

OAKDALE WEST ESTATE (OWE) - BUILDINGS
2A, 2C AND 2D
NOISE & VIBRATION ASSESSEMENT

SSD 9794683 STAGE 3 DEVELOPMENT
APPLICATION

REPORT NO. 19440-2A
VERSION C

FEBRUARY 2021

PREPARED FOR

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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	7 December 2020	Brian Mendieta	Ben Lawrence
B	Final	11 December 2020	Brian Mendieta	Ben Lawrence
C	Final Revised	3 February 2021	Brian Mendieta	-

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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.

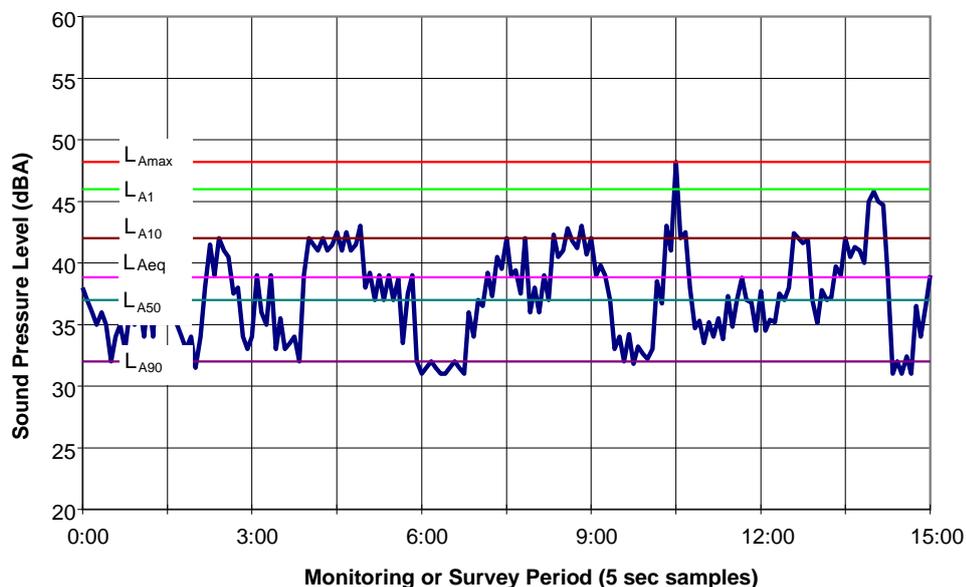
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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



1 INTRODUCTION

1.1 Introduction

Wilkinson Murray Pty Limited (WM) has been commissioned by Goodman Property Services (Aust) Pty Limited (Goodman) to undertake an operational and construction noise and vibration assessment. The assessment is for Buildings 2A, 2C and 2D within the SSD 9794683 Stage 3 Development Application (stage 3 DA) proposed Oakdale West Estate (OWE), Kemps Creek NSW.

Goodman proposes to develop the 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.

This noise and vibration 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 Oakdale West Estate MOD6 site layout and closest sensitive receivers (N1 – N5). Buildings 2A, 2C and 2D are situated on the western side of the Estate and are outlined red.

It is currently anticipated that Building 2B and 3A would operate at the estate when Buildings 2A, 2C and 2D is complete. Accordingly, this assessment has considered two separate operational noise scenarios. The first scenario consists of the operation of Precinct 1, Lots 2A, 2B, 2C, 2D (Precinct 2) and 3A, and the second scenario is the whole OWE Precinct in operation.

This assessment includes the changes associated with the proposed SSD 7348 Modification 6 (MOD 6).

