ASPECT INDUSTRIAL ESTATE

Construction Noise and Vibration Management Plan

Prepared for:

Mirvac Projects Pty Ltd
Level 28, 200 George Street
Sydney NSW 2000
Australia

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Mirvac Projects Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.19127-R05-v1.3	14 July 2022	Joshua Ridgway	Mark Irish	Mark Irish
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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Mirvac Projects Pty Ltd (Mirvac) to prepare a Construction Noise and Vibration Management Plan (CNVMP) for construction works associated with the development of the Aspect Industrial Estate (AIE) located at Mamre Road, Kemps Creek, NSW.

This CNVMP addresses the potential noise and vibration impacts associated with the construction of the development and details the mitigation and management procedures for dealing with potential impacts. Construction noise and vibration impacts were previously assessed for the site as part of the *Aspect Industrial Estate SSDA Noise and Vibration Impact Assessment* prepared by SLR in February 2021 (the NVIA).

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in **Appendix A**.

SLR is suitably qualified to produce this CNVMP and is a member of the Australian Acoustical Society (AAS). SLR is also a member firm of the Association of Australasian Acoustical Consultants (AAAC). Endorsement of the SLR Acoustics and Vibration team in accordance with Condition D44(a) of the Development Consent has been granted by the Planning Secretary (refer to **Appendix B**).

1.1 Procedure for Implementing this CNVMP

This general procedure will be followed in order to implement this CNVMP on site:

1. Review the requirements of the Development Consent Conditions relevant to construction noise and vibration (refer to **Section 3**), the location of the nearest sensitive receivers (refer to **Section 2**) and the applicable Noise Management Levels (NMLs) (refer to **Section 5.2.2**).
2. Prior to commencement of construction phases/activities, confirm the assumptions regarding construction activities/locations/equipment/methodology detailed in **Section 6.1** are accurate and remain valid. Where different methodology or equipment is proposed, further validation of the predicted noise levels will be undertaken in accordance with **Section 6.1.1**.
3. Review the predicted noise levels for the proposed construction activities (refer to **Section 6.3** and any updated assessment undertaken in step 2) to confirm the predicted impacts for each activity. Each activity has “typical” noise level predictions, and “peak” noise level predictions using the noisiest equipment for that activity.
4. Where the noise impacts are predicted to be:
   - Below the relevant NMLs – undertake best practice noise management measures to minimise noise impacts
   - Above the NMLs – implement all feasible and reasonable noise mitigation and management measures relevant to that activity (refer to **Section 7.2**) to reduce the impacts (to below the NMLs where possible). Measures considered/implemented must be documented for inclusion in the Construction Contractor’s Monthly Report to Mirvac.
   - Above 75 dBA – implement mitigation and management measures for highly noise affected receivers as per **Section 7.2** including consideration of respite periods, duration respite, and alternative accommodation. Consultation with the individual highly noise affected residences must be undertaken to discuss the appropriate mitigation/respite solution for high noise works and must be documented for inclusion in the Construction Contractor’s Monthly Report to Mirvac.

5. Review the minimum working distances for vibration intensive plant (refer to **Section 5.4.2**) and the vibration assessment results (refer to **Section 6.4**). Where vibration intensive plant is proposed to be used within the minimum working distances of vibration sensitive structures/receivers implement feasible and reasonable mitigation and management measures as per **Section 7.2**.
6. Undertake noise and/or vibration monitoring in accordance with **Section 7.3**, where required.
7. Where works are required out of the standard construction hours, additional assessment and documentation must be prepared for approval by the Planning Secretary (refer to **Section 6.2**).
8. Resolve any noise/vibration issues during construction works as per the contingency plan (refer to **Section 7.5**), and document and report incidents and complaints as per the requirements in **Sections 7.5** and **7.4**, respectively.

2 Development Overview

Aspect Industrial Estate (the site) is legally described as Lots 54-58 in DP 259135, with an area of around 56.3 hectares (ha). The site is located east of Mamre Road, Kemps Creek, within the Penrith Local Government Area.

The site has around 950 m of direct frontage to Mamre Road with a proposed intersection providing vehicular access via Mamre Road to the M4 Motorway and Great Western Highway to the north and Elizabeth Drive to the south.

The site is located around 4 km northeast of the future Western Sydney Nancy-Bird Walton Airport, 13 km southeast of the Penrith CBD and 40 km west of the Sydney CBD.

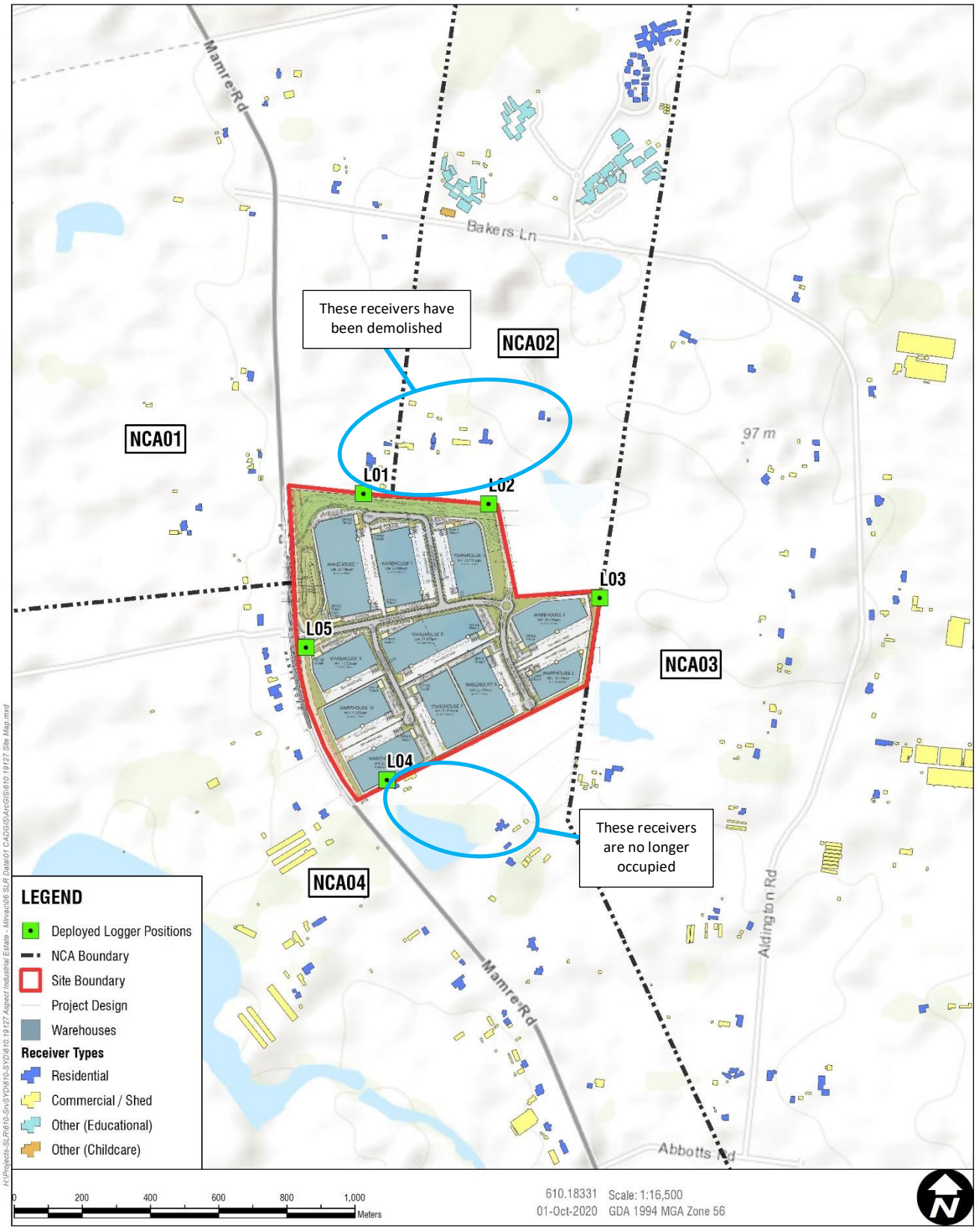
The Masterplan site consists of 11 warehouses and associated offices, hardstands, parking and landscaping spread across 11 defined lots. The site will be developed in two or more stages. Stage 1 of the site will include preparation of the site, along with construction and operation of warehouses on Lots 1 and 3. The other stages will consist of the construction and operation of warehouses and associated facilities on the remaining lots.

The site is surrounded primarily by rural residential properties and agricultural land. Several schools and a childcare centre are located around 800 m to the north of the site. Other large industrial estates including Erskine Business Park, Oakdale West and Oakdale South, are located around 1 to 2 km to the north, northeast and east of the site. The nearest receivers are located on land now zoned IN1 General Industrial as part of the Mamre Road Precinct.

The locations of the site and surrounding receivers are shown in **Figure 1**. The Masterplan design is shown in **Figure 2** and the Stage 1 design is shown in **Figure 3**.

It is noted that the nearest residences to the north of the site in NCA01 and NCA02 have been demolished since the preparation of the NVIA. The residences to the south of the site on the adjacent lots in NCA04 have been confirmed by the developer of those lots to be vacant with no intention of occupation prior to being demolished (refer to **Appendix C**). These receivers are identified in blue circles in **Figure 1**, and have been excluded from the assessment of construction noise and vibration.

