HORSLEY LOGISTICS PARK

SSD 10436
Lot 201 Warehouse 1 Internal Operations
Operational Noise Impact Assessment

Prepared for:

ESR
Level 29
20 Bond Street
Sydney

SLR Ref: 610.19360-R08
Version No: -v2.0
May 2022

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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 ESR (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.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.19360-R08-v2.0	26 May 2022	Mark Irish	Antony Williams	Mark Irish
610.19360-R08-v1.3	3 November 2021	Mark Irish	Antony Williams	Mark Irish
610.19360-R08-v1.2	2 November 2021	Mark Irish	Antony Williams	Mark Irish
610.19360-R08-v1.1	21 October 2021	Mark Irish	Antony Williams	Mark Irish

EXECUTIVE SUMMARY

An operational noise impact assessment has been conducted for the Lot 201 Warehouse 1 design of the Horsley Logistics Park (HLP). The proposed modification includes alterations to the internal layout and operation of Lot 201 Warehouse 1 to reflect the needs of Jalco, the future operator of the site.

Operational Noise Impacts

An analysis of the prevailing weather conditions for the HLP indicated that adverse weather is a feature of the area only during the night-time period.

The operational noise modelling of the Modification 3 Application Masterplan and internal operations of Lot 201 Warehouse 1 found no exceedances of the Operational Noise Limits at any sensitive receivers under both neutral (day, evening periods) and adverse (night period) weather conditions. Compliance with the sleep disturbance screening criterion in each catchment is also predicted.

Noise Mitigation Measures

The assessment concluded the following noise mitigation measures associated with Lot 201 Warehouse 1 are required:

- 18mm marine plywood internal lining fixed to inside of purlins to the Southern elevation of Liquid Packaging Area. The plywood lining is required have a minimum surface density of 10 kg/m^2 and form a continuous layer to the full height of the 0.48mm steel external wall.
- Four-sided enclosure to rooftop fans, minimum enclosure height 1.0m above fan height.
- Acoustic louvres to the Southern elevation of Liquid Packaging Area, specified as NAP 300 H-line, Fantech SBL1 or equivalent.

Comparison with Approved Development

The operational noise impacts at the identified residential receivers are generally predicted to be consistent for the Modification 3 Application Masterplan and Lot 201 Warehouse 1 internal operations.

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by ESR to prepare a noise impact assessment for a proposed alteration to internal operations of Lot 201, Warehouse 1 in the Horsley Logistics Park (HLP) Masterplan.

The proposed development seeks consent for the general industrial uses within Lot 201, Warehouse 1 for the fit-out and operation of a home and personal care consumer liquids packaging plant which would operate on a 24-hour, seven day a week basis, and that includes:

- The manufacturing of liquid soap, detergent, and cleaning agents within the general industrial component of Warehouse 1
- The continuation of warehouse and distribution in part of Warehouse 1
- The fit-out to support the Applicant's operation for both General Industrial and Warehouse & Distribution Centre components
- The storage of dangerous goods in part of Warehouse 1.

Approval for development of the HLP was granted under State Significant Development Application (SSDA) Development Consent SSD 10436. The potential acoustic impacts were was assessed in SLR report 610.19360-R02-v2.1 dated 2 November 2020.

The consent was subsequently modified in Modification 1 Application (MOD1), which was assessed in SLR report 610.19360-R06-v0.1 dated 12 April 2021. MOD1 addresses the building form, office fit-out, car parking layout and hardstand arrangements.

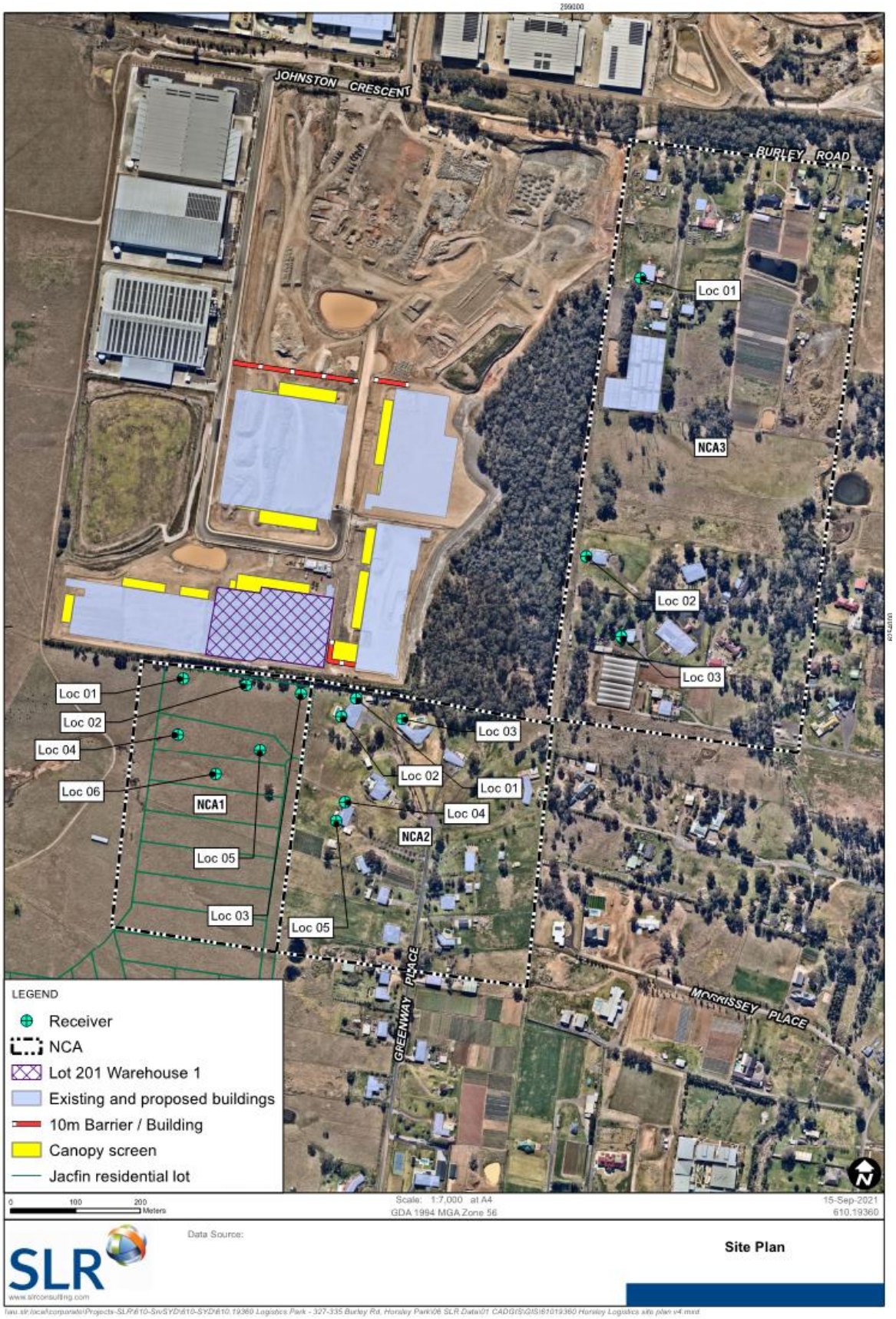
Cumulative impacts with the Modification 3 Application (MOD3), which was assessed in SLR report 610.19360-R09-v1.1 dated 2 November 2021, have also been assessed in this report. MOD3 includes the specific plant and equipment selections associated with Lot 201 Warehouse 2 & 3.

This assessment uses specific acoustic terminology. An explanation of common terms is included as **Appendix A**.

1.1 MOD1 Approved Development

The location of the approved development and surrounding receivers are shown in **Figure 1**.