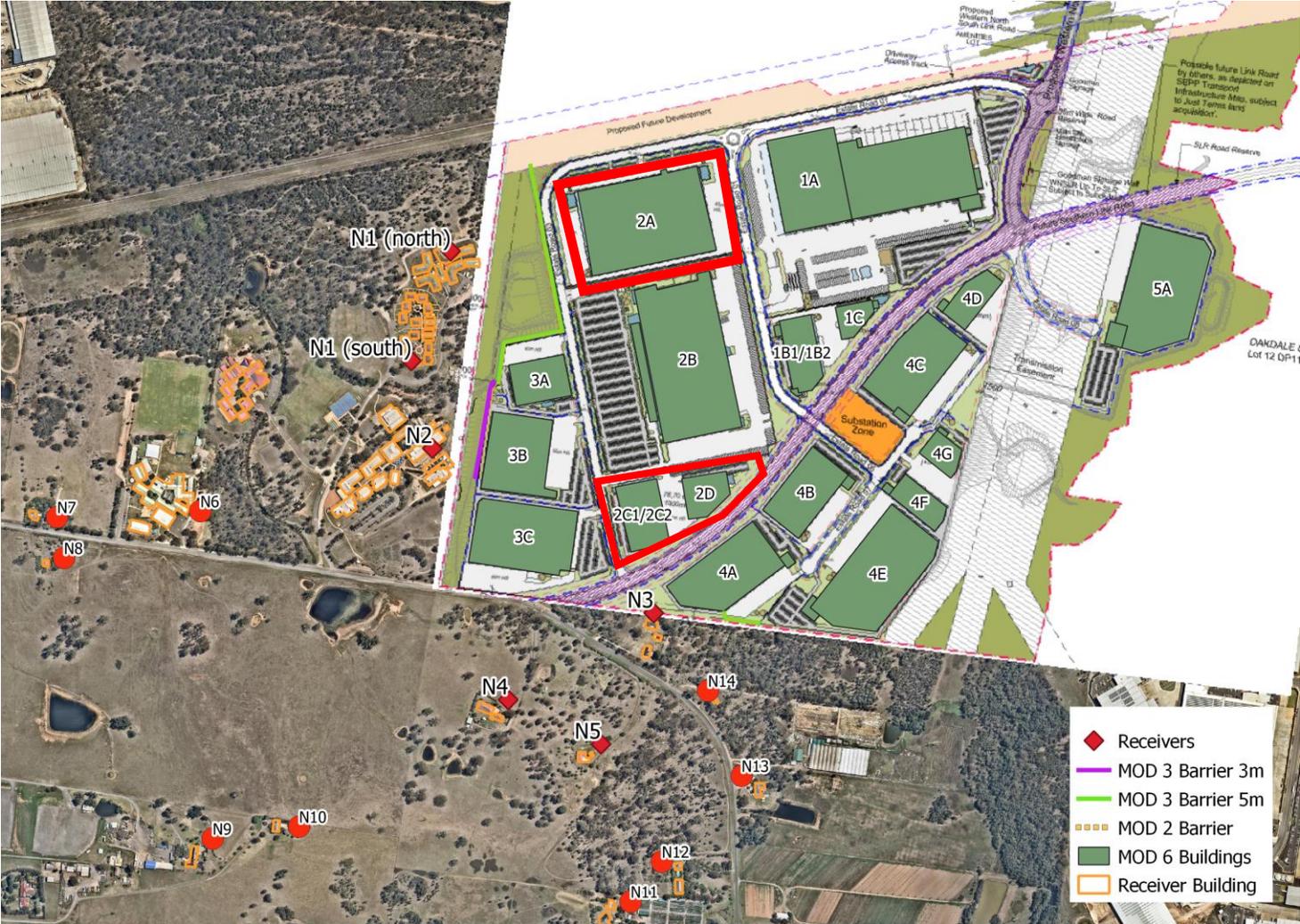
1.2 Background

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.

An overview of the approvals sought is set out in Sections 1.3 and 1.4.

Figure 1-1 Oakdale West Estate (MOD 6) – Buildings 2A, 2C and 2D



1.3 Modification 6 (SSD 7348 MOD 6)

A modification to the concept plan approval including the following was sought that includes:

- Minor change to building layout at Precinct 3 (principally Warehouses 3A/3B);
- Civil design amended to accommodate changes to Precinct 3 (as above);
- Increase in building height to Building 2A (increase to 14.9m at ridge from 13.7m);
- Minor alterations to building form and layout of Buildings 1B, 1C, 2A, 2C and 2D, resulting from detailed design development;
- Construction of Estate Road 8 under the Stage 1 Development; and
- Increasing the onsite speed limit to 50km/h for both light and heavy vehicles.

