13 October 2021

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Goodman Property Services (Aust) Pty Ltd
The Hayesbery
1-11 Hayes Road
Rosebery NSW 2018

Attention: Camila Medina

Dear Camila

Oakdale South Industrial Estate
Site 2B - DA20/0685 - MOD 2
Operational Noise Impact Assessment

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Goodman Property Services (Aust) Pty Ltd (Goodman) to assess the operational noise impacts of Site 2B of the Oakdale South Industrial Estate (Oakdale South), located in Kemps Creek.

Site 2B of Oakdale South was approved by Penrith City Council as DA20/0685 in May 2021. The design of the development has been updated as part of a modification (MOD 2) to the Development Consent.

This letter presents a review of the operational noise emissions for the MOD 2 design changes to Site 2B and compares the predicted noise levels to the noise criteria for the site and the approved noise levels.

1 Approved Development

The approved Site 2B development consists of the following:

- One warehouse building with two tenancies
- Two offices each with associated car parking areas
- Two dock offices
- Two hardstands

The primary noise sources on the site are light and heavy vehicles, forklifts and loading activities, and mechanical plant.

The approved Site 2B design plan is shown in **Figure 1**.

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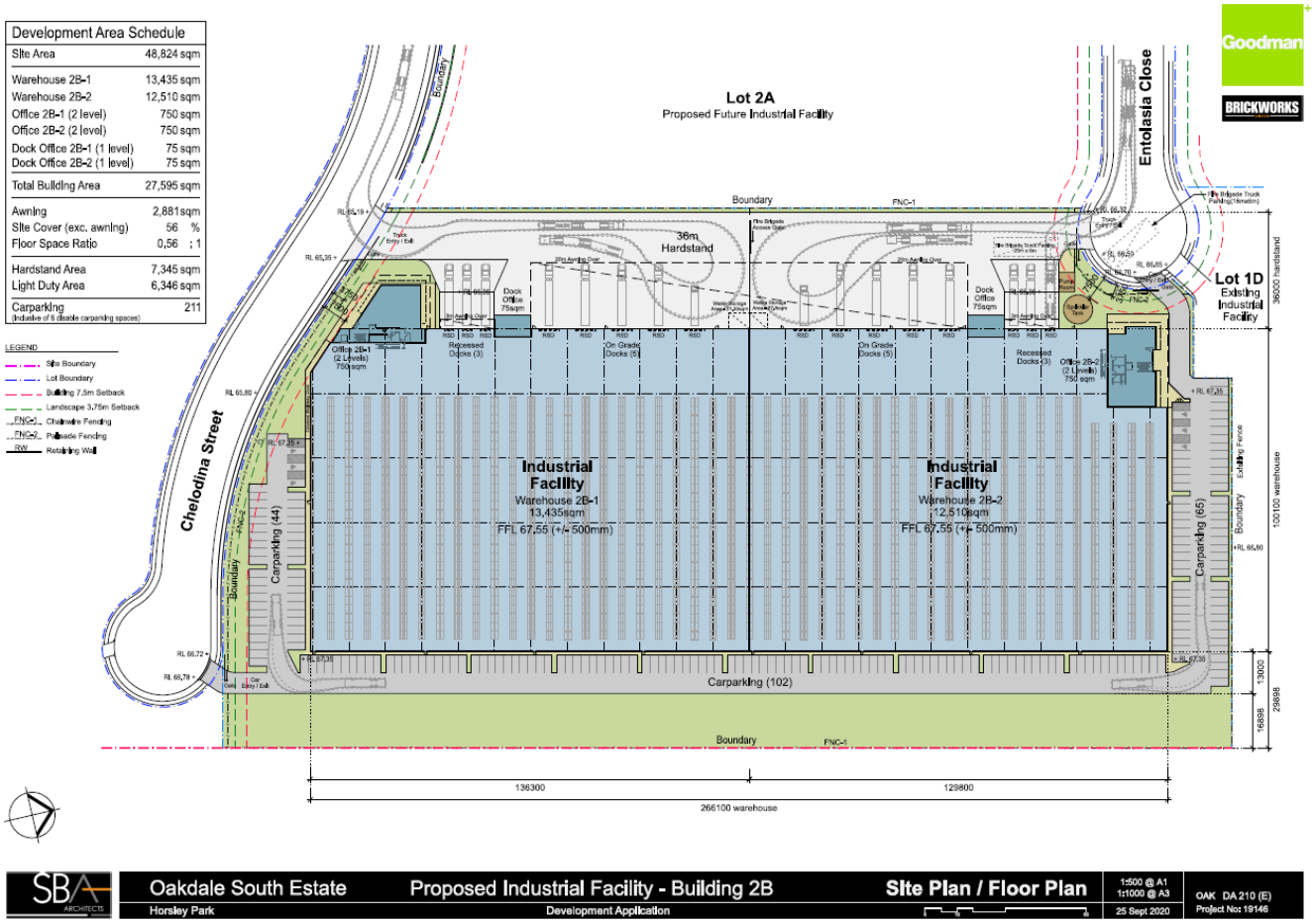
Figure 1 Approved Site 2B Design Plan



