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Environmental Noise Assessment -

Tyre Shredding Facility

Lot 981 (#14) Vinnicombe Drive, Canning Vale, WA

Reference: 23118574-01

Prepared for:
Quanxin Pty Ltd C/o Lundstrom Environmental Consultants Pty Ltd

Reference: 23118574-01

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20-Dec-23	0	Issued for Information	[redacted]	

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EXECUTIVE SUMMARY

Lloyd George Acoustics were engage by Quanxin Pty Ltd C/o Lundstrom Environmental Consultants Pty Ltd to assess noise emissions from the proposed tyre shredding facility using an existing warehouse building at Lot 981 (#14) Vinnicombe Drive, Canning Vale WA. This report represents noise assessment of the proposal based upon information received 1-Dec-23, summarised as follows:

- Operating hours will be Monday - Friday 7.00am – 6.00pm, and Saturdays 7.00am – 1.00pm;
- Used tyres will be brought to site via 4.5 Ton GVM truck with box body fitted – anticipated load capacity up to 80 trucks per week;
- x1 set of tyre shredding plant and tyre de-beader will be operated to process the tyres – plant to be located within existing warehouse with doors open for truck/forklift access;
- Shredded tyre product(s) will be taken from site using larger trucks equipped with HIAB-type loader crane for 40ft shipping container on/off loading – anticipated outloading capacity 7.5 trucks per week;
- There are no air-conditioning or exhaust fans proposed for the existing warehouse;

The development design is assessed for compliance against the *Environmental Protection (Noise) Regulations 1997* limits at adjacent industrial Lots. Fixed limits of L_{A10} 65dB, L_{A1} 80dB and L_{AMAX} 90dB apply at Industrial Lease boundary locations at all times of the day.

Regards the proposed specialist tyre shredding machinery operation with the East façade roller doors open, West roller doors closed and with no absorptive linings to internal workshop surfaces. Results for workshop operations as follows

- Internal reverberant sound levels are predicted at 77dB(A) with shredder and de-beader equipment operating*;
- Resultant noise levels at all boundary locations are <65dB(A) inclusive of *Tonality* penalty hence the operations fully comply with all roller doors closed.
- Where operations occur outside of these hours, compliance is also achieved by virtue of fixed limits applicable at Industrial premises at all times of the day.

  * *Note, noise levels will be above 85dB(A) in proximity to the tyre recycling plant hence OH&S signage and use of ear defenders will be an operational requirement.*

Where the west roller door is required to be open for operational reasons, the Principal Client may consider the roof and wall internal surface area lining with acoustic absorption material as an alternative means to reduce internal noise (and corresponding external sound emission) levels. Lining the inside of the main warehouse roof and walls areas with an acoustically absorbent finish such as 90mm thick CSR Bradford Acousticon™ perforated foil faced insulation results in a reduced internal Reverberant Sound Pressure Level ($L_{P,Rev}$) of 72dB(A).

NB: Where the West roller door is able to be closed during tyre processing operations, internal linings are not a requirement for compliance, however the Principal Client may consider the roof linings as a means to reduce internal noise levels by use of acoustic absorption. Additional benefits to reducing internal workshop noise

include potentially reducing the office/amenities building envelope fabric in terms of providing suitable noise conditions for office work.

NB – predicted compliance uses assumed Sound Power Level (SWL) data taken from Manufacturer data correlated with Lloyd George Acoustics' previous assessments of tyre recycling facility(s) using on-site measurement methods based upon internal reverberant sound pressure level measurements of ~85dB(A):

It is recommended the manufacturer supply detailed noise measurement data which may be used to calibrate and confirm the noise modelling predictions in this report during Detailed Design stage, to ensure compliance with *the Regulations* once the facility is constructed.

To minimise audible noise from day-to-day operations at nearby receiving premises, the following 'best practice' measures are suggested:

- Truck drivers are to be instructed to use good driving techniques and minimise excessive vehicle noise (no air brakes, excessive revving etc);
- Where reversing must occur, alternatives to tonal 'beeper' reversing alarms are to be implemented, whilst still maintaining a safe workplace such as:
  - Trucks and forklifts to be fitted with broadband style alarms; or
  - Reversing alarms are to be turned off and spotters used to ensure a safe environment.
- Delivery activities are to be undertaken in as careful and quiet a manner as practicable and this is to be advised to staff and delivery personnel;
- Areas where known impact noise will occur are to have suitable rubber impact matting installed;
- Service road area is to be smooth and free of gaps that may cause banging when driven over with vehicles, pallet jacks or the like. Control joints are to be filled with non-hardening mastic to provide a flat finish;
- Metal grates shall be secured with rubber gaskets or plastic grates used;
- Waste collection shall not occur outside of Monday to Saturday, 7.00am to 7.00pm and Sundays and public holidays, 9.00am to 7.00pm.

1. INTRODUCTION

Lloyd George Acoustics was engaged by Quanxin Pty Ltd C/o Lundstrom Environmental Consultants Pty Ltd to undertake an environmental noise assessment for a proposed Tyre Recycling Facility to be located at Lot 981 (#14) Vinnicombe Drive, Canning Vale, WA. Aerial imagery identifies the site in *Figure 1-1;* Figure 1-2 presents the proposed site plan showing the Subject Lot(s) 100 and 1807, and the proposed lease boundary for use as tyre shredding operations.

Figure 1-1: Subject Site Location (Source: PlanWA)

The facility is to utilise an existing warehouse with internal processing plant specific to tyre recycling. *Appendix B* includes a quotation for the proposed tyre processing equipment. A summary of operations is as follows:

- Operating hours will be Monday - Friday 7.00am – 6.00pm, and Saturdays 7.00am – 1.00pm;
- Used tyres will be brought to site via 4.5 Ton GVM truck with box body fitted – anticipated load capacity up to 80 trucks per week;
- x1 set of tyre shredding plant and tyre de-beader will be operated to process the tyres – plant to be located within existing warehouse with doors open for truck/forklift access;
- Shredded tyre product(s) will be taken from site using larger trucks equipped with HIAB-type loader crane for 40ft shipping container on/off loading – anticipated outloading capacity 7.5 trucks per week;
- There are no air-conditioning or exhaust fans proposed for the existing warehouse;

With regard to noise emissions, consideration is given to noise from the primary tyre shredding and de-beading plant equipment, delivery trucks and tyre unloading incl. forklifts at the neighbouring industrial Lot boundary, against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997*.

Appendix A contains scheme drawings used in the assessment; *Appendix C* contains a description of some of the terminology used throughout this report.