The changes assessed under MOD 6 are consistent with the proposed development under OWE Stage 3 (SSD 9794683).

1.4 Stage 3 Development Application (SSD 9794683 Stage 2 DA)

Stage 3 Development approval for the following is sought that includes:

- Construction, fit-out, and use approval of Building 2A, 2C and 2D;
- 24 / 7 operation;
- Warehouse and distribution use;
- Single level office and fit-out;
- Signage;
- Subdivision of Lot 2A, 2C and 2D;
- Landscaping; and
- Construction hours for building construction between 7am and 6pm.

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
<i>Description of all potential noise and vibration sources during the construction and operational phases of the development, including on and off-site traffic noise</i>	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
<i>A cumulative assessment of all potential noise sources in accordance with relevant Environment Protection Authority guidelines</i>	A cumulative noise assessment is provided in Section 4.8
<i>Demonstration of compliance with the noise limits set out in Condition B18, Schedule B of the Development consent SSD 7348</i>	The approved noise limits are set out in Section 3 Compliance with these limits is addressed in Section 4
<i>Details of noise mitigation, management and monitoring measures</i>	A summary of operational noise mitigation measures is provided in Section 4
	A summary of construction noise mitigation measures is provided in Section 6.5

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:

NOISE LIMITS

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	L _{AMax}
	L _{Aeq} (15 minute)	L _{Aeq} (15 minute)	L _{Aeq} (15 minute)	
N1 Emmaus Village Residential	44	43	41	52
N3 Kemps Creek – nearest residential property	39	39	37	52
N4 & N5 Kemps Creek – other residences	39	39	37	52
All other non-associated residences	40 ²	35 ²	35 ²	52
N2 Emmaus Catholic College (school)	When in use: 45 L_{Aeq} (1h)			

Notes:

1. Noise generated by the development is to be measured in accordance with the relevant procedures and modifications, including certain meteorological conditions, of the Noise Policy for Industry (EPA, 2017). Refer to the plan in Appendix 2 for the location of residential sensitive receivers.
2. or background + 5 dB, whichever is higher.

It is understood that a Noise Agreement between the applicant and receiver N3, N4 and N5 has been made. As such, the criteria in Condition B18 of the Development Consent SSD 7348 are not applicable at receivers N3, N4 and N5.

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.

Condition C10 of SSD 7348 also states the following:

NOISE AND VIBRATION

C10. Future DAs shall be accompanied by a noise and vibration impact assessment. The assessment must:

- (a) identify the noise and vibration impacts during construction and operation;
- (b) demonstrate compliance with the noise limits in Condition B18;
- (c) provide an analysis of all external plant and equipment, including but not limited to, forklifts, air conditioners and refrigeration systems;
- (d) incorporate noise mitigation measures, such as increased building setbacks, building insulation, noise barriers, layout of truck loading areas or source controls, to demonstrate the noise limits in Condition B18 can be achieved;
- (e) detail the timing to construct the noise walls shown in **Appendix 5**, to ensure noise from operation of the Development does not exceed the noise limits in Condition B18; and
- (f) recommend mitigation and management measures to be implemented to minimise noise during construction.

It should be noted that the construction of the noise walls, as per Appendix 5, has already been completed.

3.2 Noise Limits for Additional Receivers N6 to N14

The noise limits outlined in Condition B18 were taken from the original DA Noise Impact Assessment for the Oakdale West Estate prepared SLR. Noise monitoring was undertaken on the west and south boundary of the site. Locations of the noise monitoring is shown in Figure 3-1.

Noise measurement taken on the west boundary (L1) and should represent the additional receivers on the west side, this includes receivers N7 and N8. Noise measurement on the southern boundary (L2) should represent the additional receivers on the south side, this includes receivers N9 to N14.

