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# LES Building, South Eveleigh Precinct

Noise and Vibration Re-zoning Assessment

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# 1 INTRODUCTION

Acoustic Logic (AL) has been engaged to conduct an assessment of noise and vibration impacts associated with the proposed land rezoning and internal alterations to the Large Erecting Shop (LES) located within the South Eveleigh Precinct.

In accordance with the Study Requirements established by NSW Department of Planning and Environment dated April 2022, this report will address the following:

	NSW DPE Study Requirements - Noise and Vibration Assessment	Reference
a)	Identifies the existing situation, both within the site and in affected adjacent areas, showing constraints, opportunities, key issues and maps any sensitive receptors;	See Section 2 of this report, pp. 9-15
b)	Assesses the likely noise and vibration impacts on future use/development, particularly in relation to the rail operations and use of the site;	See Sections 4 and 5 of this report, pp. 15-32
c)	Assesses the likely vibration impacts on the heritage item and heritage items within its proximity and recommends mitigation measures to reduce vibration impacts, where appropriate;	See Section 5, 6 & 7 of this report, pp. 32-44
d)	Models and assesses the efficacy of the likely future noise, and vibration measures to minimise negative impacts on comfort and to minimise harm to people or property;	See Sections 6 and 8 of this report, pp. 35-40, 43- 45
e)	Ensures the proposal does not impact the stability of any existing rail related structures and infrastructure; and	See Sections 6 and 7 of this report, pp. 35-43
f)	Recommends appropriate noise and vibration development standards to be applied to subsequent development stages.	See Section 9 of this report, pp. 45-46

AL have utilised the following documents and regulations in the noise assessment of the development:

- City of Sydney Council 'Sydney Local Environmental Plan 2012'
- City of Sydney Council 'Development Control Plan 2012'
- NSW Department of Planning and Environment 'Study Requirements' dated April 2022
- State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021
- NSW Department of Environment and Heritage, Environmental Protection Authority document 'Noise Policy for Industry' (NPfI) 2017
- NSW Liquor and Gaming Standard Noise Requirements
- NSW Environmental Protection Authority (EPA) document 'Assessing Vibration A Technical Guideline.'

- German Standard DIN 4150-3 'Structural Vibration: Effects of Vibration on Structures'
- NSW Environmental Protection Authority (EPA) document 'Interim Construction Noise Guideline (ICNG)'

This assessment has been conducted using the FJMT Studio architectural drawings (dated 9<sup>th</sup> June 2022).

## 1.1 **PROJECT OVERVIEW**

The Large Erecting Shop (LES) is a large industrial building with a footprint of approximately 6,000sqm located at the northwest of the South Eveleigh Precinct. The LES ceased formal operation in 1988 and has been largely unoccupied since approximately 2017.

The NSW Government is committed to working with the local community to develop the biggest innovation district of its kind in Australia, being Tech Central. The South Eveleigh Precinct is a key neighbourhood within Tech Central, delivering workplaces and collaboration spaces that support the vision for a new tech and innovation ecosystem. The inclusion of the LES within the broader South Eveleigh Precinct has the potential to support further innovation, collaboration and jobs for the future.

Transport for NSW (TfNSW) is therefore seeking to adaptively use the LES for a mix of uses, including commercial office and retail premises. Such land uses are currently not permitted within the planning controls that apply to the LES building, which still reflect its former infrastructure function. As such, a State-led rezoning application is being proposed to the Department of Planning and Environment (DPE) to amend the planning controls that currently apply to the site under State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021 (Precincts SEPP).

The proposed new planning controls are intended to facilitate the following:

- Alterations within the existing LES to convert the ground level into commercial office and retail premises,
- Creation of two new 'internal' storeys within the existing LES building envelope for use as commercial office premises,
- External upgrade and conservation work to the existing LES building to ensure it is fit for purpose and environmentally sustainable,
- Heritage interpretation and conservation work generally throughout the LES site,
- Services augmentation, and
- Publicly accessible space upgrades.

While external works are required, the proposal does not seek to significantly alter the existing building footprint of the LES. Further it is proposed that the general form of the existing building and key architectural features of the existing building are retained in any future reuse of the building for commercial purposes, noting that the LES is part of the Eveleigh Railway Workshops complex included on the State Heritage Register.

Since 2015 Mirvac has successfully developed the South Eveleigh Precinct. With the completion of the Locomotive Workshop project, which also involved the adaptive use of industrial buildings listed on the State Heritage Register, it is now considered a logical time to adapt and integrate the LES into the broader technology precinct. Mirvac, on behalf of TfNSW, are therefore preparing documentation to support the State-led rezoning application.

## 1.2 THE SITE

The LES is an isolated building at the north west of the South Eveleigh Precinct as identified in Figure 1. The South Eveleigh Precinct is located approximately 200m to the south west of Redfern Train Station and approximately 200m to the west of the future Sydney Metro Waterloo Metro Station. The South Eveleigh Precinct includes an overall area of approximately 13.2 hectares.

The LES site is currently legally described as being part of Lot 5, in Deposited Plan 1175706. This allotment also includes the North Eveleigh Precinct, the rail lines separating the North and South Eveleigh Precincts, and Redfern Railway Station. It is proposed that the LES building will be subdivided from this overall allotment.