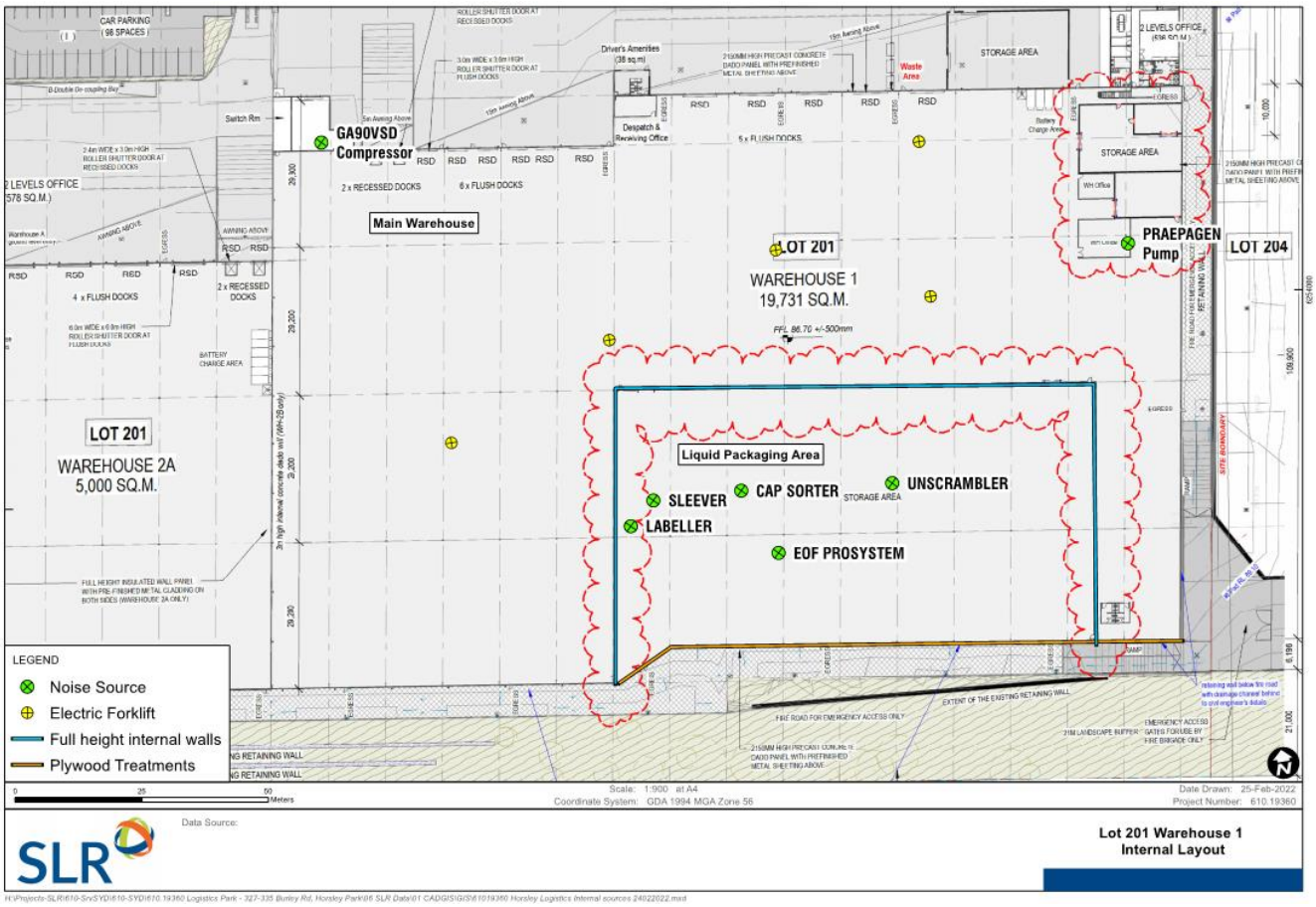
Figure 1 MOD1 Masterplan



1.2 Proposed Development

The proposed development covers the internal operation of the HLP Lot 201 Warehouse 1 building, as shown in **Figure 2**.

Figure 2 Lot 201 Warehouse 1 Internal Building Plan and Noise Sources



External operations including vehicle movements and hardstand activity for Lot 201 Warehouse 1 have been addressed in the MOD1 assessment.

2 Operational Noise Limits

The operational noise limits for the HLP are defined in Condition B11 of Development Consent SSD 10436. The operational noise limits for each receiver Noise Catchment Area (NCA) are shown in **Table 1**.

Table 1 Operational Noise Limits

Location	Daytime $L_{Aeq(15minute)}$ (dBA)	Evening $L_{Aeq(15minute)}$ (dBA)	Night-time $L_{Aeq(15minute)}$ (dBA)	Night-time L_{AFmax} (dBA)
NCA1	44	43	38	52
NCA2	40	40	38	52
NCA3	44	43	38	52

3 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) were issued on 30 June 2021. The requirements specific to noise and vibration are reproduced below.

3.1 Department of Planning, Industry & Environment (DPIE) Item 1.14

The EIS must address: *"Noise and Vibration - including a quantitative noise and vibration impact assessment for operation of the development, including traffic noise, undertaken by a suitably qualified person in accordance with the relevant EPA guidelines and Australian Standards, including:"*

DPIE Item 1.14	Relevant Section of Report
the identification of impacts associated with operation and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours and a detailed sleep disturbance assessment	**Section 7.2** Also refer SLR report 610.19360-R07-v0.4 (maximum noise level assessment)
details of noise monitoring surveys, background noise levels recording, noise source inventory including measured sound power levels of existing equipment and processes, and worst-case noise emission scenarios	**Section 7.1** Also refer SLR report 610.19360-R02-v2.1 (noise surveys)
details of annoying characteristics of noise and prevailing meteorological conditions in the study area	**Section 4** Also refer SLR report 610.19360-R07-v0.4 (annoying characteristics screening assessment)
a cumulative impact assessment inclusive of impacts from other nearby existing and future developments	**Section 7.2**
demonstration of compliance with noise criteria detailed in Condition B12, Schedule B of the SSD-10436 development consent	**Section 7.2**
details and analysis of the effectiveness of the proposed management and mitigation measures to adequately manage identified impacts, including a clear identification of residual noise and vibration following application of mitigation these measures and details of any proposed compliance monitoring programs	**Section 7.2.3** **Section 7.4**

3.2 Fairfield City Council

Fairfield City Council	Relevant Section of Report
Item 5.1. The EIS shall demonstrate compliance with the principal development standards outlined in the WSEA SEPP. In particular, the impacts the development will have on adjoining residents during construction and operational phase in terms of noise, nuisance, lighting, etc	**Section 7.2** Also refer SLR report 610.19360-R02-v2.1 (construction noise)
Item 5.2. An Operation Noise Management Plan shall be provided as part of the EIS to ensure the operational noise impacts are addressed and mitigation measures are imposed in accordance with the PEO Act	**Section 7.4**
Item 5.5. Noise impact assessment as the 24/7 operations may impact the adjoing residential land uses	**Section 7.2**

Fairfield City Council	Relevant Section of Report
The consultant has indicated that the proposal proposes to operate on a 24/7 basis with a proposed maximum annual average product throughput of 208,100 tonnes per annum and 57 heavy vehicles and 317 light vehicle movements per day over 3 shifts. This is significant increase from what was stated previously. A revised Operational noise impact assessment shall reflect the changes in vehicle movements.	**Section 7.1.1**

3.3 Penrith City Council

Penrith City Council	Relevant Section of Report
Item 6.1. DA Consents DA20/0566 and DA19/0785 permit part of the adjoining site to be subdivided into 14 residential-rural lots. These lots are zoned RU4 and likely to be developed as single residential dwelling. The applicant should therefore ensure that their SSD application consider the likely impacts to these residential-rural lots, particularly re. the following: - noise from the proposed use and machinery, including any required mitigation measures, and whether the approved warehouse construction is suitable to mitigate noise from internal manufacturing processes. Consideration should also be given to the cumulative impacts from other nearby warehouse uses and the site's proximity to the WSA;	**Section 7.1.5** **Section 7.2.3**
Item 6.4. In listing surrounding land uses in the vicinity of the site, the Scoping Report does not identify the presence of nearby receivers that are located within the Penrith LGA including: - the residential suburbs of Erskine Park and St Clair - rural-residential lots and the Twin Creeks residential area - education establishments (Mamre Anglican School and Emmaus Catholic College) and retirement village - rural-residential receivers to the south and west The EIS, including the supporting environmental and health assessments and technical reports, will need to consider these receivers particularly in regard to potential air quality impacts arising from odour, as well as noise impacts and hazardous and DG goods storage and use	**Section 7.1.5** **Section 7.2**

4 DPIE Test of Adequacy Requirements

DPIE issued Test of Adequacy comments on the Version 1.0 of this report on 14 October 2021. The requirements specific to noise and vibration are reproduced below.