Figure 1 Site Location, Sensitive Receivers Areas and Modelled Buildings



Note 1: Figure sourced from the NVIA.

Figure 2 Proposed Masterplan Design

Note 1: Figure sourced from Urbis RTS 2021.

Figure 3 Proposed Stage 1 Design

Note 1: Figure sourced from Urbis RTS 2021.

2.1 Nearest Sensitive Receivers

The area surrounding the site has been divided into four Noise Catchment Areas (NCAs). The NCAs group together sensitive receivers with similar existing noise environments.

The NCAs and sensitive receivers in the area around the site are detailed in **Table 1** and shown in **Figure 1.**

Table 1 Sensitive Receivers

NCA	Direction from Site	Description
NCA01	Northwest North	This NCA includes receivers to the north and northwest of the site where the noise environment is influenced by road traffic noise from Mamre Road. The receivers in this NCA are primarily scattered rural residential dwellings with associated commercial/shed structures. The closest residential receivers to the site boundary are around 100 m to the northwest. The cluster of receivers close to the northern site boundary have been demolished and are not included in this assessment (refer to **Figure 1**).
NCA02	North	This NCA includes receivers to the north of the site where the noise environment is less influenced by road traffic noise from Mamre Road. Distant road traffic, natural noises (such as wind and insects), and local traffic on Bakers Lane primarily influence the noise environment in this NCA. The receivers in this NCA include several schools (eg Mamre Anglican School), a childcare centre, and the Emmaus Village residential area, all located to the north of Bakers Lane. The closest residential receivers to the site boundary (Emmaus Village) are around 1,250 m to the north, with the closest childcare and educational receivers around 800 m to the north. The cluster of receivers close to the northern site boundary have been demolished and are not included in this assessment (refer to **Figure 1**).
NCA03	East	This NCA includes receivers to the east of the site where the noise environment is influenced by distant road traffic noise, natural noises (such as wind and insects), and local road traffic on Aldington Road. The receivers in this NCA are primarily scattered rural residential dwellings with associated commercial/shed structures. The closest residential receivers to the site boundary are around 250 m to the southeast and around 500 m to the east.
NCA04	South Southwest West	This NCA includes receivers to the south, southwest and west of the site where the noise environment is influenced primarily by road traffic noise from Mamre Road. The receivers in this NCA are primarily scattered rural residential dwellings with associated commercial/shed structures. The closest residential receivers to the site boundary are around 70 m to the west and around 350 m to the south. The clusters of receivers on the lots adjacent to the southern site boundary have been confirmed by the developer of those lots to be vacant with no intention of occupation prior to being demolished and are not included in this assessment (refer to **Figure 1**).

3 Development Consent

This CNVMP has been prepared to accompany the Construction Environmental Management Plan (CEMP) for the development.

Development Consent for the project was approved by the Minister for Planning and Public Spaces in SSD 10448, dated May 2022. The conditions relevant to this CNVMP are reproduced in **Table 2**.

Table 2 Development Consent Conditions

<table>
<tr><th>Development Consent</th><th>Where Addressed</th></tr>
<tr><td colspan="2">Operation of Plant and Equipment</td></tr>
<tr><td>C22. All plant and equipment used on site, or to monitor the performance of the Stage 1 Development, must be:
a) maintained in a proper and efficient condition;
b) noise amelioration featured;
c) operated in a proper and efficient manner.</td><td>Section 7.2</td></tr>
<tr><td colspan="2">Noise</td></tr>
<tr><td>Hours of Work
D41. The Applicant must comply with the hours detailed in Table 4, unless otherwise agreed in writing by the Planning Secretary.
Table 4 Hours of Work
<table>
<tr><th>Activity</th><th>Day</th><th>Time</th></tr>
<tr><td>Earthworks and construction</td><td>Monday – Friday
Saturday</td><td>7 am to 6 pm
8 am to 1 pm</td></tr>
</table></td><td>Section 6.2</td></tr>
<tr><td>D42. Works outside of the hours identified in condition D41 may be undertaken in the following circumstances:
d) works that are inaudible at the nearest sensitive receivers;
e) works agreed to in writing by the Planning Secretary;
f) for the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons; or
g) where it is required in an emergency to avoid the loss of lives, property or to prevent environmental harm.</td><td>Section 6.2</td></tr>
<tr><td>Construction Noise Limits
D43. The development must be constructed to achieve 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 management and mitigation measures in the Appendix 5.</td><td>Sections 1.1,5.2.2, 6, 7</td></tr>
<tr><td colspan="2">Construction Noise Management Plan</td></tr>
<tr><td>D44. The Applicant must prepare a Construction Noise Management Plan (CNMP) for the development to the satisfaction of the Planning Secretary. The Plan must form part of a CEMP in accordance with condition E2 and must:
a) be prepared by suitably qualified and experienced noise expert whose appointment has been endorsed by the Planning Secretary;</td><td>This CNVMP

Section 1</td></tr>
</table>

Development Consent	Where Addressed
b) be approved by the Planning Secretary prior to the commencement of construction of each stage of the development;	Refer to CEMP Table 2
c) describe procedures for achieving the noise management levels in EPA's *Interim Construction Noise Guideline* (DECC, 2009) (as may be updated or replaced from time to time);	**Section 1.1**
d) describe the measures to be implemented to manage high noise generating works, in close proximity to sensitive receivers, particularly for noise mitigation eligible receivers shown in Figure 7, in Appendix 4, including but not limited to the following:	**Section 7**
(i) details of a real-time noise monitoring system to identify occurrence of highly noise affected levels as defined in the *Interim Construction Noise Guideline*; and	**Section 7.3**
(ii) describe procedures for implementing respite periods and temporary relocation following identification of highly noise affected levels.	**Sections 1.1, 7.2**
e) include a complaints management system that would be implemented for the duration of the development.	**Section 7.4**
D45. The Applicant must: a) not commence construction of any relevant stage until the CNMP required by condition D44 is approved by the Planning Secretary; and b) implement the most recent version of the CNMP approved by the Planning Secretary for the duration of construction.	Refer to CEMP Table 2 and **Section 8**
Vibration Criteria D49. Vibration caused by construction at any residence or structure outside the site must be limited to: a) for structural damage, the criteria set in the latest version of *DIN 4150-3:2016-12 Vibration in Buildings – Part 3: Effects on Structures* (German Institute for Standardisation, 2016); and b) for human exposure, the acceptable vibration values set out in the *Environmental Noise Management Assessing Vibration: a technical guideline* (DEC, 2006) (as may be updated or replaced from time to time).	**Sections 5.4, 6.4,7.3.2**
D50. The Applicant must offer and, if the offer is accepted, implement monitoring of vibration levels during construction at 884-902 Mamre Road (Lot 53 DP259135), to the satisfaction of the Planning Secretary. Any vibration monitoring must be undertaken during the entirety of the construction period. If the criteria in Condition D48 are exceeded, management and mitigation measures must be developed and implemented to address any exceedances.	**Section 7.1**
Dilapidation Reporting D51. Prior to commencement of construction, the Applicant must offer and prepare (if the offer is accepted) a pre-construction dilapidation report at 884-902 Mamre Road (Lot 53 DP259135). The report must be submitted to the Planning Secretary and the relevant property owner(s) prior to construction works commencing on the site.	**Section 7.1**
Environmental Management	
Management Plan Requirements E1. Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	This CNVMP
a) detailed baseline data;	**Section 4**

Development Consent	Where Addressed
b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; c) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria; d) a program to monitor and report on the: (i) impacts and environmental performance of the development; and (ii) effectiveness of the management measures set out pursuant to paragraph (c) above; e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible; f) a program to investigate and implement ways to improve the environmental performance of the development over time; g) a protocol for managing and reporting any: (i) incident and any non-compliance (specifically including any exceedance of the impact assessment criteria and performance criteria); (ii) complaint; (iii) failure to comply with statutory requirements; and h) a protocol for periodic review of the plan. *Note: the Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans*	**Section 3** **Section 5** **Sections 6.1.1, 7** **Section 7** **Section 7.3** **Section 7.5** **Section 8** **Section 7.5** **Section 7.4** **Section 7.5** **Section 8**
Appendix 5 – Applicant's Management and Mitigation Measures	
Construction Noise – Stage 1 Development • Construction hours to be limited to 7:00am – 6:00pm Monday to Friday and 8:00am – 1:00pm Saturdays. • Where construction noise levels are predicted to be above the NMLs, all feasible and reasonable work practices are investigated to minimise noise emissions. • If construction noise levels are still predicted to exceed the NMLs, potential noise impacts would be managed via site specific construction noise management plans. • Construction works should be conducted during standard construction hours, with OOHW minimised as far as reasonable and feasible. • Locations for vibration intensive equipment should be reviewed during the preparation of the site specific Construction Noise and Vibration Management Plans (CNVMP) for construction works adjacent to sensitive receivers. • Further noise management measures to be incorporated into the CEMP as appropriate.	**Section 6.2** **Section 7** **Section 7** **Section 6.2** **Sections 5.4.2, 6.4, 7** **Section 7**

4 Existing Environment

4.1 Unattended Ambient Noise Monitoring

Unattended noise monitoring was completed at five locations at the boundary of the site in November 2019 as part of the NVIA. The measured noise levels have been used to determine the existing noise environment and to set the criteria used to assess the potential impacts from the project.

