ACOUSTICS AND AIR

OAKDALE WEST ESTATE (OWE)
NOISE & VIBRATION ASSESSEMENT

SSD 7348 Modification 3 and
SSD 10397 Stage 2 Development Application

REPORT NO. 19440
VERSION F

JANUARY 2020

PREPARED FOR

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

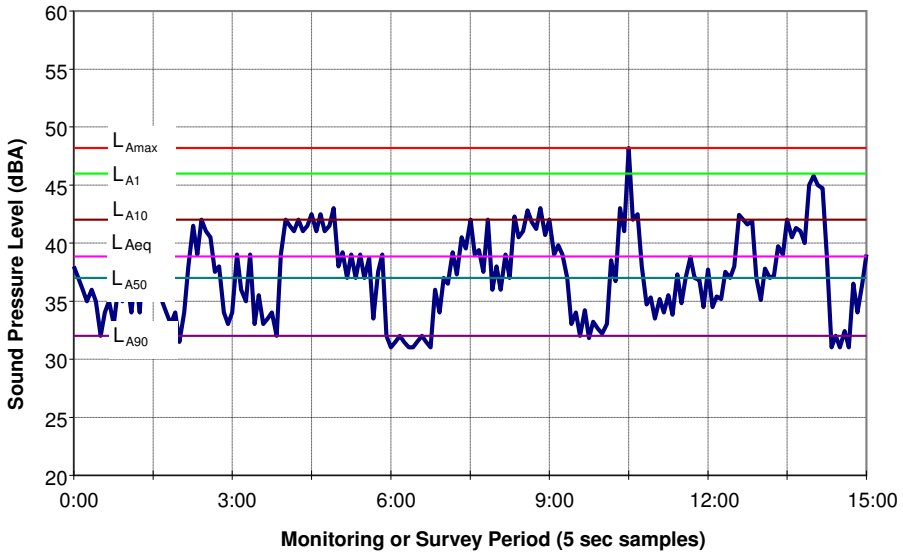
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night-time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night-time.

Typical Graph of Sound Pressure Level vs Time



EXCECUTIVE SUMMARY

Wilkinson Murray Pty Limited (WM) has undertaken an operational noise and construction noise & vibration assessment incorporating the changes associated with the proposed SSD 7348 Modification 3 (MOD 3) and SSD 10397 Stage 2 Development Application (Stage 2 DA) on the approved Oakdale West Estate (OWE) in Kemps Creek, NSW.

The relevant MOD3 changes principally concern the use of Building 2B (previously referred to as Building 3A). Additionally, changes to the masterplan layout, including modifications to the Precinct 2 building layout, the on-site road network (Estate Road 3) and the site's civil design are proposed.

It is currently anticipated there would be a period of approximately 5-6 months where only Building 2B would operate at the estate. Thereafter, Precinct 1 would be developed and then operate concurrently with Building 2B for a period before the rest of the estate is fully developed. Accordingly, this assessment has considered operational noise impacts for Lot 2B; Lot 2B + Precinct 1; and All OWE Precincts.

The principal OWE operational noise sources comprise light and heavy vehicle movements, loading activities and fixed mechanical service plant. Noise modelling of these sources has been undertaken to determine potential noise impacts associated with the proposed staged operation of the modified OWE. The findings of this assessment are as follows:

- Unmitigated, noise emissions from the OWE are predicted to exceed the approved noise limits at sensitive receivers within the Emmaus Village (N1) and at the closest sensitive Kemps Creek locations (N4, N5).
- To reduce the exceedances feasible and reasonable noise mitigation measures have been investigated. Modelling indicates that with the modified noise barrier design (as discussed in Section 4.4 and shown in Figure 1-1) and acoustic treatment of the Lot 2B mechanical plant during detailed design, the approved $L_{Aeq,15min}$ noise limits may be met for typical and seasonal peak operations under all considered meteorological conditions at receivers the west of the site.
- Due to the elevation of the sensitive receivers to the south of the OWE (N4, N5), on-site noise barriers are expected to be of limited efficacy in reducing noise levels and therefore at these locations some residual noise exceedances have potential to arise.

The following residual operational noise exceedances have been predicted:

<u>All OWE Precincts Operating</u>

- For the fully developed OWE the residual exceedances generally represent negligible to marginal impacts.
- Negligible residual exceedances of the daytime and evening limits by 1-2 dB at the most exposed receiver are predicted.
- At night, residual exceedances are predicted only under the relatively rare noise enhancing meteorological conditions. Under such conditions and for typical OWE operations, exceedances of 2-3 dB are predicted at the closest sensitive receivers to the south. During seasonal peak operations exceedances of 3-4 dB are predicted at the closest sensitive receivers to the south.

Building 2B + Precinct 1 Operating

- Prior to the full development of the OWE, during the operation of only Building 2B + Precinct 1, residual exceedances are predicted to only occur at night and under noise enhancing meteorological conditions.

- During this phase of the OWE, for typical OWE operations exceedances of 3-4 dB are predicted at the closest sensitive receivers to the south. During seasonal peak operations moderate to significant exceedances of 5-6 dB are predicted at the closest sensitive receivers to the south, though these impacts would only be expected for relatively brief periods.

Building 2B Only Operating

- With respect to the operational phase where only Building 2B would operate, residual exceedances are predicted to only occur at night and under noise enhancing meteorological conditions.

- During this phase of the OWE, exceedances of 3-4 dB (typical) and moderate to significant exceedances of 5-6 dB (seasonal peak) are predicted at the closest sensitive receivers to the south. Again, these impacts would only be expected for relatively brief periods.

To manage these potential operational noise impacts, the following mitigation measures are proposed:

- Noise barriers possessing surface mass of no less than 15 kg/m^2 to be installed at the locations and to the heights identified in Figure 1-1;

- On-site speed limits of 25 km/hour for heavy vehicles and 40 km/hr for light vehicles to be imposed on the estate roads;

- During detailed design, Lot 2B rooftop mechanical services plant to be reviewed to ensure that cumulatively emissions are controlled to not exceed $L_{Aeq,15min}$ 37 dBA at the OWE site boundary. The inclusion of silencers/attenuators and/or barrier solutions may be considered to ensure these acoustic design standards are achieved, as confirmed by noise modelling;

- Goodman to consult with landowners (N4, N5) to address the matter of potential noise impacts during the development and operation of the OWE and would seek to enter into noise agreements with the potentially affected owners.

- Subject to agreement, Goodman to provide 'at-receiver' noise mitigation treatments, consistent with the recommendations of the *NPfI* at N4, N5. Taking into consideration the particular preferences of the landowners, the treatments considered would include upgraded glazing standards to further increase the ability of the building façade to reduce noise levels. The owners would be invited to participate in the mitigation selection process in a transparent, equitable and consistent way.

Construction Phase

Additionally, this assessment has considered construction noise and vibration impacts that have potential to arise during the Stage 2 DA development of Building 2B.

The key Building 2B construction works would involve site clearing and earthworks at the Building 2B location, pad and hardstand works, the construction of the Building 2B warehouse and office structures, and the use of the site access road for the delivery of materials to the site.

Noise modelling of the anticipated construction equipment and activities has been undertaken to determine potential construction noise impacts associated with the proposed Stage 2 DA development.

It is proposed to undertake the works between 3.00am to 10.00pm seven days a week, therefore standard and out-of-hours construction periods have been considered. The requirement to undertake works between 3.00am to 7.00am is principally so that concreting works can be undertaken before air temperatures become too high during the day.

During standard construction hours, no material noise impacts are predicted. However, some *ICNG* exceedances are expected during the out of hours works.

A number of measures have been identified to mitigate the potential out-of-hours noise impacts, including the following:

- Goodman would undertake pre-construction community consultation with receivers N1, N2, N3, N4 and N5 in order clearly and transparently explain the proposed works and the potential for construction noise impacts. Regular on-going updates would be provided throughout the works in order to understand and address as far as practicable any noise related concerns of the receivers; and
- Goodman to offer to provide temporary noise curtains to provide noise shielding to the N4 and N5 dwellings. It is estimated that these may achieve reductions of up to approximately 5 dB when positioned to break the acoustic line of sight between the noise source and the windows of the dwellings.

The identified measures would be carried out to ensure the works are undertaken with minimal noise impact.

The predicted maximum noise levels marginally exceed the $L_{A1,1min}$ 52 dBA level recognised by the *NPfI*, but would not be expected to result in material sleep disturbances.

Additionally, no vibration impacts are anticipated during the proposed works.

In accordance with Condition D73, a detailed Construction Noise and Vibration Management Plan (CNVMP) would be developed during the detailed design phase of the Proposal to manage impacts. The indicative construction noise and vibration mitigation measures identified by this report would be included in the CNVMP.

1 INTRODUCTION

Goodman Property Services (Aust) Pty Limited (Goodman) proposes to develop the Oakdale West Estate (OWE) on a currently vacant 154 ha site in Kemps Creek, NSW. The OWE would comprise warehousing and office facilities over five precincts totalling approximately 93.4 ha of developable area.

