ACOUSTICS AND AIR

OAKDALE WEST ESTATE (OWE)
NOISE & VIBRATION ASSESSEMENT
INDEPENDENT ADEQUACY REVIEW & GAP ANALYSIS

REPORT NO. 14614
VERSION A

MARCH 2017

PREPARED FOR

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DOCUMENT CONTROL

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A	Final	3 March 2107	Sean Flaherty	Rob Bullen

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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.

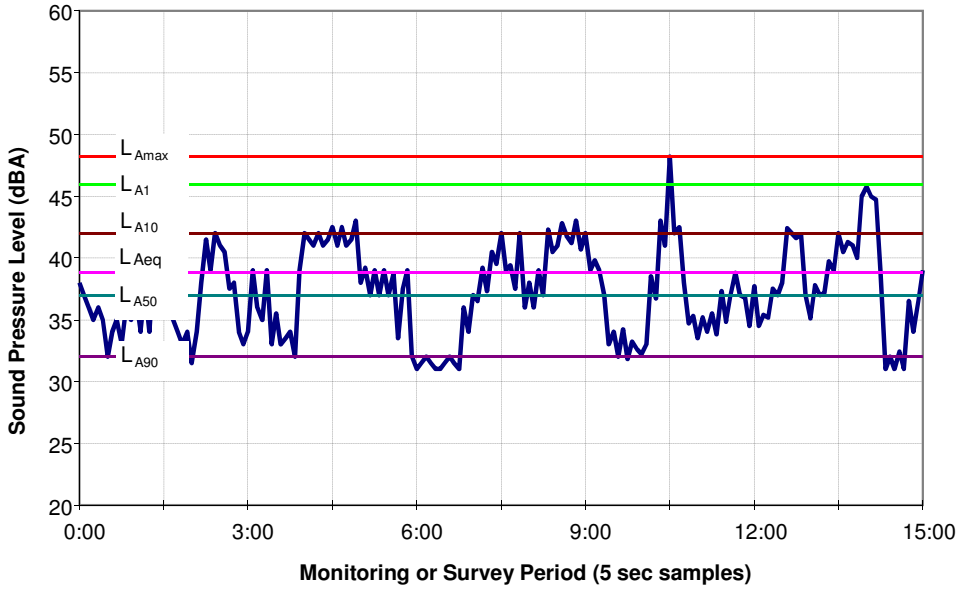
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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

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 four precincts totalling approximately 89.53 ha of developable area.