DPIE Item 2.4	Relevant Section of Report
The potential for noise impacts associated with the operation of the industrial estate was an issue raised by nearby residents, landowners and the Department during the assessment of SSD-10436. Heavy vehicle movements were restricted on Lot 201 to 10 two-way movements over a 15-minute period in the Noise Assessment to ensure cumulative operations of all tenancies met the noise limits. At the time, Lot 201 only contained one tenancy. The heavy vehicle movements of all tenancies should be provided to ensure no more than 10 two-way movements over a 15-minute period would result from the full operation of all tenancies on Lot 201.	**Section 7.1.1** **Table 3** includes a total of 7 two-way HV movements for Lot 201 tenancies identified as 201(1), 201(2), 201(3). This is a reduction compared to the original SSDA assumption of 10 two-way movements.
Detailed measures to reduce noise emissions from the operation of the loading area at night should be provided including: • avoiding the use of waste areas; • limiting the use of forklifts; and • ensuring non-tonal reversing beepers (or equivalent mechanism) are fitted to forklifts.	**Section 7.2.3**
A detailed maximum noise level assessment should be provided considering the issues identified in the original assessment of SSD 10436 and the proximity of existing and future sensitive receivers.	**Section 7.2.1** A detailed maximum noise level assessment is not required where the screening criteria are not exceeded. Also refer SLR report 610.19360-R07-v0.4 (maximum noise level assessment)
Provide the predicted operational noise levels of the facility without the mitigation measures in operation.	**Section 7.2.1**
SSD-10436 – MOD 3 proposes the use of tenancies 2B & 3 for cold storage including the installation of 11 warehouse temperature control units onto the roof of warehouse 201. The noise assessment should consider this plant and its potential noise impacts to understand cumulative impacts of the operation of all tenancies on Lot 201.	The cumulative noise impact of the selected external plant for Lot 201 Tenancies 2A & 2B has been included in this report. Further information on MOD3 inputs can be found in SLR report 610.19360-R09-v1.1.

5 NSW EPA Requests for Additional Information

The NSW Environment Protection Authority (EPA) issued a request for additional information on Version 1.3 of this report on 10 January 2022. The requirements specific to noise and vibration are reproduced below.

EPA Item	Relevant Section of Report
Ensuring assessment locations meet the requirements of the Noise Policy for Industry (NPfI)	**Section 7.1.5**
Providing readable and informative site layout figures	**Figure 2**, **Figure 3**
Providing transparent information about the inputs, assumptions and methods used to calculate noise levels	**Section 7.1**

EPA Item	Relevant Section of Report
Clarification and consideration of the scrubber system and exhausts	**Section 7.1.3**
Including an assessment of annoying characteristics to meet the NPfI requirements	**Section 7.2.3**
Clarifying the location of mitigation measures	**Section 7.2.3**

The NSW Environment Protection Authority (EPA) issued a further request for additional information on 25 March 2022. The requirements specific to noise and vibration are reproduced below.

EPA Item	Relevant Section of Report
The predicted noise level (LAeq,15min and LAFmax) from the Jalco premises only at all assessed receivers, presented as both a table of results and noise contour maps for all assessed meteorological conditions, operating scenarios and time of day (day, evening and night).	**Section 7.2.3**
An exhaustive list of operating hours for all activities and processes assessed in the application.	**Section 7.1.4**

6 Prevailing Weather Conditions

Certain meteorological/weather conditions can increase noise levels. This can occur during temperature inversions (where temperatures increase with height above ground level), or where there is a wind gradient (where wind speed increases with height).

The *Noise Policy for Industry* (NPfI) contains guidance for determining prevailing weather conditions. The weather conditions at the development site were determined using 12 months of weather data (January 2016 to December 2016) obtained from the Bureau of Meteorology automatic weather station at Horsley Park, which is approximately 6 km to the east of the development. This data was analysed to determine the frequency of noise-enhancing wind and temperature inversion conditions which may affect noise levels at the site.

The analysis indicated that during the daytime and evening periods, winds of up to 3 m/s did not exceed the 30% threshold specified in the NPfI during any season. However, the 30% threshold was exceeded during the night-time period in autumn, in both the south-west and west-south-west directions.

The analysis also indicated that temperature inversions of Class F or Class G are likely to occur for more than 30% of the night-time period during all four seasons. Therefore, noise-enhancing temperature inversions are required to be included in the assessment of noise impacts during the night-time period.

On this basis, assessment of noise-enhancing weather during the daytime and evening periods is not required, although consideration of noise-enhancing conditions (wind and temperature inversion) for night-time operations is required.

7 Operational Noise Impact Assessment

7.1 Operational Noise Modelling

Noise modelling of the development site was undertaken using the CONCAWE noise prediction algorithms in SoundPLAN modelling software.

A 3D digital noise model was constructed from a combination of aerial photography, existing ground topography, design ground topography, receiver buildings / structures and design plans for the development. Warehouse buildings and office buildings within the HLP have been modelled based on the design plans.

The modelled internal Lot 201 Warehouse 1 site layout is shown in **Figure 2**.

The modelling inputs and source sound power levels (SWL) for each type of noise source associated with Lot 201 Warehouse 1 are summarised in the following sections.

7.1.1 Lot 201 Vehicle Numbers

The heavy vehicle (HV) and light vehicle (LV) volumes for Lot 201 are unchanged from MOD1 and are provided in **Table 2** and **Table 3**. All other Lots have been modelled with identical vehicle movements to both the approved SSDA and MOD1.

The modelled line sources were subdivided into the following sections:

- Access road movements at 25 km/h, 20% accelerating driving condition
- Loading and hardstand areas at 5 km/h.

Table 2 Lot 201 Daytime Vehicle Movements

Source	Source SWL, dBA	Number of Vehicles (two way)
201 (1) HV Day Loading	105	5
201 (1) HV Day Road	105 (80%) 111 (20%)	5
201 (2) HV Day Loading	105	2
201 (2) HV Day Road	105 (80%) 111 (20%)	2
201 (3) HV Day Loading	105	2
201 (3) HV Day Road	105 (80%) 111 (20%)	2
201 (1) LV Day Carpark	96	46
201 (1) LV Day Road	96	46
201 (2) LV Day Carpark	96	7
201 (2) LV Day Road	96	7
201 (3) LV Day Carpark	96	7
201 (3) LV Day Road	96	7

Table 3 Lot 201 Night-time Vehicle Movements

Source	Source SWL, dBA	Number of Vehicles (two way)
201 (1) HV Day Loading	105	3
201 (1) HV Day Road	105 (80%) 111 (20%)	3
201 (2) HV Day Loading	105	2
201 (2) HV Day Road	105 (80%) 111 (20%)	2
201 (3) HV Day Loading	105	2
201 (3) HV Day Road	105 (80%) 111 (20%)	2
201 (1) LV Day Carpark	96	40
201 (1) LV Day Road	96	40
201 (2) LV Day Carpark	96	5
201 (2) LV Day Road	96	5
201 (3) LV Day Carpark	96	5
201 (3) LV Day Road	96	5

7.1.2 Area Sources

The area sources associated with each hardstand or loading area are included in **Table 4**.

Table 4 L_{Aeq} Sound Power Levels – Area Sources

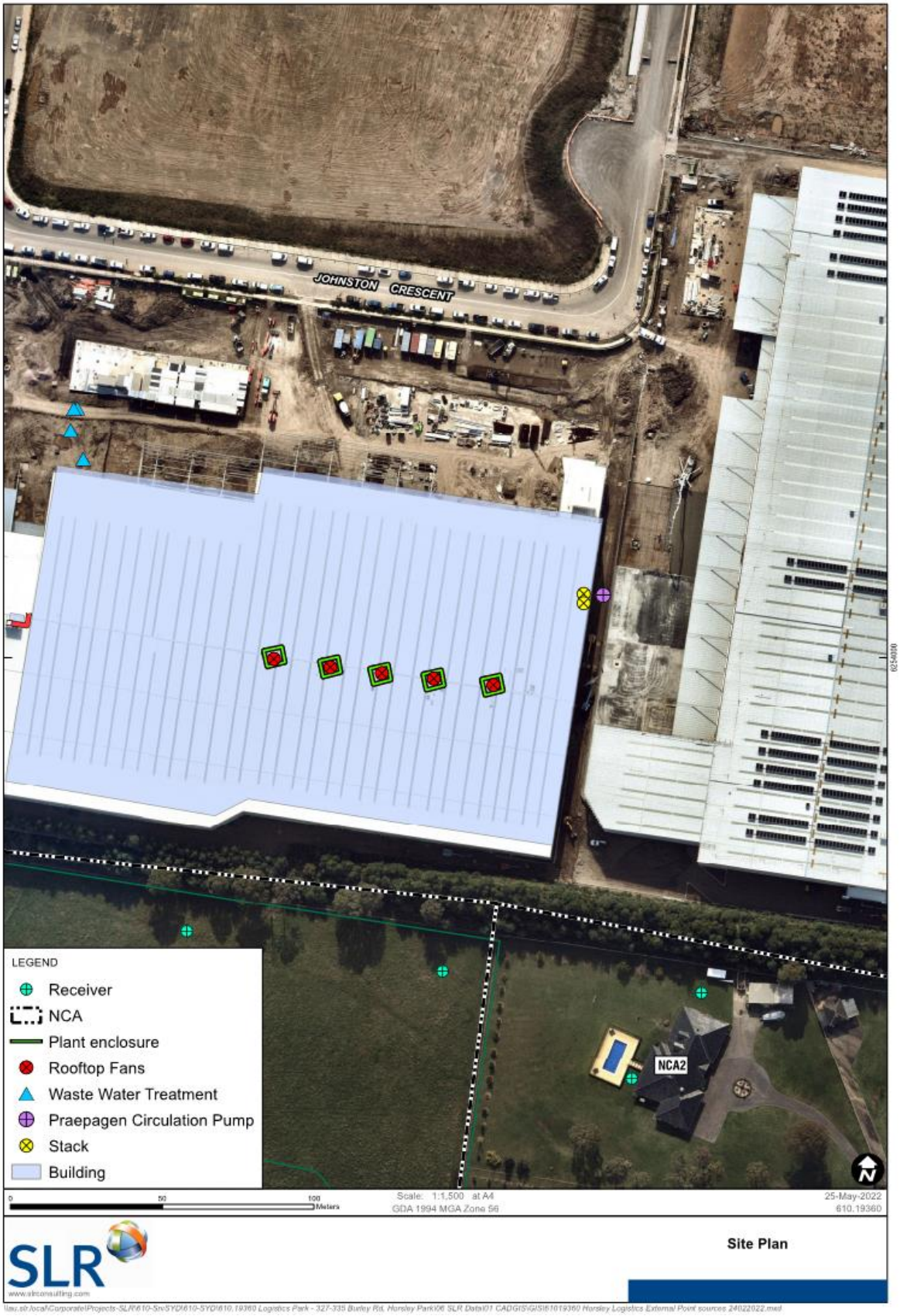
Noise Source	Source SWL, dBA	Duration of Use in Peak 15-minute Period, s	Comment
Truck Reversing Alarm	107[1]	60	Applicable to 50% of two way truck movements
Forklift Reversing Alarm	102[1]	90	-
Gas Forklift	93	900	-