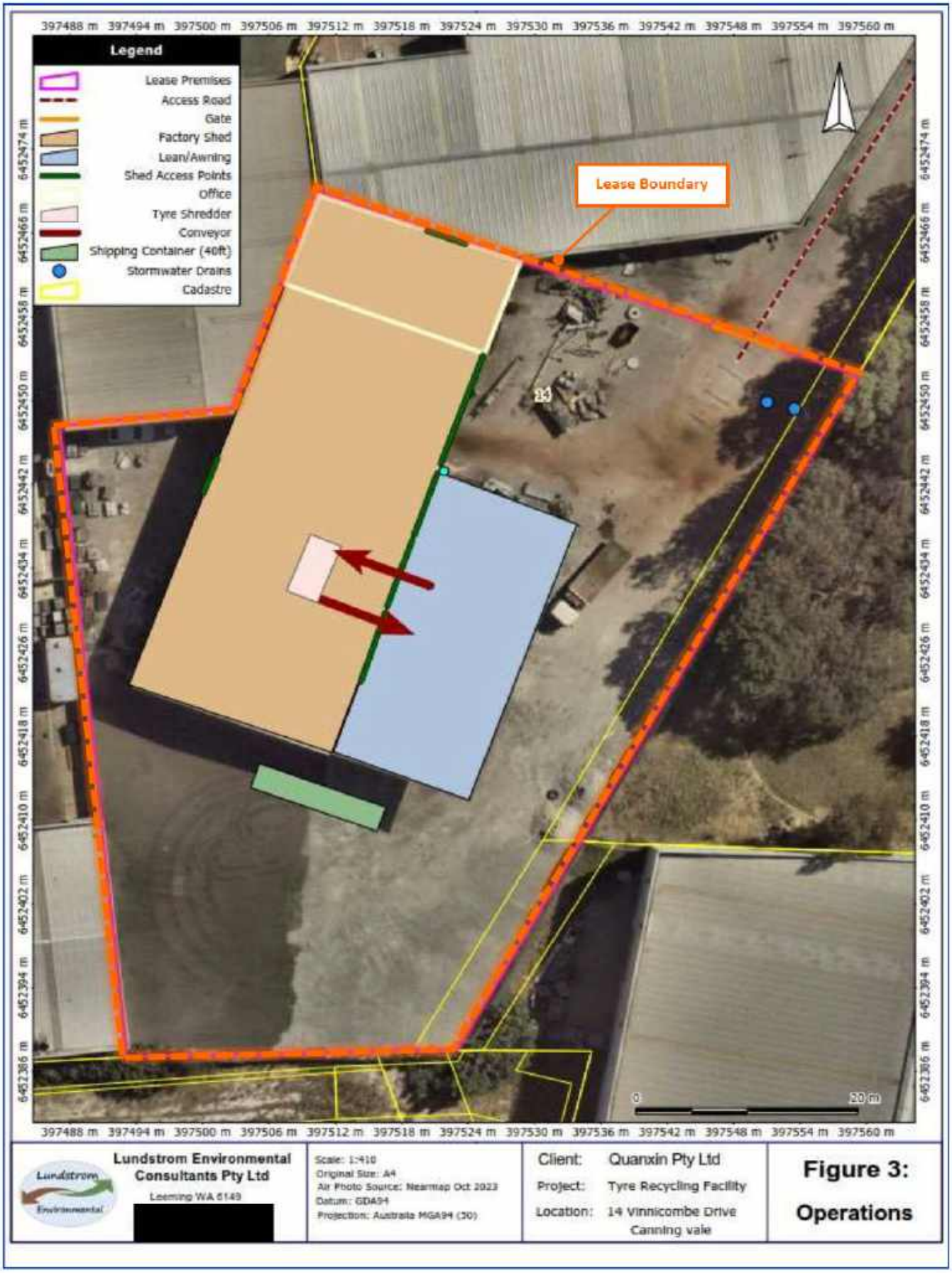


Figure 1-2: Subject Site Location (Source: Lundstrom Environmental Consultants)

2. CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

2.1. Regulations 7, 8 & 9

This group of regulations provide the prescribed standard for noise as follows:

"7. Prescribed standard for noise emissions

(1) Noise emitted from any premises or public place when received at other premises –

(a) must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

(b) must be free of –

(i) tonality; and

(ii) impulsiveness; and

(iii) modulation,

when assessed under regulation 9.

(2) For the purposes of subregulation (1)(a), a noise emission is taken to significantly contribute to a level of noise if the noise emission … exceeds a value which is 5 dB below the assigned level at the point of reception."

Tonality, impulsiveness and modulation are defined in regulation 9 (refer *Appendix C*). Under regulation 9(3), *"Noise is taken to be free of the characteristics of tonality, impulsiveness and modulation if -*

(a) the characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

(b) the noise emission complies with the standard prescribed under regulation 7(1)(a) after the adjustments in the table are made to the noise emission as measured at the point of reception."

Table 2-1 Adjustments Where Characteristics Cannot Be Removed

Where Noise Emission is Not Music*			Where Noise Emission is Music	
Tonality	Modulation	Impulsiveness	No Impulsiveness	Impulsiveness
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

* These adjustments are cumulative to a maximum of 15 dB.

The assigned levels (prescribed standards) for all premises are specified in regulation 8(3) and are shown in *Table 2-2.* The L_{A10} assigned level is applicable to noises present for more than 10% of a representative assessment period, generally applicable to "steady-state" noise sources. The L_{A1} is for short-term noise sources present for less than 10% and more than 1% of the time. The L_{Amax} assigned level is applicable for incidental noise sources, present for less than 1% of the time.

Table 2-2 Baseline Assigned Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial Premises	All hours	60	75	80
Industrial and Utility Premises	All hours	65	80	90

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

In this project, the nearest premises are all *Industrial and Utility Premises* hence fixed limits apply at all times of the day, evening and night-time. *Table 2-3* presents the limits applicable at neighbouring site boundary(s).

Table 2-3 Assigned Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Commercial Premises	All hours	60	75	80
Industrial and Utility Premises	All hours	65	80	90

It must be noted the assigned levels above apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces. Where this was not possible to be achieved due to the close proximity of existing buildings and/or fences, the noise emissions were assessed at a point within 1 metre from building facades and a -2 dB adjustment was made to the predicted noise levels to account for reflected noise.

The assigned levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as "*a period of time of not less than 15 minutes, and not exceeding 4 hours*, *determined by* an *inspector* or *authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission"*.

An inspector or authorised person is a person appointed under Sections 87 & 88 of the *Environmental Protection Act 1986* and include Local Government Environmental Health Officers and Officers from the Department of Water Environmental Regulation. Acoustic consultants or other environmental consultants are not appointed as an inspector or authorised person. Therefore, whilst this assessment is based on a 4-hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

2.2. Regulation 3

*"**3. Regulations do not apply to certain noise emissions***

(1) Nothing in these regulations applies to the following noise emissions –

(a) Noise emissions from the propulsion and braking systems of motor vehicles operating on a road;"

The car park is considered a road and therefore vehicle noise (propulsion and braking) is not assessed. Noise from vehicle car doors however are assessed, since these are not part of the propulsion or braking system.