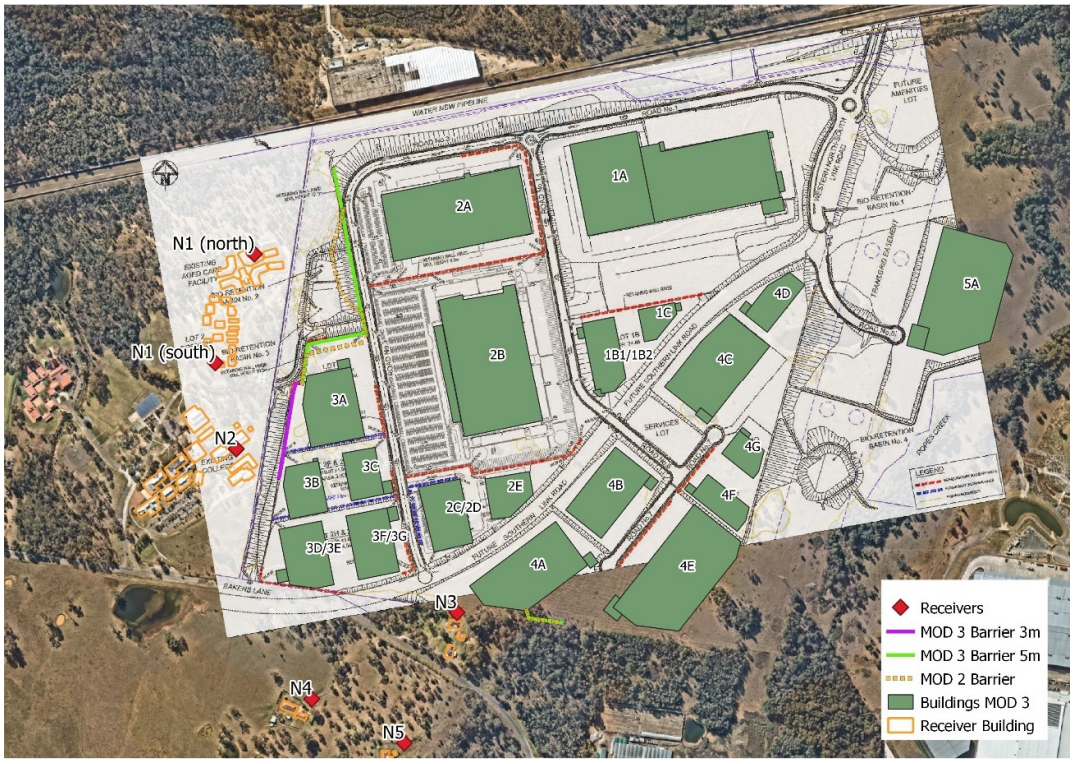
The OWE 'Concept Proposal' and 'Stage 1 Development' has been approved by the Department of Planning, Industry and Environment (DPIE), with Development Consent (SSD 7348) granted in September 2019. Additionally, two Modification submissions (MOD 1 and MOD 2) are currently under assessment by DPIE.

Wilkinson Murray Pty Limited (WM) has been commissioned by Goodman to undertake an operational and construction noise assessment incorporating the changes associated with the proposed SSD 7348 Modification 3 (MOD 3) and SSD 10397 Stage 2 Development Application (Stage 2 DA).

This assessment has been undertaken in accordance with the *Secretary's Environmental Assessment Requirements* (SEARS) and in general accordance with the NSW *Noise Policy for Industry* (NPfI) and other relevant NSW EPA guidelines.

Figure 1-1 shows the MOD3 site layout and closest sensitive receivers considered by this assessment. MOD3 principally relates to changes on Building 2B. The Stage 2 Development Application relates to Building 2B only.

Figure 1-1 Site Location Plan – MOD3



1.1 Background

SLR Consulting Australia Pty Ltd (SLR) prepared the OWE Noise & Vibration Impact Assessment (NVIA) for the State Significant Development Application (SSDA). The findings of this assessment are set out in the SLR report numbered *610.15617-R2*, dated 16 February 2017.

DPIE granted Development Consent SSD 7348 in September 2019 for the Oakdale West 'Concept Proposal' and 'Stage 1 Development'. The Concept Proposal comprises a 'Master Plan' to guide the staged development of Oakdale West and core development controls that will form the basis for design and assessment of future development applications for the site.

Modifications to Development Consent SSD 7348 have subsequently been proposed by submissions of MOD 1 and MOD 2 which are currently under assessment by DPIE.

WM's MOD 3 and Stage 2 DA assessment draws on the previous OWE assessments undertaken by SLR and incorporates the relevant updates as they relate to MOD 3 and Stage 2 DA.

An overview of the approvals sought is set out below in Sections 1.2 and 1.3.

1.2 Modification 3 (SSD 7348 MOD 3)

- A modification to the concept plan approval including the following is sought:
  - Rationalisation and re-sizing of buildings in Precinct 2 and 3 to accommodate future customers;
  - Reconfiguration of estate road network, particularly Estate Road 3 and the inclusion of a round-about at the intersection of Estate Road 1 and 3;
  - Change to the pad levels across Precinct 2 and 3;
  - Change to the retaining wall designs across Precinct 2 and 3 to accommodate the pad level changes;
  - Re-design of the acoustic wall to the north-west corner of the estate;
  - Re-design of basin 2 and 3;
  - Updated civil and servicing strategy;
  - Update to the staging plan and precinct numbering;
  - Change in the Gross Lettable Area;
  - Increase in building height for Building 3B only;
  - Change to acoustic criteria;

- A modification to the Stage 1 development approval including the following is sought:
  - Construction of Estate Road 3 including the construction of a round-about at the intersection of Estate Road 1 and 3;
  - Construction of associated retaining walls to support Estate Road 3;
  - Construction of the acoustic wall to the north-west corner of the estate;
  - Subdivision of estate roads;
  - Change to the pad levels across Precinct 2 and 3 and bulk-earthworks to that effect;
  - Construction of the retaining walls at Precinct 2 and 3 to accommodate the pad level changes;

- Construction of basins and changes to drainage and infrastructure;
- Landscaping;
- Night work for earthworks and infrastructure services;

1.3 Stage 2 Development Application (SSD 10397 Stage 2 DA)

- Stage 2 Development approval for the following is sought:
  - Construction, fit-out, and use approval of Building 2B;
  - 24 / 7 operation;
  - Warehouse and distribution use;
  - Racking, automation, and warehouse fit-out across four levels;
  - Single level office and fit-out;
  - Signage;
  - Subdivision of Lot 2B;
  - Landscaping;
  - Construction hours for building construction from 3am to 10pm seven days a week;
  - Staged handover of Building 2B to allow certain levels to be occupied and operational prior to completion of others;
  - Importation of building materials via Bakers lane, as primary access, and Aldington Road in school drop-off and pick-up periods.

1.4 Structure of this Report

Section 2 of this report sets out the relevant Secretary's Environmental Assessment Requirements (SEARs) and identifies where these have been addressed in the report.

Section 3 identifies the approved operational noise limits for the site and additional criteria considered by this assessment.

Section 4 outlines the operational noise assessment, including the sources considered, assumptions applied and predicted operational noise levels. Operational noise ($L_{Aeq,15min}$ predictions) and maximum noise ($L_{A1,1min}$ predictions) are provided for unmitigated and mitigated situations and recommended MOD3 operational mitigation measures are summarised. Additionally, an assessment of cumulative industrial noise effects is included.

Section 5 addresses the MOD3 potential off-site road traffic noise impacts associated with the operation of the OWE inclusive of MOD3.

Section 6 provides an assessment of construction noise impacts associated with the Stage 2 development.

WM has undertaken this assessment as a desktop exercise, relying on information provided by SLR in its previous reports in addition to MOD3 design change information provided by Goodman and the MOD3 design team.

2 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Assessment requirements for the project are provided by the NSW Department of Planning and Environment by way of its *Secretary's Environmental Assessment Requirements* (SEARs). Those relevant to noise and vibration are set out Table 2-1.

Table 2-1 Relevant Secretary's Environmental Assessment Requirements – SEARs

SEARs relevant to Noise and Vibration	Where Addressed in this Report
Description of all potential noise and vibration sources during the construction and operational phases of the development, including on and off-site traffic noise	On-site operational noise sources considered by this assessment including on-site traffic movements are set out in Section 4
	Off-site traffic noise is addressed in Section 5
	On-site construction noise and vibration sources considered by this assessment are set out in Section 6
A cumulative assessment of all potential noise sources in accordance with relevant Environment Protection Authority guidelines	A cumulative noise assessment is provided in Section 4.10
Demonstration of compliance with the noise limits set out in Condition B18, Schedule B of the Development consent SSD 7348	The approved noise limits are set out in Section 3 Compliance with these limits is addressed in Section 4
Details of noise mitigation, management and monitoring measures	A summary of operational noise mitigation measures is provided in Section 4.11 A summary of construction noise mitigation measures is provided in Section 6.7

2.1 Assessment Guidelines

The following NSW Environment Protection Authority (EPA) guidelines, as required by the SEARs, have been adopted:

- Noise from on-site operations (including on-site vehicle movements) has been assessed in accordance with the NSW *Noise Policy for Industry* (NPfI), NSW EPA, 2000, with guidance on sleep disturbance criteria taken from this Policy.
- Noise from off-site vehicle movements has been assessed in accordance with guidance provided by the EPA in the NSW *Road Noise Policy* (RNP), NSW EPA, 2011.
- Construction noise has been assessed in accordance with the *Interim Construction Noise Guideline* (ICNG), DECC, 2009.
- Vibration from construction has been considered in accordance with *Assessing Vibration: A Technical Guideline*, DEC, 2006.

3 OPERATIONAL NOISE CRITERIA

3.1 Approved Noise Limits (SSD 7348)

Conditions B18 and B19 of SSD 7348 include operational noise limits for the site as follows:

B18 The Applicant shall ensure the Development does not exceed the noise limits in Table 3 at the receiver locations N1, N2, N3, N4 and N5 shown on the plan in Appendix 5.

Table 3: Noise Limits dB(A)

Location	Day	Evening	Night	
	LAeq(15 minute)	LAeq(15 minute)	LAeq(15 minute)	LA1(1 minute)
N1 Emmaus Village Residential	44	43	41	51
N3 Kemps Creek – nearest residential property	39	39	37	47
N4 & N5 Kemps Creek – other residences	39	39	37	47
Location	**When in Use**			
N2 Emmaus Catholic College (school)	35 (internal)			

Note: Noise generated by the Development is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the Noise Policy for Industry, EPA 2017.

B19. The noise limits in Table 3 do not apply to receiver N3 if the Applicant has a Noise Agreement with the relevant landowner to exceed the noise limits, and the Applicant has provided written evidence to the Planning Secretary that an agreement is in place.

It is understood that a Noise Agreement between the applicant and receiver N3 has been put in place and submitted to DPIE. As such, the criteria in Condition B18 of the Development Consent SSD 7348 are not applicable at receiver N3.

The locations of receivers N1, N2, N3, N4 and N5 are shown in Appendix 5 of the Development Consent SSD 7348 and in Figure 1-1.

3.2 Noise Criteria Considered by this Assessment

The MOD 2 assessment proposed a variation to the $L_{A1,1min}$ night-time noise limits to accord with the provisions of the NSW *NPfI*, with a level of $L_{A1,1min}$ 52 dBA proposed for all residential receivers.