The LES is owned by TAHE NSW and managed by Transport Heritage NSW. It is currently being used as a maintenance facility for heritage locomotives but it requires significant capital investment to bring it up to the required standards for continued use and avoid further deterioration.



#### Figure 1: Site Location

The LES is a rectangular building consisting of two main bays with twin gable roofs running the length of the workshop. Internally, the workshops are articulated with regular cast-iron columns supporting both roof and overhead cranes. Main elevations are regularly articulated with twin semi-circular arched windows with smaller arched windows above. Existing site photographs can be seen in Figure 2.



Picture 1 Eastern Elevation of LES



Picture 2 Southern Elevation of LES with train in-situ

## Figure 2: Site Photos Source: Mirvac

## 1.3 PROPOSED CONTROLS

The proposed amendments to the Precincts SEPP involve the inclusion of the LES site within the 'Business Zone—Business Park' zone, which applies to the majority of the South Eveleigh Precinct and notably is the existing zoning for the adjacent Locomotive Sheds.

Further, the State-led rezoning application proposes new development standards including a maximum gross floor area (GFA) control on the LES site of up to 8440sqm. Other minor changes as required may be proposed to the Precincts SEPP to facilitate the reuse of the LES building for commercial office and retail purposes.

# 2 SURROUNDING RECIEVERS

Investigation has been carried out by this office in regards to the existing properties and noise impacts surrounding the proposed development, which is detailed below:

- Existing residential blocks to the south-west of the site
- Existing commercial receivers to the south of the site
- Existing commercial receivers bounding the site at all sides within the South Eveleigh Precinct
- Existing industrial receivers bounding the site at all sides within the South Eveleigh Precinct

The nearest noise receivers around the site include:

- **R1**: Residential Receiver 1 Multi storey residential dwellings to the south-west at 1-47 Rowley Street, Eveleigh
- **R2**: Residential Receiver 2 Multi storey residential dwellings further south-west at 1-12 Aurora Place, Eveleigh, 1-30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh
- **C1**: Commercial Receiver 1 Multi storey commercial block to the north of the site within the South Eveleigh Precinct.
- **C2**: Commercial Receiver 2 Multi storey commercial block to the east of the site within the South Eveleigh Precinct.
- **C3**: Commercial Receiver 3 Multi storey commercial block to the south of the site across Locomotive Street at 6-8 Central Avenue, Eveleigh.
- **I1**: Industrial Receiver 1 Single storey industrial development to the north of the site within the South Eveleigh Precinct.
- **I2**: Industrial Receiver 2 Single storey industrial development to the north-west of the site within the South Eveleigh Precinct.

It is noted that the closest residential receivers are located at **R1** (1-47 Rowley Street, Eveleigh), **R2** (1-12 Aurora Place, Eveleigh, 1-30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh), given their proximity to the proposed site. These residential receivers share line of sight to different portions of the LES.

A site map, measurement description and surrounding receivers are presented in **Figure 3** below.



Figure 3: Site Location & Surrounds Source: NSW Six Maps



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# **3 NOISE DESCRIPTORS**

Train noise constantly varies in level, due to fluctuations in frequency of train movement. Accordingly, it is not possible to accurately determine prevailing train noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of train noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L<sub>10</sub>, L<sub>90</sub> and L<sub>eq</sub>.

The L<sub>10</sub> and L<sub>90</sub> measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The L<sub>10</sub> parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the  $L_{90}$  level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The  $L_{90}$  parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the  $L_{90}$  level.

The  $L_{eq}$  parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period.  $L_{eq}$  is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the  $L_{eq}$  parameter as a means of measuring traffic noise, whereas the  $L_{10}$  parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the  $L_{90}$  parameter is not used to assess train noise intrusion.

Structure borne noise is the sound generated from a vibrating source or impact event. The noise is transmitted when sound arises from the actual impact of an object on a building element such as wall, floor or foundation. Structure borne noise occurs because the impact causes the building element to vibrate, generating sound waves. Structure borne noise is transmitted through solid structures such as concrete columns & load bearing walls.

Noise descriptors used to categorise structure borne noise are as follows;

L<sub>Amax, slow</sub>- A weighted maximum noise level during noise measurement period, with sound level meter set on slow response.

L<sub>Amax, fast</sub>- A weighted maximum noise level during noise measurement period, with sound level meter set on fast response.

# 4 EXISITING NOISE AND VIBRATION SURVEY

NSW EPA's Rating Background Noise Level (RBL) assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendices in this report present results of unattended noise monitoring conducted at the project site. Weather affected data was excluded from the assessment. The processed RBL (lowest 10<sup>th</sup> percentile noise levels during operation time period) are presented in Table 4-1.

#### 4.1 MEASUREMENT POSITIONS

Three unattended noise monitors were located on site and around the potentially most noise affected residents, Refer to Figure 3 for detailed location:

- One unattended noise monitor was located directly in front of the **R1** receivers (1-47 Rowley Street, Eveleigh), capturing the background noise levels of highly rail noise affected residents along Rowley Lane.
- One unattended noise monitor was located on the reserve next to **R2** (1-12 Aurora Place, Eveleigh, 1-30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh) capturing the background noise levels of the residents located further away from the rail lines.
- One unattended noise monitor was located on the balcony of **C1** with direct and unobstructed view of the public rail lines and South Eveleigh Precinct workshop rail lines.