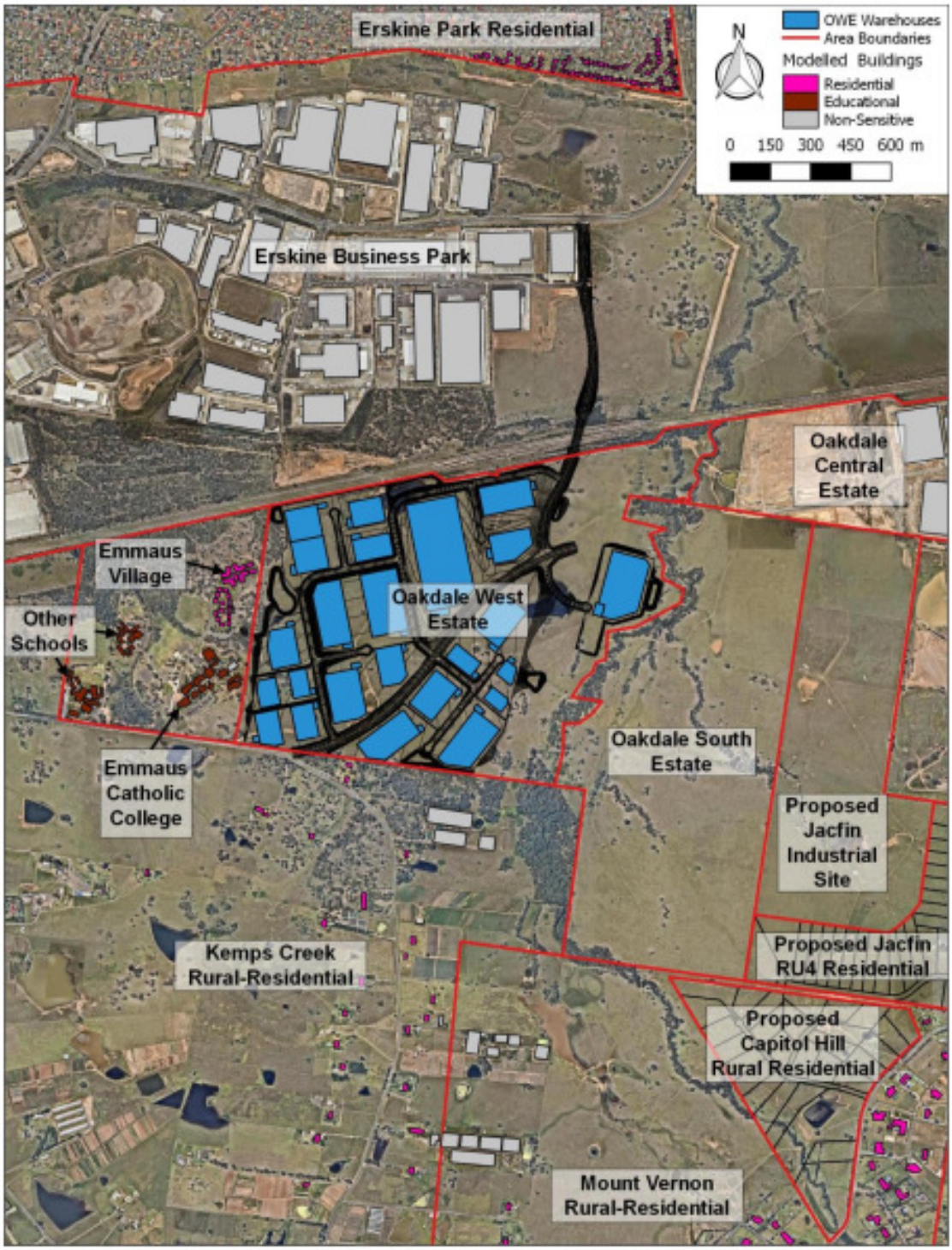
SLR Consulting Australia Pty Ltd (SLR) has prepared a Noise & Vibration Impact Assessment (NVIA) for the State Significant Development Application (SSDA). The findings of this assessment are set out in the SLR report numbered *610.15617-R2*, dated 16 February 2017.

Wilkinson Murray Pty Limited (WM) has been commissioned by Goodman in a peer review role capacity to undertake a technical review of the OWE NVIA, provide comment on its adequacy and where necessary identify any errors or omissions.

WM has reviewed the OWE NVIA inclusively, however this report is generally focused only on the points of most importance or concern. Where particular issues have not been identified, WM considers that these have been appropriately dealt with in the assessment process.

Figure 1-1, extracted from the NVIA shows the subject site, surrounding industrial sites and sensitive receivers considered by the assessment.

Figure 1-1 Site Location Plan



1.1 Overview of the Noise & Vibration Impact Assessment (NVIA)

SLR's construction and operational noise and vibration assessment for the OWE has included:

- identification of receivers surrounding the subject site potentially sensitive to noise and vibration effects;
- an ambient noise survey to broadly determine the existing noise environment within the study area;
- derivation of project specific noise and vibration criteria for the identified receivers in accordance with the relevant state policy and guidelines;
- prediction of operational noise and construction noise & vibration from the proposed development and assessment of potential impacts in accordance with relevant legislation and guidelines; and
- recommendation of management and mitigation measures to reduce and control potential impacts where noise and vibration levels are predicted to be above the assessment criteria.

1.2 Secretary's Environmental Assessment Requirements (SEARs)

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). These are set out Table 1 of the SLR report.

This review finds that the SLR report has generally addressed the relevant SEARs.

1.3 Assessment Guidelines

The SLR report has adopted the appropriate NSW Environment Protection Authority (EPA) guidelines, as required by the SEARs, as follows:

- Noise from on-site operations (including on-site vehicle movements) has been assessed in accordance with the NSW *Industrial Noise Policy (INP)*, NSW EPA, 2000, with guidance on sleep disturbance criteria taken from the online Application Notes to the *INP*.
- 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.
- Construction road traffic noise has been assessed in accordance with the NSW *Road Noise Policy (RNP)*, NSW EPA, 2011.
- Vibration from construction has been assessed in accordance with *Assessing Vibration: A Technical Guideline*, DEC, 2006 and British Standard BS 7385 Part 2 – 1993: *Evaluation and Measurement for Vibration in Buildings Part 2*.

1.4 General Review Comments

In general terms, WM considers the SLR noise and vibration assessment to have been undertaken adequately and proficiently, and generally in accordance with the relevant SEARs.