This assessment considers the $L_{A1,1min}$ levels set out under Approval Condition B18 in addition to the night-time maximum noise level criterion of $L_{A1,1min}$ 52 dBA proposed for all residential receivers.

4 OPERATIONAL NOISE ASSESSMENT

Operational noise emissions from the site have been predicted with a model prepared using the SoundPLAN V7.1 noise modelling software, implementing the CONCAWE prediction method. The model incorporates the OWE MOD 3 Masterplan design, including the updated civil design, buildings and sensitive receivers shown in Figure 1-1.

Operational noise sources included in the model comprise fixed rooftop plant, loading activities (forklifts) and on-site light and heavy vehicles movements.

Consistent with the previous MOD 2 assessment undertaken by SLR, predictions have been undertaken with consideration to neutral meteorological conditions for the daytime, evening and night-time periods and additionally under and adverse meteorological conditions during the night-time period (F-class temperature inversion with a 2 m/s source to receiver drainage flow).

4.1 On-Site Vehicle Movements

The Traffic Impact Assessment prepared by Ason Group (Report No: P1086r01) identifies the estimated OWE traffic generation that may be expected following MOD3, as set out in Table 4-1.

The traffic volumes shown in brackets in Table 4-1 represent the 'seasonal peak' demand. It is understood that these higher volumes would occur only for a short period of time in advance of busy consumer periods (e.g. Christmas and other special days).

For the purposes of assessment both 'typical peak hour' and 'seasonal peak hour' movements have been considered and applied in the noise modelling.

Sound power levels of 90 dBA for light vehicles travelling at 40 km/hr and 103 dBA for heavy vehicles travelling at 25 km/hr have been applied per vehicle movement. It has been assumed that maximum peak vehicle movements in every precinct of the OWE would occur concurrently.

The identified vehicle movements have been apportioned across the relevant estate roads. Consistent with previous assessments, for the precincts unaffected by MOD 3, the night-time vehicle volumes have been assumed to comprise 30% of day peak volume and heavy vehicles have been assumed to comprise 25% of total movements.

With respect to Building 2B, detailed operational information (hourly traffic generation for light and heavy vehicles, with separated inbound/outbound movements) has been provided. This information has been reviewed and used to determine the worst case hourly periods with respect to noise generation from the OWE, with consideration to the 'typical' and 'seasonal peak' operations, within the daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night-time (10.00pm-7.00am) timeframes.

Table 4-1 MOD 3 Precinct Traffic Generation

Precinct	GFA (m^2)	AM Peak	PM Peak	Daily
Precinct 1[1]	122,082	94 (103)[2]	74 (78)	2,059 (2,503)
Precinct 2	266,186	677 (920)[2]	468 (629)	3,797 (4,901)
Precinct 3	57,819	94	94	1,094
Precinct 4	113,693	185	185	2,151
Precinct 5	35,640	58	58	674
Total	**595,765**	**1,108 (1,360)**	**879 (1,044)**	**9,776 (11,324)**

Note 1: Detailed first principles traffic generation assessment of Building 1A is included in MOD 2 TIA.
Note 2: Figures in bracket shows peak seasonal changes. These traffic figures demonstrate the maximum possible traffic generation for Buildings 1A and 2B during their peak seasonal periods.
Note 3: The Total GFA includes 345 m^2 for amenities Lot GFA.

4.2 Mechanical Services & Fixed Plant

Based on information provided by Goodman, Table 4-2 sets out the mechanical services / fixed plant noise sources considered for Lot 2B. The rooftop locations of the Lot 2B sources are shown indicatively in Figure 4-1.

For the other OWE Lots, mechanical services/fixed plant noise source assumptions are consistent with the MOD2 assessment, including detailed mechanical services inventory of Lot 1A and assumed cumulative mechanical services sound power levels for the remaining Lots, as set out in Table 4-3.

Table 4-2 Lot 2B Mechanical Services/Fixed Plant Sound Power Levels

ID (refer Figure 4-1)	Source	Sound Power Level (SWL dBA)	Observation	Location	Assumed Operating Condition		
					Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
1	Temp 01	66.8	Emitted	Rooftop	On	On	On
		88	External Air Duct				
		89.5	External Discharge Duct				
2	Temp 02	63.4	Emitted	Rooftop	On	On	On
		84.2	External Air Duct				
		86.3	External Discharge Duct				

ID (refer Figure 4-1)	Source	Sound Power Level (SWL dBA)	Observation	Location	Assumed Operating Condition		
					Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
3	Temp 03	67.6	Emitted	Office Rooftop	On	On	On
		84.6	External Air Duct				
		91.8	External Discharge Duct				
4	Temp 04	65.1	Emitted	Rooftop	On	On	On
		87.4	External Air Duct				
		86.7	External Discharge Duct				
5	Temp 05	61.6	Emitted	Office Rooftop	On	On	On
		79.6	External Air Duct				
		85.6	External Discharge Duct				
6	Temp 06	64.4	Emitted	Rooftop	On	On	On
		82.1	External Air Duct				
		88.5	External Discharge Duct				
7	Temp 07	66.2	Emitted	Rooftop	On	On	On
		84.2	External Air Duct				
		90.2	External Discharge Duct				
8	Temp 08	67.4	Emitted	Rooftop	On	On	On
		88.6	External Air Duct				
		90.1	External Discharge Duct				
9	Temp 09	66.6	Emitted	Rooftop	On	On	On
		88.6	External Air Duct				
		88.6	External Discharge Duct				
10	Temp 10	65.4	Emitted	Rooftop	On	On	On
		83	External Air Duct				
		89.5	External Discharge Duct				
11	Rooftop	99.6	On the deck of Warehouse	Rooftop	On	On	On
12	Temp AP1	68.4	Emitted	Rooftop	On	On	On
		89.2	External Air Duct				
		91.3	External Discharge Duct				

ID (refer Figure 4-1)	Source	Sound Power Level (SWL dBA)	Observation	Location	Assumed Operating Condition		
					Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
13	Temp AP2	64.1	Emitted	Rooftop	On	On	On
		83.8	External Air Duct				
		87.6	External Discharge Duct				
14	Temp AP3	68.4	Emitted	Rooftop	On	On	On
		87.4	External Air Duct				
		92.2	External Discharge Duct				
15	Temp AP4	65.4	Emitted	Rooftop	On	On	On
		84	External Air Duct				
		89.3	External Discharge Duct				
16	Units Ext.	77	Various Equipment Maximum Sound Level	Rooftop	On	On	On
17	Groups SDMO J-77K	91	Soundproof Equipment within the CT-1W y CT-5W	Ground Level	On	On	On
18	Groups SDMO J-130K	93	Soundproof Equipment within the CT-3E	Ground Level	On	On	On
19	Groups SDMO D-330	101	Soundproof Equipment within the CT-2N y CT-4	Ground Level	On	On	On

Note: The details set out in this table have been provided by Goodman.

Figure 4-1 Lot 2B Mechanical Services/Fixed Plant Layout

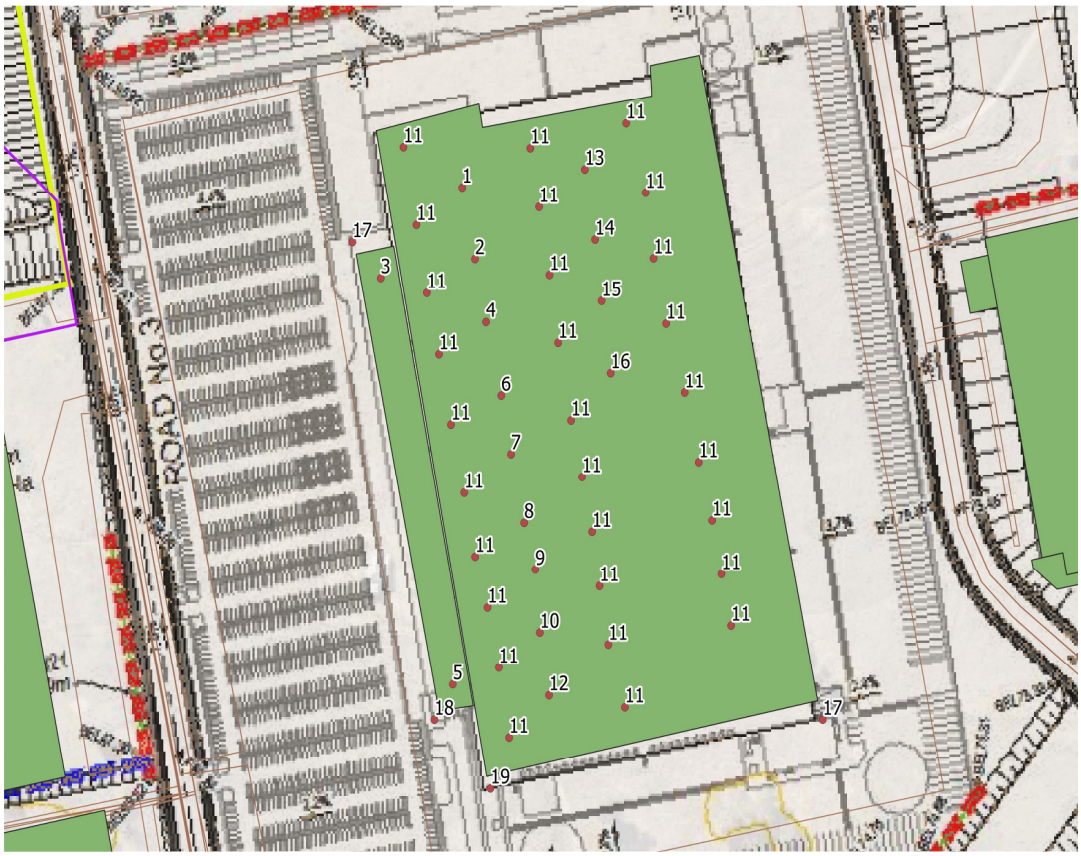


Table 4-3 Mechanical Services/Fixed Plant Noise Sources throughout OWE

Precinct	Lot	Day (7am -6pm)	Evening (6pm-10pm)	Night (10pm -7am)
Precinct 1	1A	See Footnote	See Footnote	See Footnote
	1B1	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
	1B2	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
	1C	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
Precinct 2	2A	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
	2B	Refer Table 4-2	Refer Table 4-2	Refer Table 4-2
	2C	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	2D	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	2E	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation

Precinct	Lot	Day (7am -6pm)	Evening (6pm-10pm)	Night (10pm -7am)
Precinct 3	3A	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	3B	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	3C	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	3D	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	3E	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
Precinct 4	4A	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	4B	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	4C	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
	4D	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
	4E	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	4F	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
	4G	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative
Precinct 5	5A	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	SWL 85 dBA Cumulative

Note: For the OWE Lots unaffected by MOD 3, the mechanical services/fixed plant noise source assumptions are consistent with the MOD2 assessment, including detailed mechanical services inventory of Lot 1A. Details of the Lot 1A mechanical services plant are set out in Table 4 of the MOD 2 noise assessment prepared by SLR (SLR Ref: 610.15617-L04-v1.5.doc). Assumptions for night-time plant operation has been based off estates in the surrounding area, as advised by Goodman.