2 MOD 2 Development Changes

The MOD 2 design of Site 2B changes the warehouse from two tenancies to a single tenancy, with the two hardstands combined into one continuous hardstand. The footprint of the warehouse building, offices and dock offices, hardstand and carparking do not change significantly. The combined warehouse is shown in **Figure 2**.

The DA Noise Impact Assessment (DA NIA) conservatively modelled external fixed mechanical plant on each of the office rooftops with an assumed cumulative sound power level (SWL) of 80 dBA per office.

The MOD 2 design changes the location of the external mechanical plant, detailing specific units and locations for each of the offices and dock offices. Additionally, temperature control units are proposed on the warehouse roof, and freezer plant on the 2B-1 dock office roof.

No other operational details of Site 2B have been modified by the MOD 2 design, including proposed traffic volumes. All assumptions in this assessment are consistent with the assumptions for the approved development detailed in the DA NIA.

The proposed external mechanical plant is detailed in **Table 1**, and the plant locations are shown in **Figure 2**.

Table 1 Site 2B External Mechanical Plant

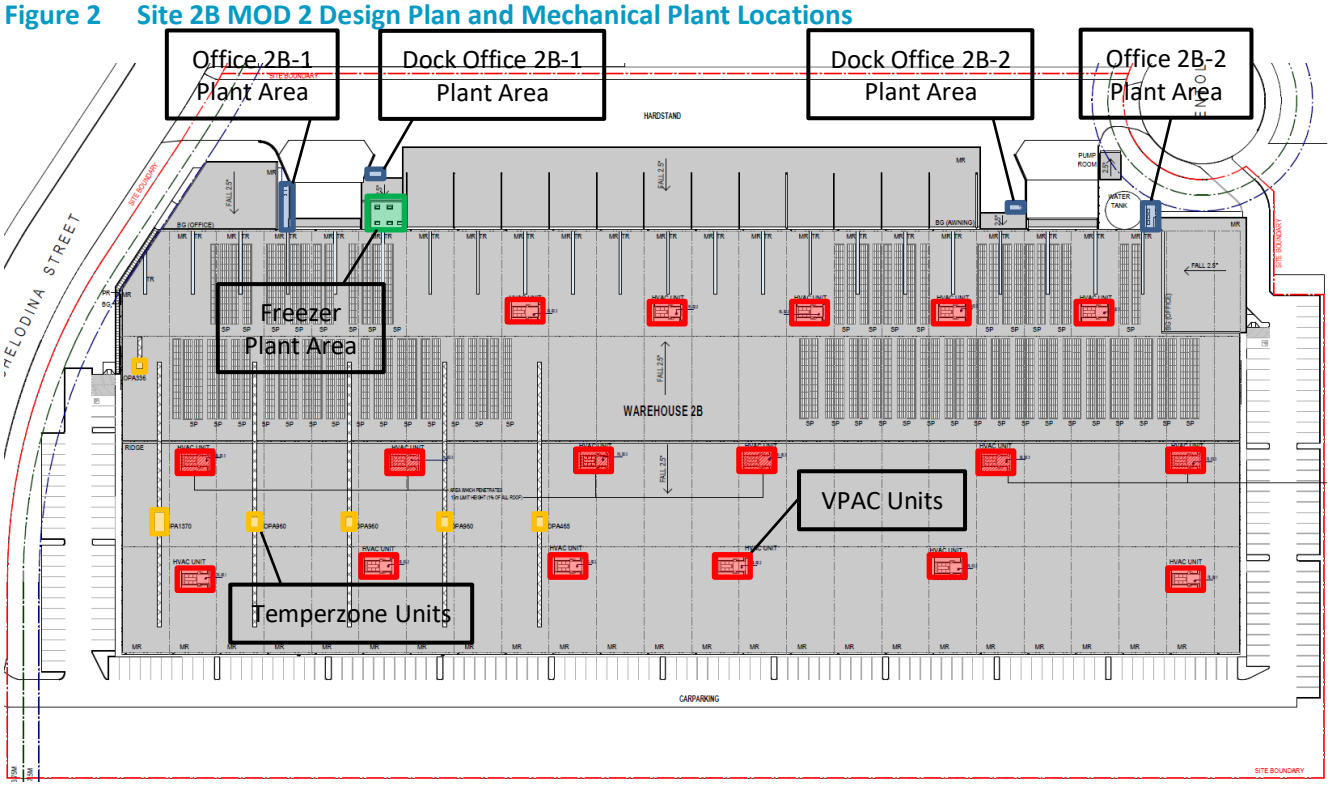
Plant ID	Location	Plant Model	SWL (dBA)