WM generally concurs with the methodologies applied to the technical assessments, which appear to have been undertaken appropriately and in line with best practice. The calculated/modelled results are broadly consistent with WM experience on other similar projects.

It is considered that the SLR assessment is sufficiently thorough considering the fact that the project is in the early planning stage.

A detailed review of the OWE NVIA is provided in the following sections.

2 DETAILED REVIEW OF OPERATIONAL NOISE ASSESSMENT

2.1 Summary of Operational Noise Impact Assessment

The operational noise impact assessment has been conducted based on the OWE Masterplan design (dated January 2017).

Operational noise criteria have been determined in general accordance with the processes outlined in the NSW *Industrial Noise Policy* (INP).

For the purpose of assessment it has been assumed that the development would operate 24 hours a day, 7 days a week.

Operational noise emissions from the site have been predicted with a model prepared using the SoundPLAN V7.1 software. The model incorporates the buildings and sensitive receivers shown in Figure 1-1.

Operational noise sources included in the model comprise fixed rooftop plant, on site vehicles movements based on vehicle volumes provided by the project traffic engineers and mobile plant used for loading/unloading. It has been conservatively assumed that maximum peak vehicle movements in every precinct of the OWE would occur concurrently.

Predictions have been conservatively undertaken with consideration to neutral and adverse meteorological conditions. The assessment applies the default adverse meteorological conditions outlined by the INP, these being:

- 3 m/s source to receiver wind during the daytime and evening periods; and
- F-class temperature inversion with a 2 m/s source to receiver drainage flow during the night-time period.

Operational noise impacts are reported and feasible and reasonable noise mitigation measures are investigated to reduce the noise impacts on the most-affected receivers.

Barriers with heights of 2 m and 5 m, located near the most affected receivers, are recommended to reduce operational noise impacts.

2.2 WM Comments Concerning Operational Noise

2.2.1 Ambient Noise Survey

Ambient noise survey locations, as detailed in Table 2 of the assessment (and shown in Figure 4) are considered to have been appropriately selected for the purpose of providing a broad characterisation of the acoustic environment.

The noise monitoring methodology appears to have been undertaken in accordance with standard practice and the instrumentation used complies with the relevant Australian Standard.

Analysis of the measured noise levels has been carried out in general accordance with the procedures contained in the NSW *Industrial Noise Policy (INP).*

The noise monitoring results set out in Tables 3 and 4 of the assessment are broadly consistent with WM's experience of ambient noise levels measured in similar environments.

2.2.2 Operational Noise Criteria

The operational noise criteria set out in Table 10 of the report appear to have been determined in general accordance with the processes outlined in the NSW *Industrial Noise Policy* (INP).

The OWE is surrounded by other industrial sites which are either currently under construction or undergoing approval. As shown in Figure 1-1, these are the Oakdale Central, Oakdale South and Jacfin sites.

The OWE assessment notes that the industrial noise contributions from these sites (based on review of their respective noise assessments) have been taken into account in determining the INP Amenity criteria for the OWE.

WM concurs with the general approach adopted to ensure that cumulatively these sites would not generate noise levels in excess of the level recommended by the INP for acceptable amenity.

It is not clear at what location(s) the existing and future contributions have been calculated, or exactly how the noise levels from these surrounding sites were determined. It is assumed that a "worst case" contribution has been conservatively adopted.

2.2.3 Considered Meteorological Conditions

The report notes in Section 4.2 that assessment has been undertaken with consideration of both neutral and adverse meteorological conditions. The assessment applies the default adverse meteorological conditions outlined by the INP, these being:

- 3 m/s source to receiver wind during the daytime and evening periods; and
- F-class temperature inversion with a 2 m/s source to receiver drainage flow during the night-time period.

The report provides an analysis of meteorological data obtained over the 12 month period between January to December 2016 from the Bureau of Meteorology automatic weather station at Horsley Park.

For a moderate strength temperature inversion to be considered a characteristic feature of an area, the INP nominates that such a condition should occur for approximately 30% of the total

night-time during winter. This equates to approximately two nights per week. While section 3.6.2 of the report does not set out exact details of the procedure used to analyse the Bureau of Meteorology's data, the conclusion that F-class conditions should be considered at night is consistent with our expectations and, if anything, conservative.

With respect to prevailing wind conditions, it is noted that the 2016 meteorological data analysis, as set out in Section 3.6.1 of the report, indicates no particular prevailing wind direction during the daytime and evening periods in any season.

