	35 dB	52 dB
Glenfield	35 dB	35 dB	35 dB	52 dB
Wattle Grove	36 dB	35 dB	35 dB	52 dB

Notes: *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 m of a dwelling where the dwelling is more than 30 m 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 of the NPI). The modification factors in Fact Sheet C of NPI must also be applied to the measured noise levels where applicable.*

To determine compliance with the $L_{A1,1\ minute}$ noise limits, noise from the project is to be measured at 1 m 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 NPI).

The noise emission limits identified above apply under meteorological conditions of:

(i) wind speeds of up to 3 m/s at 10 m above ground level; or

(ii) 'F' atmospheric stability class.

2.2.2 MPE

2.2.2.1 MPE Stage 1 SSD 6766 (Court outcome dated: 13 March 2018)

Replicated below are the SSD 6766 noise limits from *Annexure A* of the decision in *Land and Environment Court Appeal No. 2017/81889*, with the applicable operational noise limits.

F5B. Industrial noise (excluding activities covered by the *NSW Rail Infrastructure Noise Guideline*) generated by the development is to be measured and evaluated for compliance generally in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (as may be updated from time to time).

Table A: Noise Criteria dB(A)

Sensitive Receiver	Day (LAeq(15 min))	Evening (LAeq(15 min))	Night (LAeq(15 min))	Night (LA1 (1 min))
Wattle Grove (NCA 1)	43	42	42	52
Wattle Grove (NCA 2)	41	41	41	51
Casula (NCA 3)	45	42	38	47
Glenfield (NCA 4)	46	46	40	50

Note: References to sensitive receivers should be read in conjunction with the description of sensitive receivers in the EIS noting that Casula includes Glenfield Farm.

F5C. The noise criteria in Table A of condition F5B are to apply under all meteorological conditions except the following:

(a) wind speeds greater than 3 m/s at 10 metres above ground level; or
(b) stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level; or
(c) stability category G temperature inversion conditions.

2.2.2.2 MPE Stage 2 SSD 7628 (MOD 2) (31 January 2020)

Replicated below are is SSD 7628 (MOD 2) condition B80, with the applicable operational noise limits.

Operational Noise Limits

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 $L_{Aeq,15\ minute}$	Evening $L_{Aeq,15\ minute}$	Night $L_{Aeq,15\ minute}$	Night $L_{A1,\ 1\ minute)}$
Casula	35 dB	35 dB	35 dB	52 dB
Glenfield	35 dB	35 dB	35 dB	52 dB
Wattle Grove	35 dB	35 dB	35 dB	52 dB

Notes:

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 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 $L_{A1,1\ minute}$ 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.

2.2.3 Summary of applicable night-time period noise limits

Based upon a review of the approvals that are currently applicable for the MPW and MPE sites, Table 2-1 provides a summary of the noise limits set for the night time period at each site and its respective stage of development. This summary demonstrates that these limits are not consistent for the MPW and MPE sites. Additionally, some areas across the MPE and MPW have multiple noise limits for each site while others have multiple noise limits that apply cumulatively to both sites combined.

Table 2-1 Applicable noise limits (night period) in the relevant conditions of approval

Project	Wattle Grove	Wattle Grove North	Casula	Glenfield	Applicable to noise from
MPE Stage 1 (SSD 6766)[1]	42	41	38	40	MPE Stage 1
MPE Stage 2 (SSD 7628)[2]	35	35	35	35	MPE Stage 1 +2
MPW Stage 2 (SSD 7709)[3,5,6]	35	35	35	35	MPW[5] + MPE (Stage 1 +2)
MPW Stage 4 (*TBC*)	*TBC*	*TBC*	*TBC*	*TBC*	*TBC*

Notes:
1. Land & Environment Court Appeal No: 2017/81889, Annexure A, Item F5B, SSD 6766, (outcome 13 March 2018) (Court order)
2. CoA B80, SSD 7628 (MOD 2) (31 January 2020)
3. CoA B131, SSD 7709 (11 November 2019)
4. Condition of approval for MPW Concept & Stage 1 (SSD-5066) (Mod 1) (30 October 2019) does not contain numerical operational noise limits
5. The SSD 7709 approval does not include the area in the southern section of MPW shown in the concept plan area, identified as MPW Stage 4.
6. For consistency, NCA 2 is designated Wattle Grove North and NCA 1 is designated Wattle grove in MPE Concept Plan Modification, Review of Noise and Vibration Impacts, Wilkinson Murray, Report No. 12186-MO, Version A, 22 November 2016 (MPE Concept MOD 1 N&V assessment). However, Wattle Grove is a single NCA for MPW EIS noise and vibration assessments.
7. All approval noise limits are applicable under adverse meteorological conditions.

3 First MPW (SSD 7709) development and noise goals

The noise assessment prepared for SSD 6766, SSD 7628 and SSD 7709 during the environmental approval process for the concept plans and subsequent stages of the MPE and MPW developments derived project noise goals in accordance with relevant NSW EPA noise policies and were reviewed by the relevant approval authorities. These assessments also reviewed all feasible and reasonable mitigation measures with the aim of achieving the project noise goals. This process determined that the derived noise goals would be difficult to achieve but could potentially be achieved after exploring all feasible and reasonable mitigation measures. Given that these assessments found it difficult to meet the noise limits determined using the EPA's noise policy, it is unclear through the determination and decision reports accompanying the conditions of approvals (CoA), why the numerical noise limits were then set substantially below (more stringent) to those derived in the noise assessment reports.

Section 5.1 of the NPfI describes that feasible and reasonable mitigation measures and how practical or achievable noise goals are, ought to be taken into consideration when including noise limits in a planning approval.

Fact Sheet F of the NPfI also details what is to be considered when reviewing if mitigation or management measures are feasible and/or reasonable, and also notes:

> *"Project approval conditions that flow from this process should be achievable. They need to provide clarity and confidence for the proponent, local community, regulators and the ultimate operator that the proposed mitigation measures can achieve the predicted level of environmental protection."*

The first development proposed within the MPW for the Woolworths JN & JR site has recently undertaken a noise assessment. As part of the assessment process, and in order for the development to conform to the noise limits that apply cumulatively to the combined MPW and MPE and not take up the entire noise limit, noise quotas were established for the development. These noise quotas were determined in accordance with the noise limits presented in SSD 7709 CoA B131 Table 4.

The detailed noise assessment report (TL265-01F04 DA Acoustic Assessment Construction and Operation (r8), by Renzo Tonin & Associates, dated 25/06/2020) for the first development in MPW, identifies a suite of mitigation measures that have been investigated across the site with the aim of achieving their allocated noise quotas. This assessment incorporated a detailed review of feasible and reasonable on-site mitigation measures with the aim of achieving their noise quota. However, the outcomes from this assessment determined that even with the implementation of all feasible and reasonable mitigation measures, the site noise emissions are unlikely to achieve their allocated noise quotas under adverse meteorological conditions. In addition, noise emissions were also predicted to exceed the noise limits presented in SSD 7709 CoA B131 Table 4, which are applicable to the entire MPW and MPE combined, and not to an individual development within a single precinct. These predicted residual impacts remained, even after multiple workshops with the proponent and tenant to further investigate mitigation measures.

The predicted noise levels for the first development in the MPW have been found to be more consistent with what has been presented in the EIS noise assessments and documentation to date. This recent detailed noise assessment has demonstrated that as a result of the approval condition B131 noise limits being set substantially below the EIS derived noise criteria and below the EIS predicted noise levels, the noise limits cannot practically be achieved. Furthermore, the noise limits in the conditions of approval have been set as cumulative $L_{Aeq\ 15\ minute}$ levels and under adverse meteorological conditions from all noise sources across the approved MPW and MPE development, which exacerbates the problem of not being able to practically achieve the noise limits even after adopting all feasible and reasonable mitigation measures.

4 NPfI noise management precincts

As part of the release of the NPfI in 2017, there was the introduction of noise management precincts. The NPfI precinct approach allows for noise from multiple sites to be managed as a single site, which allows for a more flexible approach towards noise mitigation and management via a "whole of complex" approach, and not being restricted to only mitigating individual sites. Both MPW and MPE are suitable developable sites for the implementation of the noise management precinct approach, as they have the essential elements for a noise management precinct as detailed in Section 2.8.4 of the NPfI, which are detailed below.

Section 2.8 *Noise management precincts* of the NPfI states that a noise management precinct must have the following essential elements:

- *be binding on all relevant parties*
- *have a mechanism for quantifying impacts from new developments in combination with existing noise sources, for example, a noise model*
- *identify a party or mechanism that is responsible for managing the agreed method of noise quantification*
- *identify a party or mechanism for recording transactions*
- *have clear spatial boundaries and be characterised by a common function or activity type as, for example, with ports*
- *ensure that precinct requirements are enforceable through development consent conditions, licence conditions, conservation agreements or contracts.*

All of which are applicable to the MPW and MPE precincts.

It is also noted, that there are a number of shared areas across MPE and MPW (ie. internal distribution roads) that will have noise emissions generated by multiple parties, and as such are difficult to mitigate and manage if they are not considered from an overall precinct approach.

Approaching MPW and MPE as a single precinct for consideration of noise with a single set of overall noise limits is in line with the aims of the NPfI Section 2.8, the SSD 5066 (MOD 1) consent, and the MPW Stage 2 independent review undertaken by the noise and vibration consultant EMM on behalf of the NSW Department of Planning, Industry and Environment (DPIE), Section 5.1.2, which states;

> *The proponent's documentation concedes that from the community's perspective the project (MPW Stage 2) will be viewed as one operation together with MPW Stage 1 and MPE (Stage 1 and Stage 2). Operational noise assessment should therefore consider such an approach. There are precedents in the mining industry for example where this 'whole of complex' approach is adopted which simplifies administration of the site for the proponent and regulator, while also providing added noise benefits to the community. This should and can be readily tested by combining the operational noise predictions presented for all four projects as relevant (eg MPW Stage 1 does not include an operational component).*

As such, this report proposes a 'whole of complex' approach for managing operational noise emissions from the MPW and MPE precincts as a single precinct.