The monitoring equipment was positioned to measure existing noise levels that are representative of receivers potentially most affected by the project.

The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night-time.

The noise monitoring locations are shown in **Figure 1** and the results are summarised in **Table 3**. Further information regarding the monitoring, including methodology and detailed data, is provided in the NVIA.

Table 3 Summary of Ambient Noise Levels

ID	Address	Measured Noise Levels (dBA)					
		Background Noise (RBL)			Average Noise (L_{Aeq})		
		Day	Evening	Night	Day	Evening	Night
L01	Lot 58 DP259135	39	39	32	50	49	50
L02	Lot 58 DP259135	35	33	32	43	42	43
L03	Lot 56 DP259135	34	33	29	44	41	41
L04	Lot 54 DP259135	39	40	32	52	53	54
L05	Lot 56 DP259135	42	43	34	59	59	56

Note 1: The assessment periods are the daytime which is 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and public holidays, the evening which is 6 pm to 10 pm, and the night-time which is 10 pm to 7 am on Monday to Saturday and 10 pm to 8 am on Sunday and public holidays. See the NSW EPA *Noise Policy for Industry*.

5 Assessment Criteria

5.1 Construction Noise and Vibration Guidelines

The standards and guidelines relevant to the development are listed in **Table 4**. These guidelines aim to protect the community and environment from excessive noise and vibration impacts during construction of projects.

Table 4 Construction Noise and Vibration Standards and Guidelines

Guideline/Policy Name	Where Guideline Used
Interim Construction Noise Guideline (ICNG) (DECC, 2009)	Assessment of airborne noise impacts on sensitive receivers
Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services, 2016)	Assessment and management protocols for noise and vibration impacts
Road Noise Policy (RNP) (DECCW, 2011)	Assessment of construction traffic impacts
BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2, BSI, 1993	Assessment of vibration impacts (structural damage) to non-heritage sensitive structures
DIN 4150:Part 3-2016 Structural vibration – Effects of vibration on structures, Deutsches Institute fur Normung, 1999	Screening assessment of vibration impacts (structural damage) to heritage sensitive structures, where the structure is found to be unsound
Assessing Vibration: a technical guideline (DEC, 2006)	Assessment of vibration impacts on sensitive receivers

5.2 Interim Construction Noise Guideline

The NSW *Interim Construction Noise Guideline* (ICNG) is used to assess and manage impacts from construction noise on residences and other sensitive land uses in NSW.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers based on the existing background noise in the area. The 'worst-case' noise levels from construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact of the project.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 5**.

Table 5 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	Noise affected RBL[1] + 10 dB	• The noise affected level represents the point above which there may be some community reaction to noise • Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

	Highly Noise Affected
	75 dBA
		• The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise
		• Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account:
		  • Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences
		  • If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Outside Standard Construction Hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours • The proponent should apply all feasible and reasonable work practices to meet the noise affected level • Where all feasible and reasonable practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the NSW *Industrial Noise Policy* (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI).

'Other Sensitive' Land Uses and Commercial Receivers

The ICNG NMLs for 'other sensitive' non-residential land uses are shown in **Table 6**.

Table 6 NMLs for 'Other Sensitive' Receivers

Land Use	Noise Management Level $L_{Aeq(15minute)}$ (dBA) (Applied when the property is in use)	
	Internal	External
Classrooms at schools and other educational institutions	45	55[1]
Commercial	-	70

Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.

Sleep Disturbance

A method for assessing sleep disturbance is contained in the NPfI. Although the NPfI sleep disturbance criteria relates to industrial noise, it is also considered relevant for reviewing potential impacts from construction noise as a screening criteria to identify the need for further assessment. The NPfI notes that a detailed maximum noise level assessment should be undertaken where a project results in night-time noise levels which exceed 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is the greater.

Works will be undertaken during standard daytime construction hours, in accordance with Condition D41. For works required during out of hours periods, and approved under Condition D42, the sleep disturbance screening level of night-time RBL plus 15 dB will be applied.

5.2.2 NML Summary

The NMLs for the project have been determined in accordance with the requirements of the ICNG and are shown in **Table 7**. Further information regarding the NMLs is provided in the NVIA.

Table 7 Project Specific Noise Management Levels (dBA)

Receiver Type	NCA	NML ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Level (L_{Amax} dBA)
		Standard Construction Hours (RBL+10dB)	Out of Hours[4] (RBL+5dB)			
		Daytime	Daytime[3]	Evening	Night-time	Night-time
Residential	NCA01	49	44	44	37	52
Residential	NCA02	45	40	38	37	52
Residential	NCA03	45[1]	40	38	35	52
Residential	NCA04	49	44	44[2]	37	52
Educational	NCA01	55	55 (when in use)			-
Commercial	Various	70	70 (when in use)			-

Note 1: RBL increased to the minimum RBL specified in the NPfI.

Note 2: Where the evening RBL is higher than the daytime RBL, the daytime RBL has been used.

Note 3: Daytime out of hours is 7 am to 8 am and 1 pm to 6 pm on Saturday, and 8 am to 6 pm on Sunday and public holidays.

Note 4: In accordance with Condition D41, works will be undertaken during standard daytime construction hours. Where out of hours works are required and are approved under Condition D42, the out of hours NMLs apply.

5.3 Construction Road Traffic Noise Guidelines

The potential impacts from construction traffic on public roads are assessed under the NSW EPA *Road Noise Policy* (RNP) and Roads and Maritime (now Transport for NSW) *Construction Noise and Vibration Guideline* (CNVG).

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB as a result of construction traffic. Where this is considered likely, further assessment is required using the RNP base criteria shown in **Table 8**.

Table 8 RNP Criteria for Assessing Construction Vehicles on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am – 10 pm)	Night-time (10 pm – 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

The NVIA predicted construction traffic to result in a minimal increase (i.e. less than 2 dB) in the overall traffic noise levels along the construction haulage routes. As such, construction traffic noise impacts have not been assessed further.

5.4 Vibration Guidelines

The effects of vibration from construction work can be divided into three categories:

- Those in which the occupants of buildings are disturbed (**human comfort**). People can sometimes perceive vibration impacts when vibration generating construction work is located close to occupied buildings. Vibration from construction work tends to be intermittent in nature and the EPA's *Assessing Vibration: a technical guideline* (2006) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV), as shown in **Table 9**.
- Those where building contents may be affected (**building contents**). People perceive vibration at levels well below those likely to cause damage to building contents. For most receivers, the human comfort vibration criteria are the most stringent and it is generally not necessary to set separate criteria for vibration effects on typical building contents. Exceptions to this can occur when vibration sensitive equipment, such as electron microscopes or medical imaging equipment, are in buildings near to construction work. No such equipment has been identified in the study area.
- Those where the integrity of the building may be compromised (**structural/cosmetic damage**). If vibration from construction work is sufficiently high, it can cause cosmetic damage to elements of affected buildings. Industry standard cosmetic damage vibration limits are specified in British Standard BS 7385 and German Standard DIN 4150. The limits are shown in **Table 10** and **Table 11**.

Table 9 Human Comfort Vibration – Vibration Dose Values for Intermittent Vibration

Building Type	Assessment Period	Vibration Dose Value[1] ($m/s^{1.75}$)	
		Preferred	Maximum
Critical Working Areas (eg operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods, and is dependent on the level of vibration as well as the duration.

Table 10 Cosmetic Damage – BS 7385 Transient Vibration Values for Minimal Risk of Damage

Group	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

Table 11 Cosmetic Damage – DIN 4150 Guideline Values for Short-term Vibration on Structures

Group	Type of Structure	Guideline Values Vibration Velocity (mm/s)				
		Foundation, All Directions at a Frequency of			Topmost Floor, Horizontal	Floor Slabs, Vertical
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified as Group 1 or 2 **and** are of great intrinsic value (eg heritage listed buildings)	3	3 to 8	8 to 10	8	20[1]

Note 1: It may be necessary to lower the relevant guideline value markedly to prevent minor damage.

5.4.1 Heritage Buildings or Structures

Heritage listed buildings and structures should be considered on a case-by-case basis but as noted in BS 7385 should not be assumed to be more sensitive to vibration, unless structurally unsound. Where a heritage building is deemed to be sensitive, the more stringent DIN 4150 Group 3 guideline values in **Table 11** can be applied.

No heritage buildings have been identified in the vicinity of the development.

5.4.2 Minimum Working Distances for Vibration Intensive Works

Minimum working distances for typical vibration intensive construction equipment are provided in the CNVG and are shown in **Table 12**. The minimum working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from the NSW EPA *Assessing Vibration: a technical guideline*). They are calculated from empirical data which suggests that where work is further from receivers than the quoted minimum distances then impacts are not considered likely.

Table 12 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance		
		Cosmetic Damage		Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1–2 tonne)	5 m	11 m	15 m to 20 m
	<100 kN (2–4 tonne)	6 m	13 m	20 m
	<200 kN (4–6 tonne)	12 m	25 m	40 m
	<300 kN (7–13 tonne)	15 m	31 m	100 m
	>300 kN (13–18 tonne)	20 m	40 m	100 m
	>300 kN (>18 tonne)	25 m	50 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	15 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	44 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	5 m to 40 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	5 m	4 m
Jackhammer	Hand held	1 m (nominal)	3 m	2 m

The minimum working distances are indicative and will vary depending on the particular item of equipment and local geotechnical conditions. The distances apply to cosmetic damage of typical buildings under typical geotechnical conditions.