AC-2B.1.1	Office 2B-1 plant area	Daikin RZA140CV1	73
AC-2B.1.2	Office 2B-1 plant area	Daikin RZA140CV1	73
AC-2B.1.3	Office 2B-1 plant area	Daikin RZA140CV1	73
AC-2B.1.4	Office 2B-1 plant area	Daikin RZQ180MY1	72
AC-2B.1.5	Office 2B-1 plant area	Daikin RZQ200MY1	74
AC-2B.1.6	Office 2B-1 plant area	Daikin RZQ200MY1	74
AC-2B.1.7	Dock office 2B-1 plant area	Daikin RZA71CV1	68
AC-2B.2.1	Office 2B-2 plant area	Daikin RZA125CV1	72
AC-2B.2.2	Office 2B-2 plant area	Daikin RZA125CV1	72
AC-2B.2.3	Office 2B-2 plant area	Daikin RZQ180MY1	72
AC-2B.2.4	Office 2B-2 plant area	Daikin RZA125CV1	72
AC-2B.2.5	Office 2B-2 plant area	Daikin RZA140CV1	73
AC-2B.2.6	Office 2B-2 plant area	Daikin RZA140CV1	73
AC-2B.2.7	Office 2B-2 plant area	Daikin RZQ180MY1	72
AC-2B.2.8	Office 2B-2 plant area	Daikin RZA140CV1	73
AC-2B.2.9	Dock office 2B-2 plant area	Daikin RZA71CV1	68
TZ-1	Warehouse roof	Temperzone OPA336	83.5
TZ-2	Warehouse roof	Temperzone OPA465	88.5
TZ-3	Warehouse roof	Temperzone OPA960	83.5
TZ-4	Warehouse roof	Temperzone OPA960	83.5
TZ-5	Warehouse roof	Temperzone OPA960	83.5
TZ-6	Warehouse roof	Temperzone OPA1370	90.5
VPAC	Warehouse roof	Fusion VPAC units	83 per unit (17 units)
Freezer Plant	Plant room roof	Cooling plant TBC[1]	78 assumed total SWL[1]

Note 1: Specifications of freezer plant have not yet been determined.