4.3 Loading Activities

On-site forklift loading activities have been assumed to be consistent with the MOD2 assessment. This assumes for 1 to 4 forklifts operating per lot for all periods, with the exception of Lots 2C, 2D, 2E, 3B, 3C, 3D, 3E, 4A, 4E and 5A. On these Lots, forklift operations are assumed only during the daytime and evening periods with none at night. Goodman has advised that this assumption has been based off estates in the surrounding area. Additionally, Goodman has confirmed that there would be no external forklift operations on Lot 2B.

Forklift sound power levels of 96 dBA have been assumed.

4.4 Noise Barriers

The MOD2 noise assessment determined that noise walls to the west and south of the site should be installed as indicated in Figure 1-1 and described in the MOD2 assessment.

Due to the MOD3 change in the civil design of Bio Retention Basin No 2 to the west of the site, it is necessary to relocate the noise barrier (on the western side of the site) marginally to the east of the redesigned basin. Given the MOD3 changes to the on-site road layout, for the barrier to be effective, it is also necessary to extend its length and height to ensure satisfactory screening of on-site vehicle movements is achieved.

The noise barrier to the west will have a maximum height of 5 meters.

The proposed MOD3 barrier layouts are shown in Figure 1-1. The MOD3 barrier design is intended to supersede the approved designs.

4.5 Operational Noise Predictions – Considering All Precincts

With consideration to the operation of the fully developed OWE as outlined above, Table 4-4 sets out the MOD3 $L_{Aeq,15min}$ operational noise predictions in comparison with the MOD 2 predictions and the approved noise limits.

As shown, without mitigation noise emissions from the OWE are predicted to exceed the approved noise limits at sensitive receivers within the Emmaus Village (N1) and at the closest sensitive Kemps Creek locations (N4, N5) during worst-case peak operations.

To reduce these exceedances feasible and reasonable noise mitigation measures have been investigated. Modelling indicates that with the modified barrier design (as discussed in Section 4.4) and acoustic treatment of the Lot 2B mechanical plant during detailed design, the approved $L_{Aeq,15min}$ noise limits would be met for typical and peak operations and all considered meteorological conditions at N1 and N2 to the west of the site.

At N4, general compliance is predicted, with residual exceedances of 2 dB (typical) and 3 dB (peak season) predicted at night under noise enhancing meteorological conditions.

At N5 for typical operations, 1 dB residual exceedances of the day and evening limits are predicted, with a 3 dB exceedance of the night limit predicted under noise enhancing meteorological conditions. With respect to the seasonal peak, exceedances of 2 dB (day), 1 dB (evening), and 4 dB (night, noise enhancing conditions) are predicted.

In the context of the *NPfI* residual exceedances of up to 2 dB are generally considered negligible. The exceedances above 2 dB are defined by the *NPfI* as marginal to moderate in nature, however with consideration to the relatively rare occurrence i.e. during peak season operations and under noise enhancing conditions, these exceedances are not considered to be of great significance.

Table 4-4 Predicted $L_{Aeq,15min}$ Operational Noise Levels – All Precincts

Receiver	Period (weather)	$L_{Aeq,15min}$ Noise Level (dBA)				
		Approved Noise Limits	Predicted MOD2	Predicted MOD3 Unmitigated	Predicted MOD3 Mitigated	
					Typical	Peak Season
N1 – Emmaus Village Residential	Day	44	36	**45**	38	39
	Eve	43	36	**45**	37	38
	Night	41	30	**44**	35	36
	Night(Adverse)	41	34	**45**	38	39
N2 – Emmaus Catholic College (School)	Day	45	39	45	40	41
	Eve	n/a	n/a	45	40	40
	Night	n/a	n/a	45	37	38
	Night(Adverse)	n/a	n/a	45	40	42
N3 – Kemps Creek – nearest residential property	Day	n/a	44	51	46	48
	Eve	n/a	44	51	46	47
	Night	n/a	37	51	42	44
	Night(Adverse)	n/a	42	52	45	48
N4 – Kemps Creek – other residence	Day	39	39	**44**	39	39
	Eve	39	39	**44**	39	39
	Night	37	31	**44**	36	36
	Night(Adverse)	37	37	**46**	**39**	**40**
N5 – Kemps Creek – other residence	Day	39	38	**45**	**40**	**41**
	Eve	39	38	**45**	**40**	**40**
	Night	37	31	**44**	36	37
	Night(Adverse)	37	37	**46**	**40**	**41**

Note 1: The approved noise limit for N2 is L_{Aeq} 35 dBA which applies internally and is only applicable when the school is in use. For the purpose of this assessment a conservative inside to outside correction of +10 dBA has been applied to the internal limit for N2 to allow for comparison with the external noise predictions. An inside to outside correction of +10 dBA is typical of a building with partially open windows.
Note 2: As per Condition C19 of the Development Consent SSD 7348, the predicted noise levels at N3 have not been compared against the approved noise limits, as a noise agreement is in place between the residential landowner and the applicant. Note, however, that the predicted noise levels have increased with respect to the MOD2 assessment.
Note 3: Bold text indicates an exceedance of the approved noise limits.
Note 4: Consistent with the MOD2 assessment, noise-enhancing weather conditions during the daytime and evening periods have not been included in the assessment as these are not considered prevailing conditions for the site.
Note 5: This assessment has applied a revised sound power level of 90 dBA to represent a light vehicle movement. MOD2 applied a sound power level of 96 dBA, which is considered overly conservative.
Note 6: The 'Unmitigated MOD3' predictions assume the noise controls recommended by the MOD2 noise assessment. This includes the restriction of mechanical services use during the night-time period on Lots 3A, 3B, 3C, 3D, 3E, 2C, 2D, 2E, 4A, 4B, 4E; restriction of the use of forklifts during the night-time period on Lots 3B, 3C, 3D, 3E, 2B, 2C, 2D, 2E, 4A, 4E, 5A; and the installation of noise walls to the west and south of the site as described in the MOD2 assessment. However, due to the MOD3 change in the civil design of the Bio Retention Basin No 2 to the west of the site, the noise barrier has been relocated marginally to the east of the basin.
Note 6: The 'Mitigated MOD3' predictions have assumed that the Lot 2B mechanical services plant can be attenuated by 10 dB by inclusion of silencers/attenuators and/or barrier solutions. This would need to be addressed with the mechanical services engineers during detailed design. Note this assessment has assumed that all mech services plant would operate concurrently, at all times - this assumption would also be reviewed at detailed design.
Note 7: The 'Mitigated MOD3' predictions assume the barrier to the west of the site is extended to the extent and heights shown in Figure 1-1.

4.6 Operational Noise Predictions – Staged Development

It is currently anticipated there would be a period of approximately 5-6 months where only Building 2B would operate due to other commitments on the site. Thereafter, Precinct 1 would be developed and then operate concurrently with Building 2B for a period before the rest of the estate is fully developed.

Table 4-5 shows the $L_{Aeq,15min}$ operational noise predictions in comparison with the approved noise limits for Lot 2B; Lot 2B + Precinct 1; and All Precincts.

The predictions in Table 4-5 show that during the identified site development stages, the operational noise levels to the west of the site would be expected to remain in compliance with the approved noise limits. However, to the south of the site, some further temporary exceedances have potential to occur.

At N4, residual exceedances of up to 4 dB (typical) and 6 dB (peak season) are predicted at night under noise enhancing meteorological conditions.

At N5, residual exceedances of up to 3 dB (typical) and 5 dB (peak season) are predicted at night under noise enhancing meteorological conditions.

The residual exceedances of up to 5 dB are defined as moderate by the *NPfI* , whilst the 6 dB exceedance is defined by the *NPfI* as significant. However, again it is noted that this is only predicted to occur under relatively rare conditions (during peak season operations and under noise enhancing conditions).