6 Construction Noise and Vibration Assessment

6.1 Construction Activities

The NVIA assessed noise impacts from general construction activities required for the development. The activities likely required to build the proposal involve conventional construction equipment such as ground excavation equipment, mobile cranes, delivery trucks and trade equipment.

The construction scenarios have been categorised into 'peak' and 'typical' works which have been used to define the likely range of potential noise impacts:

- '**Peak**' works represent the noisiest stages and can require noise intensive equipment, such as rockbreakers or concrete saws. 'Peak' works scenarios also include multiple items of the same construction equipment where the works are conducted concurrently in several locations of the site. While 'peak' works would be required at times, the noisiest works would not occur for the full duration of the works.
- '**Typical**' works represent typical noise emissions when noise intensive equipment is not in use. The 'Typical' works generally include most items of equipment for a given activity except for the loudest item. These items generally support the 'Peak' works activity and are referred to as 'supporting equipment'.

The representative NVIA construction scenarios developed to assess potential impacts during construction are detailed in **Table 13**.

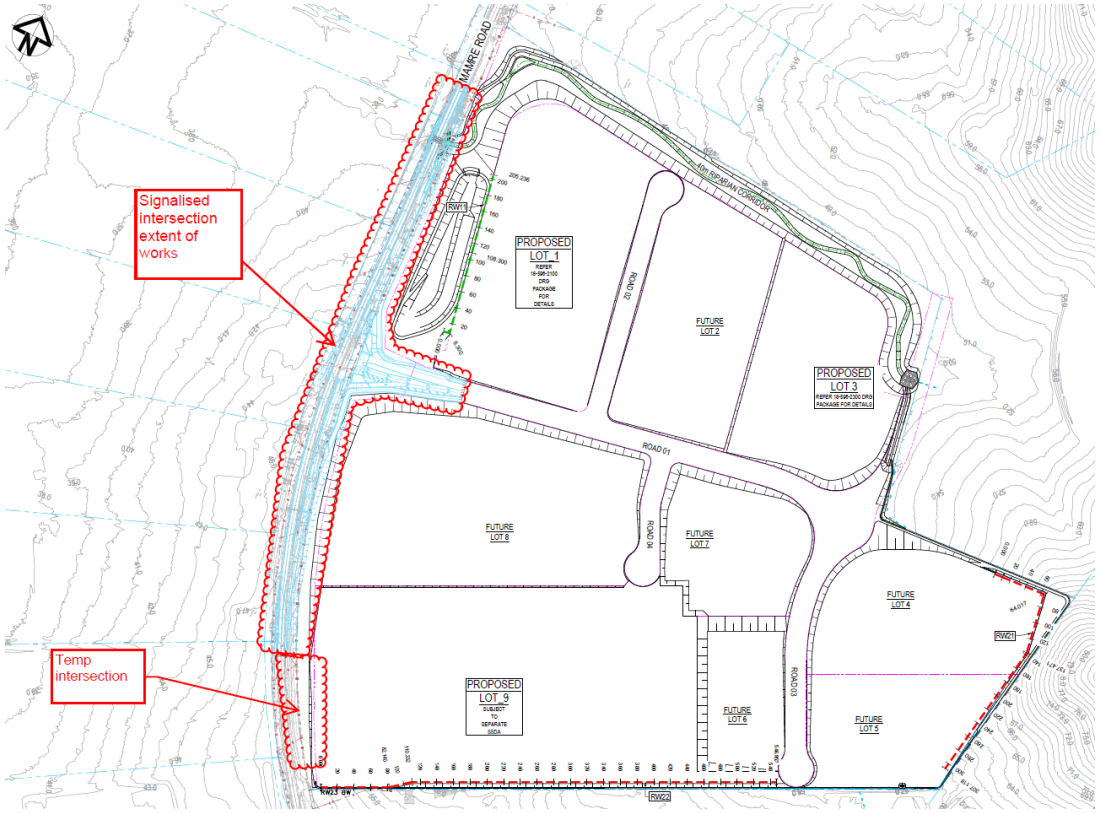
Table 13 NVIA Construction Scenario Descriptions

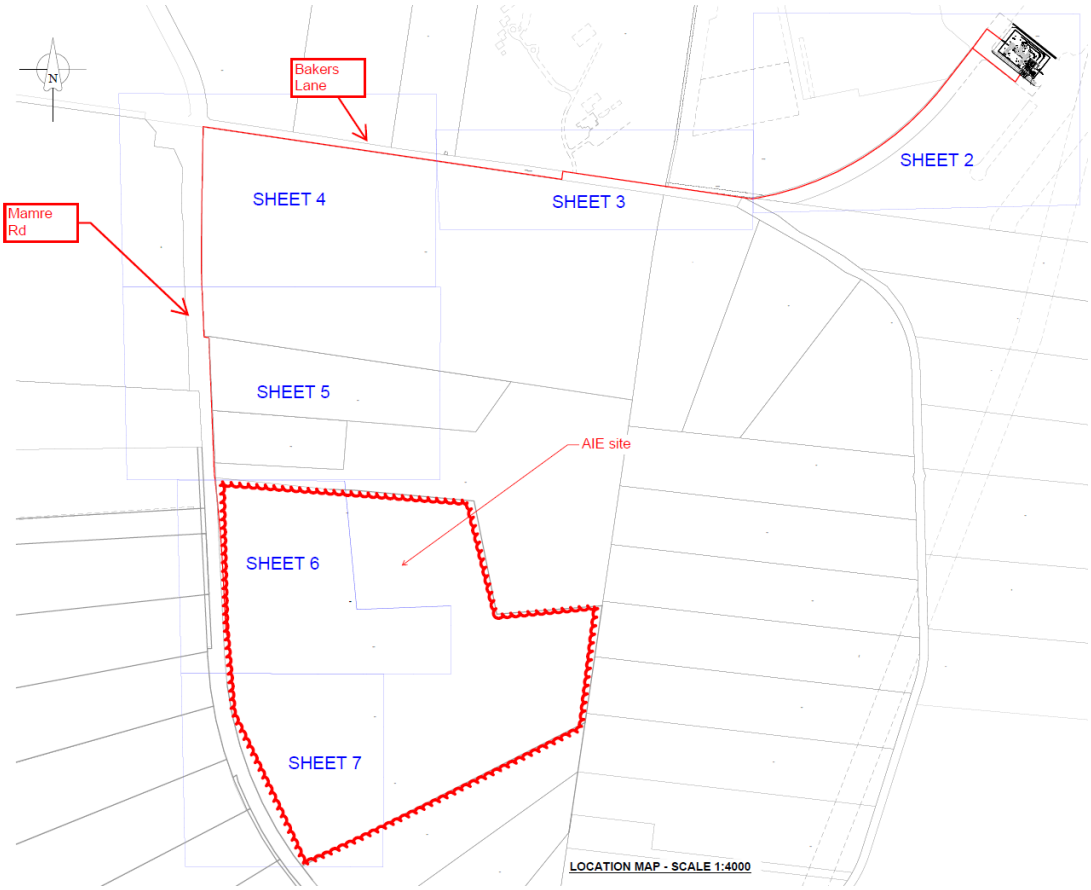
Scenario	Description
Enabling and remediation works	These works are required to prepare the site for construction occupation and would include works such as survey control, investigative drilling, archaeological salvage works and relocation of flora and fauna species (if required). Relocation of services or third-party assets may also be required. Remediation works would include: - Remediation of heavy metal (zinc, copper) and staining hotspots - Remediation of total recoverable hydrocarbon hotspots - Removal of asbestos pipe and surface fragments - Removal of hazardous building material including asbestos, lead paint and synthetic mineral fibre - Removal of anthropogenic plastics (irrigation pipes etc) from market garden areas. Some enabling and remediation works would require the use of noisy earthmoving equipment for activities such as dam decommissioning, topsoil stripping, excavation of contaminated materials, and construction of temporary access roads. Noise intensive demolition works would require the use of a rockbreaker. The works are divided into the following 'typical' and 'peak' categories: - 'Typical' works generally include operation of supporting equipment (such as generators, water tankers and utility vehicles) as well as earth moving equipment and loading of heavy vehicles. - 'Peak' works include the use of noise intensive rockbreakers and concrete saws at times, especially during demolition of existing structures.

Scenario	Description
Site establishment	These works are required to establish the construction compounds and works areas. This scenario would include works such as setup of perimeter fencing, compound facilities, signage, lighting, etc. Site establishment works would require the use of noisy earthmoving equipment for activities such as diversion of catchment drains. Noise intensive vegetation clearing works would require the use of chainsaws and woodchippers. The works are divided into the following 'typical' and 'peak' categories: - 'Typical' works generally include operation of low noise supporting equipment as well as earth moving equipment. - 'Peak' works include the use of noise intensive chainsaws and woodchippers during vegetation clearing.
Bulk earthworks	This scenario covers the majority of earthmoving activities which would require the use of noisy earthmoving equipment for activities such as: - Stripping of top soil - Stockpiling and relocation and compaction of selected material for earthworks balance and batter stabilization - Construction of fill embankments including foundation drainage - Importation, placement and compaction of fill materials to meet earthworks balance requirements Noise intensive excavation works may require the use of a rockbreaker for excavation of a cutting through hard rock. The Bulk earthworks are divided into the following 'typical' and 'peak' categories: - 'Typical' works include general operation of earth moving equipment. - 'Peak' works include the use of a noise intensive rockbreaker during excavation of hard rock.
Stage 1 infrastructure works	These works are required to construct the Stage 1 infrastructure components of the site and are generally limited to the northern half of the site and the site access roads as depicted in **Figure 3**. Stage 1 infrastructure works are divided into the following 'typical' and 'peak' categories: - 'Typical' works generally include construction of roads, hardstands, service connections, buildings and landscaping. - 'Peak' works include operation earth moving equipment for construction of a stormwater detention basin.