Attended short term measurements of rail noise were undertaken to supplement the unattended noise monitoring. Refer to Figure 3 for detailed location. Attended measurements were taken within the South Eveleigh Precinct and at the rear of **R2** to capture typical background noise levels experienced at residential receivers with significant shielding of the rail lines. All attended measurements were taken 1.5m above the local ground height.

#### 4.2 MEASUREMENT PERIOD

Unattended noise monitoring was conducted from Tuesday 10<sup>th</sup> of May 2022 to Monday 23<sup>rd</sup> of May 2022. Attended noise measurements were undertaken between the following hours:

- 10:00am and 11:00am on Tuesday 10th of May 2022
- 10:00am and 3:00pm on Friday 13th of May 2022

## 4.3 MEASUREMENT EQUIPMENT

#### 4.3.1 NOISE MEASUREMENTS

Equipment used consisted of an Acoustic Research Laboratories Pty Ltd noise monitors. Monitors were set to Aweighted fast response and programmed to store 15-minute statistical noise levels throughout the monitoring periods. The monitors were calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

Attended Measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

#### 4.3.2 VIBRATION MEASUREMENTS

Rail vibration measurements were conducted externally and internally within the South Eveleigh Precinct. Measurements were taken at what appeared to be the closest external location of the site to the existing rail lines, and at two locations within the existing LES building to assess the vibration experienced across the entire site.

Attended train vibration measurements were conducted on 13<sup>th</sup> of May between 10am and 3pm. A Svan 958 AE Vibration Analyser was used for the unattended and attended external vibration measurements. The analyser was fitted with a Dytran triaxial accelerometer. Two B&K EMS 4450 Vibration Monitors were utilised for the attended internal vibration measurements. All monitors were simultaneously collecting vibration data as a result of train passbys within the precinct.

#### 4.4 SUMMARISED BACKGROUND NOISE LEVELS

Summarised rating background noise levels for residents surrounding the proposed development are presented below. Periods of adverse weather that were determined to have affected the noise data have been eliminated when determining the rating background noise level (inclusive of Factsheet A3 of the NPI relating to shoulder periods) at the site in accordance with Fact Sheets A & B of the NPI. Appendices of this report present a graphical representation of the raw monitoring data for each location.

Monitor	Time of day	Rating Background Noise Level dB(A)L <sub>90(Period)</sub>
	Day (7am – 6pm)	49
<b>C1</b> South Eveleigh Precinct	Evening (6pm – 10pm)	49
	Night (10pm – 7am)	49
	Day (7am – 6pm)	44
R1	Evening (6pm – 10pm)	43
1-47 Rowley Street, Eveleigh	Night (10pm – 7am)	42
	Late Evening Period (10pm – 12am)	43
R2	Day (7am – 6pm)	41
1-12 Aurora Place, Eveleigh, 1-	Evening (6pm – 10pm)	41*
and 1-4 Station Street,	Night (10pm – 7am)	41*
Eveleigh	Late Evening Period (10pm – 12am)	41*

#### Table 4-1 – Measured Rating Background Noise Levels (RBL)

\* In accordance with NPfI the evening and night background has been set at no higher than the day background noise level.

The background noise spectrums for residential receivers are established from the attended and unattended measurements and summarised below.

Time of Day	Measured Noise Spectrum, Single Octave Band Frequencies									
Time of Day	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
7am – 6pm	47	53	53	47	41	36	33	29	18	44
6pm – 10pm	46	52	52	46	40	35	32	28	17	43
10pm – 12am	46	52	52	46	40	35	32	28	17	43
12am – 7am	45	51	51	45	39	34	31	27	16	42

# Table 4-2 – R1 (South Eveleigh Precinct) Measured Background Noise Spectrums (External)

# Table 4-3 – R2 (South Eveleigh Precinct) Measured Background Noise Spectrums (External)

Time of Day	Measured Noise Spectrum, Single Octave Band Frequencies									
Time of Day	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dB(A)
7am – 6pm	54	54	48	40	35	35	33	33	27	41
6pm – 10pm*	54	54	48	40	35	35	33	33	27	41
10pm – 12am*	54	54	48	40	35	35	33	33	27	41
12am – 7am*	54	54	48	40	35	35	33	33	27	41

\* In accordance with NPfI the evening and night background has been set at no higher than the day background noise level.

#### 4.5 SUMMARISED RAIL NOISE LEVELS

Summarised measured rail passby noise levels measured within the South Eveleigh Precinct are detailed below. Refer to Figure 3 for detailed location of each measurement. Given the intermittent nature of rail noise at the site, and to assist for comparison purposes, both the average (L<sub>eq</sub>) level and overall sound energy levels have been presented.