Analysis of the 2016 data indicates that winds of up to 3 m/s did exceed the 30% threshold stipulated by the INP during the night-time period in autumn. It is noted, however, that the prevailing wind in this season is indicated to be from the SW to WSW directions and that local residents would not be downwind of the site under these conditions.

Notwithstanding this, the consideration of prevailing wind by the assessment is considered to be conservative and this is acknowledged by SLR in Section 3.6.1 of the report.

2.2.4 Operational Noise Source Assumptions

The on-site vehicle movements considered in the noise assessment, which are understood to have been provided by the project's traffic engineer are reported as follows:

- *750 vehicles per hour during AM peak hour.*
- *750 vehicles per hour during PM peak hour.*
- *225 vehicles per hour during night-time peak hour (30% of PM peak).*
- *8,760 vehicles per day.*
- *Vehicles outside of the AM and PM peak hours are split evenly across each hour.*
- *Heavy vehicles make up approximately 25% of total vehicle movements.*

WM has discussed the modelling of vehicle movements with SLR and generally concurs with the applied methods as described in Section 4.2.1 of the report.

The assessment has also included sources to specifically represent the noise generated by forklift loading/unloading activities and from fixed roof-top plant.

WM concurs with the sound power levels and speeds for on-site vehicle movements applied by the assessment, as set out in Table 11 of the report. Additionally source sound power levels for roof-top mechanical services plant accord with WM's experience on other similar projects.

In the assessment of sleep disturbance the report considers maximum noise levels from heavy vehicle brake releases and reverse alarms (non-tonal) which have been modelled in the hardstand areas of the development. The assessment applies the L_{Amax} sound power level of 115 dBA which is considered appropriate.

2.2.5 Predicted Operational Noise Impacts - Neutral Met

Under neutral meteorological conditions the assessment predicts noise emissions from the operation of the OWE to marginally impact only one sensitive receiver. At this Kemps Creek residence, noise levels are predicted to be within the INP Amenity criteria at all times, but in exceedance of the nominated INP Intrusiveness noise criteria by up to 2 dB during the daytime

and evening periods during worst-case peak operations.

L_{Amax} noise emissions are also predicted to marginally exceed the nominated sleep disturbance screening criteria by 1 dB at the identified Kemps Creek receiver.

Full compliance is predicted at all other receiver locations at all times under neutral meteorological conditions.

2.2.6 Predicted Operational Noise Impacts - Adverse Met

Under adverse meteorological conditions noise emissions are predicted to exceed the nominated INP Intrusiveness noise criteria during the daytime and evening periods by up to 3 dB at eight residential receivers in Emmaus Village, and by up to 7 dB at four residential receivers in Kemps Creek. During the night-time period noise emissions are predicted to exceed the Intrusiveness criterion by up to 3 dB at three residential receivers in Kemps Creek.

Additionally, noise emissions are predicted to exceed the night-time amenity criterion under adverse weather conditions by up to 1 dB at one residential receiver in Kemps Creek.

Under adverse meteorological conditions L_{Amax} noise emissions are predicted to exceed the sleep disturbance screening criteria at two residential receivers in Kemps Creek by up to 5 dB.

2.2.7 Residual Noise Impacts with Barriers – Neutral Met

With the inclusion of the noise barriers, full compliance with the INP Intrusiveness and Amenity criteria and the nominated sleep disturbance screening criterion is predicted for all identified receivers under neutral meteorological conditions.

2.2.8 Residual Noise Impacts with Barriers – Adverse Met

Under the considered adverse meteorological conditions, the INP amenity criteria are predicted to be met at all receivers, however, residual exceedances of the INP Intrusiveness criteria by up to 3 dB are predicted at three Kemps Creek receivers during the day and evening periods.

Additionally, under adverse weather conditions residual L_{Amax} noise emissions are predicted to exceed the sleep disturbance screening criteria by up to 2dB at two residential receivers in Kemps Creek.

2.2.9 Treatment of Residual Operational Noise Impacts

The assessment suggests entering discussions with the affected landholders regarding suitable mitigation of the residual exceedances. WM would agree with this approach.

4 REVIEW OF OFF SITE TRAFFIC NOISE IMPACTS

4.1 Summary of Off-Site Traffic Noise Impact Assessment

The OWE NVIA includes the following in relation to off-site traffic noise:

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 8,760 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.