Section 2.8 *Noise management precincts* of the NPfI, states:

> *Within a precinct the source of the noise affecting receivers is managed as a single site. When a new development is proposed, the responsible landowner or entity can use any available method to ensure the precinct meets the recommended amenity noise level. For example, it might be possible to re-locate a new activity in a different area to the original proposal, or to reduce noise levels at other sources in order to accommodate the new activity.*
>
> *In all cases, the principle that all reasonable and feasible means of mitigating noise impacts must be undertaken will remain.*

For MPW and MPE the recommended amenity noise level for the surrounding residential receivers is for a suburban area, which is 40 dB(A) $L_{Aeq\ period}$. Section 2.8 *Noise management precincts* of the NPfI, also states:

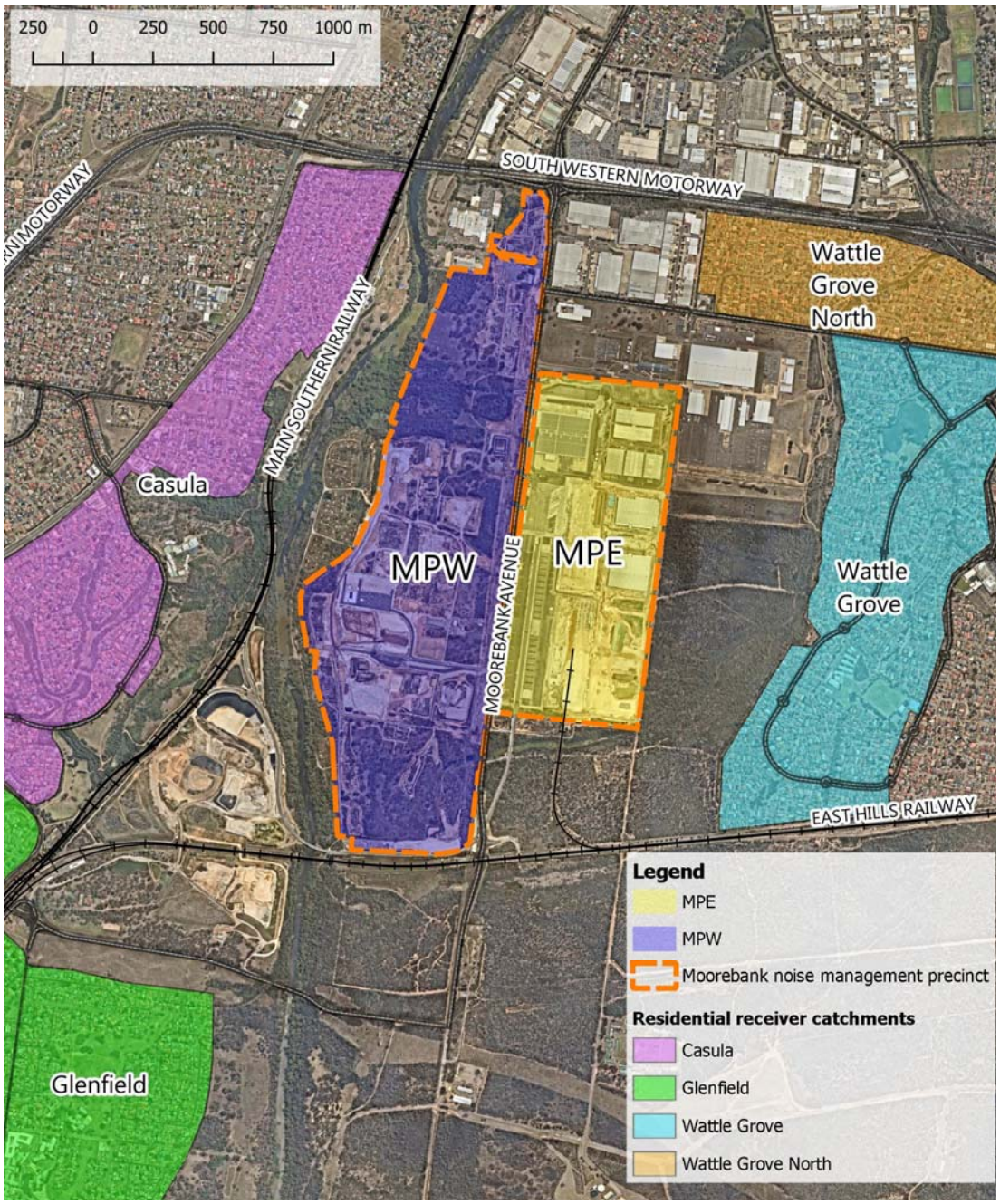
> *A noise management precinct is a form of economic instrument. Economic instruments enable environmental requirements to be achieved at a lower cost than strict controls alone. In the case of a noise management precinct, the options for mitigating or managing noise are increased compared to traditional approaches. The ability to relocate a noise source, or trade or purchase noise mitigation at another site once standard mitigation measures have been applied, can reduce the cost of development when compared to traditional approaches.*

5 Noise management objectives

5.1 Noise management precinct

The noise management precinct would be applicable to the areas shown in Figure 5-1, and so cover the operational noise sources with both the MPW and MPE precincts.

Figure 5-1 Moorebank Noise Management Precinct



5.2 Noise limits

5.2.1 Noise limits review

The following review of noise limits aims to investigate what limits would be appropriate, practical and achievable for managing noise emissions from the Moorebank Noise Management Precinct.

Noting the discrepancies in the currently applicable noise limits for the MPW and MPE sites, the environmental assessment documentation and more recent site data and detailed assessments for the MPW and MPE sites, have been reviewed as part of this proposal for the implementation of a noise management precinct, in order to determine what are appropriate, consistent, practical and achievable noise limits.

The following sections present; background information on the existing noise environment; established background noise levels; the established noise criteria derived during the environmental impacts review stages and the associated predicted noise levels; prevailing meteorological conditions; the issues that were considered by the relevant approval authorities when reviewing the site assessments; and items of note from relevant EPA noise policies.

The following reports have been reviewed as part of the noise limits review.

MPE

- SIMTA Noise Assessment – Concept Plan, Wilkinson Murray, Report No. 12186-C, Version C, 2 August 2013 (MPE Concept N&V assessment)
- MPE Concept Plan Modification, Review of Noise and Vibration Impacts, Wilkinson Murray, Report No. 12186-MO, Version A, 22 November 2016 (MPE Concept MOD 1 N&V assessment)
- SIMTA Stage 1 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S1, Version D, 25 May 2015 (MPE Stage 1 N&V assessment)
- MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016 (MPE Stage 2 N&V assessment)
- MPE Stage 2, CoC B62/B63 noise monitoring report, Wilkinson Murray, Report No. 12186-M2, Version D, 1 February 2018 (MPE B62/B63 noise monitoring report)
- Moorebank Precinct East Stage 2, Noise and vibration independent review, EMM, Report J167102RP1, Version V2, 27 October 2017 (MPE Stage 2 independent noise review)

MPW

- Moorebank Intermodal Terminal EIS- Noise and Vibration Impact Assessment, SLR, Report No. 620.10816, 1 October 2014, Revision 1 (MPW Concept N&V assessment)
- Moorebank Intermodal Terminal, Revised Project Report - Noise and Vibration Impact Assessment, SLR, Report No. 620.10816 R2, 27 April 2015, Revision 0 (MPW Concept N&V revised assessment)
- MPW Concept Plan Modification Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 15324-MO, Version B, 8 June 2016
- MPW Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 15324, Version D, 20 October 2016 (MPW Stage 2 N&V assessment)
- MPW Stage 2 Responses to Submissions – Addendum Impact Assessment -Noise, Wilkinson Murray, Report No. 15324-PA, Version E, May 2017 (MPW Stage 2 RtS N&V assessment)
- Moorebank Precinct West Stage 2, Noise and vibration independent review, EMM, Report J16215RP1, Version V2, 27 October 2017 (MPW Stage 2 independent noise review)

5.2.1.1 Existing noise environment

5.2.1.1.1 Established background noise levels

Substantial noise monitoring has been undertaken at residential areas as part of the assessments at various stages of the environmental impact assessment process. Based upon a review of the previous monitoring presented in the reviewed documents, a summary of the range of background noise levels (Rating Background Levels, RBLs) that were established in accordance with the EPA's noise policy for the MPW and MPE projects are presented in Table 5-1. Included in Appendix B.1, are the range of background noise levels that have been established in accordance with the EPA's noise policies for the EIS noise and vibration assessments.

Table 5-1 Range of monitored background noise levels (RBLs)

Period	Day (7:00am to 6:00pm)	Evening (6:00pm to 10:00pm)	Night (10:00pm to 7:00am)
Wattle Grove	35 - 42	36 – 37	32 – 37
Wattle Grove North	35 – 36 (43) [1]	36 (42) [1]	32 – 36 (37)[1]
Casula	39 – 41	37 – 39 (41) [1]	32– 34 (37) [1]
Glenfield	35 – 44 (45) [1]	37 - 44	33 – 37

Notes: 1. Numbers in brackets are considering the SSD 7628 CoA B62/B63 noise monitoring undertaken December 2017 noise monitoring which were undertaken to verify RBLs at receiver locations, which are outside of the range established in the EIS documentation.

As noted in the MPW Concept N&V Assessment, the background noise levels were generally controlled by the nearby or distant arterial roads across the residential receivers. For all residential areas there was no existing industrial noise audible contributing to the existing noise environment.

It is also noted that these controlling ambient noise sources are unlikely to decrease, noting the nature of these nearby major arterial roads, and that "*Moorebank Avenue is proposed to be the future "spine" road for the area*" (Liverpool Development Control Plan 2008, Part 2.4, Development in Moorebank Defence Lands (updated 19 February 2014)).

As required by CoA B62/B63 of SSD 7628, for the MPE Stage 2, additional noise monitoring was required to be undertaken prior to early works, to verify RBLs at the closest sensitive receivers. This monitoring was for the purposes of reviewing construction noise management levels.

B62. Prior to early works, the Applicant must undertake noise monitoring in accordance with INP to verify RBLs for the closest sensitive receivers.