Measurement location	Type of Passby	Measured Passby Noise Level dB(A)L <sub>eq(passby)</sub>	Measured Passby Sound Energy Level dB(A) SEL
	Public lines low speed electric train	57	70
5m from workshop rail lines with unobstructed view (external)	Public lines high speed electric train	60	73
	Public lines low speed diesel train	59	73
	Workshop lines low speed electric train	62	80
	Workshop lines low speed diesel train	77	94
	Public lines high speed electric train	50	64
15m from workshop rail lines in line with the façade of LES (external)	Workshop lines low speed electric train	59	75
	Workshop lines low speed diesel train	65	83
	Public lines low speed electric train	49	63
20m from workshop rail lines LES doors open (internal)	Public lines high speed electric train	50	64
``´´	Workshop lines low speed diesel train	55	72

## Table 4-4 – Measured Rail Passby Noise Levels

## 4.6 PREDICTED NOISE MODELLING

Based on the attended measurements detailed in the section above, noise from rail passbys has been predicted and modelled at each façade of the LES building.

The following figures present the SoundPLAN modelling predicted noise levels from each type of train passby identified in Table 4-4



Figure 4: Northern Façade Predicted Noise Levels - Diesel Train on Public Lines



Figure 5: Northern and Eastern Façades Predicted Noise Levels - Diesel Train on Public Lines



Figure 6: Southern and Western Façades Predicted Noise Levels - Diesel Train on Public Lines



Figure 7: Northern and Western Façades Predicted Noise Levels - Diesel Train on Workshop Lines



Figure 8: Northern and Eastern Façades Predicted Noise Levels - Diesel Train on Workshop Lines



Figure 9: Southern and Western Façades Predicted Noise Levels - Diesel Train on Workshop Lines



Figure 10: Northern and Western Façades Predicted Noise Levels - Electric Train on Public Lines



Figure 11: Northern and Eastern Façades Predicted Noise Levels - Electric Train on Public Lines



Figure 12: Southern and Western Façades Predicted Noise Levels - Electric Train on Public Lines



Figure 13: Northern and Western Façades Predicted Noise Levels - Electric Train on Workshop Lines



Figure 14: Southern and Eastern Façades Predicted Noise Levels - Electric Train on Workshop Lines



Figure 15: Southern and Western Façades Predicted Noise Levels - Electric Train on Workshop Lines



Figure 16: Northern and Western Façades Predicted Noise Levels – Cumulative Average Worst 1hr



Figure 17: Northern and Eastern Façades Predicted Noise Levels – Cumulative Average Worst 1hr



Figure 18: Southern and Western Façades Predicted Noise Levels – Cumulative Average Worst 1hr

#### 4.7 SUMMARISED RAIL VIBRATION LEVELS

Summarised measured rail passby vibration levels measured within the South Eveleigh Precinct are detailed below. Refer to Figure 3 for detailed location of each measurement. These values are based on attended passby measurements correct to a 16hr period (6am-10pm).

# Table 4-5 – Measured Rail Passby Vibration Levels

Measured Passby Vibration Dose Value (VDV <sub>16Hr</sub> ) (m.s <sup>-1.75</sup> )					
External	Internal (West End of LES)	Internal (East End of LES)			
0.06	0.05	0.05			

#### 5 EXTERNAL NOISE & VIBRATION INTRUSION

Site investigation indicates that the major external noise and vibration sources around project site are from train movements within the South Eveleigh Precinct from train passbys on public and workshop lines.

#### 5.1 NOISE INTRUSION CRITERIA

The following noise intrusion criteria and standards are relevant to the project site and proposal:

- City of Sydney Council 'Sydney Local Environmental Plan 2012'
- City of Sydney Council 'Development Control Plan 2012'
- State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021

#### 5.1.1 City of Sydney Requirements

Upon review of the City of Sydney DCP and LEP (2012), there are no quantitative requirements for mitigating rail noise intrusion into commercial buildings.

#### 5.1.2 State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021

Clause 2.99 of the NSW SEPP states the following for non-rail development on or adjacent to a rail corridor.

#### 2.99 Impact of rail noise or vibration on non-rail development

- (1) This clause applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration—
  - (a) residential accommodation,
  - (b) a place of public worship,
  - (c) a hospital,
  - (d) an educational establishment or centre-based child care facility.
- (2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette.
- (3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded—
  - (a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10.00 pm and 7.00 am,
  - (b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

## 5.1.3 Discussion

The LES proposal has provisions for retail and commercial uses, which are not considered within either the Sydney DCP or the SEPP (Transport and Infrastructure) 2021 requirements. On this basis, noise intrusion need not be considered any further for compliance with statutory or regulatory controls.

## 5.2 VIBRATION INTRUSION CRITERIA

A vibration intrusion assessment has been conducted based on the requirements of the NSW Environmental Protection Authority (EPA) document – 'Assessing Vibration – A Technical Guideline.'

## 5.2.1 NSW EPA Assessing Vibration Amenity

The NSW EPA document "Assessing Vibration: A Technical Guideline" provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings and is used in the assessment of vibration impact on amenity. This guideline draws on both the British Standard BS 6472:1992 Part 2 as well as Australian Standard AS2670.2-1990.

Relevant criteria is presented below.