The WNSLR is proposed as a new road and is subject to a separate road traffic noise assessment (SLR report 610.16083-R1).

4.2 WM Comments Concerning Off-Site Traffic Noise

WM's considers that the off-site traffic noise assessment has been adequately undertaken.

5 REVIEW OF CONSTRUCTION NOISE ASSESSMENT

5.1 Summary of Construction Noise Impact Assessment

The OWE NVIA includes the following in relation to construction noise:

Construction noise impacts have been predicted for several construction activities during the various stages of construction of the OWE.

The worst impacts are predicted during site clearing and earthworks in the vicinity of Lots 2D, 2E and 4A, when works are adjacent to the nearest sensitive receivers.

Typical noise impacts during construction of the OWE are predicted to result no exceedance to minor exceedances of the NMLs.

No receivers are considered to be Highly Noise Affected, ie with predicted noise levels exceeding 75 dB L_{Aeq}.

No exceedance of the NMLs is predicted at sensitive receivers in Horsley Park, Mt Vernon or Erskine Park during construction of the OWE.

It is important to note that the above exceedances are based on a worst-case assessment of all equipment for each activity operating simultaneously at the closest point of the site to the most affected receiver. These worst-case exceedances would not be expected to occur often, as the majority of works would be at a greater distance relative to the most-affected receivers, and the occurrence of all plant operating simultaneously would be low.

Where exceedances of the NMLs are predicted, construction noise mitigation should be considered to reduce the potential noise impacts on the surrounding sensitive receivers. Typical construction noise mitigation measures have been recommended in Section 5.

Construction impacts associated with the WNSLR are assessed in a separate report.

Construction traffic on Bakers Lane from the OWE and WNSLR sites is not predicted to increase daytime road traffic noise levels by more than 2 dBA at the nearest sensitive receivers. Construction road traffic noise mitigation or management measures are therefore not considered to be required.

5.2 WM Comments Concerning Construction Noise

WM considers that the construction noise assessment has been adequately undertaken. Construction noise criteria, as set out in Tables 16 and 17 of the OWE report appear to have been have been appropriately determined in accordance with the ICNG.

The reported exceedances are as expected with consideration to identified works.

WM concurs with the mitigation measures recommended by SLR.

6 REVIEW OF CONSTRUCTION VIBRATON ASSESSMENT

6.1 Construction Vibration Impact Assessment

Vibratory rollers and plate compactors have the potential to be operated within the recommended safe working distances of structures in Emmaus Village, Emmaus Catholic School and immediately adjacent to the southern boundary in Kemps Creek.

Vibration at the nearest receivers is likely to be perceptible at times during the works when vibration intensive equipment is operated adjacent to the nearest receivers.

There is potential for ground vibration levels to exceed the cosmetic damage criteria and human comfort criteria depending on the duration and nature of the construction activity. The required locations for vibration intensive equipment should be reviewed during the preparation of the site specific CNVMPs for construction works adjacent to the most affected receivers.

A detailed construction methodology and associated management plans (including a Construction Noise and Vibration Management Plan) should 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 which include vibration monitoring during the works.

6.2 WM Comments Concerning Construction Vibration

WM considers that the construction vibration assessment has been adequately undertaken. Construction vibration criteria, as set out in Tables 25-26 of the OWE report are considered appropriate.

The reported potential for exceedances are as expected with consideration to identified works.

WM concurs with the vibration mitigation measures recommended by SLR.

7 CONCLUSION

Wilkinson Murray Pty Limited (WM) has undertaken a technical review of the OWE noise and vibration impact assessment, prepared by SLR Consulting Australia Pty Ltd (SLR) in relation to the proposed Oakdale West Estate (OWE) in Kemps Creek, NSW.

WM considers the SLR noise and vibration assessment to have been undertaken adequately and proficiently, and generally in accordance with the relevant SEARs.

WM generally concurs with the methodologies applied to the technical assessments, which appear to have been undertaken appropriately and in line with best practice. The calculated/modelled results are broadly consistent with WM experience on other similar projects.

The OWE assessment has conservatively considered adverse meteorological conditions to be a feature of the local area during the day, evening and night assessment periods and some notable exceedances of the established criteria have been identified as a result.

It should be noted that whilst adverse wind conditions have been considered for the daytime and evening periods, these conditions have not been clearly demonstrated to be a feature of the site and as such the extent of the reported exceedances may be overstated. Nevertheless, the inclusion of these conditions may be considered conservative and good practice.