Note 1. LAeq sound power level 3 dBA lower than the maximum sound power level

7.1.3 External Point Sources

Rooftop fan and stack discharge, as well as wastewater treatment fan locations for Lot 201 Warehouse 1 are shown in **Figure 3.**

Figure 3 Lot 201 Warehouse 1 Rooftop Plant Locations



Rooftop fan sound power levels are detailed in **Table 5**.

Table 5 Rooftop Plant Sound Power Levels

Noise Source	Outlet SWL, dBA
Fantech RVE0714BP7/29	93

The scrubber system stack discharges and wastewater treatment plant fans have not been selected at DA stage. Maximum allowable sound power levels are provided in **Table 6** for each item to ensure the noise contribution will maintain compliance at the nearest receivers.

Table 6 Scrubber System Stacks and Wastewater Treatment Fans – Maximum Sound Power Levels

Noise Source	Maximum Outlet SWL, dBA
Scrubber System Stack 1	72
Scrubber System Stack 2	72
Wastewater Treatment Plant Fan 1	75
Wastewater Treatment Plant Fan 2	75

The scrubber fans are proposed to be located internally and ducted to the roof so standard engineering controls (e.g. lined ductwork or splitters) are to be included to comply with the maximum sound power limits at each stack outlet. The required scrubber stack discharge attenuation is to be determined at detail design stage once fan selections are made.

Maximum noise level events are modelled to occur anywhere within the area sources at each hardstand with the SWLs shown in **Table 7**.

Table 7 L_{Amax} Sound Power Levels – Hardstand, Loading Areas and Car Parks

Noise Source	Source SWL, dBA
Air brake	118
Truck Reversing Alarm	110
Forklift Reversing Alarm	105
Car Peak Events	100

It is anticipated that the L_{Aeq} noise contribution from occasional impact sounds due to loading activities would not be significant compared to the dominant sources included in **Table 7**.

The maximum SWL of occasional impact sounds is also considered unlikely to exceed the air brake SWL of 118 dBA in **Table 7** for the sleep disturbance screening assessment.

7.1.4 Internal Point Sources and Building Noise Breakout

Internal manufacturing activity is modelled within the Liquid Packaging Area shown in **Figure 2**, with electric forklifts operating within the remainder of the Main Warehouse. It is assumed that manufacturing activity could occur on a 24 hour basis so is included in the assessment for all time periods.

Based on proposed plant information supplied by Jalco the noise sources identified in **Figure 2** are modelled with the SWLs shown in **Table 8**.

Table 8 Sound Power Levels – Internal Activities

Source Location	Source Description	Source SWL, dBA
Liquid Packaging Area	Cap Sorter	95
	EOF Prosystem	85
	GA90VSD Compressor	84
	Labeller	85
	Labelling machine	97
	Praepagen Pump	73
	Sleever	85
	Unscrambler	85
Main Warehouse	Electric Forklift	75

Noise breakout from the building has been modelled using the source sound power levels included in **Table 8** of the report, along with the design inputs summarised in **Table 9** and **Table 10**.

Table 9 Noise breakout - building sound transmission inputs

Building Element	Transmission Loss, Rw dB
Walls	
0.48mm steel cladding	20
Precast concrete panel	53
0.48mm steel cladding, 200mm cavity, 18mm marine plywood	38
Acoustic louvre	6
Roller door (closed)	12
Kingspan wall (internal)	24
Roof	
Steel roof with insulation lining	26
Skylights	21

Table 10 Noise breakout - building absorption coefficients

Building Element	Absorption Coefficient, 500 Hz octave band
Walls	
0.48mm steel cladding	0.15
Precast concrete panel	0.01

Building Element	Absorption Coefficient, 500 Hz octave band
Roof	
Steel roof with insulation lining	0.95

The number of loading bay doors open in each scenario is in accordance with the number of HV movements in Table 2 and Table 3 of the report:

- Five loading bay doors open during the daytime
- Three loading bay doors open during the night-time

7.1.5 Nearest Sensitive Receivers

The area surrounding the development has been divided into three Noise Catchment Areas (NCAs). The NCAs and sensitive receivers near to the development are shown in **Figure 1**. NCA1 includes nominal locations of future receivers to the south of the development. NCA2 and NCA3 include existing receivers to the south and east of the development, respectively.

Noise levels have been assessed at the most-affected point at each residential property, see **Figure 1**, and at a height of between 1.2–1.5 m above ground level, in accordance with guidance in the NPfI. When assessing night-time amenity it is considered appropriate to assess both L_{Aeq} and L_{Amax} noise levels at the residential facade as the 'reasonably most affected location' in accordance with the requirements of the NPfI.

Demonstrating compliance at the nearest receivers as indicated in **Figure 1** will also result in compliance at more distant residential and educational receivers.

7.2 Predicted Operational Noise Impacts

7.2.1 All Sources - Unmitigated Scenario

The predicted operational noise levels at the most affected receiver in each catchment are summarised in **Table 11**. These predictions include external sources of noise from the MOD3 assessment and the updated noise sources for internal operational of Warehouse 1. The indicative 10 m barriers/buildings representing future Stage 3 development are also included in the noise model as shown in **Figure 1**.

Table 11 Predicted Operational Noise Levels – MOD3 Masterplan and Lot 201 Warehouse 1 (Unmitigated)

NCA	Period (weather)	$L_{Aeq(15minute)}$ Noise Level (dBA)			L_{Amax} Noise Level (dBA)		
		Operational Noise Limit	Predicted	Compliance	Sleep Disturbance Screening Noise Level	Predicted	Compliance
NCA1	Daytime (neutral)	44	42	Yes	n/a	n/a	n/a
	Evening (neutral)	43	42	Yes	n/a	n/a	n/a
	Night-time (noise-enhancing)	38	**42**	**No**	52	46	Yes
NCA2	Daytime (neutral)	40	39	Yes	n/a	n/a	n/a
	Evening (neutral)	40	39	Yes	n/a	n/a	n/a

NCA	Period (weather)	$L_{Aeq(15minute)}$ Noise Level (dBA)			L_{Amax} Noise Level (dBA)		
		Operational Noise Limit	Predicted	Compliance	Sleep Disturbance Screening Noise Level	Predicted	Compliance
	Night-time (noise-enhancing)	38	**40**	**No**	52	47	Yes
NCA3	Daytime (neutral)	44	38	Yes	n/a	n/a	n/a
	Evening (neutral)	43	38	Yes	n/a	n/a	n/a
	Night-time (noise-enhancing)	38	38	Yes	52	52	Yes

Note 1: **Bold** text indicates an exceedance of the Operational Noise Limits.

The above results indicate that exceedance of the Operational Noise Limits is predicted at the most affected receivers in noise catchments NCA1 and NCA2 during the night-time period without mitigation.