Table 4-5 Predicted $L_{Aeq,15min}$ Operational Noise Levels – Staged Development

Receiver	Period (weather)	$L_{Aeq,15min}$ Noise Level (dBA)						
		Approved Noise Limits	Lot 2B		Lot 2B + Precinct 1		All Precincts	
			Typical	Peak Season	Typical	Peak Season	Typical	Peak Season
N1 – Emmaus Village Residential	Day	44	35	37	36	37	38	39
	Eve	43	34	35	34	37	37	38
	Night	41	35	36	35	36	35	36
	Night(Adverse)	41	39	39	39	41	38	39
N2 – Emmaus College (School)	Day	45	40	45	40	45	40	41
	Eve	n/a	42	42	42	43	40	40
	Night	n/a	39	43	39	43	37	38
	Night(Adverse)	n/a	44	47	44	48	40	42
N3 – Kemps Creek – residence	Day	n/a	42	45	43	45	46	48
	Eve	n/a	43	43	42	43	46	47
	Night	n/a	42	43	42	43	42	44
	Night(Adverse)	n/a	46	48	46	48	45	48
N4 – Kemps Creek – residence	Day	39	36	39	37	40	39	39
	Eve	39	37	37	36	38	39	39
	Night	37	36	38	36	38	36	36
	Night(Adverse)	37	**41**	**43**	**41**	**43**	**39**	**40**
N5 – Kemps Creek – residence	Day	39	36	39	36	39	**40**	**41**
	Eve	39	37	37	36	37	**40**	**40**
	Night	37	36	37	36	37	36	37
	Night(Adverse)	37	**40**	**42**	**40**	**42**	**40**	**41**

Note 1: The approved noise limit for N2 is L_{Aeq} 35 dBA which applies internally and is only applicable when the school is in use. For the purpose of this assessment a conservative inside to outside correction of +10 dBA has been applied to the internal limit for N2 to allow for comparison with the external noise predictions. An inside to outside correction of +10 dBA is typical of a building with partially open windows.
Note 2: As per Condition C19 of the Development Consent SSD 7348, the predicted noise levels at N3 have not been compared against the approved noise limits, as a noise agreement is in place between the residential landowner and the applicant. Note, however, that the predicted noise levels have increased with respect to the MOD2 assessment.
Note 3: Bold text indicates an exceedance of the approved noise limits.
Note 4: Consistent with the MOD2 assessment, noise-enhancing weather conditions during the daytime and evening periods have not been included in the assessment as these are not considered prevailing conditions for the site.
Note 5: This assessment has applied a revised sound power level of 90 dBA to represent a light vehicle movement. MOD2 applied a sound power level of 96 dBA, which is considered overly conservative.
Note 6: The 'Unmitigated MOD3' predictions assume the noise controls recommended by the MOD2 noise assessment. This includes the restriction of mechanical services use during the night-time period on Lots 3A, 3B, 3C, 3D, 3E, 2C, 2D, 2E, 4A, 4B, 4E; restriction of the use of forklifts during the night-time period on Lots 3B, 3C, 3D, 3E, 2B, 2C, 2D, 2E, 4A, 4E, 5A; and the installation of noise walls to the west and south of the site as described in the MOD2 assessment. However, due to the MOD3 change in the civil design of the Bio Retention Basin No 2 to the west of the site, the noise barrier has been relocated marginally to the east of the basin.
Note 6: The 'Mitigated MOD3' predictions have assumed that the Lot 2B mechanical services plant can be attenuated by 10 dB by inclusion of silencers/attenuators and/or barrier solutions. This would need to be confirmed with the mechanical services engineers during detailed design.
Note 7: The 'Mitigated MOD3' predictions assume the barrier to the west of the site is extended to the extent and heights shown in Figure 1-1.

4.7 Managing Residual Exceedances

Modelling indicates that due to the elevations of Receivers N4 and N5 and their lines of sight to the OWE, on-site barriers have limited efficacy in reducing the identified residual noise exceedances.

Section 4.2 of the *NPfI* discusses the acceptability of residual noise impacts, where all source and pathway feasible and reasonable noise mitigation measures have been applied. With respect the fully developed site, in accordance with the provisions of the *NPfI,* the exceedances may be considered generally marginal to moderate in nature.

However, given the current expectation that Lot 2B and Precinct 1 would operate for a substantial period prior to the full development of the OWE, it is considered appropriate to consider the exceedances identified in Table 4-5. The *NPfI* defines the identified temporary residual exceedance at N4 of up to 6 dB as significant.

With consideration to the potential impacts, Goodman proposes to consult with the affected landowners (N4, N5) to address the matter of potential noise impacts during the development and operation of the OWE and would seek to enter into noise agreements with the potentially affected owners.

Subject to their agreement, Goodman proposes to offer to provide 'at-receiver' noise mitigation treatments, consistent with the recommendations of the *Noise Policy for Industry* (*NPfI*).

Taking into consideration the particular preferences of the landowners, the treatments considered would include upgraded glazing standards to further increase the ability of the building façade to reduce noise levels. The owners would be invited to participate in mitigation selection process in a transparent, equitable and consistent way.

4.8 Sleep Disturbance Assessment – Considering All Precincts

An assessment of potential sleep disturbance has been undertaken considering heavy vehicle brake releases and reverse alarms (non-tonal) modelled in the hardstand areas of the development with a sound power level of SWL 115 dBA.

Table 4-6 identifies the MOD3 $L_{A1,1min}$ maximum operational noise predictions in comparison with the adopted $L_{A1,1min}$ noise criteria.

Table 4-6 Predicted Maximum Operational Noise Levels – All Precincts

Receiver	Period (weather)	$L_{A1,1min}$ Noise Level (dBA)	
		Adopted Criteria (Approved Limit)	Predicted MOD3 Mitigated
N1 – Emmaus Village – Residential	Night	52 (51)	43
	Night(Adverse)	52 (51)	49
N2 – Emmaus College (School)	Night	n/a	n/a
	Night(Adverse)	n/a	n/a
N3 – Kemps Creek – Residence	Night	n/a	60
	Night(Adverse)	n/a	61
N4 – Kemps Creek – Residence	Night	52 (47)	49
	Night(Adverse)	52 (47)	**53**
N5 – Kemps Creek – Residence	Night	52 (47)	46
	Night(Adverse)	52 (47)	52

The modelling indicates the potential for $L_{A1,1min}$ noise emissions to marginally exceed the adopted criteria by 1 dB at N4 (adverse meteorological conditions). It is noted that with respect to the approved limit, this represents a 6 dB exceedance. However, as discussed in Section 3, this assessment principally considers the guidance from the *NPfI* with respect to the sleep disturbance.

4.9 Sleep Disturbance Assessment – Staged Development

Table 4-7 shows the $L_{A1,1min}$ maximum operational noise predictions in comparison with the approved noise limits for Lot 2B; Lot 2B + Precinct 1; and All Precincts. This shows no further impacts beyond those identified by Table 4-6.

Table 4-7 Predicted Maximum Operational Noise Levels – Staged Development

Receiver	Period	$L_{A1,1min}$ Noise Level (dBA)			
		Adopted Criteria (Approved Limit)	Lot 2B	Lot 2B + Precinct 1	All Precincts
N1 – Emmaus Village Residential	Night	52 (51)	46	46	43
	Night^{Adverse}	52 (51)	51	46	49
N2 – Emmaus College (School)	Night	n/a	n/a	n/a	n/a
	Night^{Adverse}	n/a	n/a	n/a	n/a
N3 – Kemps Creek – residence	Night	n/a	52	52	60
	Night^{Adverse}	n/a	56	52	61
N4 – Kemps Creek – residence	Night	52 (47)	44	44	49
	Night^{Adverse}	52 (47)	50	44	**53**
N5 – Kemps Creek – residence	Night	52 (47)	43	43	46
	Night^{Adverse}	52 (47)	49	43	52

The 'at receiver' treatments proposed for N4 and N5, as discussed in Section 4.7, would be expected to fully mitigate against the potential for sleep disturbances at these receivers.

4.10 Cumulative Operational Noise Assessment

As required by the SEARS, the cumulative effect of noise from all industrial sources has been considered in assessing potential noise impacts.

The *NPfI* identifies recommended Amenity Noise Levels (ANLs) for various land uses that cumulative industrial noise levels should remain below where feasible and reasonable. The residential receivers considered by this assessment fall within the 'Rural' *NPfI* land use category, to which ANLs of $L_{Aeq,Day}$ 50 dBA, $L_{Aeq,Evening}$ 45 dBA and $L_{Aeq,Night}$ 40 dBA apply. For the Emmaus College school classrooms, an internal ANL of $L_{Aeq,Day}$ 35 dBA applies, which for assessment purposes is considered equivalent to an external ANL of $L_{Aeq,Day}$ 45 dBA.

The intention is for all industrial sites in combination to comply with these ANLs.

The SSDA noise assessment (610.15617-R2) considered the potential cumulative noise impacts associated with the operation of the Oakdale Central, Oakdale South and Jacfin industrial sites which are currently either partially operational, under construction or undergoing approval. This determined that the combined industrial noise levels from these sites are expected to be >6 dB below the daytime ANL, up to 6 dB below the evening ANL, and up to 2 dB below the night ANL.

In accordance with the *NSW Industrial Noise Policy (INP)*, the SSDA noise assessment identified that to ensure cumulative industrial noise remains within the identified ANLs, the OWE should not contribute noise level of more than $L_{Aeq,Day}$ 50 dBA, $L_{Aeq,Evening}$ 44 dBA and $L_{Aeq,Night}$ 36 dBA at the residential sites or $L_{Aeq,Day}$ 45 dBA at the school site.

The *INP* was the current policy at the time of the development application and therefore the provisions of the *INP* (and the approved noise limits based thereon) have been considered for the purposes of this assessment. However, the *INP* was officially superseded by the *Noise Policy for Industry (NPfI)* in October 2017 and it is noted that the *NPfI* recommends that to ensure cumulative industrial noise levels remain within the recommended ANLs, a Project Amenity Noise Level 5 dB below the ANL should apply.

Applying the *NPfI* methodology results in the Project Amenity Noise Levels for the OWE shown in Table 4-8.

Table 4-8 *NPfI* Project Amenity Noise Levels

Receiver Type	Receiver	Day (7am -6pm)	Evening (6pm -10pm)	Night (10pm -7am)
		$L_{Aeq,Day}$ (dBA)	$L_{Aeq,Evening}$ (dBA)	$L_{Aeq,Night}$ (dBA)
Sensitive Residential Receivers	N1, N4, N5	45	40	35
School	N2	45 (External)	-	-

Note 1: The Project Amenity Noise Level for N2 is L_{Aeq} 35 dBA which applies internally and is only applicable when the school is in use. For the purpose of this assessment a conservative inside to outside correction of +10 dBA has been applied to the internal limit for N2 to allow for comparison with the external noise predictions. An inside to outside correction of +10 dBA is typical of a building with partially open windows.
Note 2: Applying the *NPfI* approach results in more onerous Project Amenity Noise Levels than determined by the SSDA noise assessment, undertaken in accordance with the NSW Industrial Noise Policy (INP). The SSDA noise assessment identified that to ensure cumulative industrial noise remains within the identified ANLs, the OWE should not contribute noise level of more than $L_{Aeq,Day}$ 50 dBA, $L_{Aeq,Evening}$ 44 dBA and $L_{Aeq,Night}$ 36 dBA at the residential sites or $L_{Aeq,Day}$ 45 dBA at the school site.

Table 4-9 shows the $L_{Aeq,Period}$ operational noise predictions in comparison with the identified Project Amenity Noise Levels for Lot 2B; Lot 2B + Precinct 1; and All Precincts.