# Table 5-1 – EPA Recommended Vibration Criteria for Intermittent Vibration

Location	Dayt	ime <sup>1</sup>	Night-time <sup>1</sup>		
2000000	Preferred Value	Maximum Value	Preferred Value	Maximum Value	
Critical areas <sup>2</sup>	0.10	0.20	0.10	0.20	
Residences	0.20	0.40	0.13	0.26	
Offices, schools, educational institutional and places of worship	0.40	0.80	0.40	0.80	
Workshops	0.80	1.60	0.80	1.60	

<sup>1</sup> Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.

<sup>2</sup> Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas. Source: BS 6472–1992

## 5.2.2 Discussion

As detailed in Table 4-5, measured vibration levels within the LES building from the existing operation of both the public lines and workshop lines are below the 'preferred value' for human comfort, and as such acceptable for use as an office/commercial building within the guideline.

#### 5.2.3 Recommendations

As per the attended site measurements of rail noise and vibration, the impacts of major external sources around project site comply with the criteria presented in the section above.

It is predicted that no new noise and/or vibration impacts are to be introduced on the LES building and its heritage façade from the surrounding rail precinct due to the re-zoning application. This office notes that both the LES building and the rail precinct are currently existing and operational.

However, it is recommended these external noise and vibration impacts are considered during the detailed design of the building to ensure the amenity of the occupants and the preservation of heritage items (LES and surrounding).

#### **6 NOISE EMISSIONS FROM SITE**

Site investigation and proposal indicates that rooftop mechanical plant servicing the site and operational noise from future retail uses are to be the primary operational noise emission sources associated with the proposed development.

#### 6.1 NOISE EMISSION CRITERIA

The following noise emission criteria and standards are relevant to the project site and proposal:

- NSW Department of Environment and Heritage, Environmental Protection Agency document '*Noise Policy* for Industry' (NPfI) 2017
- NSW Liquor and Gaming Standard Noise Requirements

#### 6.1.1 NSW EPA Noise Policy for Industry (2017)

The EPA NPI has two criteria which both are required to be satisfied, namely Intrusiveness and amenity. The NPfI sets out acceptable noise levels for various localities. The policy indicates four categories to assess the appropriate noise level at a site. They are rural, suburban, urban and urban/industrial interface. Under the policy the nearest residential receivers would be assessed against the urban criteria.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

#### 6.1.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the  $L_{eq}$  descriptor not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality. Background noise levels adopted are presented in Section 4.4. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Location	Time of Day	Measured Rating Background Noise Levels dB(A)L <sub>90(period)</sub>	Intrusiveness Noise Objective dB(A)L <sub>eq(15min)</sub> (Background + 5dB)
R1	Day (7am - 6pm)	44	49
1-47 Rowley Street, Eveleigh	Evening (6pm - 10pm)	43	48
	Night (10pm - 7am)	42	47
R2	Day (7am - 6pm)	41	46
1-12 Aurora Place, Eveleigh, 1-30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh	Evening (6pm - 10pm)	41	46
	Night (10pm - 7am)	41	46

Iable V I = LFA III Usivelless Cilleri	Table	6-1	– EPA	Intrusiveness	Criteria
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#### 6.1.1.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA's NPfl sets out acceptable noise levels for various localities. The recommended noise amenity area is based upon the measured background noise levels at the sensitive receiver. Based on the measured background noise levels detailed in Section 4.4, the Noise Policy for Industry suggests the adoption of the 'urban' categorisation.

The NPI requires project amenity noise levels to be calculated in the following manner:

 $L_{Aeq,15min}$  = Recommended Amenity Noise Level – 5 dB(A) + 3 dB(A)

The amenity levels appropriate for the receivers surrounding the site are presented in Table 6-2.

Type of Receiver	Time of day	Recommended Noise Level dB(A)L <sub>eq(period)</sub>	Project Amenity Noise Level dB(A)L <sub>eq(15 minute)</sub>
Residential – urban	Day (7am - 6pm)	60	58
	Evening (6pm - 10pm)	50	48
	Night (10pm - 7am)	45	43
Commercial	When in use	65	63

# Table 6-2 – NPfl Project Amenity Noise Levels

The NSW EPA Noise Policy for Industry (2017) defines:

- Day as the period from 7 am to 6 pm Monday to Saturday and 8 am to 6 pm Sundays and Public Holidays.
- Evening as the period from 6 pm to 10 pm.
- Night as the period from 10 pm to 7 am Monday to Saturday and 10 pm to 8 am Sundays and Public Holidays.
#### 6.1.1.3 Sleep Arousal Criteria

#### The Noise Policy for Industry recommends the following noise limits to mitigate sleeping disturbance:

*Where the subject development / premises night -time noise levels at a residential location exceed:* 

- L<sub>eg,15min</sub> 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L<sub>Fmax</sub> 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

a detailed maximum noise level even assessment should be undertaken.