Receiver N6 is Mamre Anglican College which will have the same the noise criteria as N2 – Emmaus Catholic College (school).

Figure 3-1 Noise monitoring location



3.3 Noise Criteria Considered by this Assessment

The MOD 3 assessment proposed a variation to the $L_{A1,1min}$ night-time noise limits to accord with the provisions of the NSW *NPfl*, 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 V8 noise modelling software, implementing the CONCAWE prediction method. The model incorporates the OWE MOD 6 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 3 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 MOD 6, as set out in Table 4-1.

The traffic volumes shown in brackets in Table 4-1 represent the 'Peak Season' 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 91 dBA for light vehicles travelling at 50 km/hr and 106 dBA for heavy vehicles travelling at 50 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 6, 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 2A 2C and 2D, operational information (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 6 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	269,006	677 (920) ²	468 (629)	3,797 (4,901)
Precinct 3	57,819	93	93	1,082
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 m² for amenities Lot GFA.

4.2 Mechanical Services & Fixed Plant

Table 4-2 presents the mechanical services/ fixed plant noise source assumptions for the OWE Lots.

Table 4-2 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 of Oakdale West Estate (OWE) Noise & Vibration Assessment Report (Report No.:19940 Version F)		
	2C-1	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	2C-2	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
	2D	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation
Precinct 3	3A	SWL 90 dBA Cumulative	SWL 90 dBA Cumulative	No Operation

Precinct	Lot	Day (7am -6pm)	Evening (6pm-10pm)	Night (10pm -7am)
	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 MOD 2 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 MOD 3 assessment. This assumes for 1 to 4 forklifts operating per lot for all periods, with the exception of Lots 2C, 2D, 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.

Forklift sound power levels of 96 dBA have been assumed.

4.4 Noise Barrier

The MOD 2 and MOD 3 noise assessment determined that noise walls to the west and south of the site were required and have been installed, as indicated in Figure 1-1.

The noise barrier to the west has a maximum height of 5 meters. The proposed MOD3 barrier layouts are shown in Figure 1-1. The noise barriers are installed

4.5 Operational Noise Scenarios

It is currently anticipated that Building 2B and 3A would operate at the estate when Buildings 2A,

2C and 2D is complete. Table 4-3 presents the assumptions for each noise prediction scenarios.

Table 4-3 Noise Prediction Scenarios

Scenario	Lot Operation	Description
Precincts 1 and 2 + Lot 3A	Lots 1A-1C, 2A, 2B, 2C, 2D and 3A	Light and Heavy onsite vehicle movements associated with Precinct 2 and Lot 3A. Precinct 2 and Lot 3A Mechanical Operation as per Table 4-2. Loading Activities as per Section 4.3 Barrier as per Sections 4.4.
All OWE Precincts	All Lots listed in Table 4-2	Light and Heavy onsite vehicle movements All Lots Mechanical Operation as per Table 4-2. Loading Activities as per Section 4.3 Barrier as per Sections 4.4.

4.6 Operational Noise Predictions – Considering All Precincts

Table 4-4 shows the $L_{Aeq,15min}$ operational noise predictions for both operational scenarios as outlined in Table 4-3.

The predictions in Table 4-4 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. Noise impact prediction at N2 is predicted to be higher during the operation of Precinct 1 and 2 + Lot 3A compared to all precinct operation. This is because the proposed building at Lot 3B and Lot 3C provide shielding from the OWE site, hence there is a reduction in noise impact during the 'All OWE Precincts' scenario.

Both the 'typical' and 'peak season' vehicle movements have been considered in the noise prediction model and the results for both scenarios are presented in the table below.