2.3. Regulation 14A

*"**14A. Waste Collection and Other Works***

(2) Regulation 7 does not apply to noise emitted in the course of carrying out class 1 works if –

(a) The works are carried out in the quietest reasonable and practicable manner; and

(b) The equipment used to carry out the works is the quietest reasonably available;

class 1 works means specified works carried out between -

(a) 0700 hours and 1900 hours on any day that is not a Sunday or a public holiday; or

(b) 0900 hours and 1900 hours on a Sunday or public holiday.

specified works means -

(a) The collection of waste; or

(b) The cleaning of a road or the drains for a road; or

(c) The cleaning of public places, including footpaths, cycle paths, car parks and beaches;"

In the case where specified works are to be carried out outside of class 1, a noise management plan is to be prepared and approved by the CEO.

3. METHODOLOGY

Computer modelling has been used to predict the noise emissions from the development to all nearby receivers. The software used was *SoundPLAN 8.2* with the CONCAWE (ISO 171534-3 improved method) algorithms selected, as they include the influence of meteorological conditions. Input data required in the model are listed below and discussed in *Section 3.1* to *Section 3.3*:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1. Meteorological Conditions

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

Table 3-1: Modelling Meteorological Conditions

Parameter	Day (7.00am to 7.00pm)[2]	Night (7.00pm to 7.00am)[2]
Temperature (°C)	20	15
Humidity (%)	50	50
Wind Speed (m/s)	4	3
Wind Direction[1]	All	All
Pasquil Stability Factor	E	F

Notes:

1. The modelling package allows for all wind directions to be modelled simultaneously.
2. The conditions above are as defined in *Guideline: Assessment of Environmental Noise Emissions*; May 2021

Alternatives to the above default conditions can be used where one year of weather data is available and the analysis considers the worst 2% of the day and night for the month of the year in which the worst-case weather conditions prevail (source: *Draft Guideline on Environmental Noise for Prescribed Premises*, May 2016). In most cases, the default conditions occur for more than 2% of the time and therefore must be satisfied.

3.2. Topographical Data

Topographical data was adapted from publicly available information (e.g. *Google*) in the form of spot heights and combined with the site plan. Surrounding existing buildings were also incorporated in the noise model, as these can provide noise shielding as well as reflection paths. Industrial Warehouse buildings are typically 6.0 - 12.0 metres in height with receivers 1.4 metres above ground.

The area is an established industrial estate south of Roe Highway. *Figure 3-1* shows a 3D overview of the noise model with proposed new roads, existing industrial buildings and relevant aspects of the model identified:

- Red Sphere – Noise Prediction points at lease boundary and nearby building facades;
  - *Note, Receivers R2, R8 and R9 not visible from East perspective;*
- Yellow Building – Existing Industrial Buildings
- Pink Sphere – Outdoor Noise Sources
- Red Building – Sound Radiating Warehouse Building (Façade and Roof)
- Turquoise – Sound Radiating Building Openings
- Orange Building – Existing Office (On Lease)