### Table 6-3 – Sleep Arousal Criteria for Residential Receivers

Receiver	Rating Background Noise Level (Night) dB(A)L <sub>90</sub>	Emergence Level		
<b>R1</b> 1-47 Rowley Street, Eveleigh	42	47 dB(A)L <sub>eq, 15min</sub> ; 57 dB(A)L <sub>Fmax</sub>		
<b>R2</b> 1-12 Aurora Place, Eveleigh, 1-30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh	41	46 dB(A)L <sub>eq, 15min</sub> ; 56 dB(A)L <sub>Fmax</sub>		

#### 6.1.2 NSW Liquor and Gaming

### NSW Liquor & Gaming requirements are as follows:

- The L<sub>10</sub> noise level emitted from the premises shall not exceed 5dB above the background L<sub>90</sub> sound level in any Octave Band Centre Frequency (31.5kHz to 8kHz inclusive) between the hours of 7.00am to 12.00 midnight when assessed at the boundary of the nearest affected residential premises.
- L<sub>10</sub> noise level emitted from the premises shall not exceed the background L<sub>90</sub> sound level in any Octave Band Centre Frequency (31.5kHz to 8kHz inclusive) after midnight when assessed at the boundary of the nearest affected residential premises.

After midnight, noise emissions from the Place of Public Entertainment are to be inaudible within any habitable rooms in nearby residential properties.

The above assessment criteria have been determined based on the background noise level spectrum data detailed in Section 4.4. These apply when measured at the external façade of surrounding residential properties.

# 6.2 SUMMARISED NOISE EMISSION CRITERIA

# Table 6-4 – EPA NPI Noise Emission Criteria (Mechanical Noise Emissions)

Receiver	Time Period	Assessment Background Noise Level dB(A)L90	Project Amenity Criteria dB(A) L <sub>eq</sub>	Intrusiveness Criteria L <sub>eq(15min)</sub>	NPI Criteria for Sleep Disturbance
	Day (7am - 6pm)	44	58	49	-
<b>R1</b> 1-47 Rowley Street, Eveleigh	Evening (6pm - 10pm)	Evening 43 <b>48 48</b>		-	
	Night (10pm - 7am)	42	43	47	47 dB(A)L <sub>eq, 15min</sub> ; 57 dB(A)L <sub>Fmax</sub>
<b>R2</b>	Day (7am - 6pm)	41	58	46	-
Place, Eveleigh, 1-30 Explorer Street, Eveleigh	Evening (6pm - 10pm)	41	48	46	-
and 1-4 Station Street, Eveleigh	Night (10pm - 7am)	41	43	46	46 dB(A)L <sub>eq, 15min</sub> ; 56 dB(A)L <sub>Fmax</sub>
Commercial Premises	When in Use	-	63	-	-

The project noise trigger levels are indicated by the bolded values in the table above.

Table 6-5 – L&GNSW Noise Emission Objectives (Operational Noise) – dB(A) L<sub>10(15min)</sub>

Receiver	Time	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-wt
<b>R1</b> 1-47 Rowley Street, Eveleigh	Day (7am-6pm) (BG+5)	52	58	58	52	46	41	38	34	23	49
	Evening (6pm-10pm) (BG+5)	51	57	57	51	45	40	37	33	22	48
	Late Evening (10pm-12am) (BG+5)	51	57	57	51	45	40	37	33	22	48
	Night (12am-7am) (BG+0)	45	51	51	45	39	34	31	27	16	42
<b>R2</b> 1-12 Aurora Place, Eveleigh, 1- 30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh	Day (7am-6pm) (BG+5)	59	59	53	45	40	40	38	38	32	46
	Evening (6pm-10pm) (BG+5)	59	59	53	45	40	40	38	38	32	46
	Late Evening (10pm-12am) (BG+5)	59	59	53	45	40	40	38	38	32	46
	Night (12am-7am) (BG+0)	54	54	48	40	35	35	33	33	27	41

## 6.3 NOISE FROM MECHANICAL PLANT (IN PRINCIPLE)

Detailed plant selection and location has not been completed at this stage, however a preliminary design/selection of major plant items has been provided with proposed placement on the roof of the site. Of these, the largest plant items at this stage are 3 Heat Recovery Units with a sound power level of approximately 97 dB(A) each. Based on the provided sound power level data and the distance to receivers from the roof, these units are capable of complying with the noise emission requirements detailed in Section 6.2. If required, typical treatments may include locating plant items further away from surrounding receivers, re-selection of plant or barrier/louvre construction around the plant area.

Smaller fans and other ancillary items will be readily able to achieve the noise emission requirements for the site. Satisfactory levels will be achievable through appropriate plant selection, location and if necessary, standard acoustic treatments such as duct lining, acoustic silencers and enclosures.

Detailed acoustic review should be undertaken throughout the design to determine acoustic treatments to control noise emissions to satisfactory levels as detailed in Section 6.2 of this report.

## 6.4 NOISE FROM LOADING DOCK (IN PRINCIPLE)

The current reference scheme prepared by fjmt includes an option for the loading dock to be located at the southwestern corner of the LES, accessible via Locomotive Street to the immediate south of the LES, which would provide sufficient loading along the rear (southern) boundary of the LES. The loading dock location provides a high level of function required for the intended outcome for the site, see Figure 19 below for indicative location.



### Figure 19: Proposed Loading Dock Location Source: Mirvac

Detailed acoustic review should be undertaken throughout the design to determine acoustic treatments to control noise emissions to satisfactory levels based on predicted truck movements, location of loading dock and hours of usage when this information becomes available.