It is noted that the specifications of the freezer plant have not yet been determined. For the purpose of this assessment, an assumed cumulative SWL of 78 dBA has been modelled on the plant room roof, based on measurements undertaken by SLR on a similar system installed at Site 5A of Oakdale South. Noise emissions from the external freezer mechanical plant area should be reassessed in a later design stage once specific mechanical plant for this area has been determined if the cumulative SWL of the plant exceeds 78 dBA and/or the location of the plant is modified. Internal freezer plant within the plant room is not expected to have significant external noise emissions.

The NPfI requires modifying factor corrections to be applied to the predicted noise levels where the noise emissions have characteristics that are tonal, low-frequency, intermittent or short duration. Application of modifying factor corrections is not required for the proposed mechanical plant listed in **Table 1**. All other sources are consistent with the assumptions for the approved development detailed in the DA NIA.

Figure 2 Site 2B MOD 2 Design Plan and Mechanical Plant Locations



Note 1: Office and dock office plant areas shown in blue.
Fusion VPAC units shown in red.
Temperzone units shown in yellow.
Freezer plant area shown in green.

3 Operational Noise Criteria and Receiver Locations

The operational noise criteria applicable to Site 2B of Oakdale South are specified in Conditions 30 and 35 of the Development Consent DA20/0685. Conditions 30 and 35 are reproduced below:

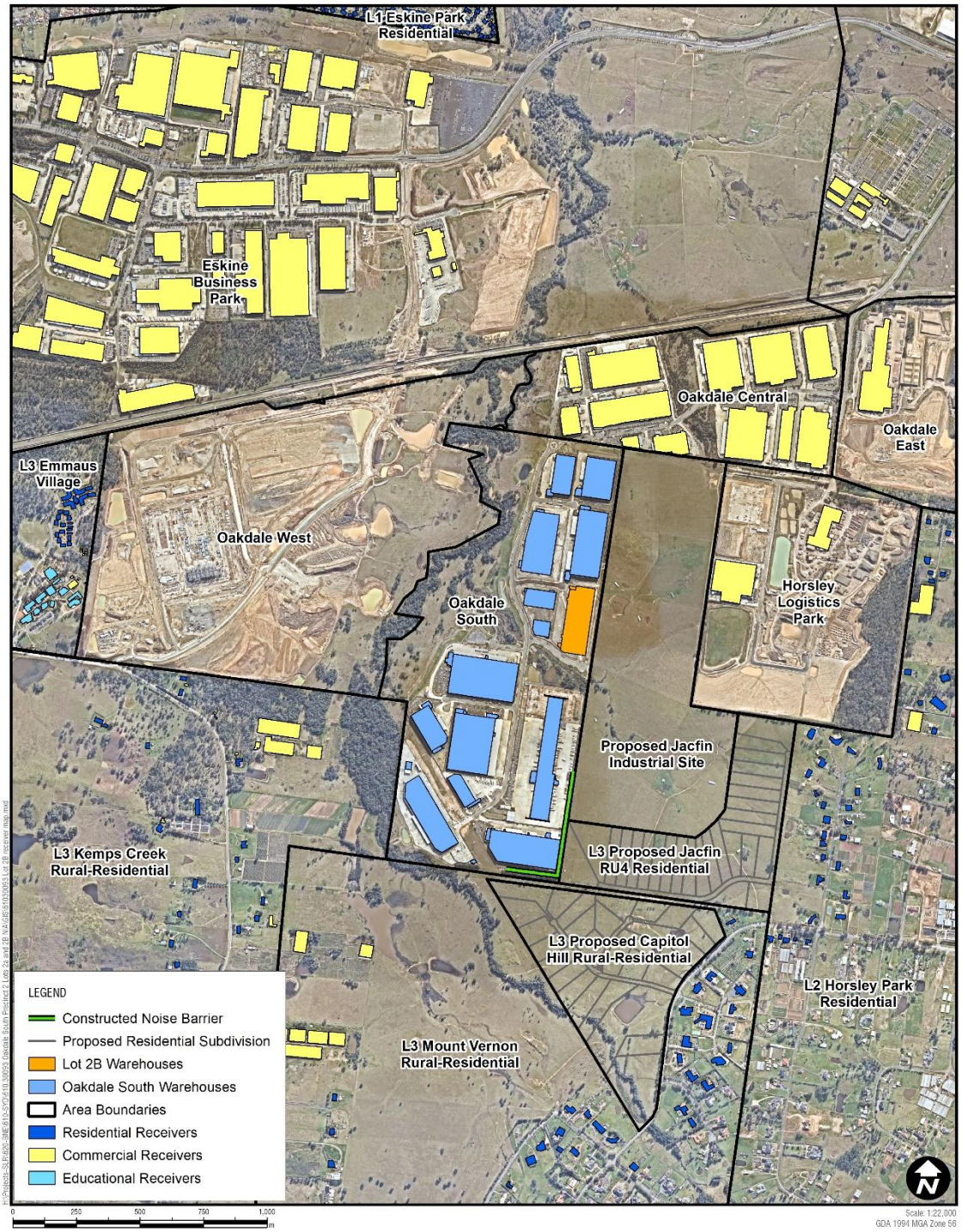
> 30 *Noise levels from the premises shall not exceed the relevant noise criteria detailed in the Oakdale South Industrial Estate Lot 2B DA Noise Impact Assessment prepared by SLR and dated 26/10/2020.*
> *The provisions of the Protection of the Environment Operations Act 1997 apply to the development, in terms of regulating offensive noise.*
>
> 35 *All mechanical plant and equipment is to comply with the noise criteria outlined in Oakdale South Industrial Estate Lot 2B DA Noise Impact Assessment prepared by SLR and dated 26/10/2020.*