Compliance with the sleep disturbance screening criterion is predicted, therefore, a detailed maximum noise level assessment is not required. A detailed maximum noise level assessment of external activities was included in the Lot 201 Noise Verification Report (SLR report 610.19360-R07-v0.4).

7.2.2 All Sources - Mitigated Scenario

The noise mitigation measures included in **Section 7.2.3** were implemented and the predicted operational noise levels at the most affected receiver in each catchment are summarised in **Table 12**.

Table 12 Predicted Operational Noise Levels – MOD3 Masterplan and Lot 201 Warehouse 1 (Mitigated)

NCA	Period (weather)	$L_{Aeq(15minute)}$ Noise Level (dBA)			L_{Amax} Noise Level (dBA)		
		Operational Noise Limit	Predicted	Compliance	Sleep Disturbance Screening Noise Level	Predicted	Compliance
NCA01	Daytime (neutral)	44	38	Yes	n/a	n/a	n/a
	Evening (neutral)	43	38	Yes	n/a	n/a	n/a
	Night-time (noise-enhancing)	38	38	Yes	52	46	Yes
NCA02	Daytime (neutral)	40	39	Yes	n/a	n/a	n/a
	Evening (neutral)	40	39	Yes	n/a	n/a	n/a
	Night-time (noise-enhancing)	38	38	Yes	52	47	Yes
NCA03	Daytime (neutral)	44	38	Yes	n/a	n/a	n/a
	Evening (neutral)	43	38	Yes	n/a	n/a	n/a
	Night-time (noise-enhancing)	38	38	Yes	52	52	Yes

Note 1: **Bold** text indicates an exceedance of the Operational Noise Limits.

The above results indicate that compliance with the Operational Noise Limits is predicted at the most affected receivers in all noise catchments during all periods.

Noise contours with mitigation measures included are provided for daytime/evening (neutral weather) in **Figure 4** and night-time (noise-enhancing weather) in **Figure 5.**

Figure 4 Predicted Daytime/Evening Noise Levels – MOD3 Masterplan and Lot 201 Internal Operations

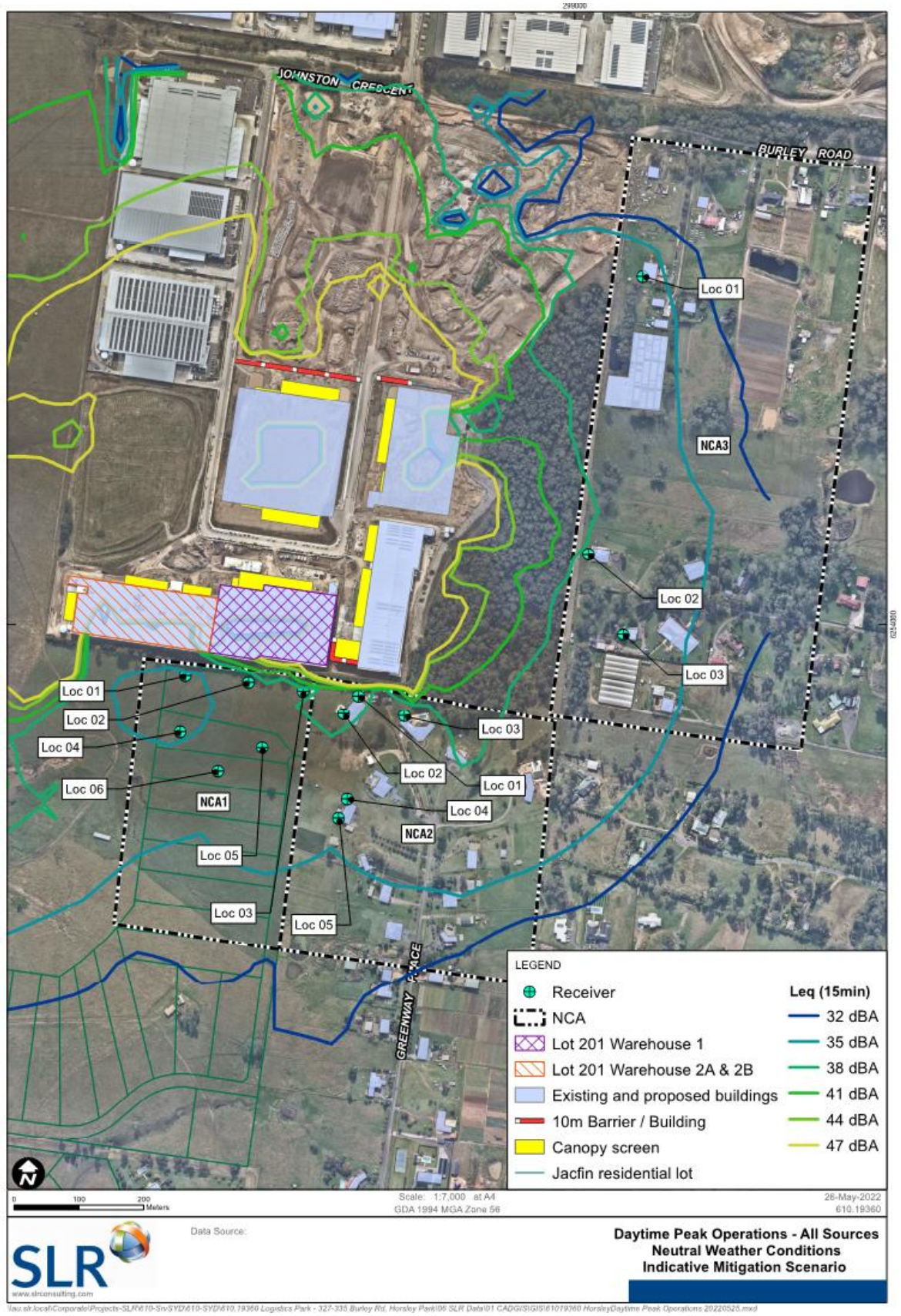
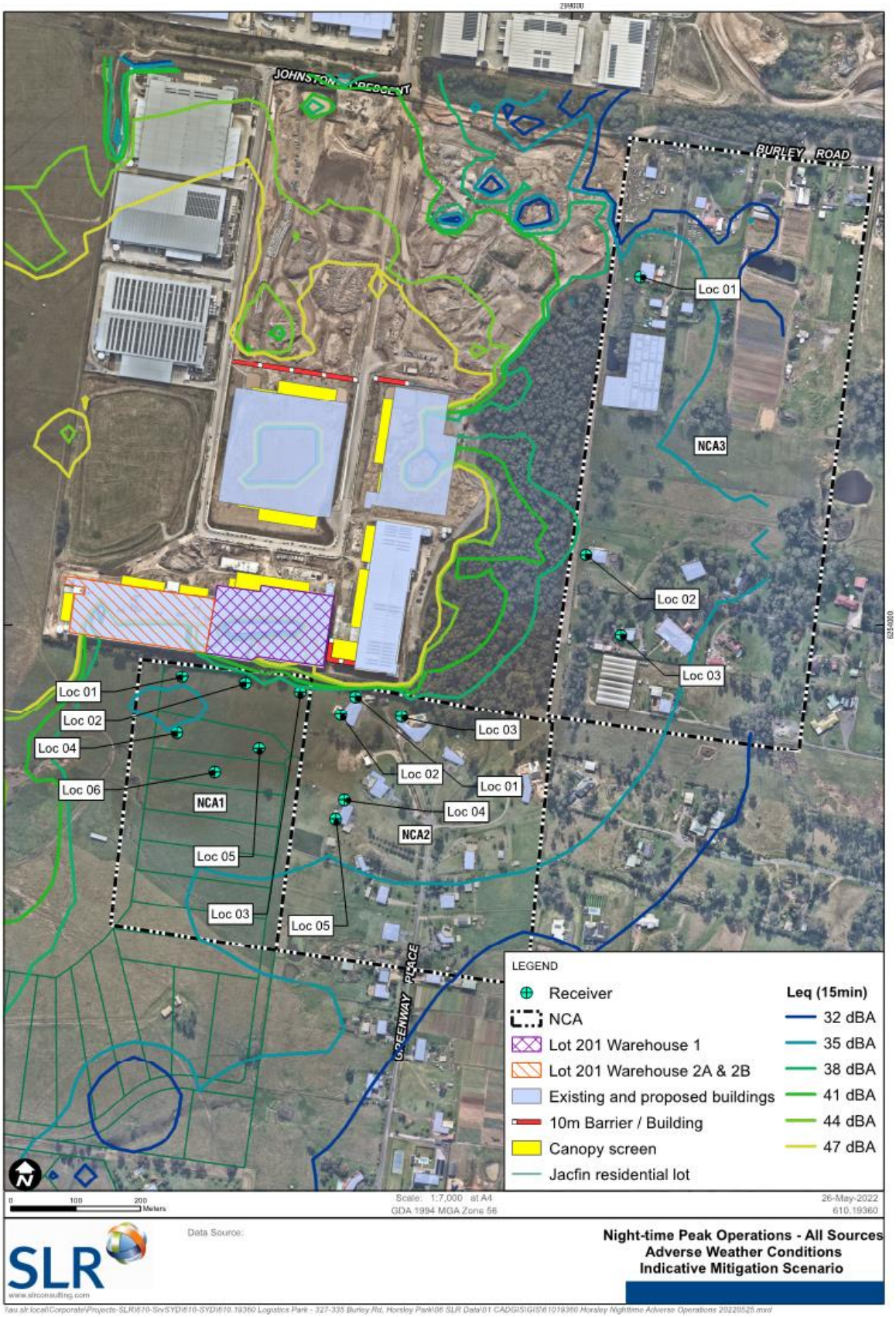