# 7 CONSTRUCTION NOISE & VIBRATION IMPACTS

### 7.1 NOISE MANAGEMENT LEVELS

Noise associated of construction activities on the site will be assessed in accordance with the NSW EPA Interim Construction Noise Guideline.

### 7.1.1 EPA Interim Construction Noise Guidelines

The "quantitative" assessment procedure, as outlined in the Interim Construction Noise Guideline (ICNG) will be used. The quantitative assessment method requires: Determination of noise generation goals (based on ambient noise monitoring); Prediction of operational noise levels at nearby development; and if necessary, recommendation of noise controls strategies in the event that compliance with noise emission goals is not possible.

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- "Noise affected" level. Where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected level". For residential properties, the "noise affected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)L<sub>eq(15min)</sub>.
- "Highly noise affected level". Where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered. For residential properties, the "highly noise affected" level occurs when construction noise exceeds 75dB(A)L<sub>eq(15min)</sub> at nearby residences.

Receiver	"Noise Affected" Level - dB(A)L <sub>eq(15min)</sub>	"Highly Noise Affected" Level - dB(A)L <sub>eq(15min)</sub>		
<b>R1</b> 1-47 Rowley Street, Eveleigh	54			
<b>R2</b> 1-12 Aurora Place, Eveleigh, 1-30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh	51	75		

## Table 7-1 – Residential Receiver Noise Emission Goals

Section 4.1.2 and 4.1.3 of this guideline also nominates management levels for other sensitive land uses (other than residences). Noise affected management levels relevant to this assessment is detailed below;

### Table 7-2 – Noise Emission Goal – Non-Residential Properties

Land Use	Management Level				
Commercial premises (offices, retail outlets)	External noise level 70 dB(A)L <sub>eq(15mins)</sub>				

## 7.2 VIBRATION CRITERIA

Vibration associated with demolition and excavation activities on the site will be assessed in conjunction with the following guidelines:

**For human exposure to vibration** - Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) is based on the guidelines contained in BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment.

**For structural damage vibration -** German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures.* 

### 7.2.1 Assessing Amenity (Human Comfort Guidelines)

Vibration goals for the amenity of nearby land users are those recommended by the EPA document *Assessing Vibration: A technical guideline.* These levels are presented below:

		RMS acceleration (m/s <sup>2</sup> )		RMS veloc	ity (mm/s)	Peak velocity (mm/s)		
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum	
Continuous Vibration								
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56	
Offices	Day or night-	0.02	0.04	0.4	0.8	0.56	1.1	
Workshops	time	0.04	0.08	0.8	1.6	1.1	2.2	
	Impulsive	Vibration						
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0	
Offices	Day or night-	0.64	1.28	13	26	18	36	
Workshops	time	0.64	1.23	13	26	18	36	

### **Table 7-3 – Vibration Goals**

Note 1: Continuous vibration relates to vibration that continues uninterrupted for a defined period (usually throughout the daytime or night-time), e.g. continuous construction or maintenance activity. (DECC, 2006).

Note 2: Impulsive vibration relate to vibration that builds up rapidly to a peak followed by a damped decay and that may or may not involve several cycles of vibration (depending on frequency and damping), with up to three occurrences in an assessment period, e.g. occasional loading and unloading, or dropping of heavy equipment. (DECC, 2006).

### 7.2.2 Structure Borne Vibration (Damage Criteria)

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) is shown in the below table.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

# Table 7-4 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

		PEAK PARTICLE VELOCITY (mms <sup>-1</sup> )							
	TYPE OF STRUCTURE	At Foun	Plane of Floor of Uppermost Storey						
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies				
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40				
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15				
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8				

All surrounding commercial structures would be considered as 'Type 1', whereas all surrounding residential dwellings are to be assessed as 'Type 2'. Any heritage items such as the LES or surrounding items are to be assessed per 'Type 3' in the above table.

### 7.3 **DISCUSSION**

The above guidelines and requirements identify the requirements and framework within which future construction activities within the LES building should be assessed to, once details of proposed construction activities, methodologies and timeframes have been identified. It is recommended that a Construction Nosie and Vibration Management Plan (CNVMP) shall be prepared at SSDA stage to discuss mitigation measures associated with the construction works.

## 8 **RECOMMENDATIONS**

It is recommended that a consultation with Sydney Trains shall be conducted to discuss the project specific targets and potential noise and vibration impacts on the existing rail precinct.

A further study shall be conducted at state significant development application stage once the preliminary design has been completed to recommend required mitigation measures to ensure that noise and vibration impacts associated with the LES building comply with the intrusion and emission criteria detailed in this land re-zoning report. Based on the similar state significant developments near the LES building, specific mitigation recommendations are given during the design development when internal alterations are known. We note that this approach is consistent with the approved ATP Locomotive Workshop SSDA, which does not provide specific mitigation measures for operational or construction, however recommends that a separate assessment be undertaken to develop a CNVMP.