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

Receiver	Period (weather)	$L_{Aeq,15min}$ Noise Level (dBA)				
		Approved Noise Limits	Precincts 1 & 2 + Lot 3A		All Precincts	
			Typical	Peak Season	Typical	Peak Season
N1 – Emmaus Village Residential	Day	44	37	38	38	39
	Eve	43	36	37	37	38
	Night	41	35	36	35	36
	Night ^(Adverse)	41	38	39	39	39
N2 – Emmaus College (School)	Day	45	41	44	39	39
	Eve	n/a	41	42	39	39
	Night	n/a	38	40	33	34
	Night ^(Adverse)	n/a	42	44	37	37
N6 – Mamre Anglican College	Day	45	32	33	32	32
	Eve	n/a	31	32	32	32
	Night	n/a	31	31	30	30
	Night ^(Adverse)	n/a	35	36	34	35
N7 – 21-42 Bakers Ln, Kemps Creek	Day	44	29	30	30	30
	Eve	43	28	29	29	30
	Night	41	27	28	27	28
	Night ^(Adverse)	41	33	34	33	34
N8 – 706-752 Mamre Rd, Kemps Creek	Day	44	29	30	30	31
	Eve	43	29	29	30	30
	Night	41	28	28	28	28
	Night ^(Adverse)	41	33	34	33	34
N9 – 754-770 Mamre Rd, Kemps Creek	Day	39	17	18	18	18
	Eve	39	16	17	17	18
	Night	37	15	16	16	16
	Night ^(Adverse)	37	20	21	20	21
N10 – 784-786 Mamre Rd, Kemps Creek	Day	39	28	30	30	31
	Eve	39	28	28	29	30
	Night	37	27	27	27	28
	Night ^(Adverse)	37	31	33	32	33
N11 – 99-111 Aldington Rd Kemps Creek	Day	39	31	32	33	35
	Eve	39	30	31	33	34
	Night	37	29	30	30	32
	Night ^(Adverse)	37	34	35	36	37
N12 – 53 Aldington Rd Kemps Creek	Day	39	30	31	33	34
	Eve	39	30	30	32	33
	Night	37	29	30	30	31

Receiver	Period (weather)	L _{Aeq,15min} Noise Level (dBA)				
		Approved Noise Limits	Precincts 1 & 2 + Lot 3A		All Precincts	
			Typical	Peak Season	Typical	Peak Season
	Night ^(Adverse)	37	33	35	35	37
N13 – 54-72 Aldington Rd Kemps Creek	Day	39	30	31	32	33
	Eve	39	30	30	32	33
	Night	37	29	30	30	31
	Night ^(Adverse)	37	33	34	34	36
N14 – 74-88 Aldington Rd	Day	39	31	32	31	32
	Eve	39	31	31	30	32
	Night	37	30	30	26	27
	Night ^(Adverse)	37	32	33	31	33

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: 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 3: This assessment has applied a revised sound power level of 91 dBA to represent a light vehicle movement. MOD2 applied a sound power level of 96 dBA, which is considered overly conservative.

4.7 Sleep Disturbance Assessment

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 4-5 identifies the MOD 3 L_{A1,1min} maximum operational noise predictions in comparison with the adopted L_{A1,1min} noise criteria. The table shows the L_{A1,1min} maximum noise predictions in comparison with the approved noise limits for 'Precinct 1 and 2 + Lot 3A' scenario and 'All OWE Precincts' scenario.

Table 4-5 Predicted Maximum Operational Noise Levels – All Precincts

Receiver	Period	L _{A1,1min} Noise Level (dBA)		
		Adopted Criteria (Approved Limit)	Precincts 1 & 2 + Lot 3A	All Precinct
N1 – Emmaus Village Residential	Night	52 (51)	44	44
	Night ^{Adverse}	52 (51)	50	50
N2 – Emmaus College (School)	Night	n/a	n/a	n/a
	Night ^{Adverse}	n/a	n/a	n/a
N6 – Mamre Anglican College	Night	n/a	n/a	n/a
	Night ^{Adverse}	n/a	n/a	n/a
N7 – 21-42 Bakers Ln,	Night	52 (51)	37	37