At N1, at night under noise enhancing meteorological conditions an OWE noise contribution in the range $L_{Aeq,Period}$ 37-41 dBA is predicted. This exceeds the Project Amenity Noise Level by 2 to 6 dB. However, when consideration is given to the screening effects of the OWE and the additional separation distance to the other industrial sites located further to the east (Oakdale Central, Oakdale South and Jacfin), it would be expected that the *NPfI* recommended ANLs (for cumulative industrial noise) would be generally achieved at N1, apart from a potential negligible 1 dB exceedance under the 'Lot 2B + Precinct 1' scenario.

At N4, at night the OWE is predicted to contribute levels in the range $L_{Aeq,Period}$ 36-38 dBA (standard meteorological conditions) and $L_{Aeq,Period}$ 39-43 dBA (noise enhancing meteorological conditions). These levels exceed the Project Amenity Noise Level by up to 3 dB (standard) and by up to 8 dB (noise enhancing).

At N5, at night the OWE is predicted to contribute levels in the range $L_{Aeq,Period}$ 35-37 dBA (standard meteorological conditions) and $L_{Aeq,Period}$ 39-42 dBA (noise enhancing meteorological conditions). These levels exceed the Project Amenity Noise Level by up to 2 dB (standard) and by up to 7 dB (noise enhancing).

The 'at receiver' treatments proposed for N4 and N5, as discussed in Section 4.7, would be expected to mitigate against the potential for cumulative industrial noise impacts at these receivers.

Table 4-9 Predicted $L_{Aeq,Period}$ Operational Noise Levels – Staged Development

Receiver	Period (weather)	$L_{Aeq,Period}$ Noise Level (dBA)						
		NPfI Project Amenity Noise Levels (SSDA Levels shown in brackets)	Lot 2B		Lot 2B + Precinct 1		All Precincts	
			Typical	Peak	Typical	Peak	Typical	Peak
N1 – Emmaus Village Residential	Day	45 (50)	34	35	35	36	37	38
	Eve	40 (44)	34	35	35	37	37	37
	Night	35 (36)	34	35	34	36	35	36
	Night(Adverse)	35 (36)	37	38	38	41	38	39
N2 – Emmaus College (School)	Day	45	39	42	40	42	39	40
	Eve	n/a	39	43	40	43	39	39
	Night	n/a	39	42	39	43	36	38
	Night(Adverse)	n/a	43	46	40	47	40	41
N3 – Kemps Creek – residence	Day	n/a	42	43	42	43	45	47
	Eve	n/a	42	43	42	43	45	45
	Night	n/a	41	43	41	43	42	43
	Night(Adverse)	n/a	45	47	45	47	45	47
N4 – Kemps Creek – residence	Day	45 (50)	36	37	36	37	38	39
	Eve	40 (44)	36	38	36	38	38	38
	Night	35 (36)	36	37	36	38	36	36
	Night(Adverse)	35 (36)	**40**	**42**	**39**	**43**	**39**	**40**
N5 – Kemps Creek – residence	Day	45 (50)	36	36	36	37	**39**	**40**
	Eve	40 (44)	36	37	36	37	**39**	40
	Night	35 (36)	35	37	35	37	36	37
	Night(Adverse)	35 (36)	**39**	**41**	**40**	**42**	**40**	**42**

Note 1: The Project Amenity Noise Level for N2 is L_{Aeq} 35 dBA which applies internally and is only applicable when the school is in use. For the purpose of this assessment a conservative inside to outside correction of +10 dBA has been applied to the internal limit for N2 to allow for comparison with the external noise predictions. An inside to outside correction of +10 dBA is typical of a building with partially open windows.
Note 2: As per Condition C19 of the Development Consent SSD 7348, the predicted noise levels at N3 have not been compared against the approved noise limits, as a noise agreement is in place between the residential landowner and the applicant.
Note 3: Bold text indicates an exceedance of the Project Amenity Noise Levels.
Note 4: Consistent with the MOD2 assessment, noise-enhancing weather conditions during the daytime and evening periods have not been included in the assessment as these are not considered prevailing conditions for the site.
Note 5: This assessment has applied a revised sound power level of 90 dBA to represent a light vehicle movement. MOD2 applied a sound power level of 96 dBA, which is considered overly conservative.
Note 6: The predictions assume the noise controls recommended by the MOD2 noise assessment. This includes the restriction of mechanical services use during the night-time period on Lots 3A, 3B, 3C, 3D, 3E, 2C, 2D, 2E, 4A, 4B, 4E; restriction of the use of forklifts during the night-time period on Lots 3B, 3C, 3D, 3E, 2B, 2C, 2D, 2E, 4A, 4E, 5A; and the installation of noise walls to the west and south of the site as described in the MOD2 assessment. However, due to the MOD3 change in the civil design of the Bio Retention Basin No 2 to the west of the site, the noise barrier has been relocated marginally to the east of the basin.
Note 6: The predictions have assumed that the Lot 2B mechanical services plant can be attenuated by 10 dB by inclusion of silencers/attenuators and/or barrier solutions. This would need to be confirmed with the mechanical services engineers during detailed design.
Note 7: The predictions assume the barrier to the west of the site is extended to the extent and heights shown in Figure 1-1.
Note 8: The Project Amenity Noise Levels determined by the SSDA noise assessment are shown in brackets.

4.11 Summary of Operational Noise Mitigation

In order to ensure the levels identified in Tables 4-4 to 4-7 are achieved, and that internal residential amenity standards are maintained the following operational noise mitigation controls have been identified and are recommended:

- Noise barriers possessing surface mass of no less than 15 kg/m^2 to be installed at the locations and to the heights identified in Figure 1-1;
- On-site speed limits of 25 km/hour for heavy vehicles and 40 km/hr for light vehicles to be imposed on the estate roads;
- During detailed design, Lot 2B rooftop mechanical services plant to be reviewed to ensure that cumulatively emissions are controlled to not exceed $L_{Aeq,15min}$ 37 dBA at the OWE site boundary. The inclusion of silencers/attenuators and/or barrier solutions may be considered to ensure these acoustic design standards are achieved, as confirmed by noise modelling;
- Goodman to consult with landowners (N4, N5) to address the matter of potential noise impacts during the development and operation of the OWE and would seek to enter into noise agreements with the potentially affected owners.
- Subject agreement, Goodman to provide 'at-receiver' noise mitigation treatments, consistent with the recommendations of the *NPfI* at N4, N5. Taking into consideration the particular preferences of the landowners, the treatments considered would include upgraded glazing standards to further increase the ability of the building façade to reduce noise levels. The owners would be invited to participate in mitigation selection process in a transparent, equitable and consistent way.

5 OFF SITE TRAFFIC NOISE IMPACTS

5.1 Off-Site Traffic Noise Impact Assessment

The *RNP* requires noise mitigation where new land use developments increase road traffic noise by more than 2 dB. An increase of greater than 2 dB requires an increase in traffic volumes of approximately 60% or higher.

The main access route to the development site is via the proposed Western North-South Link Road (WNSLR) then the arterial road of Lenore Drive. The forecast traffic daily traffic volumes on Lenore Drive at opening of the WNSLR is approximately 28,000 vehicles (refer to SLR report 610.16083-R1), including vehicle movements from the OWE. The daily traffic volume from the OWE is estimated to be approximately 11,324 vehicles, which equates to an increase in traffic volumes of approximately 45%.

Therefore, an increase in traffic noise due to the OWE of greater than 2 dB is not considered likely. No mitigation is likely to be required as a result.

6 CONSTRUCTION NOISE & VIBRATION ASSESSMENT

Construction noise and vibration impacts from the OWE have previously been assessed by SLR (610.15617-R2). With respect to Stage2 DA, this assessment considers the potential for construction noise and vibration impacts from the development of Building 2B.

The Building 2B construction works are proposed to be undertaken between 3.00am to 10.00pm seven days a week, therefore standard and out-of-hours construction periods have been considered.

The following scenarios have been assessed:

- Site clearing and earthworks at Building 2B location;
- Pad and hardstand works, including concrete pours at Building 2B location;
- Construction of Building 2B warehouse and office structures; and
- The use of the site access road for the delivery of materials to the site.

6.1 Construction Noise Criteria

Condition D70 of SSD 7348 limits noise generating construction works to within standard construction hours (7.00am – 6.00pm Monday to Friday and 8.00am – 1.00pm Saturdays), with the exceptions identified by Condition D71 as follows:

> *D71. Works outside of the hours identified in Condition D70 may be undertaken in the following circumstances:*
> *a) works that are inaudible at the nearest sensitive receivers;*
> *b) works agreed to in writing by the Planning Secretary;*
> *c) for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or*
> *d) where it is required in an emergency to avoid the loss of lives, property or to prevent environmental harm.*

Condition D72 requires the following:

> *D72. Stage 1 must be constructed with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009) (as may be updated or replaced from time to time). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the Construction Noise and Vibration Management Plan required by Condition D73.*

Adopting the measured background noise levels determined by SLR (SLR report *610.15617-R2*), the Construction Noise Management Levels NMLs derived for the project in accordance with the NSW *Interim Construction Noise Guideline* (*ICNG)* are detailed in Table 6-1.

Table 6-1 *ICNG* Construction Noise Management Levels (CNMLs)

Receiver	Period	$L_{Aeq,15min}$ Construction NMLs (dBA)		
		Standard Hours	Out of Hours	Highly Noise Affected
N1 – Emmaus Village Residential	Day	49	44	75
	Evening	n/a	43	75
	Night	n/a	41	75
N2 – Emmaus Catholic College (School)	Day	55*	n/a	n/a
	Evening	n/a	n/a	n/a
	Night	n/a	n/a	n/a
N3 – Kemps Creek – residence	Day	n/a	39	75
	Evening	n/a	39	75
	Night	n/a	37	75
N4 – Kemps Creek – residence	Day	44	39	75
	Evening	n/a	39	75
	Night	n/a	37	75
N5 – Kemps Creek – residence	Day	44	39	75
	Evening	n/a	39	75
	Night	n/a	37	75

* An internal CNML of L_{Aeq} 45 dBA applies internally for school classrooms. For the purpose of assessment an external noise level of L_{Aeq} 55 dBA has been adopted, with consideration to the generally accepted 10 dB noise reduction typically achieved through a partially open window.