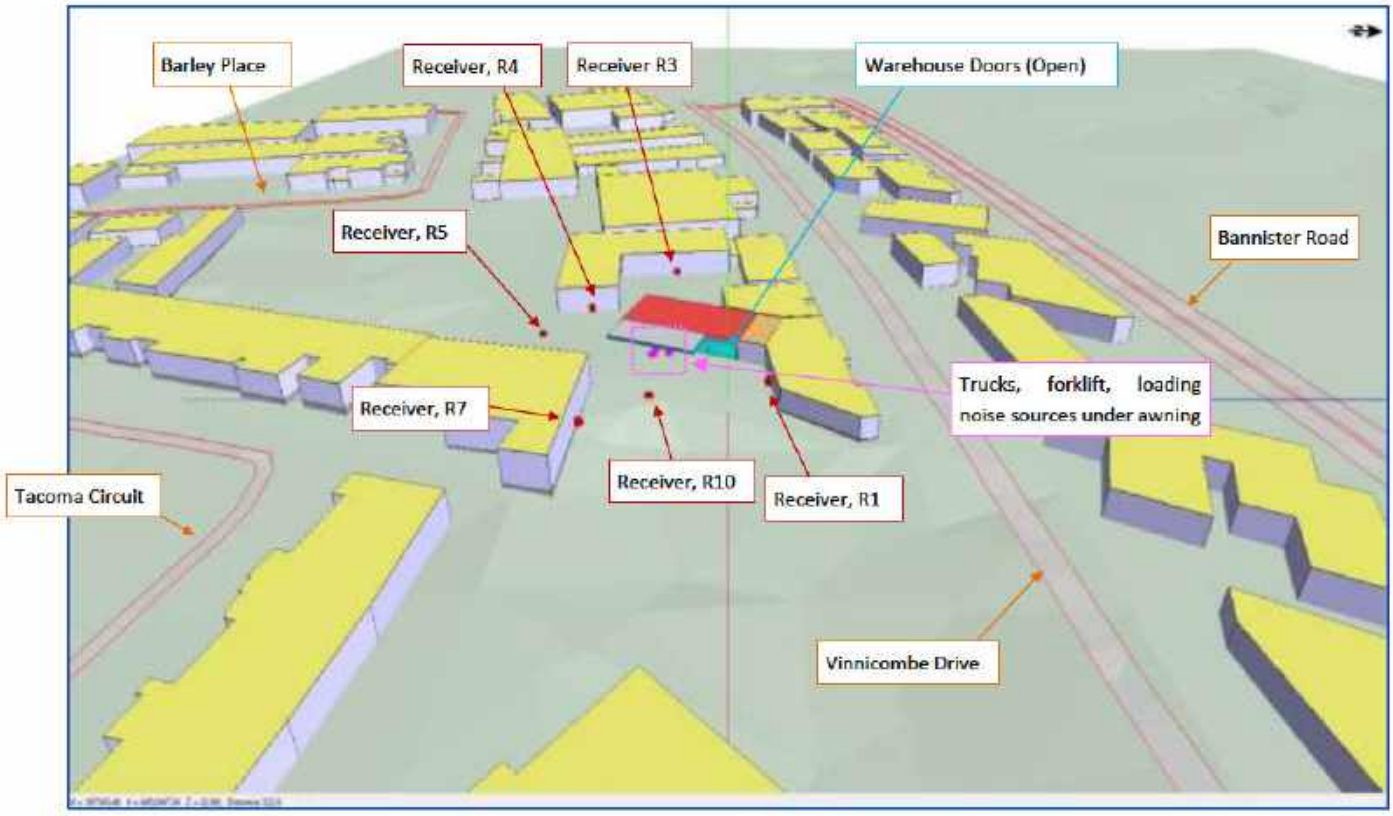


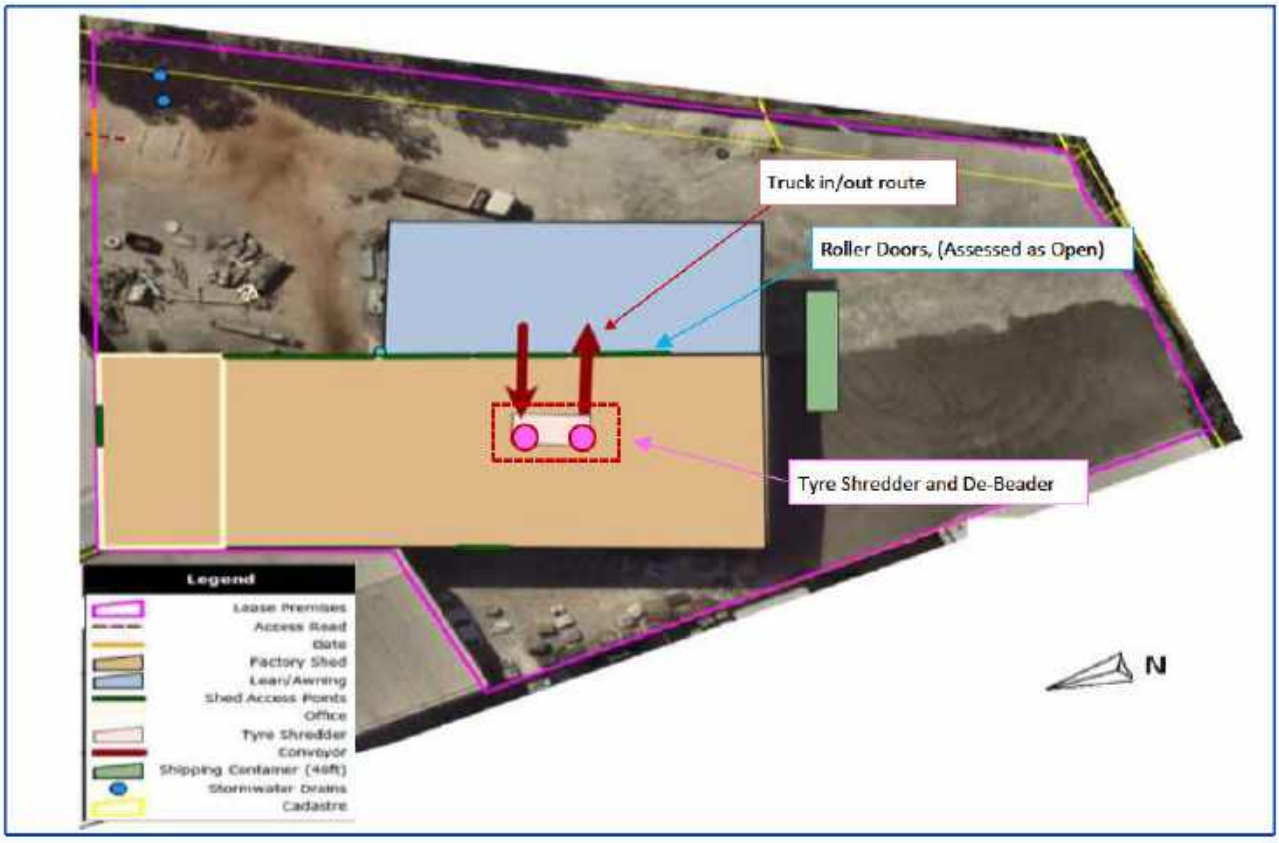
Figure 3-1: Overview of Noise Model and Influencing Surrounding Buildings

3.2.1. Ground Absorption

The ground absorption has been assumed to be 0.0 (0%) for the roads and 0.4 (40%) elsewhere, noting that 0.0 represents hard reflective surfaces such as water and 1.0 represents absorptive surfaces such as grass.

3.3. Internal Plant Layout

Figure 3-2 shows the plant layout assessed in this study, as provided by Lundstrom Environmental Consultants – specialist tyre shredding and de-beading plant is proposed to be supplied by Nanjing Fante Machinery Manufacture Co., Ltd, detail included in *Appendix B*. This plant and location information is then input into the noise model to account for the machinery noise radiating our of open warehouse doors and through building fabric – shown in the lower noise modelling image:



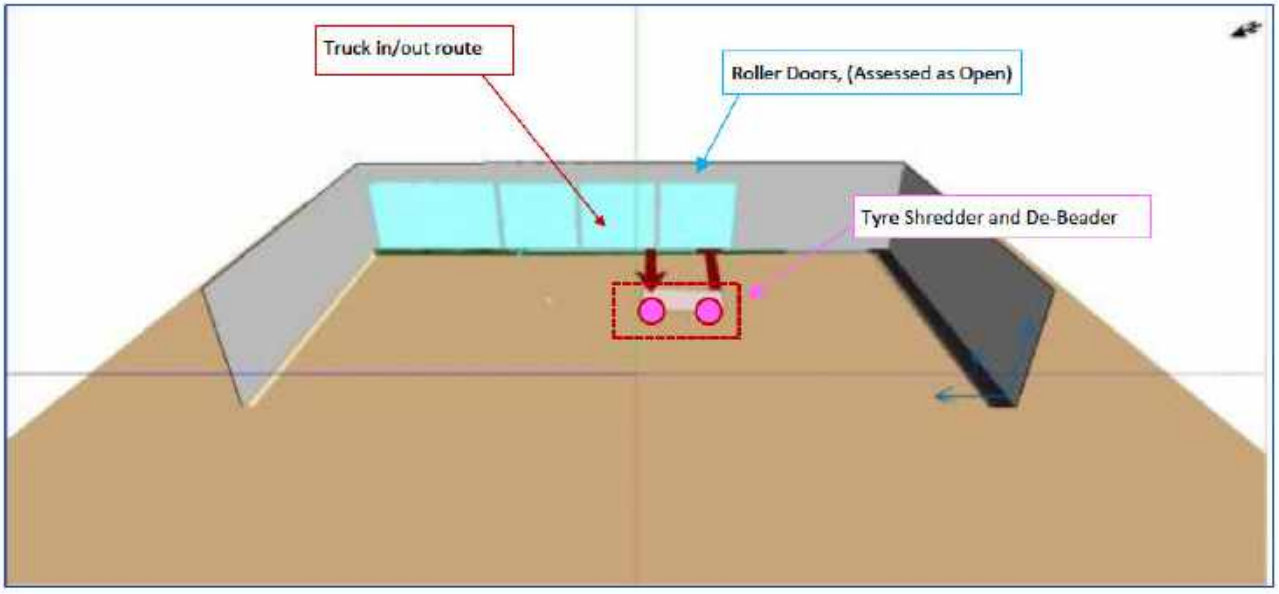


Figure 3-2: Proposed Tyre Shredding and De-Beading Plant – Plan and Indoor Noise Model Layout

3.3.1. Source Sound Levels

The source sound power levels used in the modelling are provided in *Table 3-2*.