Receiver	Period	L _{A1,1min} Noise Level (dBA)		
		Adopted Criteria (Approved Limit)	Precincts 1 & 2 + Lot 3A	All Precinct
Kemps Creek	Night ^{Adverse}	52 (51)	44	41
N8 – 706-752 Mamre Rd, Kemp's Creek	Night	52 (51)	35	35
	Night ^{Adverse}	52 (51)	41	42
N9 – 754-770 Mamre Rd, Kemp's Creek	Night	52 (51)	35	20
	Night ^{Adverse}	52 (51)	42	27
N10 – 784-786 Mamre Rd, Kemp's Creek	Night	52 (51)	20	35
	Night ^{Adverse}	52 (51)	27	41
N11 – 99-111 Aldington Rd Kemp's Creek	Night	52 (51)	35	36
	Night ^{Adverse}	52 (51)	41	43
N12 – 53 Aldington Rd Kemp's Creek	Night	52 (51)	35	36
	Night ^{Adverse}	52 (51)	41	42
N13 – 54-72 Aldington Rd Kemp's Creek	Night	52 (51)	35	36
	Night ^{Adverse}	52 (51)	42	43
N14 – 74-88 Aldington Rd Kemp's Creek	Night	52 (51)	35	49
	Night ^{Adverse}	52 (51)	40	51

The two scenarios have the same noise impact results because the maximum truck engine brake originates from Lot 2A or 2D, which is found in both scenarios.

4.8 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 allowing for openable windows.

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 4-6.

Table 4-6 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, N7 – N14	45	40	35
School	N2 & N6	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 4-7 shows the $L_{Aeq,Period}$ operational noise predictions in comparison with the identified Project Amenity Noise Levels for 'Precincts 1 & 2 + Precinct 3A' operation and 'All Precincts' operation.

At N1, at night under noise enhancing meteorological conditions an OWE noise contribution in the range $L_{Aeq,Period}$ 37-39 dBA is predicted. This exceeds the Project Amenity Noise Level by 1 to 4 dB for both scenarios. And N11, at night under noise enhancing meteorological conditions a 37 dBA is predicted during all precinct operation. This exceeds the Project Amenity Noise Level by 1dB. However, when consideration is given to the additional 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.

Table 4-7 Predicted $L_{Aeq,Period}$ Operational Noise Levels – Staged Development

Receiver	Period (weather)	$L_{Aeq,Period}$ Noise Level (dBA)				
		NPII Project Amenity Noise Levels (SSDA Levels shown in brackets)	Precincts 1 and 2 + Lot 3A		All Precincts	
			Typical	Peak Season	Typical	Peak Season
N1 – Emmaus Village Residential	Day	45 (50)	36	37	38	39
	Eve	40 (44)	36	37	37	38
	Night	35 (36)	34	35	35	35
	Night ^(Adverse)	35 (36)	37	38	38	39
N2 – Emmaus College (School)	Day	45	41	43	39	39
	Eve	n/a	41	43	39	39
	Night	n/a	38	40	33	34
	Night ^(Adverse)	n/a	42	44	36	37
N6 – Mamre Anglican College	Day	45	31	32	31	32
	Eve	n/a	31	32	31	32
	Night	n/a	31	31	30	30
	Night ^(Adverse)	n/a	35	36	34	35
N7 – 21-42 Bakers Ln, Kemps Creek	Day	45 (50)	28	29	29	30
	Eve	40 (44)	28	29	29	30
	Night	35 (36)	27	28	27	28
	Night ^(Adverse)	35 (36)	32	34	32	33
N8 – 706-752 Mamre Rd, Kemps Creek	Day	45 (50)	28	29	29	30
	Eve	40 (44)	29	29	29	30
	Night	35 (36)	28	28	27	28
	Night ^(Adverse)	35 (36)	33	33	32	33
N9 – 754-770 Mamre Rd, Kemps Creek	Day	45 (50)	16	17	17	18
	Eve	40 (44)	16	17	17	18
	Night	35 (36)	15	16	16	16
	Night ^(Adverse)	35 (36)	20	21	20	21
N10 – 784-786 Mamre Rd, Kemps Creek	Day	45 (50)	27	29	29	30
	Eve	40 (44)	28	29	29	30
	Night	35 (36)	27	27	27	28
	Night ^(Adverse)	35 (36)	31	32	32	33
N11 – 99-111 Aldington Rd Kemps Creek	Day	45 (50)	30	31	32	34
	Eve	40 (44)	30	31	32	34
	Night	35 (36)	29	30	30	32
	Night ^(Adverse)	35 (36)	34	35	36	37
N12 – 53	Day	45 (50)	30	31	32	33