The results from this review are reproduced below in Table 5-2.

Table 5-2 CoA B62/B63 of SSD 7628 background noise level verification monitoring

Stage	CoA B62/B63 verification monitoring			MPE Stage 2 EIS		
Period	Day	Eve	Ngt	Day	Eve	Ngt
Wattle Grove	39	37	35	42	37	37
Wattle Grove North	43	42	37	36	36	36
Casula	41	41	37	41	37	34
Glenfield	45	42	36	44	44	37

Notes: 1. MPE Stage 2, Noise monitoring report, Wilkinson Murray, Report No. 12186-M2, Version D, 1 February 2018 (MPE Stage 2 noise monitoring report)

The MPE Stage 2 noise monitoring report concluded that the background noise levels were generally consistent with those established in the MPE Concept Plan, even though there were substantial variations measured, and no adjustments were recommended.

It is also noted that in the MPE Concept Plan N&V Assessment Table 5-3, no existing industrial noise was audible in each of the receiver catchments.

5.2.1.1.2 Background noise levels under prevailing meteorological conditions

In reviewing the background noise levels, it was noted that background noise levels were generally controlled by the nearby or distant arterial roads, such as the M5 South-West Motorway for receivers in Casula.

Scenarios can arise where background noise levels at the receiver locations are different from where the noise source is. That is, where there is a worst-case prevailing wind occurring with the source elevated and the receiver shielded from the wind, there is no elevated background noise level from wind moving through nearby vegetation. However, the situation at Moorebank for the MPE and MPW sites is that the main noise sources controlling the background noise levels are the nearby arterial road corridors, which means that for periods when there are increased noise emissions for activities within MPE and MPW due to adverse meteorological conditions, there would likely be a corresponding increase of noise levels from the noise sources controlling background noise levels.

To investigate if this was the case, noise monitoring from permanent monitoring stations that have been established at four (4) locations surrounding the project for the period of winter 2019 (June, July and August) have been reviewed.

In accordance with the NPfI (Fact Sheet A, Section A1) "*The background noise level is defined here as 'the underlying level of noise present in ambient noise, generally excluding the noise source under investigation, when extraneous noise is removed*". It is noted that during the period of noise monitoring that was reviewed, the MPE had been constructed, and mechanical plant serving the offices of the first warehouse (Target) and the IMEX offices may have been operational. However, as these were the only potential noise sources in operation and noting the distance to the nearby receiver from these noise sources, they would not have influenced the measured background noise levels at the permanent monitoring stations. In addition, attended noise monitoring undertaken in February 2020 by RT&A during the night period nearby to these MPE developments observed that noise levels from these site noise sources were barely audible in close proximity, and were not audible when undertaking measurements at the surrounding residential receivers. While the MPW site was under construction during this period, the construction activities were predominately during standard daytime construction hours with only sporadic periods of construction works outside these hours. As such, these activities would not have influenced the analysed evening and night period background noise levels.

Evening and night period (6:00pm to 7:00am) noise levels from permanent monitoring stations located nearby to residential receivers surrounding the MPW and MPE sites were analysed for the period of Winter 2019 (June, July and August), and correlated with data from the Department of Planning, Industry and Environment (DPIE) Liverpool air quality monitoring analysed for periods of worst-case prevailing meteorological conditions (temperature inversion using the sigma-theta method in accordance with the NPfI).

This analysis aimed to determine if there is a difference in background noise levels (L_{A90}) under neutral meteorological conditions compared with when adverse meteorological conditions were present. This analysis is presented in full in Appendix B.2. For the evening and night period the summary of the difference between when neutral meteorological and adverse meteorological is presented in Table 5-3.

Table 5-3 Difference in background noise levels during neutral and adverse meteorological conditions

Location	Difference in median background noise levels – June to August 2019, dB	
	Evening	Night
Casula	1	2
Glenfield	1	1
Wattle Grove	1[2]	2[2]
Wattle Grove North	0	2

Notes:
1. These results are based upon the $L_{A90\ 15\ minute}$ background noise level measurement data for the period of 3 months during June to August 2019. This data was separated into two data sets depending upon if A' to 'E' atmospheric stability class or 'F' or 'G' atmospheric stability class were present, determined based upon data from the Environment (DPIE) Liverpool air quality monitoring station analysed for periods of adverse prevailing meteorological conditions (temperature inversion using the sigma-theta method in accordance with the NPfI). The median level for each hour was calculated for the purpose of determining typical differences between Neutral and Adverse condition levels.
2. Based upon $L_{A90\ 1hour}$ monitoring data

The analysis shows that typically for this project, there is an increase of approximately 1 to 2 dB(A) between background noise levels under neutral meteorological conditions compared with adverse meteorological conditions location dependant. It is noted that adverse and neutral conditions vary in their impact on noise propagation depending upon the distance from source to receiver and the nature of the noise source. As such, both situations should be assessed and are applicable when considering reasonable and feasible mitigation when undertaking design work for a proposal.

5.2.1.2 EIS noise criteria

There are a range of operational noise criteria that were derived across the MPE and MPW submissions. These are summarised in Table 5-4.

Table 5-4 Operational noise criteria established in the environmental impact assessment documentation

Project	Wattle Grove (NCA 1)		Wattle Grove North (NCA 2)		Casula		Glenfield	
	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$
	Day							
MPE[1]	47	55	41	60	46	55	49	55
MPW[2]	40	55	40	55	44	55	40	55
	Evening							
MPE[1]	42	45	41	50	42	45	49	45
MPW[2]	41 (40)[3]	45	41 (40)[3]	45	44	45	42 (40)[3]	45
	Night							
MPE[1]	42	40	41	45	39	40	42	40
MPW[2]	37	40	37	40	38	40	38	40

Notes:
1. MPE criteria sourced from
   a. MPE Concept N&V assessment
   b. MPE Stage 1 N&V assessment
   c. MPE Stage 2 N&V assessment
2. MPW criteria sourced from
   a. MPW Concept N&V assessment
   b. MPW Stage 2 N&V assessment
3. As per the INP Application notes, it is recommended that the intrusiveness noise criteria in the evening should not be greater than during the daytime.

5.2.1.3 EIS predicted noise levels

The predicted noise levels from the Noise and Vibration Impact Assessments that supported the various MPW and MPE applications (SSD 6766, SSD 7628 and SSD 7709) have been compiled and included in Appendix B.4. The two (2) sections outlined below detail the following parameters:

1. the progressive predicted night-time levels ($L_{Aeq\ 15\ minute}$ and $L_{Aeq\ period}$)
2. the predicted cumulative levels ($L_{Aeq\ period}$)

These two (2) sections aim to demonstrate the noise levels that were expected at the environmental assessment stage both from the individual precincts and cumulatively.

5.2.1.3.1 MPW and MPE predicted noise levels

Presented in Table 5-5 are the night-time predicted noise levels for the various stage applications for both the MPW and MPE.

It is noted that the $L_{Aeq\ 15\ minute}$ noise levels are often higher than the converted $L_{Aeq\ period}$ + 3 dB(A) levels, as the intrusive assessment aims to capture a "reasonable worst-case period", while the $L_{Aeq\ period}$ averages the activities that take place over the entire assessment period (ie. night from 10:00pm to 7:00am).

Table 5-5 Night period – Predicted noise levels at residential receiver areas

Stage	EIS predicted (night) Intrusive $L_{Aeq,15min}$	EIS predicted (night) Amenity $L_{Aeq,period}$
Wattle Grove		
MPE Stage 1 (SSD 6766)	39	33
MPE Stage 2 (SSD 7628)	28	23
MPW Stage 2 (SSD 7709)	36	32[2]
MPW 4 (TBC)	-	-
Total (summation)	**41**	**36**
Wattle Grove North		
MPE Stage 1 (SSD 6766)	24	20
MPE Stage 2 (SSD 7628)	20	< 20
MPW Stage 2 (SSD 7709)[3]	36[3]	33[3]
MPW 4 (TBC)	-	-
Total (summation)	**36**	**33**
Casula		
MPE Stage 1 (SSD 6766)	35	33
MPE Stage 2 (SSD 7628)	25	< 20
MPW Stage 2 (SSD 7709)	39	35[2]
MPW 4 (TBC)	-	-
Total (summation)	**41**	**38**
Glenfield		
MPE Stage 1 (SSD 6766)	31	25
MPE Stage 2 (SSD 7628)	< 20	< 20
MPW Stage 2 (SSD 7709)	20	20
MPW 4 (TBC)	-	-
Total (summation)	**32**	**27**

Notes:
1. Under adverse meteorological conditions
2. Exhibited predicted level was 1 dB(A) higher, 36 dB(A) or Casula and 33 dB(A) for Wattle Grove, and was reduced by 1 dB(A) in the response to submissions report.
3. MPW does not separate Wattle Grove North and Wattle Grove, and so the predicted noise level for Wattle Grove has been included to cover both Wattle Grove North and Wattle Grove.

Presented in Table 5-6 is a consolidated summary of the night time period predicted noise levels summed across the MPE and MPW stages based upon the noise and vibration assessments for the various applications.

Table 5-6 Night period – Summary of combined noise levels for MPW and MPE at residential receiver areas

Stage	EIS predicted (night) [1,2] Intrusive $L_{Aeq,15min}$	EIS predicted (night) [1,2] Amenity $L_{Aeq,period}$	Calculated (night) [1,2] (Amenity + 3dB) $L_{Aeq,15min}$
Wattle Grove	41	36	39[2]
Wattle Grove North	36	33	36[2]
Casula	41	38	41[2]
Glenfield	32	27	30[2]

Notes:
1. Noise levels based upon addition of the predictions in included in Table 5-5 and not cumulative noise modelling
2. Under adverse meteorological conditions
3. These have been converted from LAeq,period values to LAeq, 15minute values in accordance with the NPfI approach of LAeq,period + 3dB(A)

The last column in Table 5-6 above shows the $L_{Aeq,15min}$ noise levels calculated for each receiver area through converting the $L_{Aeq\ period}$ by adding 3 dB(A), as per the NPfI. This approach was followed in the cumulative noise assessments presented in the next section.