Table 3-2: Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Industrial Processing Sources									
Tyre Shredding Plant	93	96	99	93	91	88	94	86	**103**
Tyre De-Beader Plant	79	90	98	95	92	88	85	80	**94**
Logistics									
Slow Moving Delivery Truck (L_{A1})	97	88	84	85	80	78	76	72	**87**
Isuzu 12 Tonne Truck, High Idle (L_{A1})	96	101	96	97	101	99	95	92	**104**
Unloading (Incl. Forklifts) (L_{AMAX})	94	99	88	82	82	95	88	81	**97**

* - Noise data compared and correlated with Lloyd George Acoustics' previous assessments of tyre recycling facility(s) using on-site measurement methods based upon internal reverberant sound pressure level measurements of ~85dB(A):

The following is noted in relation to *Table 3-2*:

- Tyre Recycling plant is arranged with 1 x Tyre Shredder and 1 x Tyre De-beader machine(s) located inside the warehouse as per proposed plant layout, refer *Figure 3-2*;
- All tyre processing plant assumed to be installed on anti-vibration mounts between plant and skid, appropriately suited to plant dynamic load under full 100% duty to mitigate structural vibration;
- Initial model is with all roller doors open;
  - *Note, preliminary assessment indicates warehouse roller doors to west are to remain closed.*
- All tyre plant operations noise sources are considered steady-state and assessed against L_{A10} assigned level, deemed appropriate for fixed industrial constant noise emission sources;
- Delivery trucks are assessed against L_{A1} assigned level, deemed appropriate for temporary arrival/departure of heavy vehicles, approx. 1 per hour, calculated from 80 trucks per week across usual business hours Monday to Friday 7.00am – 6.00pm and Saturday 7.00am – 1.00pm;
- Tyre unloading noise incl. forklifts is assessed against L_{AMAX} assigned level, deemed appropriate for short-term instantaneous noise;

3.4. Sound Attenuation Performance of Building Materials

3.4.1. Building Envelope Material Sound Insulation Properties

Sound insulation of the main building envelope (roof and walls) is a key consideration for industrial noise processes. High levels of internal noise from the tyre recycling plant will radiate more or less sound through the roof and walls as noise emissions in a direct relationship to the acoustic performance of the wall/roof material.

This characteristic is referred as Sound Transmission Loss, expressed as a single figure value "R_w" – however, each material build-up is frequency specific, hence a profile across the frequency range 63Hz – 8kHz is required to ensure adequacy of design relative to processing noise. Example constructions and their performances are listed in *Table 3-3*.

Table 3-3: Building Envelope Materials - Sound Transmission Loss Data, R_w

Construction Build-up	R_w	Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Steel Roller Door	**15**	9	14	15	14	15	17	17	16
1mm bmt profile steel sheet to one side of steel frame	**21**	8	11	15	19	23	20	21	31
1mm bmt profile steel sheet to one side of steel frame, lined internally w/75mm thick perf foil face Anticon™ fibrous insulation	**28**	12	15	19	25	30	28	30	31
90mm depth steel frame clad externally w/1mm bmt profile steel sheet, an internally with perforated FC sheet lined with 90mm thick fibrous insulation in formed cavity	**45**	18	22	33	51	54	54	56	58
180mm thick Concrete	**54**	36	42	41	50	57	60	65	70
Steel door T30, with seals	**25**	21	22	28	28	24	23	24	28
Warehouse Door Large Openings	**0**	0	0	0	0	0	0	0	0

3.4.2. Acoustic Absorption Profile Properties

Internal sound levels within the building can be reduced by the application of acoustic absorption at room boundary surfaces, causing conversion of sound energy into heat via friction between fibres in the applied absorbing materials. The extent to which a sound is absorbed at each reflection is expressed an acoustic absorption coefficient, referred as Alpha, "α", and is frequency-specific hence is expressed in octave bands.

A coefficient of 0.1 is considered mostly reflective, absorbing only 10% of incident sound energy, whereas a rating of 0.9 absorbs 90% of incident sound energy. By reducing internal sound levels, there is a directly proportional reduction in corresponding noise emissions. Given the intended environment and application, a perforated sheet lining with fibrous insulation in the formed cavity is used in internal noise modelling.

Table 3-4 lists the acoustic absorption coefficients used in modelling

Table 3-4: Internal Acoustic Absorption Coefficient Data, "α"

Acoustic Absorbing Surface	α	Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
1mm bmt profile steel sheet	**0.1**	0.3	0.25	0.15	0.1	0.08	0.05	0.06	0.05
Concrete	**0.05**	0.02	0.03	0.04	0.05	0.05	0.05	0.08	0.08
Perforated foil face Bradford Acousticon™ 90mm thick	**0.9**	0.15	0.3	0.7	0.9	0.95	0.95	0.95	0.9
Large Opening	**1.0**	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

4. RESULTS

Noise modelling has been undertaken against the following scenarios, assuming the Tyre Recycling facility observes standard business hours, operating 7:00am – 6.00pm on weekdays and 7:00am – 1.00pm on Saturdays.

- **Scenario 1A** Standard operations for tyre shredding and de-beading plant operating Monday to Friday 7.00am to 6.00pm and Saturday 7.00am to 1.00pm;
  - All tyre processing plant operating simultaneously;
  - All east façade and west façade roller doors Open;
  - No internal lining walls or roof assessed;

- **Scenario 1B** Standard operations for tyre shredding and de-beading plant operating Monday to Friday 7.00am to 6.00pm and Saturday 7.00am to 1.00pm;
  - All tyre processing plant operating simultaneously;
  - All east façade roller doors Open only;
  - No internal lining walls or roof assessed;

- **Scenario 2** – Delivery Truck movements (L_{A1}) and Unloading (incl. forklifts) (L_{Amax}) – considered in isolation to other noise sources at the above times.

Results and assessment of these scenarios are presented in *Section 4.1* to *Section 4.4.*

4.1. Scenario 1A – Standard Operations, Roller Doors All Open

Figure 4-1 presents the noise modelling scenario for emissions from the tyre processing plant with:

- Indoor tyre processing plant operating at 100%;
- All roller doors open; And
- Bare Steel walls (i.e. no internal acoustic absorption treatment) to walls and roof – refer *Table 3-4*.