Additional construction scenarios have been identified since preparation of the NVIA. These activities are detailed in **Table 14**.

Table 14 Additional Construction Scenario Descriptions

Scenario	Description
Intersection works	These works are required construct a temporary intersection to access the site, and the permanent signalised intersection which will become the main entry into the AIE from Mamre Road. As the intersection works interface directly with Mamre Road, out of hours works will be required to minimise disruptions to live traffic. Construction of the temporary intersection is expected to take around 5 days, while the signalised intersection is expected to take around 10 days. It is also anticipated additional night works will be required for the milling and repaving of the road surface at the signalised intersection. The duration of these works will be confirmed at a later date when the specific extent of the works is determined. The locations of the temporary and signalised intersections are shown in red below.  Noise intensive works would require the use of an asphalt milling machine. The works are divided into the following 'typical' and 'peak' categories: - 'Typical' works generally include minor excavation, and asphalt placement, paving and rolling (SWL 110 dBA). - 'Peak' works include the use of noise intensive asphalt milling machines at times (SWL 117 dBA). Equipment likely to be used during this activity includes the following: - Asphalt milling machine - Asphalt paving machine - 3pt roller - Watercart - 15t excavator - Bogey trucks

Scenario	Description
Electrical lead in works	These works are required to establish an electrical lead in to the AIE from the substation located in the Oakdale West Estate on Bakers Lane to the northeast. The approximate location of the electrical lead in is shown in red below.  These works will be undertaken separately to Stage 1 construction on the AIE site and will be subject to their own construction noise impact assessment and management plan (if required). This works scenario is not addressed further in this CNVMP.

6.1.1 Confirmation of Construction Activities Prior to Commencement

Prior to commencement of the construction stages included in **Table 13** and **Table 14**, the methodology and equipment will be reviewed and confirmation provided that the assumptions in the CNVMP remain valid. Where different methodology or equipment is proposed, further validation of the predicted noise levels will be undertaken to ensure that the proposed mitigation measures are anticipated to be sufficient.

Where feasible, validation of noise levels during high noise works must be measured in advance of commencement of the works, ie test measurements of the equipment undertaking the works for a short period prior full commencement of the works. For example, measurement for a short period during the daytime of equipment/activities proposed to be undertaken during night works.

6.2 Hours of Construction

Condition D41 requires construction activities to only be undertaken during the following hours:

- 7:00 am to 6:00 pm, Mondays to Fridays
- 8:00 am to 1:00 pm on Saturdays
- At no time on Sundays or Public Holidays.

Notwithstanding, Condition D42 allows out of hours work to be undertaken in the following circumstances:

- Works that are inaudible at the nearest sensitive receivers
- Works agreed to in writing by the Planning Secretary
- For the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons
- Where it is required in an emergency to avoid the loss of lives, property or to prevent environmental harm.

Works that are inaudible at the nearest receivers would typically be limited to fitout works inside fully enclosed buildings. Where noisier internal works or any external works are required out of hours a construction noise impact statement (CNIS) must be prepared detailing the proposed out of hours works activities, predicted noise and vibration impacts, and proposed mitigation and management measures. CNIS for out of hours works will be provided to the Planning Secretary for approval.

The intersection works detailed in **Table 14** will require out of hours work to be undertaken. This work must be agreed to in writing by the Planning Secretary in accordance with Condition D42(b).

6.3 Construction Noise Predictions

The predicted impacts in the NVIA at the most affected receivers have been updated to remove the demolished or vacant receivers (refer to **Figure 1**) and add in the additional scenario for intersection works. The results are representative of the worst-case noise levels that are likely to occur during construction.

The assessment shows the predicted impacts based on the exceedance of the management levels, as per the categories in **Table 15**.

Table 15 Exceedance Bands and Impact Colouring

Exceedance of Management Level	Subjective Classification	Impact Colouring
No exceedance	Negligible	
1 to 10 dB	Low impact	
11 dB to 20 dB	Moderate impact	
>20 dB	High impact	

The predicted airborne noise impacts from construction works are summarised in **Table 16** for the NVIA scenarios during daytime standard construction hours, and in **Table 17** for the intersection works during out of hours periods. The predictions are representative of the highest noise levels that would likely be experienced at the surrounding receivers when the works are at their closest. The number of receivers predicted to experience exceedances of the NMLs are summarised in bands of 10 dB and are separated by construction works scenarios and activities.

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most-exposed receiver, as the noise levels presented are based on each scenario occurring at the nearest point of the site to the receiver.

Table 16 Overview of NML Exceedances – NVIA Construction Scenarios – Day Standard Hours

Receiver Category	NCA	Exceedance Category[1]	Number of Receivers with Day Standard Hours NML Exceedance[2]							
			Enabling and remediation works		Site establishment		Bulk earthworks		Stage 1: Infrastructure works	
			'Typical'	'Peak'	'Typical'	'Peak'	'Typical'	'Peak'	'Typical'	'Peak'
			Supporting works	Demolition of existing structures	Supporting and earthmoving	Vegetation clearing	General earthworks	Excavation through hard rock	Construction works	Earthworks
Residential	NCA01	1-10 dB	4	7	5	5	5	8	4	6
		11-20 dB	-	6	-	4	1	5	-	-
		>20 dB	-	-	-	-	-	1	-	-
		HNA	-	-	-	-	-	-	-	-
	NCA02	1-10 dB	-	8	-	1	-	12	-	-
		11-20 dB	-	-	-	-	-	-	-	
		>20 dB	-	-	-	-	-	-	-	
		HNA	-	-	-	-	-	-	-	
	NCA03	1-10 dB	1	38	2	22	5	37	1	1
		11-20 dB	-	3	-	1	1	5	-	-
		>20 dB	-	-	-	-	-	1	-	-
		HNA	-	-	-	-	-	-	-	-
	NCA04	1-10 dB	5	16	1	13	3	15	4	2
		11-20 dB	3	2	7	5	7	3	1	4
		>20 dB	-	7	-	3	-	7	-	-
		HNA	-	1	-	-	-	3	-	-
Other Sensitive	All NCAs	1-10 dB	-	-	-	-	-	-	-	-
		11-20 dB	-	-	-	-	-	-	-	-
		>20 dB	-	-	-	-	-	-	-	-
		HNA	-	-	-	-	-	-	-	-

Note 1: HNA = Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq(15minute)}$ noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

Table 17 Overview of NML Exceedances – Intersection Works – Out of Hours

Receiver Category	NCA	Exceedance Category[1]	Number of Receivers with NML Exceedance[2]							
			Day Standard Hours		Day OOH		Evening OOH		Night OOH	
			'Typical'	'Peak'	'Typical'	'Peak'	'Typical'	'Peak'	'Typical'	'Peak'
			General works	Asphalt milling	General works	Asphalt milling	General works	Asphalt milling	General works	Asphalt milling
Residential	NCA01	1-10 dB	2	6	5	3	5	3	3	9
		11-20 dB	-	-	-	5	-	5	5	5
		>20 dB	-	-	-	-	-	-	-	1
		HNA	-	-	-	-	-	-	-	-
	NCA02	1-10 dB	-	-	-	-	-	5	-	5
		11-20 dB	-	-	-	-	-	-	-	-
		>20 dB	-	-	-	-	-	-	-	-
		HNA	-	-	-	-	-	-	-	-
	NCA03	1-10 dB	-	1	-	9	1	22	2	38
		11-20 dB	-	-	-	-	-	-	-	1
		>20 dB	-	-	-	-	-	-	-	-
		HNA	-	-	-	-	-	-	-	-
	NCA04	1-10 dB	4	2	2	11	2	11	11	10
		11-20 dB	4	8	7	1	7	1	1	7
		>20 dB	-	-	-	7	-	7	7	8
		HNA	-	-	-	-	-	-	-	-
Other Sensitive	All NCAs	1-10 dB	-	-	-	-	n/a	n/a	n/a	n/a
		11-20 dB	-	-	-	-	n/a	n/a	n/a	n/a
		>20 dB	-	-	-	-	n/a	n/a	n/a	n/a
		HNA	-	-	-	-	n/a	n/a	n/a	n/a

Note 1: HNA = Highly Noise Affected, based on ICNG definition (i.e. predicted $L_{Aeq(15minute)}$ noise at residential receiver is 75 dBA or greater).

Note 2: Based on worst-case predicted noise levels.

The assessment of construction noise levels presented above identifies the following:

- The highest impacts are predicted to be 'moderate' or 'high' during 'peak' works activities associated with enabling and remediation works, site establishment, and bulk earthworks which involve the use of noise intensive equipment in close proximity to the nearest sensitive receivers. These works are, however, limited to daytime hours and would likely only be apparent for a relatively short durations when noise intensive equipment are used near receivers. Noise levels and impacts during 'typical' works, which do not require noise intensive equipment, are considerably lower.
- Worst-case noise levels in NCA04 are predicted to be around 75 dBA. These noise levels would only occur at receivers that are adjacent to the site when noise intensive equipment, such as rockbreakers or concrete saws, are used nearby.