Figure 5 Predicted Night-time Noise Levels – MOD3 Masterplan and Lot 201 Internal Operations



7.2.3 Jalco Sources only - Mitigated Scenario

The noise mitigation measures included in **Section 7.2.3** were implemented and the predicted operational noise levels (Jalco sources only) at each receiver are summarised in **Table 12**.

Table 13 Predicted Operational Noise Levels – Jalco Lot 201 Warehouse 1 only (Mitigated)

NCA	Receiver	$L_{Aeq(15minute)}$ Noise Level (dBA)			L_{Amax} Noise Level (dBA)	
		Daytime/Evening (neutral)	Night-time (neutral)	Night-time (noise-enhancing)	Night-time (neutral)	Night-time (noise-enhancing)
NCA01	Loc 1	29	29	30	32	34
	Loc 2	35	35	35	32	34
	Loc 3	33	32	33	32	35
	Loc 4	27	27	28	27	30
	Loc 5	30	30	31	29	33
	Loc 6	28	28	29	28	30
NCA02	Loc 1	28	27	28	30	32
	Loc 2	30	30	30	27	33
	Loc 3	25	24	25	28	31
	Loc 4	28	28	29	28	32
	Loc 5	27	27	28	27	32
NCA03	Loc 1	21	19	25	32	39
	Loc 2	20	18	22	29	34
	Loc 3	19	17	21	26	32

Note 1: **Bold** text indicates an exceedance of the Operational Noise Limits.

The above results indicate that compliance with the Operational Noise Limits is predicted at all receivers in all noise catchments during all periods and weather conditions.

Noise contours with mitigation measures included are provided for daytime/evening (neutral weather) in **Figure 6,** night-time (neutral weather) in **Figure 7** and night-time (noise-enhancing weather) in **Figure 8.**

Figure 6 Predicted Daytime/Evening Noise Levels – Lot 201 Jalco Operations only

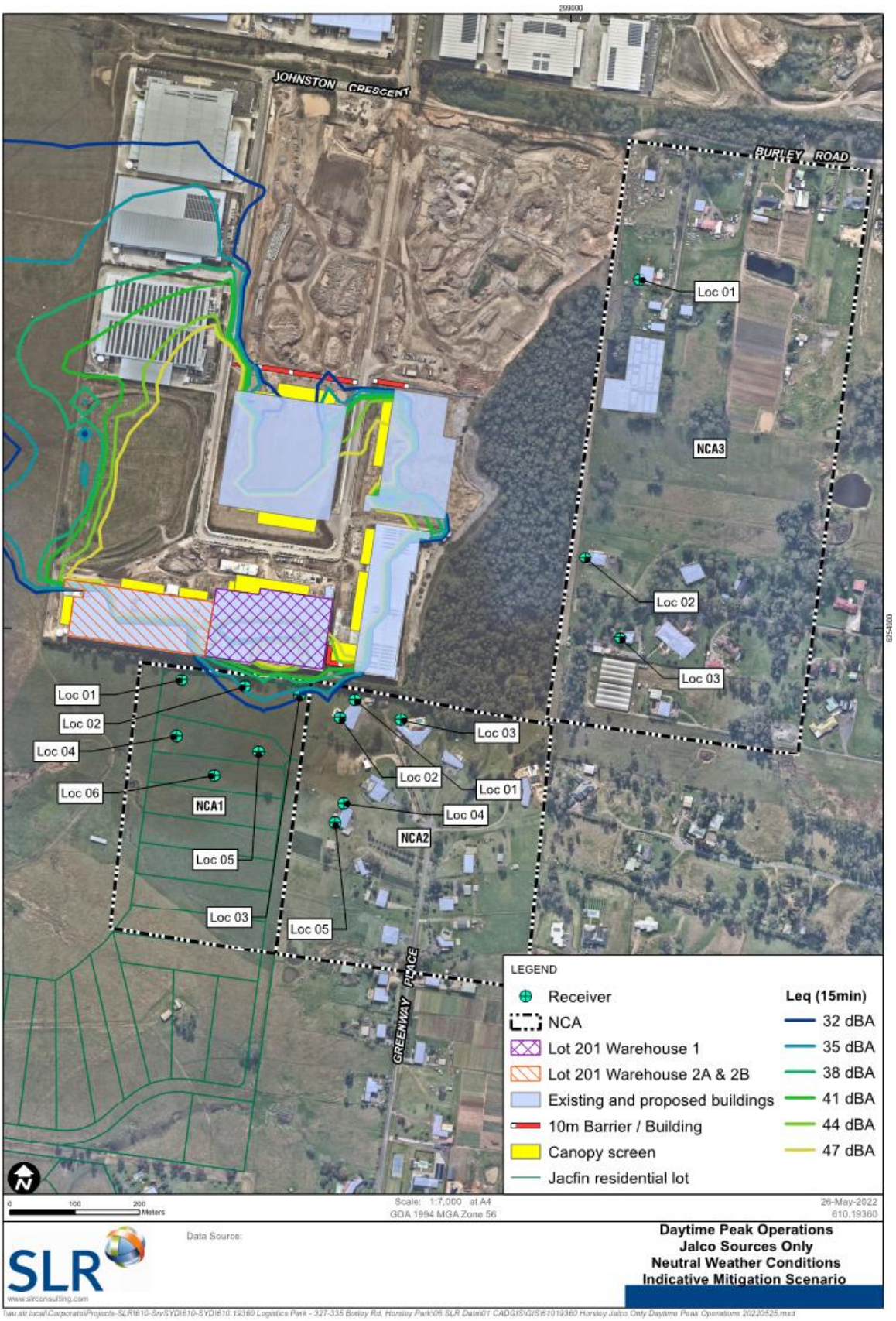


Figure 7 Predicted Night-time (Neutral Weather) Noise Levels – Lot 201 Jalco Operations only