Receiver	Period (weather)	L _{Aeq,Period} Noise Level (dBA)				
		NPFT Project Amenity Noise Levels (SSDA Levels shown in brackets)	Precincts 1 and 2 + Lot 3A		All Precincts	
			Typical	Peak Season	Typical	Peak Season
Aldington Rd Kemps Creek	Eve	40 (44)	30	31	32	33
	Night	35 (36)	29	29	30	31
	Night ^(Adverse)	35 (36)	33	34	35	36
N13 – 54-72 Aldington Rd Kemps Creek	Day	45 (50)	30	31	32	33
	Eve	40 (44)	30	31	32	33
	Night	35 (36)	29	30	30	31
	Night ^(Adverse)	35 (36)	32	34	34	35
N14 – 74-88 Aldington Rd	Day	45 (50)	31	32	31	32
	Eve	40 (44)	31	32	31	32
	Night	35 (36)	30	30	26	27
	Night ^(Adverse)	35 (36)	32	32	31	33

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: Bold text indicates an exceedance of the Project Amenity Noise Levels.

Note 3: 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 4: This assessment has applied a revised sound power level of 91 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, 4A, 4B, 4E; restriction of the use of forklifts during the night-time period on Lots 3B, 3C, 3D, 3E, 2B, 2C, 2D, 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.

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 Stage 2 DA, this assessment considers the potential construction noise and vibration impacts from the development of Buildings 2A, 2C, 2D and 3A.

The construction works are proposed to be undertaken between normal operating hours (7.00am – 6.00pm Monday to Friday and 8.00am – 1.00pm Saturdays)

The following scenarios have been assessed:

- Site clearing and earthworks at lots 2A, 2C, 2D and 3A;
- Pad and hardstand works, including concrete pours at Lot 2A, 2C, 2D and 3A; and
- Construction of warehouse and office structures.

The use of the site access road for the delivery of materials to the site is assumed in all construction work scenarios

6.1 Construction Noise Criteria

Construction works will be undertaken within the standard construction hours (7.00am – 6.00pm Monday to Friday and 8.00am – 1.00pm Saturdays), as per Condition D70 of SSD 7348.

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	Highly Noise Affected
N1, N7 & N8	Day	49	75
N9 – N14	Day	44	75
N2 & N6	Day	55*	n/a

*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

The proposed construction works have been divided into three construction work areas. The first work area is within Lot 2A, the second area is within Lot 2C and 2D, and the third is in Lot 3A.

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. The western site boundary noise wall, as shown in Figure 1-1, is constructed and is included the construction noise prediction model.

Table 6-2 Sound Power Levels for Construction Equipment

Construction Activity	Equipment	Operating minutes in 15-min period	No of Items in each Work Area	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	Lot 2A: 4 HV per Hour (Daytime) Lot 2C & 2D: 4HV Movements per Hour (Daytime) Lot 3A: 4HV Movements per Hour (Daytime)			115 (Heavy 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	Construction
N1 – Emmaus Village Residential	Day (Standard)	49	75	50	48	43
N2 – Emmaus Catholic College (School)	Day (Standard)	55*	n/a	55	52	46
N6 – Mamre Anglican College	Day (Standard)	55*	n/a	41	39	34
N7 – 21-42 Bakers Ln, Kemps Creek	Day (Standard)	49	75	39	37	32
N8 – 706-752 Mamre Rd, Kemps Creek	Day (Standard)	49	75	25	22	18
N9 – 754-770 Mamre Rd, Kemps Creek	Day (Standard)	44	75	37	34	30
N10 – 784-786 Mamre Rd, Kemps Creek	Day (Standard)	44	75	39	36	32
N11 – 99-111 Aldington Rd Kemps Creek	Day (Standard)	44	75	36	34	29
N12 – 53 Aldington Rd Kemps Creek	Day (Standard)	44	75	35	32	28
N13 – 54-72 Aldington Rd Kemps Creek	Day (Standard)	44	75	41	39	34
N14 – 74-88 Aldington Rd Kemps Creek	Day (Standard)	44	75	39	37	32

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: Bold text indicates an exceedance of the *ICNG* CNML.