- Individual receivers would be subject to a large range of worst-case impacts, depending on how far from the works they are. The highest impacts are seen when works are near to receivers and are generally much lower when works are further away. For example, several works with 'high' impacts at the potentially most affected receivers are predicted to be compliant with the NMLs when the works are conducted further away.
- All works scenarios are predicted to be compliant with the NMLs at all receivers during 'typical' works activities when the works are not close to receivers.
- The impacts at childcare, educational and commercial receivers are predicted to be compliant with the management levels for all construction scenarios and activities.
- Intersection works during out of hours periods are predicted to result in 'moderate' or 'high' impacts at the nearest receivers. Worst-case noise levels in NCA04 are around 70 dBA when equipment is used near the receivers.

All feasible and reasonable noise mitigation measures will be applied to the construction work. Construction noise and vibration mitigation measures are discussed in **Section 7**.

6.4 Construction Vibration

Vibration intensive items of plant proposed for use during the construction of the site would include rockbreakers and vibratory rollers. These items of equipment are proposed to be used primarily during enabling works and bulk earthworks.

Offset distances for the vibration intensive equipment have been determined from the CNVG minimum working distances for cosmetic damage and human response (see **Table 12**). Buildings within the minimum working distances are shown in **Figure 4.** This figure assumes that vibration intensive works are occurring at the site boundaries.

Cosmetic Damage Assessment

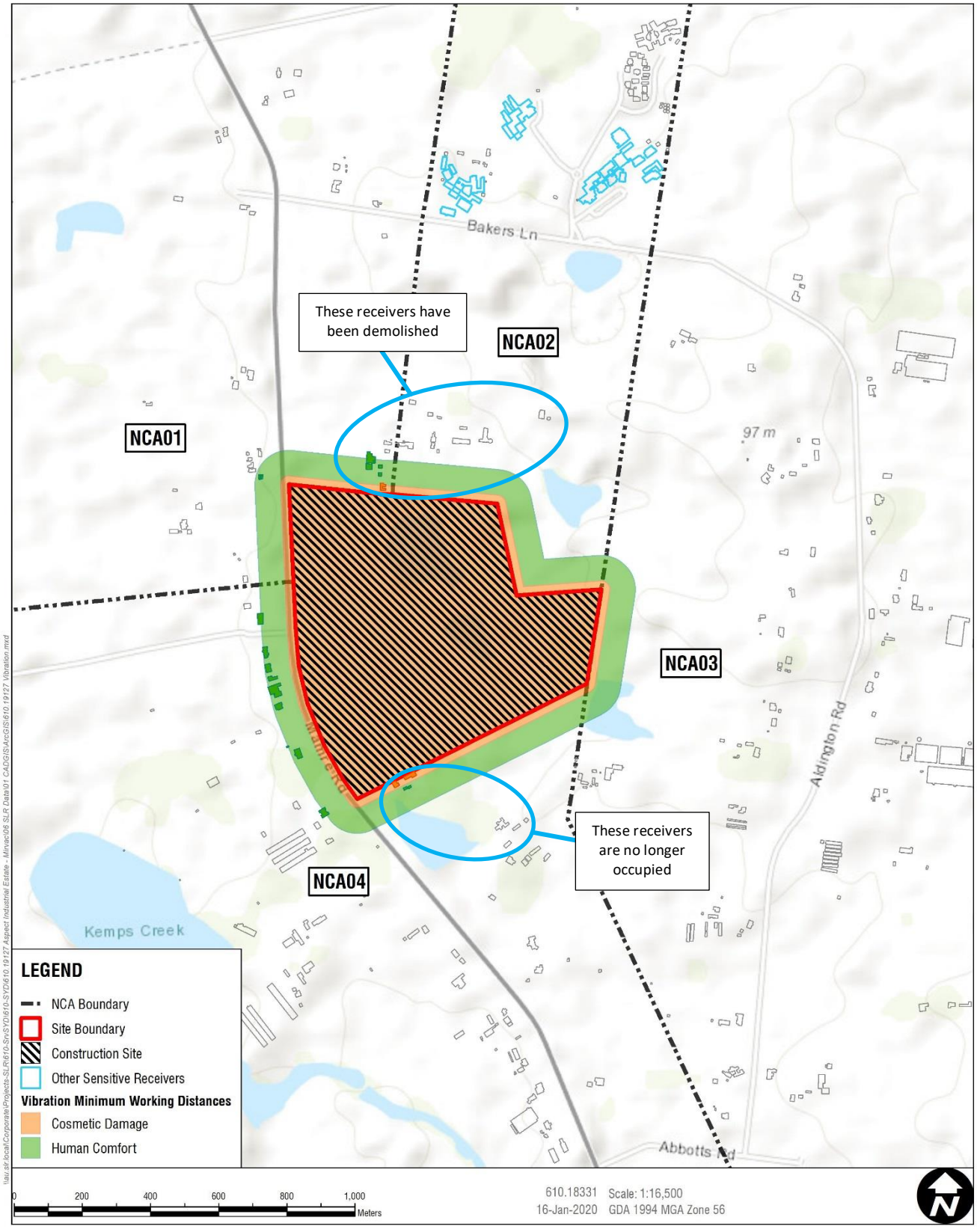
Figure 4 shows that there are no vibration sensitive receivers/structures within the minimum working distances for cosmetic damage. The receivers north and south of the site identified in the NVIA have since been demolished or permanently vacated.

Human Comfort Vibration Assessment

For human comfort vibration, a total of seven residential receivers and two commercial/shed structures (in NCA01 and NCA04) may be within the minimum working distances should rockbreaking or vibratory rolling works be required at the site boundaries closest to these receivers.

Occupants of affected buildings may be able to perceive vibration impacts at times when vibration intensive equipment is in use. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is nearby.

Figure 4 Receivers within Construction Vibration Minimum Working Distances



Note 1: Figure sourced from the NVIA.

7 Mitigation and Management Measures

The ICNG acknowledges that due to the nature of construction works it is inevitable that there will be impacts where construction is near to sensitive receivers. The worst-case noise impacts during construction of the project are predicted to be 'moderate' to 'high', however, this would likely only occur on an infrequent basis when noise intensive works are being completed near to receivers. Works are also generally limited to daytime hours only, with the exception of intersection works which will be undertaken during out of hours periods.

All appropriate feasible and reasonable mitigation measures will be applied to the work to minimise the potential impacts, as far as practicable.

Specific receivers eligible for noise mitigation are identified in Figure 7 in Appendix 4 of the Development Consent. These receivers are shown in **Figure 5**.

Figure 5 Mitigation Eligible Receivers

7.1 Consultation Undertaken to Date

The consultation activities undertaken to date are summarised below:

- A fact sheet and letterbox drop outlining the key features of the proposal and contact details for feedback was distributed in May 2020 to households on Mamre Road, Bakers Lane and Aldington Road, Kemps Creek.
- A near neighbour information letter was distributed accompanying the fact sheet and letterbox drop.
- Stakeholder notification was provided to members of Council and Government, along with the retirement village, schools and childcare centres in the area.
- An engagement email and phone line was established for feedback arising from the above fact sheets.
- Social media monitoring was undertaken to gather community thoughts, feedback and sentiment regarding the proposal.
- Agency consultation was undertaken with multiple government agencies.
- Responses were provided to agency and stakeholder feedback.

Consultation activities are detailed in full in the Urbis *Mamre Road Rezoning – Engagement Outcomes Report*.

Conditions D50 and D51 require consultation to be undertaken with the owner(s) of 884-902 Mamre Road (Lot 53 DP259135) to offer provision of a dilapidation report and vibration monitoring for the duration of works. The developer that owns this property has confirmed that the dwellings are vacant with no intention of occupation prior to demolition. As such, dilapidation reporting and vibration monitoring is not required for this property. Evidence of consultation is provided in **Appendix C**.

7.2 Standard Mitigation and Management Measures

The mitigation and management measures that would be applied to the project are detailed in **Table 18**.

Table 18 Environmental Management Controls for Construction Noise and Vibration

Measure	Person Responsible	Timing / Frequency	Reference / Notes
Project Planning			
Use quieter and less vibration emitting construction methods where feasible and reasonable.	Project Manager	Ongoing	Best practice
Works will be completed during standard daytime construction hours outlined in **Section 6.2**.			
Truck routes to site will be limited to major roads (refer to CTMP for details of traffic route control measures).			