Table 5-6 shows that the predicted $L_{Aeq,15minute}$ noise levels are similar to the converted noise levels but are higher in some cases. This highlights the noise limits that should be applied considering the NPfI $L_{Aeq,15minute}$ noise descriptor, and the assumptions that surround this. In addition, the data highlights how the $L_{Aeq,15minute}$ intrusive assessment aims to capture a "reasonable worst-case period", while the $L_{Aeq\ period}$ is more representative of average noise levels. This difference is to be considered when setting achievable noise limits, considering concurrent sets of activities, and if it is reasonable for a site to be designed for concurrent activities in the "reasonable worst-case period" period for each site, or for the design to achieve the $L_{Aeq\ period}$ noise level converted to a $L_{Aeq,15minute}$, in line with the NPfI recommendation that "*precinct meets the recommended amenity noise level."* (Section 2.8 *Noise management precincts, NPfI).*

5.2.1.3.2 MPW and MPE summary of cumulative predicted noise levels

The most recent assessment that presents a cumulative assessment to determine the overall impacts which included noise contributions from MPE Stage 1, MPE Stage 2 and MPW Stage 2 is:

- MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016

This assessment states:

It is anticipated that the Proposal site will operate concurrently with the MPE Stage 1 site, and the MPW Stage 2 site. Since the noise sources within the sites are very similar, they are expected to have noise "signatures" which are almost identical. Therefore, it is likely that sensitive receivers will look upon the facilities as a single noise generating activity. Accordingly, the following section presents the predicted

cumulative noise levels from the cumulative operational noise scenario for MPE Stage 1, MPE Stage 2 and MPW Stage 2 facilities, and assesses them against the relevant amenity criteria.

The predicted cumulative noise levels presented in this report are included in Table 5-7, along with the equivalent $L_{Aeq\ 15minute}$ noise level, in accordance with the NPfI. These noise levels include operational activities for MPE Stage 1, MPE Stage 2 and MPW Stage 2, but do not include the future MPW Stage 4.

Table 5-7 Residential receiver predicted cumulative noise levels (MPE Stage 1, MPE Stage 2 and MPW Stage 2)

Location	EIS predicted cumulative noise levels (Amenity - $L_{Aeq,period}$) noise levels[1]					
	Day		Evening		Night	
	$L_{Aeq,period}$	$L_{Aeq,15minute}$[2]	$L_{Aeq,period}$	$L_{Aeq,15minute}$[2]	$L_{Aeq,period}$	$L_{Aeq,15minute}$[2]
Wattle Grove	27	30[2]	27	30[2]	29	32[2]
Wattle Grove North	30	33[2]	30	33[2]	33	36[2]
Casula	33	36[2]	33	36[2]	36	39[2]
Glenfield	22	25[2]	22	25[2]	27	30[2]

Notes: 1. Under adverse meteorological conditions

2. These have been converted from LAeq,period values to LAeq, 15minute values in accordance with the NPfI approach of LAeq,period + 3dB(A).

5.2.1.4 DPIE, Planning Assessment commission (PAC) and Independent Planning Commission (IPC) comments and findings

A review of the following PAC determination reports and the IPC statement of reason for decision reports:

- MPE Stage 1 (SSD 6766) Planning Assessment Commission (PAC) report (12 December 2016)
- MPE Stage 2 (SSD 7628) Planning Assessment Commission (PAC) report (31 January 2018)
- MPW Concept Plan (SSD 5066 MOD 1) Independent Planning Commission (IPC) report (30 October 2019)
- MPW Stage 2 (SSD 7709) Independent Planning Commission (IPC) report (11 November 2019)

Reviewing these determinations and reasons for decision reports, no clear technical basis was provided for setting the noise limits (eg. night 35 dB(A) $L_{Aeq\ 15\ minute}$ at Casula) to be substantially below those that would be derived in accordance with the EPA's noise policies, especially when predicted noise levels were not substantially lower than the EIS noise criteria.

The PAC and IPC reports generally found that the noise impacts predicted in the accompanying Noise and Vibration Assessment Reports for each of the stages for MPW and MPE were generally consistent

with the associated concept plan requirements or predicted impacts or any exceedances or differences were considered negligible or manageable with feasible and reasonable mitigation.

As part of the MPW Stage 2 (SSD 7709) IPC report, it noted that the department had identified a range of conditions to monitor, mitigate and manage potential operational noise impacts, including:

Setting compliance-based operational noise limits, based on predicted noise levels as measured at sensitive receivers.

However, the noise limits set for MPW Stage 2 (SSD 7709) in Table 4 Condition B131 of SSD 7709 condition of approval, are not consistent with any of the predicted noise levels in the EIS Noise and Vibration Assessment Report.

As part of DPIE's review of the EIS documentation for MPW Stage 2 (SSD 7709), the noise and vibration consultant EMM was engaged by DPIE to undertake an independent review of the proposal Noise and Vibration Assessment Report. The MPW Stage 2 independent noise review for DPIE (October 2017), recommended in item 25 of the draft recommended conditions:

The Proponent shall ensure that the noise generated by the overall precinct operations (defined as all activities within the MPW site boundary, together with MPE Stage 1 and Stage 2 areas as shown in Appendix B figures herein) does not exceed the noise impact assessment criteria below at any residence on privately-owned land:

a) Casula - 39 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night;

b) Glenfield - 35 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night; and

c) Wattle Grove - 36 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night.

Despite this advice from the DPIE's consultant, these noise levels were not adopted in the Table 4 Condition B131 of SSD 7709.

Similarly, as part of DPIE's review of the EIS documentation for MPE Stage 2 (SSD 7628), the noise and vibration consultant EMM was engaged by DPIE to undertake an independent review of the proposal Noise and Vibration Assessment Report. EMM also noted the disparities between the RBL values that were set between the MPE and MPW assessments. The MPE Stage 2 independent noise review for DPIE (October 2017), recommended in item 14 of the draft recommended conditions:

The Proponent shall ensure that the noise generated by the overall operations does not exceed the noise impact assessment criteria below at any residence on privately-owned land:

a) Casula

i) 35 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for MPE alone; and

ii) 39 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for the precinct (MPE and MPW).

b) Glenfield - 35 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for the precinct (MPE and MPW); and

c) Wattle Grove

i) 35 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for MPE alone; and

ii) 36 dB $L_{Aeq,15minute}$ for the day, evening and night time periods and 45 dB $L_{A1,1minute}$ during the night for the precinct (MPE and MPW).

The precinct is defined as all activities within the MPE site boundary (stage 1 and 2), together with MPW areas as shown in Appendix B figures herein.

Similarly to MPW, despite this advice from the DPIE's consultant, these noise levels were not adopted in the Table 5 Condition B80 of SSD 7628, which only applies to MPE.

As part of the MPE Stage 2 (SSD 7628) PAC report it was noted that:

The Department's assessment did not raise significant issue with the potential operational noise that would result from the application. Nevertheless, the Department recommended conditions to ensure that the applicant could not exceed the modelled noise impacts so that there would be sufficient protection to sensitive receivers.

However, as detailed in Section 3 of this report, by setting noise limits substantially below the levels that are predicted in the EIS, it is possible that even through a detailed implementation of all feasible and achievable mitigation measures, that these noise levels may not be practicable or achievable, especially when set as cumulative noise limits for an $L_{Aeq\ 15\ minute}$ period.

It is also noted that all cumulative assessments undertaken for the project proposals (except for the case in MPE Stage 2 N&V assessment which reviewed MPE Stage 1 & MPE Stage 2) only considered the whole of night (10:00pm to 7:00am) amenity period and not a 15 minute period $L_{Aeq\ 15\ minute}$ level, which is an accepted approach consistent with the EPA's noise policies. However, Table 4 Condition B131 of SSD 7709 deviates from this accepted approach.

5.2.1.5 Prevailing meteorological conditions

In accordance with the NSW EPA's noise policies, any industrial noise assessment should consider the effects of adverse meteorological conditions such as prevailing wind and temperature inversions.

The NPfI permits two (2) approaches for assessing these effects: use of default parameters and use of site-specific parameters.

- When using default parameters, general meteorological values are used to predict noise levels, foregoing detailed analyses of site-specific meteorological data. This approach assumes that meteorological effects are conservative, in that it is likely to predict the upper range of increases in noise levels. Actual noise levels may be less than predicted.

- The use of site-specific parameters is a more detailed approach, which involves analysing site meteorological data to determine whether inversion and/or wind effects are significant features warranting assessment. Where assessment is warranted, default parameters are available for use in predicting noise or, where preferred, measured values may be used instead. The use of site-specific parameters provides a more accurate prediction of noise increases due to meteorological factors.

Determined in both the MPE Stage 1 N&V assessment and the MPW Concept N&V assessment, were that temperature inversions were likely during the night period. Both assessments also assessed for the potential of prevailing gradient winds, and determined it was likely and adopted a conservative approach consistent with the INP default parameters.

An analysis of recent meteorological data for likely occurrence frequency of temperature inversions and wind effects has been carried in accordance with the NPfI. Meteorological results have been taken from the DPIE Liverpool air quality monitoring station. A review of 2017, 2018 and 2019 was undertaken to determine typical years. Meteorological conditions representative for the assessment have been reviewed to determine the prevailing wind and temperature inversion conditions. The analyses of the meteorological conditions are summarised below.

5.2.1.5.1 Wind effects

The NPfI specifies a procedure for assessing the significance of wind effects, and a default wind speed to be used in the assessment where these effects are found to be significant. The procedure requires that wind effects be included in the noise assessment where wind is a feature of the area. The assessment considers each of the four seasons and assessment periods (day, evening, and night) individually.

Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 0.5 to 3 metres per second (m/s) occur for 30% of the time or more in any assessment period (day, evening and night) in any season. Winds with velocities less than 0.5 m/s (calm conditions) and greater than 3 m/s (at 10 m height), are not included in the calculations of wind occurrence.