The receiver locations and operational noise criteria from the DA NIA referred to in the above conditions are provided in **Sections 3.1** and **3.2**.

3.1 Receiver Locations

The locations of noise sensitive receivers in the vicinity of Oakdale South are shown in **Figure 3**.

Figure 3 Residential Receiver Areas and Modelled Buildings



Note 1: Figure sourced from DA NIA.

3.2 Operational Noise Criteria

The DA NIA detailed the operational noise criteria applicable to Site 2B, reproduced in **Table 2**.

Table 2 Oakdale South Operational Noise Limits – Residential

Location	Day	Evening	Night	Night
	$L_{Aeq(15minute)}$	$L_{Aeq(15minute)}$	$L_{Aeq(15minute)}$	$L_{A1(1minute)}$
L1 North of Warragamba Pipeline	37	37	37	47
L2 Horsley Park	39	39	39	49
L3 Kemps Creek, Mt Vernon, Jacfin and Capitol Hill	40	40	40	48

Note 1: As per the *NSW Industrial Noise Policy* (INP), the above criteria are applicable at the most-affected point on or within the residential property boundary or, if this is more than 30 m from the residence, at the most-affected point within 30 m of the residence. (It is noted that the INP has been superseded by the *NSW Noise Policy for Industry* (NPfI), however the INP was current when the noise criteria for Oakdale South were approved.)

As detailed in the DA NIA, standard weather conditions are applicable to all periods, with noise-enhancing weather conditions applicable only during the night-time period.

4 MOD 2 Operational Noise Impact Assessment

The operational noise model prepared for the Site 2B DA NIA was updated with the MOD 2 design changes as outlined in **Section 2**.

The predicted operational noise levels for the MOD 2 design are compared to the applicable criteria and the approved noise levels in **Table 3**.