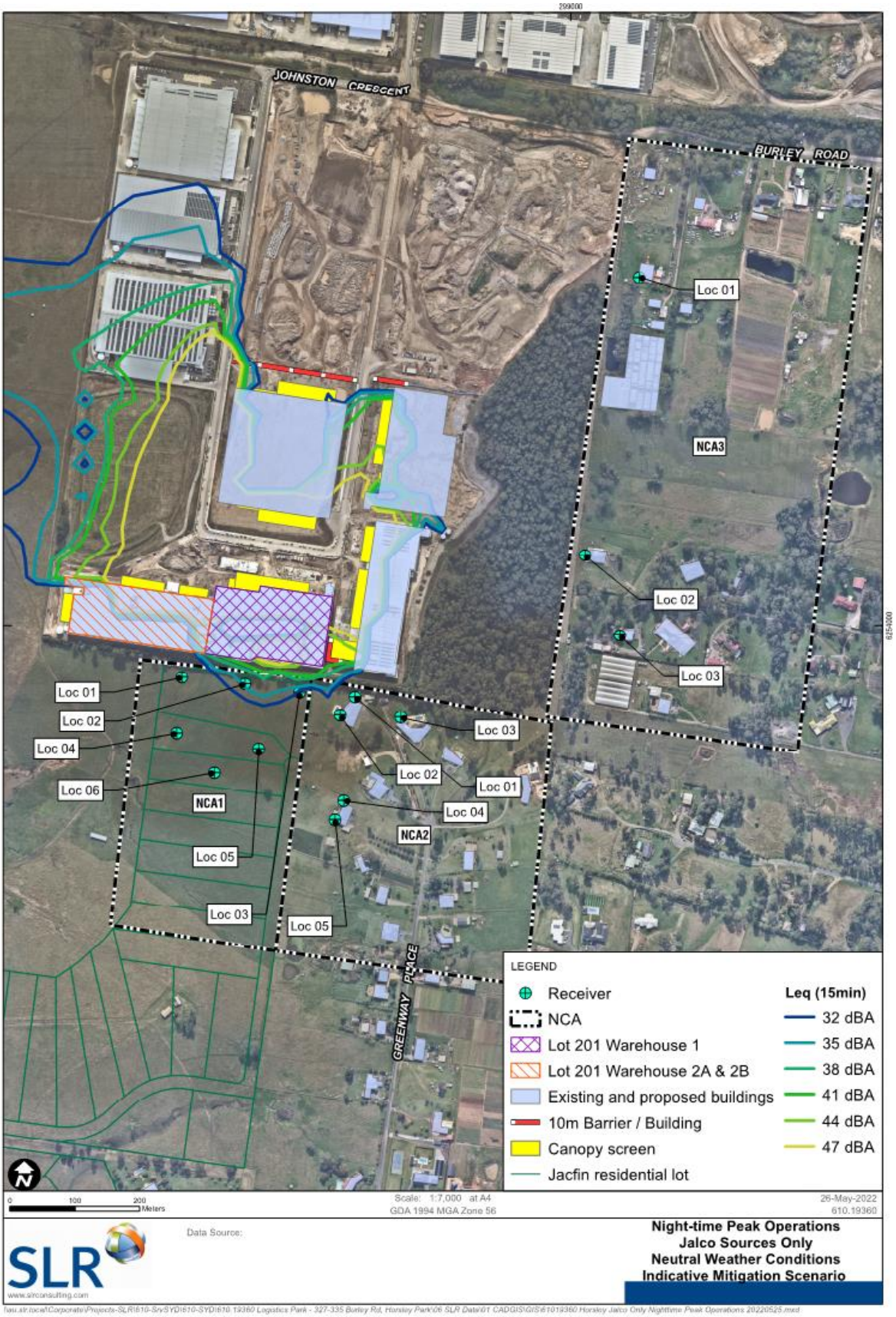
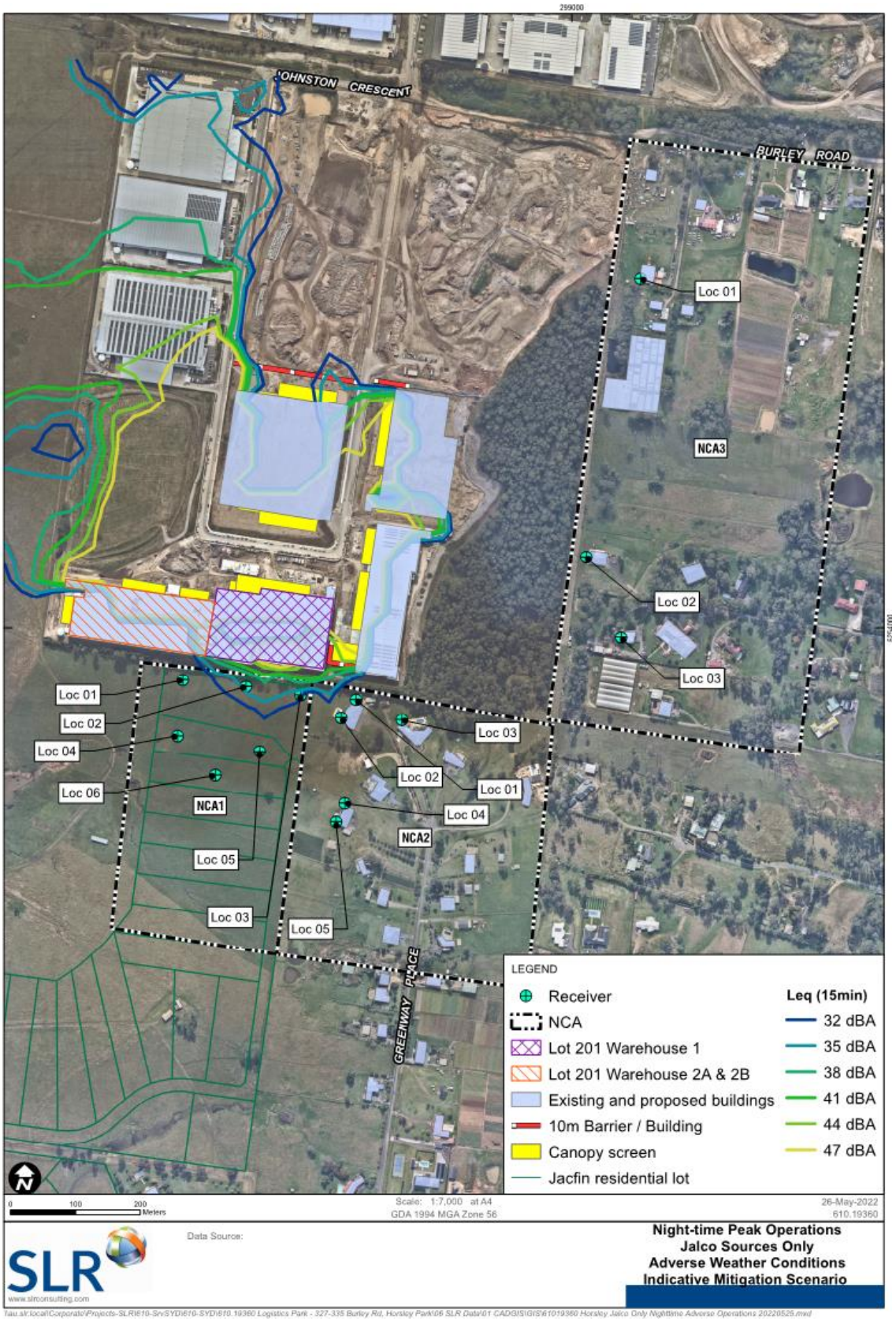


Figure 8 Predicted Night-time (Noise-enhancing weather) Noise Levels – Lot 201 Jalco Operations only



7.2.4 Screening Test for Annoying Characteristics

Jalco has advised that all proposed manufacturing plant included in the NIA operates continuously and none are expected to exhibit strong low frequency noise components.

To confirm whether an intermittency correction for internal plant is required, a screening test of the source rankings for night-time (noise-enhancing weather conditions) has been conducted. This confirms that noise breakout from all manufacturing activities is not dominant at the nearest receiver as shaded in **Table 14** below.

Table 14 NCA1 Loc 03 Receiver – Dominant noise source ranking

Noise Source (with Jalco noise mitigation measures included)	Source Noise Level Contribution LAeq
South wall (Jalco manufacturing area)	**25.7**
Jalco Vent 4	**24.3**
Roof - Jalco manufacturing area	**23.9**
Loading 202 (WHA Holman)	23.5
206-B HV Night Loading	23.2
202 (WH-A) HV Night Loading	22.8
Loading 206 (B)	22.4
South wall (storage area)	**21.3**
202 WH C - LV Night Carpark	21.1
UPS TZ 1400 Chiller 01 Facade 01	21.1
Total Receiver Noise Level [1]	**LAeq 38 dB**

Note 1. The total receiver noise level includes contributions from all sources operating at night-time, not just the ten highest source contributions included in the table.

Given the number of internal manufacturing noise sources operating concurrently and considering the overall noise contribution at the nearest receiver, it is not considered appropriate to include corrections for annoying characteristics in the event that any individual item of plant switches on or off as noise levels at the receivers are not likely to suddenly change by at least 5 dB.

With regard to low frequency noise adjustments, A-weighted and C-weighted third octave noise data was not available for the proposed plant. In the absence of any spectral data, reference was made to operational noise measurements carried out at the current Jalco premises at 277-303 Woodpark Road, Smithfield (Benbow Environmental report 201048_NIA_Rev11 dated 11 January 2021) in which no low frequency corrections were considered applicable to the existing operations.