However, mitigation measures (for architectural elements) for the LES building will be discussed in detail in the SSDA acoustic assessment. A review will be undertaken of existing building shell construction and requirements/upgrades (if required) to minimise noise intrusion from the existing rail precinct depending on space usage type and size. Potential recommendations may include acoustically rated glazing systems or additional treatments to the internal lining of the wall or ceiling constructions, with consideration around heritage items of the LES building. Additionally, noise emissions from the proposed loading dock and mechanical plant servicing the development will be assessed. Potential recommendations may include specific selection of mechanical plant items and location of the loading dock/mechanical plant away from affected receivers (if required).

## 9 SUMMARY

The future use of the site should be designed to ensure that the criteria and recommendations in this report are adhered to, as summarised below.

Receiver	Time Period	Assessment Background Noise Level dB(A)L90	Project Amenity Criteria dB(A) L <sub>eq</sub>	Intrusiveness Criteria L <sub>eq(15min)</sub>	NPI Criteria for Sleep Disturbance
	Day (7am - 6pm)	44	58	49	-
<b>R1</b> 1-47 Rowley Street, Eveleigh (6μ (10	Evening (6pm - 10pm)	43 <b>48 48</b>		-	
	Night (10pm - 7am)	42	43	47	47 dB(A)L <sub>eq, 15min</sub> ; 57 dB(A)L <sub>Fmax</sub>
<b>R2</b> 1-12 Aurora	Day (7am - 6pm)	41	58	58 <b>46</b>	
Place, Eveleigh, 1-30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh	Evening (6pm - 10pm)	41	48	46	-
	Night (10pm - 7am)	41	43	46	46 dB(A)L <sub>eq, 15min</sub> ; 56 dB(A)L <sub>Fmax</sub>
Commercial Premises	When in Use	-	63	-	-

### Table 9-1 – Summarised EPA NPI Noise Emission Criteria

The project noise trigger levels are indicated by the bolded values in the table above.

Table 9-2 – Summarised	L&GNSW Noise	Emission Ob	ojectives – dB(A)	L <sub>10(15min)</sub>
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Receiver	Time	31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	A-wt
<b>R1</b> 1-47 Rowley Street, Eveleigh	Day (7am-6pm) (BG+5)	52	58	58	52	46	41	38	34	23	49
	Evening (6pm-10pm) (BG+5)	51	57	57	51	45	40	37	33	22	48
	Late Evening (10pm-12am) (BG+5)	51	57	57	51	45	40	37	33	22	48
	Night (12am-7am) (BG+0)	45	51	51	45	39	34	31	27	16	42
<b>R2</b> 1-12 Aurora Place, Eveleigh, 1- 30 Explorer Street, Eveleigh and 1-4 Station Street, Eveleigh	Day (7am-6pm) (BG+5)	59	59	53	45	40	40	38	38	32	46
	Evening (6pm-10pm) (BG+5)	59	59	53	45	40	40	38	38	32	46
	Late Evening (10pm-12am) (BG+5)	59	59	53	45	40	40	38	38	32	46
	Night (12am-7am) (BG+0)	54	54	48	40	35	35	33	33	27	41

# 10 CONCLUSION

Potential noise and vibration impacts associated with the proposed land rezoning and internal alterations to the Large Erecting Shop (LES) located within the South Eveleigh Precinct have been assessment and outlined in this report. Based on this assessment, it can be concluded that relevant noise and vibration requirements are able to be met for commercial uses, and as such the land is suitable to be rezoned from 'Infrastructure' to 'Business Park'.

In accordance with the Study Requirements established by NSW Department of Planning and Environment dated April 2022, this report investigates the following:

- Evaluation of the existing site environment and identification of surrounding affected receivers
- Future noise and vibration impacts on the proposed development due to location within the rail precinct
- Future vibration impacts associated with heritage items within the development
- Noise and vibration emissions associated with various future uses of the development and associated mechanical plant to service the project site (in principle)
- Potential noise and vibration sources during the construction stages of the proposed alteration to the development

Noise impacts from existing environmental noise sources on future occupants of the development, have been assessed in accordance with the requirements of the following:

- City of Sydney Council 'Sydney Local Environmental Plan 2012'
- City of Sydney Council 'Development Control Plan 2012'
- State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021

Noise and vibration impacts associated with the operation of proposed future uses of the development have been assessed in accordance with the requirements of the following:

- NSW Department of Environment and Heritage, Environmental Protection Authority document 'Noise Policy for Industry' (NPfI) 2017
- NSW Liquor and Gaming Standard Noise Requirements
- NSW Environmental Protection Authority (EPA) document 'Assessing Vibration A Technical Guideline.'
- German Standard DIN 4150-3 'Structural Vibration: Effects of Vibration on Structures'
- NSW Environmental Protection Authority (EPA) document 'Interim Construction Noise Guideline (ICNG)'

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Lakel

Acoustic Logic Pty Ltd Lillian Lockett

**APPENDIX A – SOUTH EVELEIGH PRECINCT UNATTENDED NOISE MONITORING DATA** 

























**APPENDIX B – 1-47 ROWLEY STREET, EVELEIGH UNATTENDED NOISE MONITORING DATA** 




























APPENDIX C – 1-12 AURORA STREET, EVELEIGH UNATTENDED NOISE MONITORING DATA



