Analysis of the wind data was undertaken using the EPA's Noise Enhancement Wind Analysis program to determine if wind is a 'feature' of the area as defined by the NPfI. The program determines whether there are prevailing source-to-receiver wind conditions. The results from the highest values in the analysis across the three year period (2017 to 2019) are presented in Table 5-8 below.

Table 5-8 Percentage of wind direction (ie. direction wind came from) (up to 3 m/s), %

Direction	Summer			Autumn			Winter			Spring		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
N	18.2	7.5	8.6	21.7	6.0	4.7	12.8	6.8	5.6	15.9	6.3	6.5
NNE	21.0	17.8	9.0	21.0	10.6	3.7	12.0	7.1	4.6	18.5	15.9	6.0
NE	24.2	28.6	12.5	20.3	16.0	3.1	8.3	5.4	2.3	18.9	22.5	7.0
ENE	22.2	**38.9**	15.6	19.6	20.1	5.0	8.6	6.0	1.1	17.0	30.2	7.1
E	19.7	**46.7**	17.5	20.4	23.4	6.2	7.9	6.8	0.5	16.8	**39.6**	7.8
ESE	25.7	**51.4**	22.3	23.5	25.0	6.9	12.4	6.0	0.8	21.3	**42.0**	9.0
SE	24.4	**48.3**	26.7	27.1	27.7	7.1	16.6	5.2	1.3	19.9	**34.6**	9.3
SSE	18.1	**35.7**	21.7	22.9	21.7	7.4	13.9	2.7	1.3	17.6	24.5	7.3
S	18.3	**30.6**	27.7	22.7	29.6	20.5	18.9	14.4	7.4	18.5	27.2	15.8
SSW	10.9	21.1	**33.0**	27.4	**37.2**	**35.9**	26.6	**31.8**	28.3	12.2	23.6	**31.5**
SW	8.2	14.4	30.4	27.2	**44.0**	**57.2**	**30.1**	**48.9**	**55.8**	11.3	20.9	**41.1**
WSW	8.3	9.2	25.6	26.7	**40.2**	**60.3**	**35.3**	**51.1**	**62.2**	13.7	15.9	**41.8**
W	8.6	6.7	20.7	23.5	**32.6**	**50.5**	**36.8**	**47.3**	**60.3**	15.6	16.2	**37.2**
WNW	9.3	3.4	9.9	18.6	17.1	**31.5**	28.1	**32.1**	**41.2**	14.5	9.6	24.3
NW	11.0	3.3	6.8	19.1	7.6	12.3	24.3	14.1	14.5	16.8	6.9	8.8
NNW	14.8	3.1	7.0	20.5	6.8	6.0	17.7	7.6	7.7	16.6	4.7	6.3

Notes Bold denotes greater than 30% occurrence of wind scenario.

Figure 5-2 Summary of prevailing winds (based upon NPfI assessment considering winds up to 3 m/s for greater than 30% of the time in any assessment period in any season)

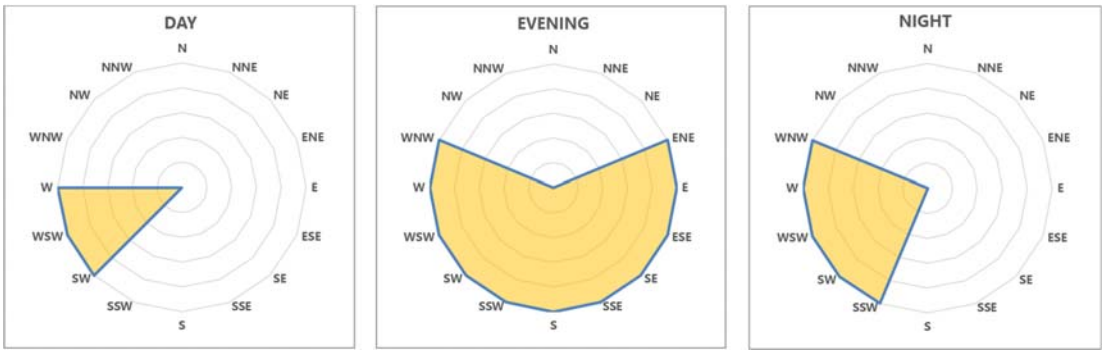


Table 5-8 and Figure 5-2 above show the following:

- **Day**: For the day period there is only prevailing wind potentially impacting receivers in the Wattle Grove and Wattle Grove North areas. There is no prevailing wind from the easterly direction affecting receivers to the west and south of the site (ie in Casula and Glenfield respectively).
- **Evening**: For the evening period there is only prevailing wind potentially impacting receivers in the Wattle Grove, Wattle Grove North and Casula areas. There is no prevailing wind from the northerly direction affecting receivers to the south of the site (ie Glenfield).
- **Night**: For the critical night period there is no prevailing wind from the easterly direction affecting receivers to the west and south of the site (ie in Casula and Glenfield respectively). However, at night there are prevailing winds potentially affecting receivers in the Wattle Grove and Wattle Grove North areas.

5.2.1.5.2 Temperature inversions

During the winter night-time period for 2017, 2018 and 2019 temperature inversion conditions were calculated based upon the sigma-theta method referred to in Part E4 of Appendix E to the NSW INP. Based upon this method, it was determined that temperature inversions (Stability Class F/G) occurred for more than 30% of the winter month night time periods.

On the basis of the assessment temperature inversion noise enhancing adverse meteorological effects are to be considered as a prevailing meteorological condition, and are to be included in assessment of noise impacts (modelled or monitored), in accordance with the NPfI requirements.

5.2.1.5.3 Summary of meteorological assessment conditions

Table 5-9 presents a summary of the meteorological conditions to be considered for the assessment and monitoring for the Moorebank Noise Management Precinct.

Table 5-9 Summary of applicable meteorological assessment conditions

Period	Meteorological assessment conditions
Day	Calm/neutral
	Noise enhancing wind directions: SW, WSW, W
Evening	Calm/neutral
	Noise enhancing wind directions: ENE, E, ESE, SE, SSE, S, SSW, SW, ESE, WSW, W, WNW
	Temperature inversion: 'F' atmospheric stability class
Night	Calm/neutral
	Noise enhancing wind directions: SSW, SW, WSW, W, WNW
	Temperature inversion: 'F' atmospheric stability class

5.2.1.6 EPA NPfI project trigger levels

The NPfI notes the following:

The project intrusiveness noise level aims to protect against significant changes in noise levels, whilst the project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses.

As such, in line with the cumulative assessment in each of the EIS noise and vibration assessments, the project amenity noise level is the appropriate metric to use when reviewing cumulative operational impacts. While, for any individual development, it is important to consider the potential intrusive impacts for developments across the MPW and MPE sites, total or cumulative noise from all the sites should only be viewed in terms of amenity $L_{Aeq,\ period}$ noise levels.

5.2.1.6.1 NPfI amenity noise levels

Section 2.4.2 of the NPfI "*Amenity noise levels in areas near an existing or proposed cluster of industry*", notes:

*The recommended amenity noise level from Table 2.2 represents the **total** industrial noise level from all sources (new and proposed) that is sought to be achieved using feasible and reasonable controls…*

Where an existing cluster of industry, for example, an industrial estate or port area, is undergoing redevelopment and/or expansion and the development constitutes a single premises addition or expansion, with no other redevelopment planned in the foreseeable future, the project amenity noise level approach procedure in Section 2.4 can be applied.

It is also noted that in the MPE Concept Plan N&V assessment Table 5-3, no existing industrial noise was audible in each of the receiver catchments. Therefore, in accordance with Section 2.4 of the NPfI the following applies:

Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development.

Based upon this guidance and noting that MPW and MPE would be managed as a single precinct, and there is no other existing industrial noise significantly contributing to these same receivers, the overall precinct amenity noise level would be 40 dB(A) from Table 2.2 of the NPfI without any correction for additional existing industrial noise.

Converting this to a $L_{Aeq15min}$ value (as per Section 2.2 NPfI), which is $L_{Aeq,\ period}$ + 3 dB(A) would mean that the amenity trigger level is 43 dB(A) $L_{Aeq15min}$ for the overall Moorebank Noise Management Precinct.

5.2.1.6.2 NPfI intrusive noise levels

The range of background noise levels that have been established for the project are detailed in Appendix B.1. As per the NPfI, an intrusive project trigger level should be established as 5 dB(A) above the RBL level.

5.2.2 Noise limit considerations

Following a review of the existing noise limits, noise predictions and the appropriate limits in accordance with the EPA noise policies across all the project stages and areas, there are a range of factors that are to be considered when harmonising the Moorebank Noise Management Precinct's cumulative noise limits. A range of potential options for noise limits, with the supporting reason, for the example receiver area of Casula during the night period, is presented in Table 5-10.

Table 5-10 Summary of noise limit options at example receiver area of Casula (night)

Noise limit	Justification	Reference section
Casula		
43 dB(A) $L_{Aeq\ 15\ minute}$	Section 2.8 *Noise management precincts* of the NPfI	Section 4
42 dB(A) $L_{Aeq\ 15\ minute}$	1. Summed MPE1/MPE2/MPW predicted intrusive $L_{Aeq\ 15minute}$	Table 5-6
	2. Intrusive criteria based upon SSD 7628 CoA B62/B63 verification monitoring Dec 2017	Table 5-2
41 dB(A) $L_{Aeq\ 15\ minute}$	Summed MPE1/MPE2/MPW predicted amenity $L_{Aeq,\ period}$ + 3 dB(A)	Table 5-6
40 dB(A) $L_{Aeq\ 15\ minute}$	1. Amenity noise level, without correction to 15 minutes (Section 2.8 NPfI)	Table 5-4
	2. MPW intrusive criteria + 2 dB(A), approximate difference between RBL for neutral and adverse met for Casula receivers	Table 6-3
39 dB(A) $L_{Aeq\ 15\ minute}$	1. MPE EIS intrusive criteria	Table 5-4
	2. MPE Stage 2 MPE1/MPE2/MPW predicted cumulative amenity period + 3 dB(A)	Table 5-7
	3. MPW Stage 2 independent review (EMM) recommended level	Section 5.2.1.4
	4. MPE Stage 2 independent review (EMM) recommended level	Section 5.2.1.4
	5. MPW Stage 2 $L_{Aeq\ 15minute}$ predicted level	Table 6-5
	6. MPW Stage 2 $L_{Aeq\ period}$ predicted level + 3 dB(A)	Table 5-7
	7. In line with the current permanent monitoring adverse meteorological condition L_{A90} levels + 5 dB(A)	Table 6-3s
38 dB(A) $L_{Aeq\ 15\ minute}$	1. MPE concept plan predicted (MPE alone (original))	Table 6-5
	2. MPW EIS intrusive criteria	Table 5-4
	3. CoA noise limit - MPE Stage 1 SSD 6766 only (Land & Environment Court outcome dated: 13 March 2018)	Section 2.2.2.1
	4. In line with the current permanent monitoring (neutral met) L_{A90} levels + 5dB(A)	Table 6-3

Notes 1. These have been converted from LAeq,period values to LAeq, 15minute values in accordance with the NPfI approach of LAeq,period + 3dB(A).