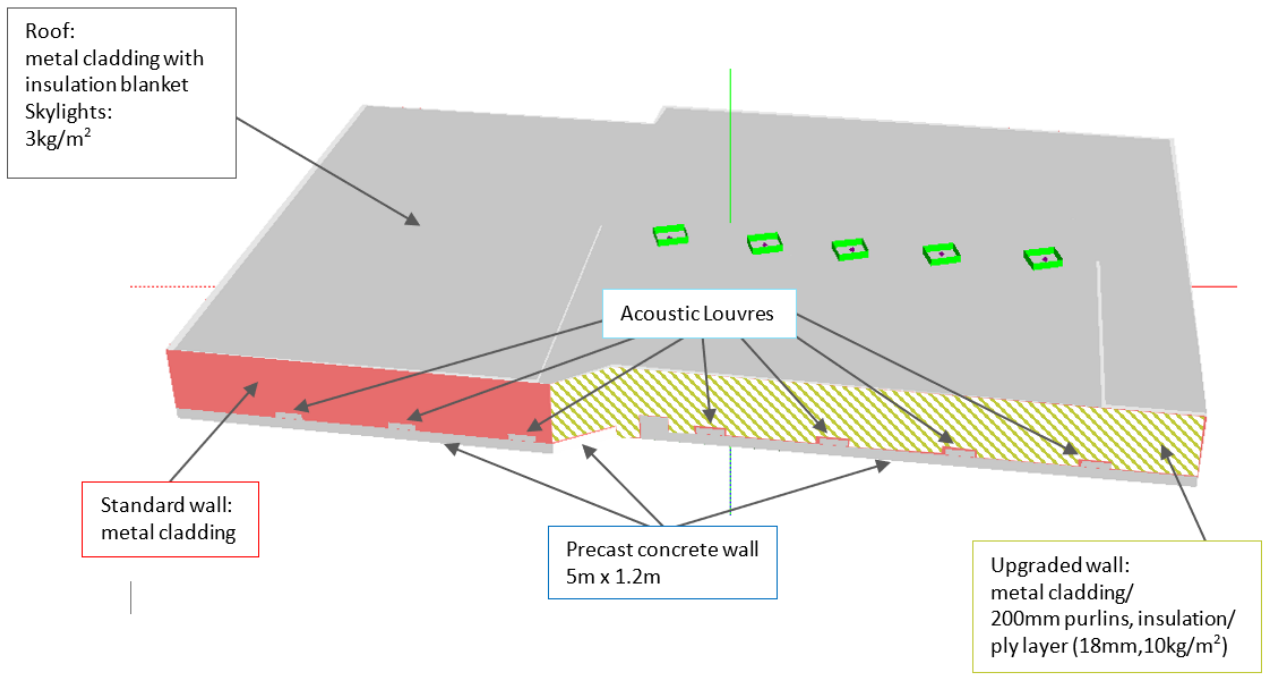
Although the proposed plant will not be identical to the existing facility, given the operation and processes will be similar it is considered appropriate that no low frequency corrections are likely to be applicable to the new plant.

7.3 Noise Mitigation Measures

The following noise mitigation measures, shown in **Figure 2**, have been used in the design of Lot 201 Warehouse 1:

- 18mm marine plywood internal lining fixed to inside of purlins to the Southern elevation of Liquid Packaging Area. The plywood lining is required have a minimum surface density of 10 kg/m^2 and form a continuous layer to the full height of the 0.48mm steel external wall (extent shown in **Figure 2)**
- Four-sided enclosure to rooftop fans (required as part of the Odour assessment), minimum enclosure height 1.0m above fan height (shown in **Figure 3**).
- Acoustic louvres to the Southern elevation of Liquid Packaging Area (shown in **Figure 9**), specified as NAP 300 H-line, Fantech SBL1 or equivalent (required as part of the Odour assessment).

Figure 9 Location of noise breakout mitigation measures



These mitigation measures are required to achieve the predicted operational noise levels in **Table 12**.

The following additional noise management measures have been implemented for Lot 201 Warehouse 1 during the night-time period:

- The use of non-tonal reversing alarms for all vehicles and forklifts accessing the loading and hardstand areas.
- Electric forklifts are proposed to be used for all external and internal operations to reduce noise compared to gas forklifts.

- The maximum SWL of occasional impact sounds in the Waste Area (identified in **Figure 2**) is considered unlikely to exceed the modelled heavy vehicle air brake SWL of 118 dBA and these activities are therefore covered by the sleep disturbance screening assessment.

The noise mitigation measures associated with other Lots included in the model are summarised below:

- Rooftop plant screening for Lot 201 Warehouse 2A & 2B in accordance with MOD3 Masterplan
- Infill noise wall to southern and western eave height of Lot 202 super canopy (shown in **Figure 1**)
- Rooftop plant screening to southern and eastern elevations of other Lots.

Lot 202 infill noise wall is included in the noise model primarily to provide screening of noise sources associated with Lot 202 itself, along with a residual screening benefit to external sources associated with other Lots.

7.4 Discussion of Noise Impacts

The results in **Table 12** indicate that internal operational noise levels of Lot 201 Warehouse 1 and the MOD3 Masterplan design are predicted to comply with the residential noise limits at all identified residential receivers under both neutral and adverse weather conditions during the applicable periods.

Compliance with the sleep disturbance screening criterion in each NCA is also predicted, therefore, a detailed maximum noise level assessment is not required. A detailed maximum noise level assessment of external activities was included in the Lot 201 Noise Verification Report (SLR report 610.19360-R07-v0.4).

As such, operational noise emissions from the MOD3 Masterplan and Lot 201 Warehouse 1 internal operations are considered to be compliant, assuming the mitigation measures detailed in **Section 7.2.3** are used.

An Operation Noise Management Plan for Lot 201 should be provided prior to occupancy to ensure the operational noise impacts are appropriately managed and monitored to maintain compliance with the Operational Noise Limits.

7.5 Comparison with Approved MOD1 Development Impacts

The operational noise impacts at the identified residential receivers are predicted to be compliant with the Operational Noise Limits with the addition of the Lot 201 Warehouse 1 internal operations.

Overall, the predicted operational noise impacts of the Lot 201 Warehouse 1 internal operations are considered to be consistent with those of the approved MOD1 and the MOD3 development.

8 Conclusion

An operational noise impact assessment has been conducted for the internal operations of Lot 201 Warehouse 1 of the Horsley Logistics Park.

Approval for development of the Horsley Logistics Park was granted under State Significant Development Application Development Consent SSD 10436. The consent was subsequently modified in Modification 1 Application.

The operational noise modelling of the Modification 3 Application Masterplan and internal operations of Lot 201 Warehouse 1 found no exceedances of the Operational Noise Limits at any sensitive receivers under both neutral (day, evening and night periods) and adverse (night period) weather conditions. Compliance with the sleep disturbance screening criterion in each catchment is also predicted.

Overall, the predicted operational noise impacts of the internal operations of Lot 201 Warehouse 1 are considered to be consistent with those of the approved Modification 1 Application and Modification 3 development.

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

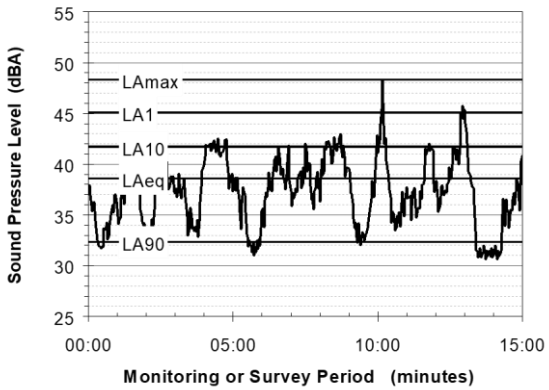
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

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

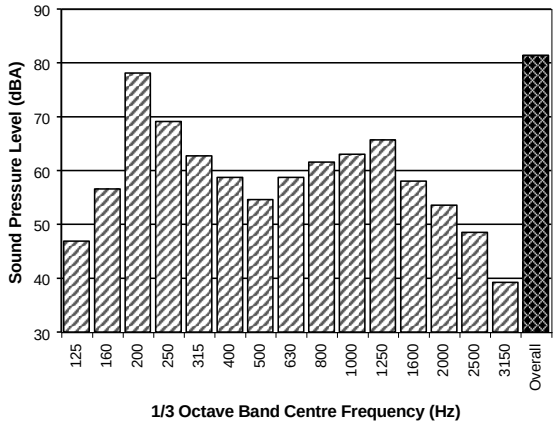
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

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

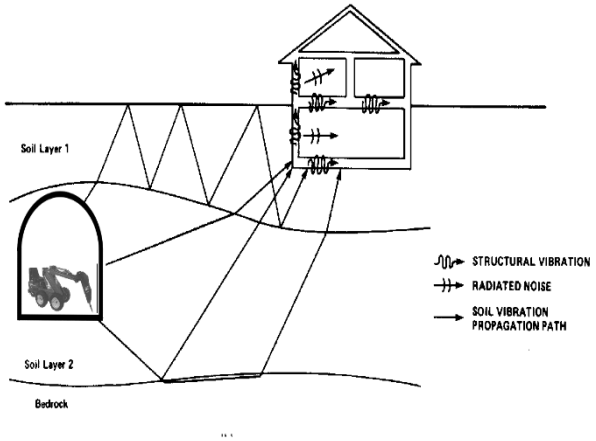
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience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

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