Note 3: The predictions assume the western site boundary noise wall, as shown in Figure 1-1.

All construction noise scenarios are predicted to be within the daytime CNML with exception to noise impact from earthworks at N1. It should be noted, a 1dB difference in noise is not noticeable in this context and should be considered negligible. However, noise mitigation should be implemented in order to minimise noise impact on the surrounding receivers, as provided in Section 6.3.

6.3 Construction Noise Mitigation

As noted, the predictions indicate general compliance with the *ICNG* standard hours criteria without any focussed mitigation requirements, except for the minor exceedance of earthworks noise at N1.

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; and
- 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.

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

6.4 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.

6.5 Construction Noise & Vibration Management Plan

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 noise and construction noise & vibration assessment of Buildings 2A, 2C and 2D within the SSD 10397 Stage 2 Development Application (Stage 2 DA) on the approved Oakdale West Estate (OWE) in Kemps Creek, NSW.

It is currently anticipated that Building 2B and 3A would operate at the estate when Buildings 2A, 2C and 2D is complete. Accordingly, this assessment considered two separate operational noise scenarios. One scenario with Precinct 1 + 2 and 3A is in operation and the second scenario with the whole OWE Precinct in operation.

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 following items have been found during the assessment:

Precincts 1 & 2 + Lot 3A Operating

- Prior to the full development of the OWE, the operation of Precincts 1 & 2 + Lot 3A is predicted to comply with the operational noise criteria during the day, evening and night period.
- An assessment of potential sleep disturbance has been undertaken considering heavy vehicle brake releases and reverse alarms. Sleep disturbance prediction indicate that noise impact would comply with the relevant criterion.

All OWE Precincts Operating

- The operation of full development of the OWE is predicted to comply with the operational noise criteria during the day, evening and night period.
- An assessment of potential sleep disturbance has been undertaken considering heavy vehicle brake releases and reverse alarms. Sleep disturbance prediction indicate that noise impact would comply with the relevant criterion.

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

At N1, at night under noise enhancing meteorological conditions an OWE noise contribution in the range $L_{Aeq,Period}$ 37-39 dBA is predicted. This exceeds the Project Amenity Noise Level by 1 to 4 dB for both scenarios. And N11, at night under noise enhancing meteorological conditions an 37 dBA is predicted during all precinct operation. This exceeds the Project Amenity Noise Level by 1dB. However, when consideration is given to the additional 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 *NPII* recommended ANLs (for cumulative industrial noise) would be generally achieved at N1.

Site operation for Buildings 2A, 2C and 2D are to adhere to the mechanical and loading activity assumptions as outlined in Section 4.2 and 4.3 to ensure noise compliance is achieved.

Construction Phase

This assessment has considered construction noise and vibration impacts that have potential to arise during the Stage 2 DA development of Building 2A, 2C and 2D, and 3A.

The key construction works would involve site clearing and earthworks at lots 2A, 2C, 2D and 3A, pad and hardstand works at each lot and the construction of the Building warehouse and office structures at each lot in question. All construction work scenarios include 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 of lots 2A, 2C, 2D and 3A. The construction works are proposed to be undertaken between normal operating hours (7.00am – 6.00pm Monday to Friday and 8.00am – 1.00pm Saturdays).

All construction noise scenarios are predicted to be within the daytime CNML with exception to noise impact from earthworks at N1. It should be noted that the 1dB exceedance of the CNML noise is negligible. However, noise mitigation should be implemented in order to minimise noise impact on the surrounding receivers, as provided in Section 6.3.

No vibration impacts are anticipated during the proposed works.