All of the information summarised in Table 5-10 has been considered when recommending the noise limits presented in Section 5.2.3.

5.2.3 Recommended MPW & MPE overall precinct management noise limit levels

The Responsible entity is in the process of establishing a quota/budget system to manage the cumulative noise emission obligations across the MPE and MPW sites under the respective approvals. To do this effectively, it is recommended to harmonise the applicable noise limits.

It is also noted, that there are a number of shared areas (ie. internal distribution roads) that will have noise emissions generated by multiple parties, and as such very difficult to mitigate if not considered from an overall precinct approach.

Considering the various information presented in Section 5.2.1 noise limits review and Section 5.2.2 noise limit considerations, the noise limits presented in Table 5-11 are recommended for the Moorebank Noise Management Precinct, to cover all operational activities within MPW and MPE.

The key reasons for selecting these noise limits are:

- Consistency across the MPE and MPW
- In line with the criteria derived in accordance with the NPfI
- A more stringent approach than adopting the amenity criteria directly as per NPfI recommended approach for cumulative industrial scenarios has been taken
- In line with the criteria established in the EIS documentation to date
- Includes noise limits for the critical Casula area that are in line with those recommended in the independent review undertaken by EMM for the DPIE for SSD 7709 and SSD 7628
- Consistent with the predicted noise levels in the EIS documentation to date, with the implementation of feasible and reasonable mitigation measures. As such, would not result in worst outcomes for any receivers compared to what was assessed and accepted in the EIS documentation to date
- Consistent with recent noise monitoring data considering the prevailing meteorological conditions.

Table 5-11 Moorebank Noise Management Precinct cumulative noise limits

Location (residential receivers)	Day $L_{Aeq,\ 15\ minute}$	Evening $L_{Aeq,\ 15\ minute}$	Night $L_{Aeq,\ 15\ minute}$	Night $L_{A1,\ 1\ minute}$
Casula	46	44	39	52
Glenfield	49	46	42	52
Wattle Grove	44	42	42	52
Wattle Grove North	41	41	41	52

These noise limits would apply to relevant operational noise sources within the boundary shown in Figure 5-1.

The noise limits would apply under the assessment meteorological conditions presented in Section 5.2.1.5.

5.3 Other relevant items

5.3.1 Relevant NSW EPA policy

The NSW Industrial Noise Policy (EPA 2000) was withdrawn in November 2017 and replaced by the Noise Policy for Industry (EPA 2017). Each of the applicable approval conditions reference the relevant government policies as follows:

The current latest MPE conditions of approval:

- MPE Stage 1 SSD 7628 (MOD 2) (31 January 2020) refers to the NSW Industrial Noise Policy (INP) (NSW EPA 2000), but notes *(as may be updated from time to time)*.
- MPE Stage 2 SSD 7628 (MOD 2) (31 January 2020) refers to the NSW Industrial Noise Policy (INP) (NSW EPA 2000).

The current latest MPW condition of approvals

- MPW Concept Proposal and Stage 1 SSD 5066 (MOD 1) (dated 30 October 2019) makes no reference to either INP or NPfI
- MPW Stage 2 SSD 7709 (11 November 2019)] refers to the NSW Noise Policy for Industry (NPfI) (NSW EPA 2017).

It is recommended that the overall noise management precinct be undertaken with consideration of the NSW Noise Policy for Industry (NPfI) (NSW EPA 2017).

By adopting the NPfI for the noise management precinct, this would assist with consistency with the NSW EPA document *Implementation and transitional arrangements for the Noise Policy for Industry (2017)*, points 5, 7 and 8, presented below:

> *5. Modification to a planning approval:*
>
> *a. where the planning authority requires a noise impact assessment to support the modification; or,*

…

> *7. Where application of the policy is triggered through the above circumstances and processes the policy is to be applied in full. The Noise Policy for Industry (2017) is designed to be used in its*

entirety and 'cherry picking' or 'mix and match' between the NSW Industrial Noise Policy (2000) and Noise Policy for Industry (2017) will not be accepted.

8. *The NSW Industrial Noise Policy (2000) will continue to apply where it is referenced in existing statutory instruments (such as consents and licences), except for the NSW Industrial Noise Policy Section 4 modifying factors, which will be transitioned to the Noise Policy for Industry (2017) Fact Sheet C through a NSW Industrial Noise Policy application note. This approach has been taken because the Noise Policy for Industry (2017) modification factor approach reflects more recent understanding of the impact of tonal and low-frequency noise on the community.*

6 Conclusion

Renzo Tonin & Associates (RT&A) was engaged by Woolworth Pty Ltd (Woolworths) to provide a review of the operational noise requirements for the Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) in accordance with SSD 7709 consent as part of the modification application for the MPW Woolworths JN & JR site for the consideration of managing cumulative operational noise.

The applicable approval conditions for the MPW and MPE require the management of cumulative operational noise impacts on nearby residential receivers. This involves managing the cumulative operational noise from both sites, for which an approach consistent with the NSW Noise Policy for Industry (NPfI) *Section 2.8 Noise management precincts* is proposed, which is the intent of MPW Concept approval (SSD 5066) conditions E28 "*Cumulative Impacts*" and E29 "*Interaction between MPW and MPE sites*".

There are a number of approval conditions that are applicable across these MPW and MPE sites. In the application of these approvals to the site activities it has become apparent that the requirements are not consistent across the MPE and MPW sites. Additionally, the requirements in the Conditions of Consent for SSD 7709 Condition B131 were set substantially below both the noise criteria and the predicted noise levels (even with feasible and reasonable mitigation measures) established during the environmental assessment stages, and do not allow for clear management as an overall noise generating development, as would be perceived by nearby receivers.

This report has reviewed the project documentation and relevant project data, and recommends:

- an overall approach for cumulative operational noise management of the Moorebank intermodal terminal precinct (for East and West precinct) for a "whole of complex" approach that would allow for a clearer, effective, consistent and flexible way of managing and mitigating noise emissions across the MPW and MPE precincts to allow them to be used in a safe and efficient manner; and
- noise management objectives for the Moorebank intermodal terminal precinct which are consistent across MPE and MPW, are consistent with EPA's noise policy, are appropriate and are achievable.

In conclusion, it is recommended that Table 4 of Condition B131 in SSD 7709 be modified to reflect the noise limits set out in Table 6-1 below.

Table 6-1 Moorebank Noise Management Precinct cumulative operational noise limits

Location (residential receivers)	Day $L_{Aeq,\ 15\ minute}$	Evening $L_{Aeq,\ 15\ minute}$	Night $L_{Aeq,\ 15\ minute}$	Night $L_{A1,\ 1\ minute}$
Casula	46	44	39	52
Glenfield	49	46	42	52
Wattle Grove	44	42	42	52
Wattle Grove North	41	41	41	52

These modified noise limits would apply to the relevant operational noise sources within the Moorebank Noise Management Precinct boundary shown in Figure 5-1. These modified noise limits would apply under the prevailing meteorological conditions presented in Section 5.2.1.5.

References

[1] NSW Environment Protection Authority 2017, *Noise Policy for Industry* (NPfI)

[2] NSW Environment Protection Authority 2000, *Industrial Noise Policy* (INP)

[3] NSW Environment Protection Authority 2000, *Applying the NSW Industrial Noise Policy (2000) - application notes*

[4] NSW Environment Protection Authority 2017, *Implementation and transitional arrangements for the Noise Policy for Industry*

MPE

[5] Wilkinson Murray, 2013, *SIMTA Noise Assessment – Concept Plan*, Report No. 12186-C, Version C, 2 August 2013

[6] Planning Assessment Commission, 2014, *MPE Concept Plan (MP10_0193) (PAC) report*, 29 September 2014

[7] Wilkinson Murray, 2016, *MPE Concept Plan Modification - Review of Noise and Vibration Impacts*, Report No. 12186-MO, Version A, 22 November 2016

[8] Wilkinson Murray, 2015, *SIMTA Stage 1 Noise and Vibration Impact Assessment*, Report No. 12186-S1, Version D, 25 May 2015

[9] Planning Assessment Commission, 2016, *MPE Stage 1 (SSD 6766) Planning Assessment Commission (PAC) report*, 12 December 2016

[10] Wilkinson Murray, 2016, *MPE Stage 2 Noise and Vibration Impact Assessment*, Report No. 12186-S2, Version C, 29 November 2016

[11] EMM, 2017, *Moorebank Precinct East Stage 2, Noise and vibration independent review*, Report J17102RP1, Version V2, 27 October 2017

[12] Planning Assessment Commission, 2018, *MPE Stage 2 (SSD 7628) Planning Assessment Commission (PAC) report*, 31 January 2018

[13] Wilkinson Murray, 2018, *MPE Stage 2 CoC B62/B63 noise monitoring report*, Report No. 12186-M2, Version D, 1 February 2018

MPW

[14] SLR, 2014, *Moorebank Intermodal Terminal EIS- Noise and Vibration Impact Assessment*, Report No. 620.10816, 1 October 2014, Revision 1

[15] SLR, 2015, *Moorebank Intermodal Terminal, Revised Project Report - Noise and Vibration Impact Assessment*, Report No. 620.10816 R2, 27 April 2015, Revision 0

[16] Wilkinson Murray, 2016, *MPW Concept Plan Modification Noise and Vibration Impact Assessment*, Report No. 15324-MO, Version B, 8 June 2016

[17] Independent Planning Commission, 2019, *MPW Concept Plan (SSD 5066 MOD 1) Independent Planning Commission (IPC) report*, 30 October 2019

[18] Wilkinson Murray, 2016, *MPW Stage 2 Noise and Vibration Impact Assessment*, Report No. 15324, Version D, 20 October 2016

[19] Wilkinson Murray, 2017, *MPW Stage 2 Responses to Submissions – Addendum Impact Assessment - Noise*, Report No. 15324-PA, Version E, May 2017

[20] EMM, 2017, *Moorebank Precinct West Stage 2, Noise and vibration independent review*, Report J16215RP1, Version V2, 27 October 2017

[21] Independent Planning Commission , 2019, *MPW Stage 2 (SSD 7709) Independent Planning Commission (IPC) report*, 11 November 2019

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 (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.

Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{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 Environmental assessment data review

B.1 Environmental assessment established background noise levels

Based upon this review of environmental approvals stage noise and vibration assessments for the MPE and MPW sites, a summary of the range of background noise levels that have been established in accordance with the EPA's noise policies are presented in Table 6-2.

Table 6-2 Range of RBL levels adopted for the EIS assessments

Period	Day (7:00am to 6:00pm)		Evening (6:00pm to 10:00pm)		Night (10:00pm to 7:00am)	
Project	**MPE**	**MPW**	**MPE**	**MPW**	**MPE**	**MPW**
Wattle Grove	42[1,2,3]	35[4,5,6]	37[1,2,3]	36[4,5,6]	37[1,2,3]	32[4,5,6]
Wattle Grove North	36[1,2,3]	35[4,5,6]	36[1,2,3]	36[4,5,6]	36[1,2,3]	32[4,5,6]
Casula	41[1,2,3]	39[4,5]	37[1,2,3]	39[4,5]	34[1,2,3]	33[4,5]
Glenfield	44[1,2,3]	35[4,5]	44[1,2,3]	37[4,5]	37[1,2,3]	33[4,5]

Notes:
1. MPE Concept Plan - SIMTA Noise Assessment – Concept Plan, Wilkinson Murray, Report No. 12186-C, Version C, 2 August 2013
2. MPE Stage 1 SIMTA Stage 1 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S1, Version D, 25 May 2015, based upon MPE Concept Plan
3. MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016. based upon MPE Concept Plan
4. MPW Concept and Stage 1 –
   a. Moorebank Intermodal Terminal EIS- Noise and Vibration Impact Assessment, SLR, Report No. 620.10816, 1 October 2014, Revision 1. Based upon the continuous noise monitoring survey over 20 months.
   b. Moorebank Intermodal Terminal, Revised Project Report - Noise and Vibration Impact Assessment, SLR, Report No. 620.10816 R2, 27 April 2015, Revision 0. Logging is based upon the levels adopted in Table 10 of the report.
5. MPW Stage 2 - MPW Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 15324, Version D, 20 October 2016
6. Wattle Grove and Wattle Grove North are not separated in the MPW noise and vibration assessments

B.2 Background noise levels under prevailing meteorological conditions

Presented in Table 6-3, are the monitoring results, analysis to determine the background noise levels of each hour period, based upon 3 months of data (June to August 2019) that are either separated into data sets where either A' to 'E' atmospheric stability class or 'F' or 'G' atmospheric stability class, and the median levels of this data set determined, for the purpose of determining typical differences between Neutral and Adverse condition levels.

Table 6-3 Difference in background noise levels during adverse meteorological conditions (Night)

Time period	Median background noise level values – June to August 2019		
	Neutral meteorological conditions 'A' to 'E' atmospheric stability class	Adverse meteorological conditions 'F' or 'G' atmospheric stability class	Difference, dB
Casula			
6:00pm to 7:00pm	44.0	44.6	0.6
7:00pm to 8:00pm	43.6	44.2	0.6
8:00pm to 9:00pm	42.5	44.4	1.8
9:00pm to 10:00pm	41.2	43.7	2.5
10:00pm to 11:00pm	39.6	42.1	2.5
11:00pm to 12:00am	38.2	41.4	3.2
12:00am to 1:00am	37.4	38.4	1.0
1:00am to 2:00am	35.9	37.4	1.5
2:00am to 3:00am	35.5	37.4	1.9
3:00am to 4:00am	36.5	37.9	1.5
4:00am to 5:00am	38.7	40.4	1.7
5:00am to 6:00am	42.3	43.0	0.7
6:00am to 7:00am	45.5	44.9	-0.6
Median (Evening)	**43.1**	**44.3**	**1.2**
Median (Night)	**38.2**	**40.4**	**1.5**
Glenfield			
6:00pm to 7:00pm	47.8	47.0	-0.8
7:00pm to 8:00pm	45.9	46.3	0.5
8:00pm to 9:00pm	45.0	45.5	0.5
9:00pm to 10:00pm	45.0	46.0	1.1
10:00pm to 11:00pm	42.8	44.4	1.6
11:00pm to 12:00am	39.7	42.3	2.6
12:00am to 1:00am	39.0	39.8	0.8
1:00am to 2:00am	36.5	37.8	1.3
2:00am to 3:00am	35.7	36.9	1.1
3:00am to 4:00am	37.7	38.0	0.3
4:00am to 5:00am	40.7	42.7	2.0
5:00am to 6:00am	47.1	48.2	1.1
6:00am to 7:00am	51.0	51.1	0.1
Median (Evening)	**45.4**	**46.2**	**0.5**
Median (Night)	**39.7**	**42.3**	**1.1**

Time period	Median background noise level values – June to August 2019		
	Neutral meteorological conditions 'A' to 'E' atmospheric stability class	Adverse meteorological conditions 'F' or 'G' atmospheric stability class	Difference, dB
Wattle Grove[2]			
6:00pm to 7:00pm	44.3	42.5	-1.8
7:00pm to 8:00pm	44.0	43.8	-0.2
8:00pm to 9:00pm	43.4	45.4	2.0
9:00pm to 10:00pm	42.7	45.6	2.8
10:00pm to 11:00pm	42.3	44.9	2.6
11:00pm to 12:00am	40.5	42.8	2.3
12:00am to 1:00am	40.0	41.6	1.7
1:00am to 2:00am	38.4	40.1	1.7
2:00am to 3:00am	38.9	39.8	0.9
3:00am to 4:00am	39.6	40.2	0.6
4:00am to 5:00am	41.3	43.0	1.7
5:00am to 6:00am	44.3	45.8	1.5
6:00am to 7:00am	47.6	47.1	-0.5
Median (Evening)	**43.7**	**44.6**	**0.9**
Median (Night)	**40.5**	**42.8**	**1.7**
Wattle Grove North			
6:00pm to 7:00pm	49.0	46.9	-2.1
7:00pm to 8:00pm	48.6	47.4	-1.2
8:00pm to 9:00pm	47.8	48.2	0.4
9:00pm to 10:00pm	47.2	48.5	1.3
10:00pm to 11:00pm	45.5	47.9	2.5
11:00pm to 12:00am	43.4	45.8	2.4
12:00am to 1:00am	43.0	43.5	0.5
1:00am to 2:00am	41.1	42.3	1.3
2:00am to 3:00am	39.8	43.7	3.9
3:00am to 4:00am	42.3	44.0	1.8
4:00am to 5:00am	44.7	47.0	2.3
5:00am to 6:00am	49.5	49.6	0.1
6:00am to 7:00am	51.2	51.9	0.7
Median (Evening)	**48.2**	**47.8**	**-0.4**
Median (Night)	**43.4**	**45.8**	**1.8**

Notes:
1. Noise levels are based upon the $L_{A90\ 15\ minute}$ background noise level measurement data for the period of 3 months during June to August 2019 at the permanent monitoring stations established for MPE. This data was separated into two data sets depending upon if A' to 'E' atmospheric stability class or 'F' or 'G' atmospheric stability class were present, determined based upon data from the Environment (DPIE) Liverpool air quality monitoring station analysed for periods of adverse prevailing meteorological conditions (temperature inversion using the sigma-theta method in accordance with the NPfI). The median level for each hour was calculated for the purpose of determining typical differences between Neutral and Adverse condition levels.
2. Based upon $L_{A90\ 1hour}$ monitoring data

B.3 Environmental assessment criteria

There are a range of operational noise criteria that were derived across the MPE and MPW submissions. These are summarised in Table 6-4.

Table 6-4 Operational noise criteria established in the environmental impact assessment documentation

Project	Wattle Grove (NCA 1)		Wattle Grove North (NCA 2)		Casula		Glenfield	
Day	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$
MPE Concept Plan (MP10_0193-MOD2)	47	55	41	60	46	55	49	55
MPE Stage 1 (SSD 6766)[1]								
MPE Stage 2 (SSD 7628)[2]								
MPW Concept & Stage 1 (SSD 5066 MOD 1)[3,5]	40	55	40	55	44	55	40	55
MPW Stage 2 (SSD 7709)[3,5]								
Evening	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$
MPE Concept Plan (MP10_0193-MOD2)	42	45	41	50	42	45	49	45
MPE Stage 1 (SSD 6766)[1]								
MPE Stage 2 (SSD 7628)[2]								
MPW Concept & Stage 1 (SSD 5066 MOD 1)[3,5]	41 (40)[8]	45	41 (40)[8]	45	44	45	42 (40)[8]	45
MPW Stage 2 (SSD 7709)[3,5]								
Night	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$	$L_{Aeq,15min}$	$L_{Aeq,period}$
MPE Concept Plan (MP10_0193-MOD2)	42	40	41	45	39	40	42	40
MPE Stage 1 (SSD 6766)[1]								
MPE Stage 2 (SSD 7628)[2]								
MPW Concept & Stage 1 (SSD 5066 MOD 1)[3,5]	37	40	37	40	38	40	38	40
MPW Stage 2 (SSD 7709)[3,5]								

Notes:

1. MPE Concept Plan modification, Review of Noise and Vibration Impacts, Wilkinson Murray, Report No. 12186-MO, Version A, 22 November 2016
2. SIMTA Stage 1 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S1, Version D, 25 May 2015
3. Item F5B, SSD 6766 - Appeal No: 2017/81889, (outcome 13 March 2018) (Court order)
4. CoA B80, SSD 7628 (MOD 2) (31 January 2020)
5. CoA B131, SSD 7709 (11 November 2019)
6. MPW Concept & Stage 1 (SSD-5066) (Mod 1) (30 October 2019) does not contain operational noise limits
7. This does not include the southern section of MPW shown in the concept plan area
8. As per the INP Application notes, it is recommended that the intrusiveness noise criteria in the evening should not be greater than during the daytime.