6.2 Construction Noise Impact Assessment

For the identified construction activities, this assessment considers the construction equipment and sound power levels set out in Table 6-2.

Predicted $L_{Aeq,15min}$ construction noise levels are compared with the *ICNG* criteria in Table 6-3. Maximum night-time construction noise levels are set out in Table 6-4. The predictions assume the western site boundary noise wall, as shown in Figure 1-1, is constructed prior to the commencement of the works approved under this DA.

Table 6-2 Sound Power Levels for Construction Equipment

Construction Activity	Equipment	Operating minutes in 15-min period	No of Items in same location	Sound Power Level (dBA)		
				$L_{Aeq,15min}$		L_{Amax}
				Item	Activity	Activity
Site Clearing and Earthworks	Dozer	15	1	110	116	121
	Dump Truck	15	3	100		
	Excavator	15	1	102		
	Front End Loader (FEL) 962	15	1	112		
	Grader	15	1	108		
Pad and Hardstand Works	Concrete Pump	7.5	1	106	113	118
	Concrete Truck / Agitator	7.5	1	106		
	Concrete Vibrator	15	1	102		
	Paving Machine	15	1	104		
	Plate Compactor	5	1	108		
	Vibratory Roller (12 tonne)	15	1	109		
Construction of Warehouse and Office Structures	Elevated Working Platform	15	2	97	107	112
	Flatbed Truck	15	1	100		
	Hand Tools (electric)	15	4	96		
	Mobile Crane (100 tonne)	15	1	101		
	Welding Equipment	15	1	97		
Use of Access Road for Deliveries	13 HV & 4 LV Movements per Hour (Daytime) 4 HV & 4 LV Movements per Hour (Evening) 5 HV & 4 LV Movements per Hour (Night)			115 (Heavy Vehicle) 90 (Light Vehicle)		

Note 1: In accordance with the *ICNG*, for activities identified as particularly annoying (such as jackhammering, rock breaking and power saw operations), a 5 dB 'penalty' is added to the source sound power level when predicting noise using the quantitative method.

Table 6-3 Predicted $L_{Aeq,15min}$ Construction Noise Levels

Receiver	Period (weather)	$L_{Aeq,15min}$ Noise Level (dBA)					
		CNML	Highly Affected NML	Predicted			
				Earthworks	Hardstand	Warehouse	Access Road
N1 – Emmaus Village Residential	Day (Standard)	49	75	38	35	47	36
	Day (Out of Hours)	44	n/a	38	35	**47**	36
	Eve	43	n/a	38	35	**47**	36
	Night	41	n/a	38	35	**47**	36
	Night(Adverse)	41	n/a	40	37	**49**	38
N2 – Emmaus Catholic College (School)	Day (Standard)	55*	n/a	47	44	48	41
	Day (Out of Hours)	n/a	n/a	47	44	48	41
	Eve	n/a	n/a	47	44	48	41
	Night	n/a	n/a	47	44	48	41
	Night(Adverse)	n/a	n/a	49	46	50	43
N3 – Kemps Creek – residence	Day (Standard)	n/a	n/a	48	45	49	51
	Day (Out of Hours)	n/a	n/a	48	45	49	51
	Eve	n/a	n/a	48	45	49	51
	Night	n/a	n/a	48	45	49	51
	Night(Adverse)	n/a	n/a	50	47	51	53
N4 – Kemps Creek – residence	Day (Standard)	44	75	43	40	42	40
	Day (Out of Hours)	39	n/a	**43**	**40**	**42**	**40**
	Eve	39	n/a	**43**	**40**	**42**	**40**
	Night	37	n/a	**43**	**40**	**44**	**40**
	Night(Adverse)	37	n/a	**45**	**42**	**42**	**42**
N5 – Kemps Creek – residence	Day (Standard)	44	75	43	40	42	38
	Day (Out of Hours)	39	n/a	**43**	**40**	**42**	38
	Eve	39	n/a	**43**	**40**	**42**	38
	Night	37	n/a	**43**	**40**	**42**	**38**
	Night(Adverse)	37	n/a	**45**	**42**	**44**	**40**

Note 1: The *ICNG* criterion for N2 is L_{Aeq} 45 dBA which applies internally and is only applicable when the school is in use. For the purpose of this assessment a conservative inside to outside correction of +10 dBA has been applied to the internal limit for N2 to allow for comparison with the external noise predictions. An inside to outside correction of +10 dBA is typical of a building with partially open windows.
Note 2: As per Condition C19 of the Development Consent SSD 7348, the predicted noise levels at N3 have not been compared against the approved noise limits, as a noise agreement is in place between the residential landowner and the applicant.
Note 3: Bold text indicates an exceedance of the *ICNG* CNML.
Note 4: Noise-enhancing weather conditions during the daytime and evening periods have not been included in the assessment as these are not considered prevailing conditions for the site.
Note 5: The predictions assume the western site boundary noise wall, as shown in Figure 1-1, is constructed prior to the commencement of the works approved under this DA.

Table 6-4 Predicted L_{Amax} Construction Noise Levels

Receiver	Period (weather)	L_{Amax} Noise Level (dBA)				
		CNML	Predicted			
			Earthworks	Hardstand	Warehouse	Access
N1 – Emmaus Village Residential	Night	52	42	40	52	41
	Night(Adverse)	52	44	42	**54**	43
N2 – Emmaus Catholic College (School)	Night	n/a	52	49	53	46
	Night(Adverse)	n/a	54	51	55	48
N3 – Kemps Creek – residence	Night	n/a	53	50	54	56
	Night(Adverse)	n/a	55	52	56	58
N4 – Kemps Creek – residence	Night	52	48	45	49	45
	Night(Adverse)	52	50	47	47	47
N5 – Kemps Creek – residence	Night	52	48	45	47	43
	Night(Adverse)	52	50	47	49	45

Note 1: As per Condition C19 of the Development Consent SSD 7348, the predicted noise levels at N3 have not been compared against the approved noise limits, as a noise agreement is in place between the residential landowner and the applicant.
Note 3: Bold text indicates an exceedance of the *ICNG* CNML.
Note 4: Noise-enhancing weather conditions during the daytime and evening periods have not been included in the assessment as these are not considered prevailing conditions for the site.
Note 5: The predictions assume the western site boundary noise wall, as shown in Figure 1-1, is prior to the commencement of the works approved under this DA.

6.3 Construction Noise Criteria Exceedances

The predictions indicate general compliance with the *ICNG* standard hours criteria without any focussed mitigation requirements.

The out of hours works have potential to exceed the *ICNG* criteria as follows:

Daytime Out of Hours

- N1 – by up to 3 dB;
- N4 – by up to 1-4 dB;
- N5 – by up to 1-4 dB;

Evening Out of Hours

- N1 – by up to 4 dB;
- N4 – by up to 1-4 dB;
- N5 – by up to 1-4 dB;

Night (Standard Meteorology)

- N1 – by up to 6 dB;
- N4 – by up to 3-7 dB;
- N5 – by up to 1-6 dB;

Night (Noise Enhancing Meteorology)

- N1 – by up to 8 dB;
- N4 – by up to 5-8 dB;
- N5 – by up to 3-8 dB.

The daytime out-of-hours exceedances, being < 5dB above the CNML are considered to be marginal only and are not considered to warrant any particular focused noise mitigation.

The evening exceedances, being < 5dB above the NML are also not considered to be particularly significant or intrusive.

At night, with exceedances of up to 7 dB (standard meteorology) and 8 dB (noise enhancing meteorology) the works may be expected to be clearly audible, but not highly intrusive.

The predicted maximum noise levels marginally exceed the for $L_{A1,1min}$ 52 dBA level recognised by the *NPfI*, but would not be expected to result in material sleep disturbances.

6.4 Off-Site Construction Traffic Noise

The Traffic Impact Assessment (TIA - Report No. P1086r01) notes that OWE Stage 2 DA construction traffic would access the site from Bakers Lane, via Mamre Road outside of network peak hours. During the network peak periods the OWE construction traffic would be rerouted to Aldington Road/Abbotts Road, via Mamre Road. The Aldington Road/Abbotts Road route would only be used during the Emmaus School peak traffic hours, which are between 8.00am-10.00am and 2.00pm-4.00pm Monday to Friday.

It should be noted that the Bakers Lane and Aldington Road/Abbotts Road routes would only be used temporarily, until the WNSLR is constructed which is expected in Q4 2020.

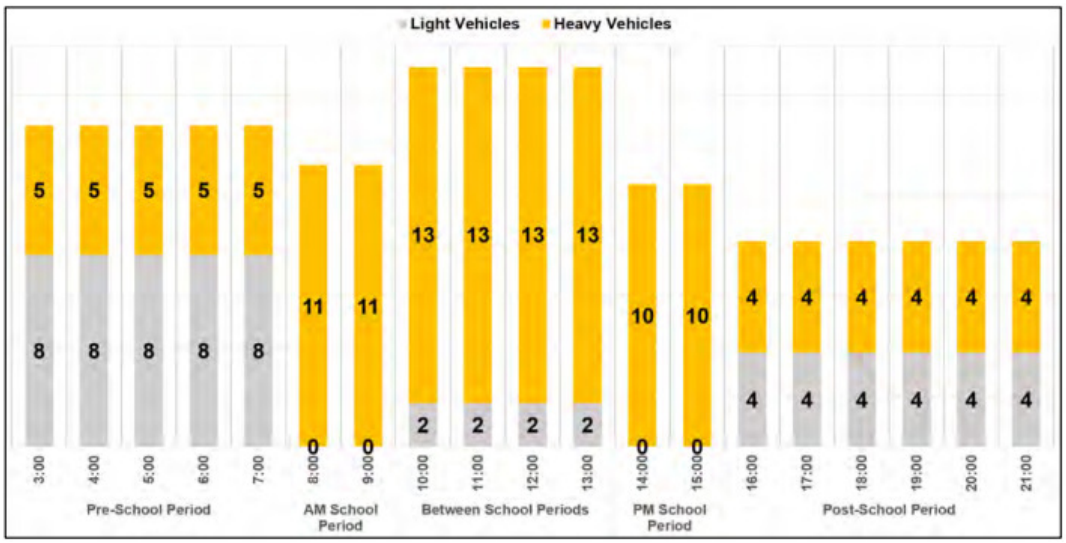
Whilst not specifically applicable to construction traffic movements, the road traffic noise criteria recognised by the *NSW Road Noise Policy* (*RNP*) have been conservatively considered in the assessment of off-site construction traffic noise effects. The *RNP* recommends that for existing residences on local roads, additional traffic generated by land use developments should not result in levels exceeding:

- $L_{Aeq,1\ hour}$ 55 dBA during the daytime (7.00am-10.00pm); or
- $L_{Aeq,1\ hour}$ 50 dBA during the night (10.00pm-7.00am).