Table 3 Predicted Operational Noise Levels – Site 2B

Receiver	Period (weather)	$L_{Aeq(15\ minute)}$ Noise Level (dBA)					Change in Predicted Noise Level (dB)
		Criteria	Approved Design	MOD 2 Design			
			Predicted	Predicted	Exceedance	Compliance	
L1 Erskine Park Residential	Day/Eve (standard)	37	<30	<30	-	Yes	0
	Night (standard)	37	<30	<30	-	Yes	1
	Night (noise-enhancing)	37	<30	<30	-	Yes	1
L2 Horsley Park Residential	Day/Eve (standard)	39	<30	<30	-	Yes	4
	Night (standard)	39	<30	<30	-	Yes	8
	Night (noise-enhancing)	39	<30	<30	-	Yes	6
L3 Proposed Jacfin Residential	Day/Eve (standard)	40	<30	<30	-	Yes	2
	Night (standard)	40	<30	<30	-	Yes	5
	Night (noise-enhancing)	40	<30	31	-	Yes	3
L3 Proposed Capitol Hill Residential	Day/Eve (standard)	40	<30	<30	-	Yes	1
	Night (standard)	40	<30	<30	-	Yes	3
	Night (noise-enhancing)	40	<30	<30	-	Yes	2
L3 Mount Vernon Residential	Day/Eve (standard)	40	<30	<30	-	Yes	2
	Night (standard)	40	<30	<30	-	Yes	4
	Night (noise-enhancing)	40	<30	<30	-	Yes	3
L3 Kemps Creek Residential	Day/Eve (standard)	40	<30	<30	-	Yes	0
	Night (standard)	40	<30	<30	-	Yes	1
	Night (noise-enhancing)	40	<30	<30	-	Yes	1
L3 Emmaus Village Residential	Day/Eve (standard)	40	<30	<30	-	Yes	0
	Night (standard)	40	<30	<30	-	Yes	1
	Night (noise-enhancing)	40	<30	<30	-	Yes	1

Note 1: **Bold** text indicates an exceedance of the criteria.

Operational noise emissions from the development are predicted to comply with the relevant criteria at the surrounding sensitive receivers. Noise levels are predicted to increase by up to 8 dB at the most-affected receivers compared to the approved Site 2B design. This is due to the additional mechanical plant.

As such, a cumulative noise assessment of the MOD 2 design with the other sites of Oakdale South is detailed in **Section 5**.

Night-time $L_{A1(1minute)}$ noise levels from Site 2B are not caused by mechanical plant, and as such are consistent with the approved $L_{A1(1minute)}$ noise levels.

5 Cumulative Noise Impacts

The predicted cumulative operational noise levels for the MOD 2 design with the other sites of Oakdale South are compared to the applicable criteria and the approved cumulative noise levels in **Table 4**.

All noise sources and assumptions for the other sites of Oakdale South are consistent with the approved development as detailed in the DA NIA.

Table 4 Predicted Operational Noise Levels – Site 2B and Oakdale South Cumulative Impacts

Receiver	Period (weather)	Cumulative $L_{Aeq(15\ minute)}$ Noise Level (dBA)					Change in Predicted Noise Level (dB)
		Criteria	Approved Design	MOD 2 Design			
			Predicted	Predicted	Exceedance	Compliance	
L1 Erskine Park Residential	Day/Eve (standard)	37	<30	<30	-	Yes	0
	Night (standard)	37	<30	<30	-	Yes	0
	Night (noise-enhancing)	37	31	31	-	Yes	0
L2 Horsley Park Residential	Day/Eve (standard)	39	30	30	-	Yes	0
	Night (standard)	39	<30	<30	-	Yes	0
	Night (noise-enhancing)	39	33	33	-	Yes	0
L3 Proposed Jacfin Residential	Day/Eve (standard)	40	40	40	-	Yes	0
	Night (standard)	40	38	38	-	Yes	0
	Night (noise-enhancing)	40	40	40	-	Yes	0
L3 Proposed Capitol Hill Residential	Day/Eve (standard)	40	39	39	-	Yes	0
	Night (standard)	40	36	36	-	Yes	0
	Night (noise-enhancing)	40	39	39	-	Yes	0
L3 Mount Vernon Residential	Day/Eve (standard)	40	31	31	-	Yes	0
	Night (standard)	40	<30	<30	-	Yes	0
	Night (noise-enhancing)	40	33	33	-	Yes	0
L3 Kemps Creek Residential	Day/Eve (standard)	40	35	35	-	Yes	0
	Night (standard)	40	30	30	-	Yes	0
	Night (noise-enhancing)	40	37	37	-	Yes	0
L3 Emmaus Village Residential	Day/Eve (standard)	40	<30	<30	-	Yes	0
	Night (standard)	40	<30	<30	-	Yes	0
	Night (noise-enhancing)	40	32	32	-	Yes	0