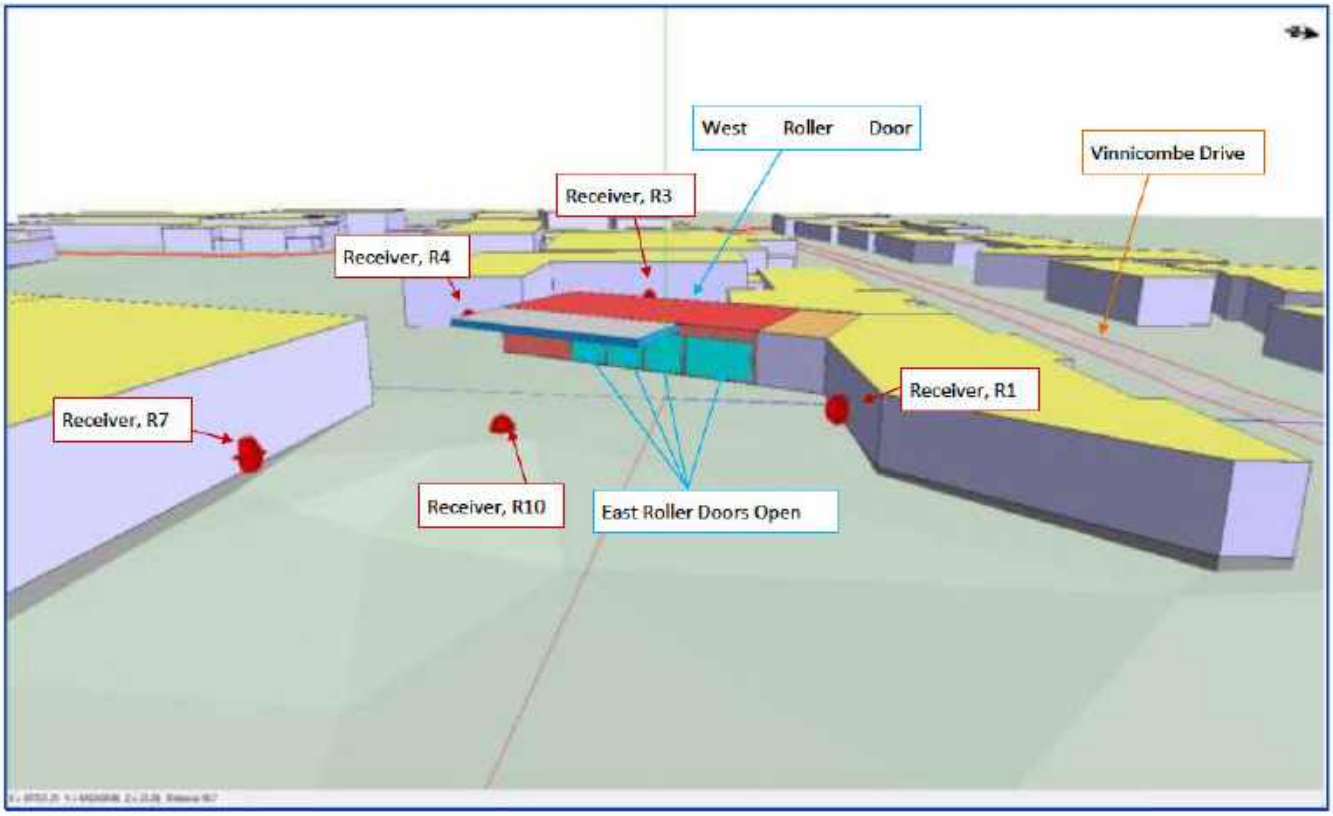


Figure 4-1: Overview of Tyre Plant Noise Model w/ Roller Doors All Open – Sources and Receivers

The results for Scenario 1A are provided in *Table 4-1*. A *Tonal* penalty of +5 dB is applied to tyre recycling plant noise to account for potential tonal characteristics associated with the systems. A noise contour plot is also provided in *Figure 4-2* showing noise levels at ground floor.

Table 4-1: Scenario 1A Standard Tyre Processing Operations, Roller Doors All Open: Predicted Levels, L_{A10}, dB

Receiver	Predicted Noise Level	+5dB *Tonal* Penalty	Fixed Limit L_{A10}	Assessment
R1 Adjacent Warehouse to Office Bldg (Outside Leased Area)	58	63	65	*COMPLIES*
R2 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg (Adjacent Bldg Facade)	64	69	**65**	*EXCEEDS, (+4dB(A)*
R3 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg	52	57	**65**	*COMPLIES*
R4 Lot 982, 18 Vinnicombe Dr,Warehouse Bldg (Adjacent Bldg Facade)	42	47	**65**	*COMPLIES*

Receiver	Predicted Noise Level	+5dB *Tonal* Penalty	Fixed Limit L_{A10}	Assessment
R5 Leased Area, South Lot Boundary (Free Field)	56	61	**65**	*COMPLIES*
R6 33 Tacoma Circuit (Warehouse Bldg W Facade)	56	61	**65**	*COMPLIES*
R7 33 Tacoma Circuit (Warehouse Bldg N Facade)	55	60	**65**	*COMPLIES*
R8 Lot 804, 1-3 Martin Place (Commercial Bldg, SW Facade)	47	52	**65**	*COMPLIES*
R9 Lot 804, 1-3 Martin Place (Commercial Bldg, NW Facade)	48	53	**65**	*COMPLIES*
R10 Leased Area, West Lot Boundary (Free Field)	59	64	**65**	*COMPLIES*

23118574 Tyre Processing Facility 14, Vinnicombe Dv, Canning Vale
Noise Level Contours @ 1.4m Above Ground Level

Scenario 1A - L_{A10} Tyre Processing Operations, All Roller Doors Open, No Internal Absorption

SoundPLAN v8.2
CONCAWE Algorithms

20 December 2023

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Length Scale 1:3000
0 15 30 60 90 120 m

Figure 4-2

Signs and symbols
- Noise Source
- Point receiver
- Roof as source
- Facade as source

Noise levels
L_{A10} - dB
- = 35
- = 38
- = 41
- = 44
- = 47
- = 50
- = 53
- = 56
- = 59
- = 62
- = 65

N

4.1.1. Comment on Scenario 1A Results

Table 4-1 shows that under standard operations with no internal acoustic treatment and all roller doors closed, noise levels are predicted to comply with the assigned limits (inclusive of +5 dB *Tonality* penalty) at all locations EXCEPT R2, corresponding to Lot 982, 18 Vinnicombe Dr, a Warehouse building façade immediately adjacent to the West façade and open roller door – refer *Figure 4-3*.