The construction traffic movements shown in Figure 6-1 identified by the TIA have been considered in the assessment of off-site construction traffic noise effects.

With consideration of these movements, traffic noise levels at dwellings located within approximately 100m of the routes have been calculated and compared against the *RNP* criteria.

Figure 6-1 Hourly Construction Traffic Movements



Calculations undertaken applying the CoRTN (*Calculation of Road Traffic Noise*, UK Department of Transport, 1988) methodology indicate that during the Stage 2 construction, traffic noise levels would not be expected to exceed the identified *RNP* criteria at residences located on Bakers Lane or Aldington Road /Abbotts Road.

Notwithstanding, consultation has been undertaken with the immediate neighbours located on the route.

6.5 Construction Noise Mitigation

As noted, the predictions indicate general compliance with the *ICNG* standard hours criteria without any focussed mitigation requirements

However, where exceedances of the out-of-hours NMLs are predicted, construction noise mitigation should be considered where feasible and reasonable to reduce the potential noise impacts on the surrounding sensitive receivers.

The *ICNG* describes strategies for construction noise mitigation and control that are applicable to this proposal. The strategies are designed to minimise, to the fullest extent practicable, noise during construction.

The following construction noise mitigation measures would be applied during the works:

- Minimising the coinciding use of multiple noisy plant items;
- Equipment which is used intermittently is to be shut down when not in use;
- Equipment with directional noise emissions would be oriented away from sensitive receivers as much as practicable;
- Regular compliance checks on the noise emissions of all plant and machinery used for the proposal would indicate whether noise emissions from plant items were higher than predicted. This also identifies defective silencing equipment on the items of plant;

- Non-tonal reversing alarms should be used on all items of plants and heavy vehicles used for construction;
- Permanent noise walls located to the west of the site would be constructed as early as practicable and prior to the commencement of the works approved under this DA to assist in reducing construction noise impacts;
- Where practicable, temporary acoustic hoarding may be installed as close to the noise source as feasible aiming to block direct line of sight between the receiver position and the noise source. This measure typically suits dominant single items of plant, such as rockbreakers, concrete saws and jackhammers where the source of noise is typically near the ground.
- Goodman would undertake pre-construction community consultation with receivers N1, N2, N3, N4 and N5 in order clearly and transparently explain the proposed works and the potential for construction noise impacts. Regular on-going updates would be provided throughout the works in order to understand and address as far as practicable any noise related concerns of the receivers; and
- Goodman to offer to provide temporary noise curtains to provide noise shielding to the N4 and N5 dwellings. It is estimated that these may achieve reductions of up to approximately 5 dB when positioned to break the acoustic line of sight between the noise source and the windows of the dwellings.

The identified measures would be carried out to ensure the works are undertaken with minimal noise impact.

6.6 Construction Vibration Impact Assessment

The vibration generating plant items would be set back from the site boundaries by several hundreds of metres. Given this setback distance, vibration levels would not be discernible off-site, therefore no vibration impacts would be expected.

6.7 Construction Noise & Vibration Management Plan

In accordance with Condition D73, a detailed Construction Noise and Vibration Management Plan would be developed during the detailed design phase of the Proposal to manage impacts. Indicative construction noise and vibration mitigation measures have been recommended in Section 5 of SLR report *610.15617-R2* and above.

7 CONCLUSION

Wilkinson Murray Pty Limited (WM) has undertaken an operational and construction noise assessment incorporating the changes associated with the proposed Modification 3 (MOD 3) & Stage 2 DA on the approved Oakdale West Estate (OWE) in Kemps Creek, NSW.

The relevant MOD 3 changes principally concern the use of Building 2B (previously referred to as Building 3A). Additionally, changes to the masterplan layout, including modifications to Precinct 2 buildings, the on-site road network and site's civil design are proposed.

It is currently anticipated there would be a period of approximately 5-6 months where only Building 2B would operate. Thereafter, Precinct 1 would be developed and then operate concurrently with Building 2B for a period before the rest of the estate is fully developed. Accordingly, this assessment has considered operational noise impacts for Lot 2B; Lot 2B + Precinct 1; and All OWE Precincts.

The principal OWE operational noise sources comprise light and heavy vehicle movements, loading activities and fixed mechanical service plant. Noise modelling of these sources has been undertaken to determine potential noise impacts associated with the proposed staged operation of the modified OWE. The findings of this assessment are as follows:

- Unmitigated, noise emissions from the OWE are predicted to exceed the approved noise limits at sensitive receivers within the Emmaus Village (N1) and at the closest sensitive Kemps Creek locations (N4, N5).
- To reduce the exceedances feasible and reasonable noise mitigation measures have been investigated. Modelling indicates that with the modified noise barrier design (as discussed in Section 4.4 and shown in Figure 1-1) and acoustic treatment of the Lot 2B mechanical plant during detailed design, the approved $L_{Aeq,15min}$ noise limits may be met for typical and seasonal peak operations under all considered meteorological conditions at receivers the west of the site.
- Due to the elevation of the sensitive receivers to the south of the OWE (N4, N5), on-site noise barriers are expected to be of limited efficacy in reducing noise levels and therefore at these locations some residual noise exceedances have potential to arise.

The following residual operational noise exceedances have been predicted:

<u>All OWE Precincts Operating</u>

- For the fully developed OWE the residual exceedances generally represent negligible to marginal impacts.
- Negligible residual exceedances of the daytime and evening limits by 1-2 dB at the most exposed receiver are predicted.
- At night, residual exceedances are predicted only under the relatively rare noise enhancing meteorological conditions. Under such conditions and for typical OWE operations exceedances of 2-3 dB are predicted at the closest sensitive receivers to the south. During seasonal peak operations exceedances of 3-4 dB are predicted at the closest sensitive receivers to the south.

Building 2B + Precinct 1 Operating

- Prior to the full development of the OWE, during the operation of only Building 2B + Precinct 1, residual exceedances are predicted only to occur at night and under noise enhancing meteorological conditions.

- During this phase of the OWE, for typical OWE operations exceedances of 3-4 dB are predicted at the closest sensitive receivers to the south. During seasonal peak operations moderate to significant exceedances of 5-6 dB are predicted at the closest sensitive receivers to the south, though these impacts would only be expected for relatively brief periods.

Building 2B Only Operating

- With respect to the operational phase where only Building 2B would operate, residual exceedances are predicted only to occur at night and under noise enhancing meteorological conditions.

- During this phase of the OWE, exceedances of 3-4 dB (typical) and moderate to significant exceedances of 5-6 dB (seasonal peak) are predicted at the closest sensitive receivers to the south. Again, these impacts would only be expected for relatively brief periods.

To manage these potential operational noise impacts, the following mitigation measures are proposed:

- Noise barriers possessing surface mass of no less than 15 kg/m^2 to be installed at the locations and to the heights identified in Figure 1-1;

- On-site speed limits of 25 km/hour for heavy vehicles and 40 km/hr for light vehicles to be imposed on the estate roads;

- During detailed design, Lot 2B rooftop mechanical services plant to be reviewed to ensure that cumulatively emissions are controlled to not exceed $L_{Aeq,15min}$ 37 dBA at the OWE site boundary. The inclusion of silencers/attenuators and/or barrier solutions may be considered to ensure these acoustic design standards are achieved, as confirmed by noise modelling;

- Goodman to consult with landowners (N4, N5) to address the matter of potential noise impacts during the development and operation of the OWE and would seek to enter into noise agreements with the potentially affected owners.

- Subject to agreement, Goodman to provide 'at-receiver' noise mitigation treatments, consistent with the recommendations of the *NPfI* at N4, N5. Taking into consideration the particular preferences of the landowners, the treatments considered would include upgraded glazing standards to further increase the ability of the building façade to reduce noise levels. The owners would be invited to participate in the mitigation selection process in a transparent, equitable and consistent way.

Construction Phase

Additionally, this assessment has considered construction noise and vibration impacts that have potential to arise during the Stage 2 DA development of Building 2B.

The key Building 2B construction works would involve site clearing and earthworks at Building 2B location, pad and hardstand works, the construction of the Building 2B warehouse and office structures, and the use of the site access road for the delivery of materials to the site.

It is proposed to undertake the works between 3.00am to 10.00pm seven days a week, therefore standard and out-of-hours construction periods have been considered. The requirement to undertake works between 3.00am to 7.00am is principally so that concreting works can be undertaken before air temperatures become too high during the day.

During standard construction hours, no material noise impacts are predicted. However, some *ICNG* exceedances are expected during the out of hours works.

A number of measures have been identified to mitigate the potential out-of-hours noise impacts, including the following:

- Goodman would undertake pre-construction community consultation with receivers N1, N2, N3, N4 and N5 in order clearly and transparently explain the proposed works and the potential for construction noise impacts. Regular on-going updates would be provided throughout the works in order to understand and address as far as practicable any noise related concerns of the receivers; and
- Goodman to offer to provide temporary noise curtains to provide noise shielding to the N4 and N5 dwellings. It is estimated that these may achieve reductions of up to approximately 5 dB when positioned to break the acoustic line of sight between the noise source and the windows of the dwellings.

The identified measures would be carried out to ensure the works are undertaken with minimal noise impact.

The predicted maximum noise levels marginally exceed the for $L_{A1,1min}$ 52 dBA level recognised by the *NPfI*, but would not be expected to result in material sleep disturbances.

Additionally, no vibration impacts are anticipated.

In accordance with Condition D73, a detailed Construction Noise and Vibration Management Plan (CNVMP) would be developed during the detailed design phase of the Proposal to manage impacts. The indicative construction noise and vibration mitigation measures identified by this report would be included in the CNVMP.