Measure	Person Responsible	Timing / Frequency	Reference / Notes
Scheduling for High Noise or Vibration Generating Works			
Respite offers will be considered where high-noise works are predicted to exceed 75 dBA for residential receivers. For schools and other sensitive receivers a lower level of 65 dBA will be used to account for the sensitive daytime uses of these receivers. Respite offers will be considered for high-vibration works where the works are undertaken within the human comfort minimum working distances for all receiver types. Consultation with these receivers will be undertaken to determine appropriate respite periods, such as exam periods for schools.	Project Manager/ Communications and Community Liaison Representative	Ongoing	Best practice / Condition D44(d)(ii)
High-noise or vibration generating works will be carried out in continuous blocks no longer than three hours in length, with a minimum respite period of one hour between each block. 'Continuous' includes any period during which there is less than a one hour respite between ceasing and recommencing these works.			
Duration Respite will be considered where it may be beneficial to sensitive receivers to increase the duration of blocks of work or number of consecutive periods in order to complete the works more quickly. The project team will engage with the community where Duration Respite is considered in accordance with the Community Communication Strategy (CCS).			
In addition to respite periods and/or duration respite, temporary relocation measures can be offered to sensitive receivers where high-noise works are predicted to exceed 75 dBA, such as offer of alternative accommodation for high-noise works during out of hours periods.			
Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone numbers will be undertaken in accordance with the CCS.			
Site Layout			
Compounds and worksites will be designed to promote one-way traffic and minimise the need for vehicle reversing.	Project Manager	Ongoing	Best practice
Where practicable, work compounds, parking areas, and equipment and material stockpiles will be positioned away from noise-sensitive locations and take advantage of existing screening from local topography.			
Documentation of how site layout has been considered to reduce noise impacts must be provided to the Contractor's Project Manager for inclusion in the Monthly Report to Mirvac. This must occur any time there are significant changes to the site layout.			

Measure	Person Responsible	Timing / Frequency	Reference / Notes
Equipment that is noisy will be started away from sensitive receivers			
Training			
Training will be provided to all personnel on noise and vibration requirements for the project. Inductions and toolbox talks to be used to inform personnel of the location and sensitivity of surrounding receivers.	Project Manager	Ongoing	Best practice
Plant and Equipment Source Mitigation			
All plant and equipment must be maintained in a proper and efficient condition, operated in a proper and efficient manner, and feature standard noise amelioration measures where applicable.	Project Manager	Ongoing	Condition C22
Where practicable, tonal reversing alarms (beepers) will be replaced with non-tonal alarms (squawkers) on all equipment in use (subject to occupational health and safety requirements).			Best practice
Noisy equipment will be sited behind structures that act as barriers, or at the greatest distance from the noise-sensitive area. Equipment will be oriented so that noise emissions are directed away from any sensitive areas, where possible.			
Noise generating equipment will be regularly checked and effectively maintained, including checking of hatches/enclosures regularly to ensure that seals are in good condition and doors close properly against seals.			
Noise monitoring spot checks of equipment will be completed to ensure individual items are operating as expected			
Dropping materials from a height will be avoided.			
Loading and unloading will be carried out away from noise sensitive areas, where practicable.			
Trucks will not queue outside residential properties. Truck drivers will avoid compression braking as far as practicable.			
Truck movements will be kept to a minimum, ie trucks are fully loaded on each trip.			
Screening			
Where possible, install purpose-built screening or enclosures will be used around long-term fixed plant that has the potential to impact nearby receivers	Project Manager	Ongoing	Best practice
The layout of the site will take advantage of existing screening from local topography, where possible. Site huts, maintenance sheds and/or containers will be positioned between noisy equipment and the affected receivers.			

Measure	Person Responsible	Timing / Frequency	Reference / Notes
Community Consultation			
Notifications will be provided to the affected community where high impacts are anticipated or where out of hours works are required. Notification will be a minimum of 24 hours.	Communications and Community Liaison Representative	Ongoing	Best practice
Where complaints are received, work practices will be reviewed and feasible and reasonable practices implemented to minimise any further impacts. Refer to **Section 7.4**.			
Monitoring			
A real-time noise monitoring system must be installed at a location representative of the most-affected residences on the western side of Mamre Road to identify occurrence of highly noise affected levels (refer to **Figure 5**). Requirements of the real-time noise monitoring system are detailed in **Section 7.3**.	Environmental Coordinator	Ongoing	Condition D44(d)(i)
Noise and/or vibration monitoring will be conducted (as appropriate) when noise/vibration intensive works are being undertaken in close proximity to sensitive receivers.			Best practice
Noise and/or vibration monitoring will be conducted (as appropriate) in response to any complaints received to verify that levels are not substantially above the predicted levels.			
Refer to **Section 7.3** for full details of monitoring requirements.			
Vibration			
If vibration generating works are required within the minimum cosmetic damage working distances and considered likely to exceed the criteria: • Different construction methods with lower source vibration levels will be investigated and implemented, where feasible • Attended vibration measurements will be undertaken at the start of the works to determine actual vibration levels at the item. Works will cease if the monitoring indicates vibration levels are likely to, or do, exceed the relevant criteria.	Environmental Coordinator	Ongoing	Best practice
Where works are required within the cosmetic damage minimum working distances, building condition surveys will be completed before and after the works to ensure no cosmetic damage has occurred.			

7.3 Monitoring

7.3.1 Construction Noise Monitoring

In accordance with Condition D44(d)(i) a real-time noise monitoring system must be installed at a location representative of the most-affected residences on the western side of Mamre Road (refer to **Figure 5**) to identify occurrence of highly noise affected levels as defined in the *Interim Construction Noise Guideline* (refer to **Table 5**). This equipment is to be real-time enabled with an online portal, allowing the project team to investigate the noise impacts of work either as it happens or immediately afterward. Notifications (SMS/email) of exceedances of the established trigger level (75 dBA rolling $L_{Aeq(15minute)}$) will be enabled. The noise monitoring system is required to be capable of recording audio when noise levels approach 75 dBA L_{Amax} so that the source of the noise can be determined. Triggered photographs or video recording during audio recording is not required but would also assist in determining sources of noise.

To supplement the real-time noise monitoring, attended noise measurements will be undertaken at the start of noise intensive works that are near to sensitive receivers to verify the levels are as predicted and to check the effectiveness of mitigation and management measures. The contractor will undertake attended noise monitoring for rock excavation works where hammering and ripping of rock will be occurring, for demolition of existing structures works, and also for out of hours works associated with the intersection works. Attended noise monitoring will be conducted quarterly at a minimum.

Where feasible, validation of noise levels during high noise works must be measured in advance of commencement of the works, ie test measurements of the equipment undertaking the works for a short period prior full commencement of the works. For example, measurement for a short period during the daytime of equipment/activities proposed to be undertaken during night works.

Attended noise monitoring will also be undertaken in response to any formal complaints. All monitoring will be completed by suitably qualified acoustic specialists. The location and extent of attended monitoring will be determined in consultation with project staff and would be dependent on the activities taking place.

The monitoring will take place during the expected noisiest construction periods and be representative / indicative of the impacts at the potentially affected sensitive receivers.

A noise monitoring report will be prepared after each attended monitoring survey. Monthly monitoring reports will be prepared for the real-time monitor.

All items of acoustic instrumentation utilised will be designed to comply with *IEC 61672.1-2004 Electroacoustics – Sound level meters* (AS IEC 61672) and carry current calibration certificates.

7.3.2 Construction Vibration Monitoring

Where vibration intensive works (such as rockbreaking, vibratory rolling or plate compacting) are required within the minimum working distances of sensitive receivers or structures (refer to **Section 5.4.2**), vibration will be monitored continuously for the duration of works within the minimum working distances.

Attended vibration measurements will be undertaken at the start of vibration intensive works within the minimum working distances to confirm the levels of vibration are below the applicable vibration limits (refer to **Section 5.4**).

Geophones will be installed by an acoustic consultant at the closest points of the sensitive structure to the vibration intensive works to continuously monitor vibration for the duration of the works. Should the works location change, the geophones will be relocated to remain at the closest point of the structure to the works.

The vibration monitoring equipment will have visible and audible alarms installed where operators of equipment can see/hear them:

- A warning vibration level of 2/3 of the applicable vibration limit will trigger a 'warning' alarm if exceeded.
- A 'halt work' alarm will trigger if vibration is measured equal to the applicable vibration limit. Actions to be carried out if the exceedance alarms are triggered are detailed in **Section 7.5**.

Vibration monitoring data will be downloaded and reported at the following timeframes:

- Monthly during works (at a minimum)
- Within one week of an exceedance of the vibration limit alarm level
- Upon completion of vibration monitoring.

All items of vibration instrumentation will be designed to comply with applicable guidelines and carry current calibration certificates.

7.3.3 Monitoring Reports

Noise and/or vibration monitoring reports will be provided to the relevant regulatory authorities after review, unless otherwise agreed by the relevant regulatory authorities. Monitoring reports would include the following details, at a minimum:

- Noise/vibration monitoring/measurement locations
- Date, time and length of noise monitoring/measurements
- Weather conditions during the measurements
- Name and position of personnel undertaking measurements
- Construction activities being undertaken during measurements
- Locations of construction equipment and distance from monitoring location
- Measured L_{Aeq} and L_{Amax} noise levels during construction works (for each activity) along with a comparison to the predicted noise levels (noise monitoring only)
- Measured L_{A90} background noise level in absence of the construction works (noise monitoring only)
- Measured vibration levels during construction works (for each activity) along with a comparison to the relevant vibration criteria (vibration monitoring only)
- Measured vibration levels and relevant details of any of exceedance of the warning vibration level or vibration limits (vibration monitoring only)
- Measured background vibration level in absence of the construction works (vibration monitoring only)
- Operator observations noting any extraneous noise/vibration sources or other points of relevance.

Note: A summary or monitoring and reporting is included in Section 5 of the CEMP for quick reference.