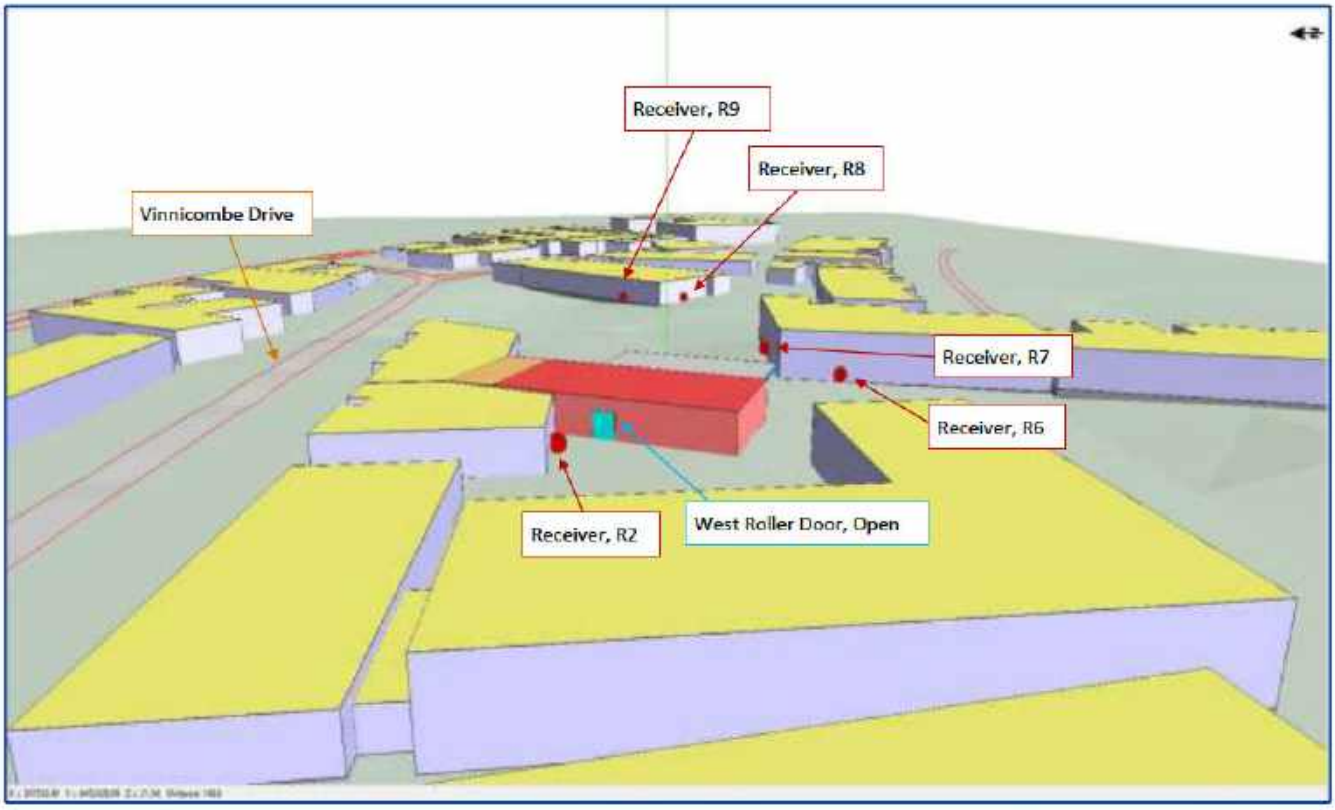

Figure 4-3: Overview of Tyre Plant Noise Model showing R2 and West Roller Door Open

An exceedence of +4dB(A) (incl. *Tonality* penalty) is predicted adjacent to the open West roller door.

Internal noise levels within the warehouse space are predicted at 77dB(A)* when averaged across the entire warehouse floor area. The warehouse internal environment is modelled as bare steel walls and roof, concrete floor.

** Note, noise levels will be above 85dB(A) in proximity to the tyre recycling plant hence OH&S signage and use of ear defenders will be an operational requirement.*

To reduce the predicted level to achieve compliance, Scenario 1B examines the effect of closing the West roller door during tyre processing operations.

4.2. Scenario 1B – Standard Operations, West Roller Door Closed

Scenario 1B examines the noise emissions from the tyre recycling facility with:

- Indoor tyre processing plant operating at 100%;
- East roller doors open, West Roller door closed; And
- Bare Steel walls (i.e. no internal acoustic absorption treatment) to walls and roof – refer *Table 3-4*.

The results for Scenario 1B are provided in *Table 4-2*. A noise contour plot is also provided in *Figure 4-4* showing reduced noise levels at ground floor level in the vicinity of R2.

Table 4-2: Scenario 1B Standard Tyre Processing Operations, West Roller Door Closed: Predicted Levels, L_{A10} dB

Receiver	Predicted Noise Level	+5dB *Tonal* Penalty	Fixed Limit L_{A10}	Assessment
R1 Adjacent Warehouse to Office Bldg (Outside Leased Area)	58	63	**65**	*COMPLIES*
R2 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg (Adjacent Bldg Facade)	52	57	**65**	*COMPLIES*
R3 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg	44	49	**65**	*COMPLIES*
R4 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg (Adjacent Bldg Facade)	41	46	**65**	*COMPLIES*
R5 Leased Area, South Lot Boundary (Free Field)	56	61	**65**	*COMPLIES*
R6 33 Tacoma Circuit (Warehouse Bldg W Facade)	56	61	**65**	*COMPLIES*
R7 33 Tacoma Circuit (Warehouse Bldg N Facade)	55	60	**65**	*COMPLIES*
R8 Lot 804, 1-3 Martin Place (Commercial Bldg, SW Facade)	47	52	**65**	*COMPLIES*
R9 Lot 804, 1-3 Martin Place (Commercial Bldg, NW Facade)	48	53	**65**	*COMPLIES*
R10 Leased Area, West Lot Boundary (Free Field)	59	64	**65**	*COMPLIES*

Note, the west roller door is assumed to be an existing steel sectional roller door with Sound Transmission Loss performance of R_w 15dB as per Table 3-3 when in the closed position.

Where the west roller door is required to be open for operational reasons, the Principal Client may consider the roof and wall internal surface area lining with acoustic absorption material as an alternative means to reduce internal noise (and corresponding external sound emission) levels. Lining the inside of the main warehouse roof and walls areas with an acoustically absorbent finish such as 90mm thick CSR Bradford Acousticon™ perforated foil faced insulation results in a reduced internal Reverberant Sound Pressure Level ($L_{P,Rev}$) of 72dB(A).

NB: Where the West roller door is able to be closed during tyre processing operations internal linings are not a requirement for compliance, however the Principal Client may consider the roof linings as a means to reduce internal noise levels by use of acoustic absorption. Additional benefits to reducing internal workshop noise include potentially reducing the office/amenities building envelope fabric in terms of providing suitable noise conditions for office work.

23118574 Tyre Processing Facility 14, Vinnicombe Dv, Canning Vale
Noise Level Contours @ 1.4m Above Ground Level

Scenario 1B - L_{A10} Tyre Processing Operations, West Roller Door Closed, No Internal Absorption

SoundPLAN v8.2
CONCAWE Algorithms

20 December 2023

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HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:3000
0 15 30 60 90 120 m

Figure 4-4

Signs and symbols
- Noise Source
- Point receiver
- Roof as source
- Facade as source

Noise levels
L_{A10} - dB
- = 35
- = 38
- = 41
- = 44
- = 47
- = 50
- = 53
- = 56
- = 59
- = 62
- = 65

N

4.3. Scenario 2 – Delivery Truck (L_{A1}) and Tyre Unloading (L_{AMAX}) Noise

Scenario 2 examines the noise emissions from anticipated delivery truck movements (outside of main warehouse) using the applicable L_{A1} criteria for:

- Approx. 1x 4.5T GVM truck movement per hour, calculated from anticipated maximum load of 80 movements per week divided by 61 hours per work week, Monday to Saturday;
- Approx. 1x 12T Shipping Container loader truck movement per day, calculated from anticipated maximum load of 7.5 movements per week divided by 6 days per work week;

Separately, tyre cargo unloading noise is assessed using the applicable L_{AMAX} criteria as appropriate to assess short term "transient" noise sources associated with unloading tyres using forklift trucks.