Note 1: **Bold** text indicates an exceedance of the criteria.

Cumulative operational noise emissions from Site 2B with Oakdale South are predicted to comply with the relevant criteria at the surrounding sensitive receivers. While noise levels from Site 2B are predicted to increase, the cumulative noise levels are consistent with the approved cumulative noise levels due to the relatively low contribution from Site 2B to the cumulative noise levels at the most affected receivers.

Overall, the predicted operational noise impacts from the MOD 2 design are consistent with the approved design and comply with the relevant operational noise criteria.

I trust that this letter covers your requirements.

Yours sincerely

[redacted]

JOSHUA RIDGWAY
Senior Consultant

Checked/
Authorised by: MI

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

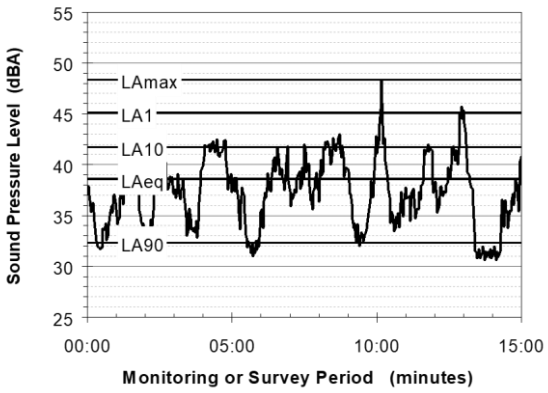
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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 LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 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:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 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.

LAeq 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

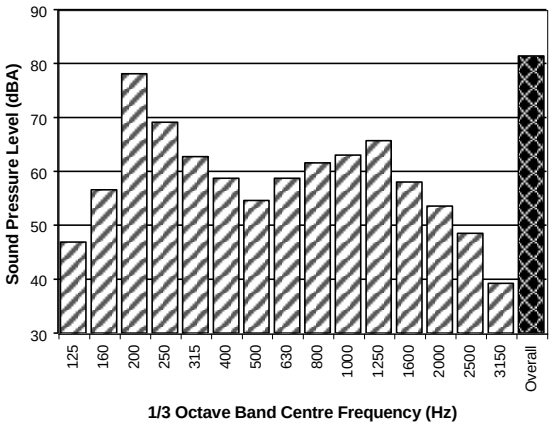
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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

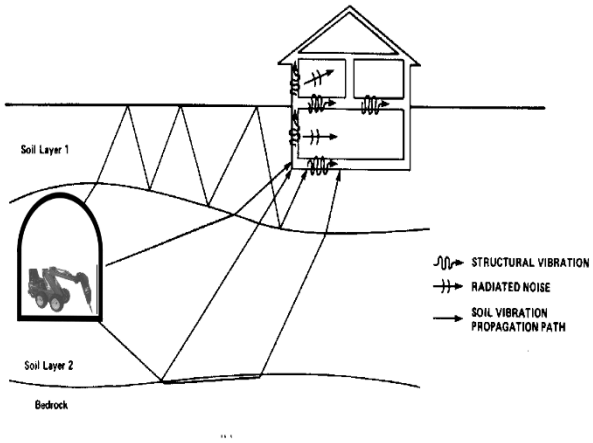
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience 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.