7.4 Complaints Management

Any complaint received in relation to the environmental performance or management of the development shall be managed and reported in accordance with Section 3.6 of the CEMP.

7.5 Contingency Plan

The following contingency management plan, shown in **Table 19**, would be used to manage noise and vibration impacts that are higher than expected.

Any incident or non-compliance shall be handled and reported in accordance with Section 3.5 of the CEMP. As detailed in Section 5.4 of the CEMP, all Condition Amber and Condition Red occurrences will be recorded in the Construction Contractor's Monthly Report to Mirvac and discussed during the toolbox talks.

The following events constitute an incident in terms of noise and vibration:

- Trigger of Condition Red for noise impacts during the standard construction hours detailed in Condition D41
- Any works occurring outside the standard construction hours detailed in Condition D41, where those works do not meet the allowable circumstances defined in Condition D42, including being agreed in writing by the Planning Secretary
- Trigger of Condition Red for vibration impacts at sensitive receivers.

Table 19 Contingency Management Plan

Key Element	Trigger / Response	Condition Green	Condition Amber	Condition Red
Noise impacts at sensitive receiver locations	Trigger	Noise levels do not exceed applicable NMLs	Noise levels exceed applicable NMLs	Noise levels exceed Highly Noise Affected criteria (75 dBA)
	Response	On-going best practice management measures to minimise noise emissions	Undertake all feasible and reasonable mitigation and management measures to minimise noise impacts (aiming to achieve NMLs)	Works exceeding the Highly Noise Affected criteria will be managed in accordance with the strategies for high-noise generating works determined through community consultation, as detailed in **Section 7.1** and **7.2**.
Vibration impacts at sensitive receiver locations	Trigger	Vibration intensive works undertaken outside minimum working distance for the specific equipment in use	Vibration intensive works undertaken within minimum working distance for the specific equipment in use	Vibration levels exceed applicable vibration limits
	Response	On-going best practice management measures to minimise vibration emissions	Undertake vibration monitoring for the duration of the works to confirm vibration levels.	Stop work. Undertake all feasible and reasonable mitigation and management measures to ensure vibration levels are below applicable limits. If vibration levels cannot be kept below applicable limits then a different construction method or equipment must be utilised.

Note: This contingency management plan is replicated in Section 5 of the CEMP for quick reference.

7.6 Internal Audits

Periodic internal audits will be conducted to ensure that the development consent conditions and commitments and environmental management controls outlined in this CNVMP are being properly implemented. Audit reports will be used to inform of any corrective actions.

7.7 Roles and Responsibilities

Overall roles and responsibilities relating to the project are outlined in the CEMP. The key responsibilities specifically for noise and vibration management are as follows:

7.7.1 Contractor's Project Manager

- Ensuring appropriate resources are available for the implementation of this CNVMP
- Assessing data from inspections and providing project-wide advice to ensure consistent approach and outcomes are achieved
- Providing necessary training for project personnel to cover noise and vibration management

- Reviewing and update of this CNVMP, where necessary
- Commissioning suitably qualified consultants to complete noise and vibration monitoring. Ensuring environmental coordinators appropriately undertake attended noise and vibration measurements required by this CNVMP
- Assessing and (as required) mitigating risks of high noise and vibration levels before commencing works and ensuring that the appropriate controls are implemented
- Ceasing works in the event of excessive noise and vibration generation
- In the event that a noise or vibration complaint is received, implementing the procedure outlined in **Section 7.4**.

7.7.2 Environmental Coordinator

- Coordinating noise and/or vibration monitoring program, where required
- Review control measures in accordance with the CNVMP
- Identifying and reporting any high or non-compliant noise and vibration emissions.

7.7.3 All Workers on Site

- Observing any noise and vibration emission control instructions and procedures that apply to their work
- Taking action to prevent or minimise noise and vibration emission incidents
- Identifying and reporting noise and vibration emission incidents.

8 Review and Improvement of Noise Management Plan

Reviews, investigations, and improvements to this plan and the environmental performance shall be undertaken in accordance with Section 6 of the CEMP.

This CNVMP will be reviewed, and if necessary, updated in the following circumstances:

- Significant changes to the equipment, machinery and plant operated within the site
- Where it is identified via monitoring that the performance of the project is not meeting the objectives of the CNVMP
- At the request of the relevant regulatory authority or other relevant government agency.

All employees and contractors will be informed of any revisions to the CNVMP by Site Management during toolbox talks. The most recent version of the CNVMP as approved by the Planning Secretary, will be implemented for the duration of construction works.

APPENDIX A

Acoustic Terminology

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

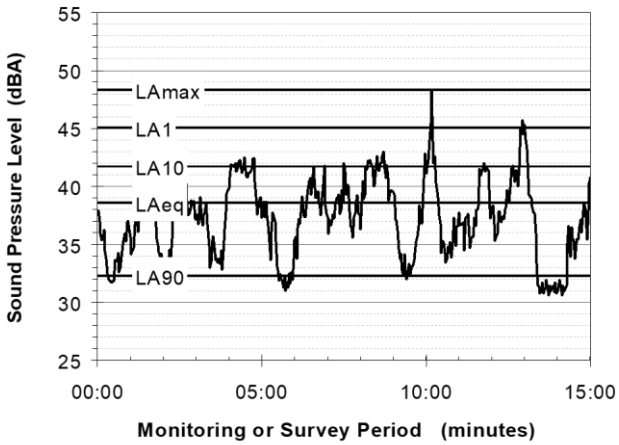
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

5. Frequency Analysis

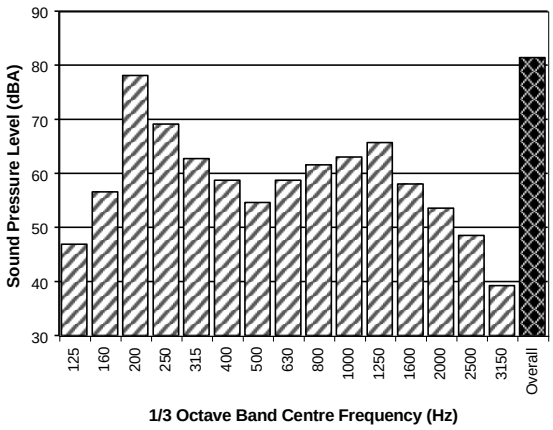
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

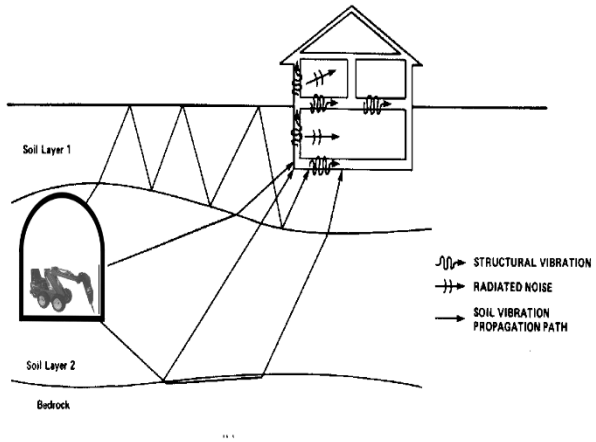
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

APPENDIX B

Planning Secretary's Endorsement

Department of Planning and Environment

Our ref: SSD-10448-PA-5

Mr Russel Hogan

Mirvac Projects Pty Ltd

Level 28, 200 George Street

SYDNEY NSW 2000

16 June 2022

Subject: Aspect Industrial Estate (SSD-10448) Approval of Noise Consultants

Dear Mr Hogan

I refer to your request for the Planning Secretary's endorsement of suitably qualified and experienced noise consultants to prepare a Construction Noise Management Plan (CNMP) for the Stage 1 Development of the Aspect Industrial Estate (AIE) (SSD-10448). The request has been submitted in accordance with Condition D44(a), Schedule 2 of development consent SSD-10448.

The Department has carefully reviewed the request and curriculum vitae of Mr Joshua Ridgway, Mr Mark Irish, and Mr Antony Williams. The Department considers the nominated consultants to be suitably qualified and experienced.

The Department hereby approves the appointment of Mr Joshua Ridgway, Mr Mark Irish, and Mr Anthony Williams as the noise consultants to prepare the CNMP for the Stage 1 Development of the AIE.

Pleasure ensure that the approval is placed on the project website at the earliest convenience.

Should you have any questions in relation to this matter, please contact Bruce Zhang on 9274 6137 or bruce.zhang@planning.nsw.gov.au.

Yours sincerely,

Pamela Morales

A/Team Leader
Industry Assessments

As nominee of the Planning Secretary

APPENDIX C

Evidence of Consultation

ALTIS
PROPERTY PARTNERS

29 April 2022

Russell Hogan
Senior Development Manager
Mirvac
Level 28, 200 George St Sydney NSW 2000

Sent via Email russell.hogan@mirvac.com

Dear Russell,

Altis Kemps Creek Pty Ltd as trustee for the Altis Kemps Creek Investment Trust (**Altis**) is the owner of the properties being 884-902 Mamre Rd, Kemps Creek, and 904-928 Mamre Rd, Kemps Creek. Altis has lodged a State Significant Development Application (SSD-17647189) for the development of these properties and intend to commence development immediately following receipt of the SSD approval. Altis can confirm that the above-mentioned properties are both currently vacant and are not intended to be occupied for residential use prior to redevelopment of the site.

Yours sincerely,

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