B.4 Environmental assessment predicted noise levels

B.4.1 MPW noise and vibration assessment predicted (night) operational noise levels

A consolidated summary of the noise predictions during the night period (10:00pm to 7:00am) across the noise and vibration assessment for the MPW are presented in Table 6-5.

Table 6-5 MPW – Night period – EIS criteria and predicted noise levels

Stage	EIS criteria	EIS predicted	EIS criteria	EIS predicted
	Intrusive, $L_{Aeq,15min}$		Amenity, $L_{Aeq,period}$	
Concept Plan[3]				
Casula	38[3]	44[1,3,4,6] (38[5])	40[3]	-
Glenfield	38[3]	33[1,3,4,6]	40[3]	-
Wattle Grove	37[3]	43[1,3,4,6] (37[5])	40[3]	-
Stage 2[2]				
Casula	38[2]	39[1,2]	40[2]	35[1,2,7]
Glenfield	38[2]	< 20[1,2]	40[2]	< 20[1,2]
Wattle Grove	37[2]	36[1,2]	40[2]	32[1,2,7]

Notes:
1. Under adverse meteorological conditions
2. MPW Stage 2 Responses to Submissions – Addendum Impact Assessment -Noise, Wilkinson Murray, Report No. 15324-PA, Version E, May 2017
3. Moorebank Intermodal Terminal, Revised Project Report - Noise and Vibration Impact Assessment, SLR, Report No. 620.10816 R2, 27 April 2015, Revision 0
4. Report Item 4 – (Section 9) Scenario 3 (Full build) – Unmitigated – 1.5 million TEU for IMEX, 500,000 TEU for interstate, 300,00sqm warehousing.
5. Section 11 of Moorebank Intermodal Terminal, Revised Project Report - Noise and Vibration Impact Assessment, SLR, Report No. 620.10816 R2, 27 April 2015, Revision 0, notes that with mitigation measures that the criteria can be achieve under adverse weather conditions, and so it is assumed that the predicted noise level is the criteria for Casula and Wattle Grove.
6. Highest predicted level for each NCA from Table 21 (Report Item 4)
7. Exhibited predicted level was 1 dB(A) higher, 36 dB(A) or Casula and 33 dB(A) for Wattle Grove and was reduced by 1 dB(A) in the response for submissions report.

B.4.2 MPE noise and vibration assessment predicted (night) operational noise levels

A consolidated summary of the noise predictions during the night period (10:00pm to 7:00am) across the noise and vibration assessment for the MPE are presented in Table 6-6.

Table 6-6 MPE – Night period – EIS criteria and predicted noise levels

Stage	EIS criteria	EIS predicted	EIS criteria	EIS predicted
	Intrusive, $L_{Aeq,15min}$		Amenity, $L_{Aeq,period}$	
Concept Plan (1 million TEU per annum)[6]				
Wattle Grove (R1)	42[6]	39[1,6]	40[6]	36[1,6,8]
Wattle Grove North (R2)	41[6]	39[1,6]	45[6]	36[1,6,8]
Casula (R3)	39[6]	43[1,6] (39)[7]	40[6]	40[1,6,8]
Glenfield (R4)	42[6]	31[1,6]	40[6]	28[1,6,8]

Stage	EIS criteria	EIS predicted	EIS criteria	EIS predicted
	Intrusive, $L_{Aeq,15min}$		Amenity, $L_{Aeq,period}$	
Concept Plan (250k TEU per annum)[9]				
Wattle Grove	42[9]	33[1,9]	-	-
Wattle Grove North	49[1]	33[1,9]	-	-
Casula	39[9]	37[1,1]	-	-
Glenfield	42[9]	25[1,9]	-	-
Stage 1[2]				
Wattle Grove (NCA 1)	42[2]	39[1,2,3]	40[2]	33[1,2,3,4]
Wattle Grove North (NCA 2)	41[2]	24[1,2,3]	45[2]	20[1,2,3,4]
Casula (NCA 3)	39[2]	38[1,2,3]	40[2]	33[1,2,3,4]
Glenfield (NCA 4)	42[2]	31[1,2,3]	40[2]	25[1,2,3,4]
Stage 2[5]				
Wattle Grove	42[5]	28[1,5]	40[5]	23[1,5]
Wattle Grove North	41[5]	20[1,5]	45[5]	< 20[1,5]
Casula	39[5]	25[1,5]	40[5]	< 20[1,5]
Glenfield	42[5]	< 20[1,5]	40[5]	< 20[1,5]
Stage 1 + 2[5,9]				
Wattle Grove	42[5]	32[1,3,5,9]	40[5]	27[1,3,5]
Wattle Grove North	41[5]	23[1,3,5,9]	45[5]	< 20[1,3,5]
Casula	39[5]	35[1,3,5,9,9]	40[5]	32[1,3,5]
Glenfield	42[5]	25[1,3,5,9]	40[5]	27[1,3,5]

Notes:

1. Under adverse meteorological conditions
2. MPE Stage 1 - SIMTA Stage 1 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S1, Version D, 25 May 2015
3. Levels differ from those presented in the MPW Stage 2 report (Item 5). The DPIE Independent review (EMM, 2017) sort clarification on this, and it was confirmed as due to shielding offered by warehousing proposed as part of MPE Stage 2.
4. Assumed that adverse meteorological conditions don't persist for the entire night period, but persist for 5 hours in a typical night
5. MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016
6. MPE Concept Plan - SIMTA Noise Assessment – Concept Plan, Wilkinson Murray, Report No. 12186-C, Version C, 2 August 2013. Based upon a capacity of 1,000,000 TEU per annum.
7. Section 6.1.3 notes that trucks are the key noise source, and that a noise barrier could reduce levels by 4 dB(A) within Casula.
8. These are LAeq, 15 minute levels, reduced by 3dB(A) because adverse meteorological conditions may not occur throughout the entire night, and some sources may be in transient.
9. MPE Concept Plan modification, Review of Noise and Vibration Impacts, Wilkinson Murray, Report No. 12186-MO, Version A, 22 November 2016. It is noted that noise levels are predicted based upon 6dB(A) reduction in the predicted LAeq 15 minute levels for a reduction from 1,000,000 TEU to 250k.

B.4.3 Cumualtive MPW and MPE noise and vibration assessment predicted (night) operational noise levels

A consolidated summary of the cumulative MPW and MPE noise predictions during the night period (10:00pm to 7:00am) included in the noise and vibration assessment are presented in Table 6-6.

Table 6-6 MPE & MPW cumulative – Night period – Residential receivers

	EIS criteria	EIS predicted	EIS criteria	EIS predicted
	Intrusive, $L_{Aeq,15min}$		Amenity, $L_{Aeq,period}$	
Cumulative (Concept Plan-MPW N&V)[6,7]				
Casula	-	-	40	45[1,6,7]
Glenfield	-	-	40	34[1,6,7]
Wattle Grove	-	-	40	45[1,6,7]
Cumulative (Concept Plan-MPE N&V)[8]				
Wattle Grove (R1)	42[8]	-	40[8]	33[8,9,10]
Wattle Grove North (R2)	41[8]	-	45[8]	34[8,9,10]
Casula (R3)	39[8]	-	40[8]	37[8,9,10]
Glenfield (R4)	42[8]	-	40[8]	25[8,9,10]
Cumulative (MPW Stage 2 N&V)[4]				
Casula	-	-	40[4]	36[1,4,5]
Glenfield	-	-	40[4]	24[1,4,5]
Wattle Grove	-	-	40[4]	36[1,4,5]
Cumulative (MPE Stage 2 N&V)[2]				
Wattle Grove	-	-	40[2]	29[1,2,3]
Wattle Grove North	-	-	45[2]	33[1,2,3]
Casula	-	-	40[2]	36[1,2,3]
Glenfield	-	-	40[2]	27[1,2,3]

Notes:

1. Under adverse meteorological conditions
2. MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016
3. From MPE Stage 2 N&V assessment (Item 2) - "The LAeq, period noise levels at sensitive receivers due to the concurrent operation of the Proposal site, the MPE Stage 1 site, and the MPW Stage 2 site have been predicted by combining the computer noise models developed for each proposal"
4. MPW Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 15324, Version D, 20 October 2016
5. Section 1.3.2 of the MPW Stage 2 Responses to Submissions – Addendum Impact Assessment -Noise (Wilkinson Murray, Report No. 15324-PA, Version E, May 2017) demonstrates no significant differences in predictions from the exhibited EIS N&V report (reference Item 4)
6. Moorebank Intermodal Terminal, Revised Project Report - Noise and Vibration Impact Assessment, SLR, Report No. 620.10816 R2, 27 April 2015, Revision 0. Reference is made to Concept Plan -Cumulative Scenario B, which is most similar to the current arrangement.
7. Unmitigated concept
8. MPE Concept Plan - SIMTA Noise Assessment – Concept Plan, Wilkinson Murray, Report No. 12186-C, Version C, 2 August 2013. Based upon a capacity of 1,000,000 TEU per annum.
9. Based upon a capacity of 1,000,000 TEU per annum split between MPW and MPE. The split was modelled with a direct 3 dB(A) reduction.
10. Unclear if predicted under adverse meteorological conditions.