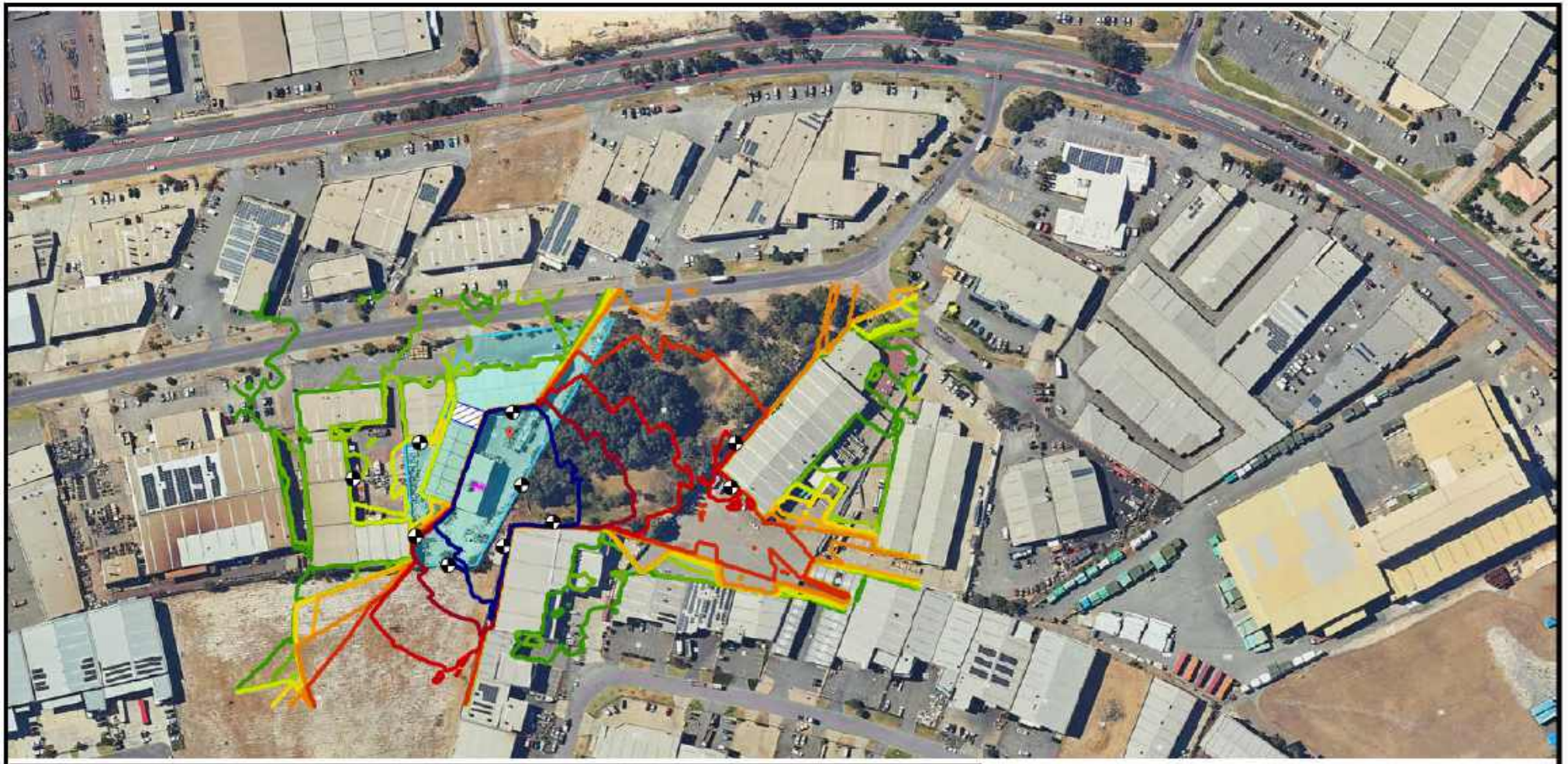
4.3.1. Delivery Truck Noise (L_{A1})

The results for Cumulative 4.5T and Shipping Container Loader delivery truck movements (L_{A1}) noise emissions are provided in *Table 4-3*. No additional penalties are assessed for delivery truck noise.

Table 4-3: Scenario 2 Cumulative Delivery Truck (L_{A1}) Noise: Predicted Levels, L_{A1} dB

Receiver	Predicted Noise Level	Fixed Limit L_{A1}	Assessment
R1 Adjacent Warehouse to Office Bldg (Outside Leased Area)	65	**80**	*COMPLIES*
R2 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg (Adjacent Bldg Facade)	44	**80**	*COMPLIES*
R3 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg	39	**80**	*COMPLIES*
R4 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg (Adjacent Bldg Facade)	54	**80**	*COMPLIES*
R5 Leased Area, South Lot Boundary (Free Field)	65	**80**	*COMPLIES*
R6 33 Tacoma Circuit (Warehouse Bldg W Facade)	66	**80**	*COMPLIES*
R7 33 Tacoma Circuit (Warehouse Bldg N Facade)	65	**80**	*COMPLIES*
R8 Lot 804, 1-3 Martin Place (Commercial Bldg, SW Facade)	57	**80**	*COMPLIES*
R9 Lot 804, 1-3 Martin Place (Commercial Bldg, NW Facade)	57	**80**	*COMPLIES*
R10 Leased Area, West Lot Boundary (Free Field)	70	**80**	*COMPLIES*

Table 4-3 shows that delivery truck noise is calculated to comply at all receivers at all times, with no mitigation required. A noise contour plot is also provided in *Figure 4-5* showing noise levels at ground floor.



23118574 Tyre Processing Facility 14, Vinnicombe Dv, Canning Vale
Noise Level Contours @ 1.4m Above Ground Level

Scenario 2 - L_{A1} Cumulative Delivery Truck (LA1)

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CONCAWE Algorithms

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HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:3000
0 15 30 60 90 120 m

Figure 4-5

Signs and symbols
- Noise Source
- Point receiver

Noise levels
L_{A1} - dB
- = 35
- = 38
- = 41
- = 44
- = 47
- = 50
- = 53
- = 56
- = 59
- = 62
- = 65

N

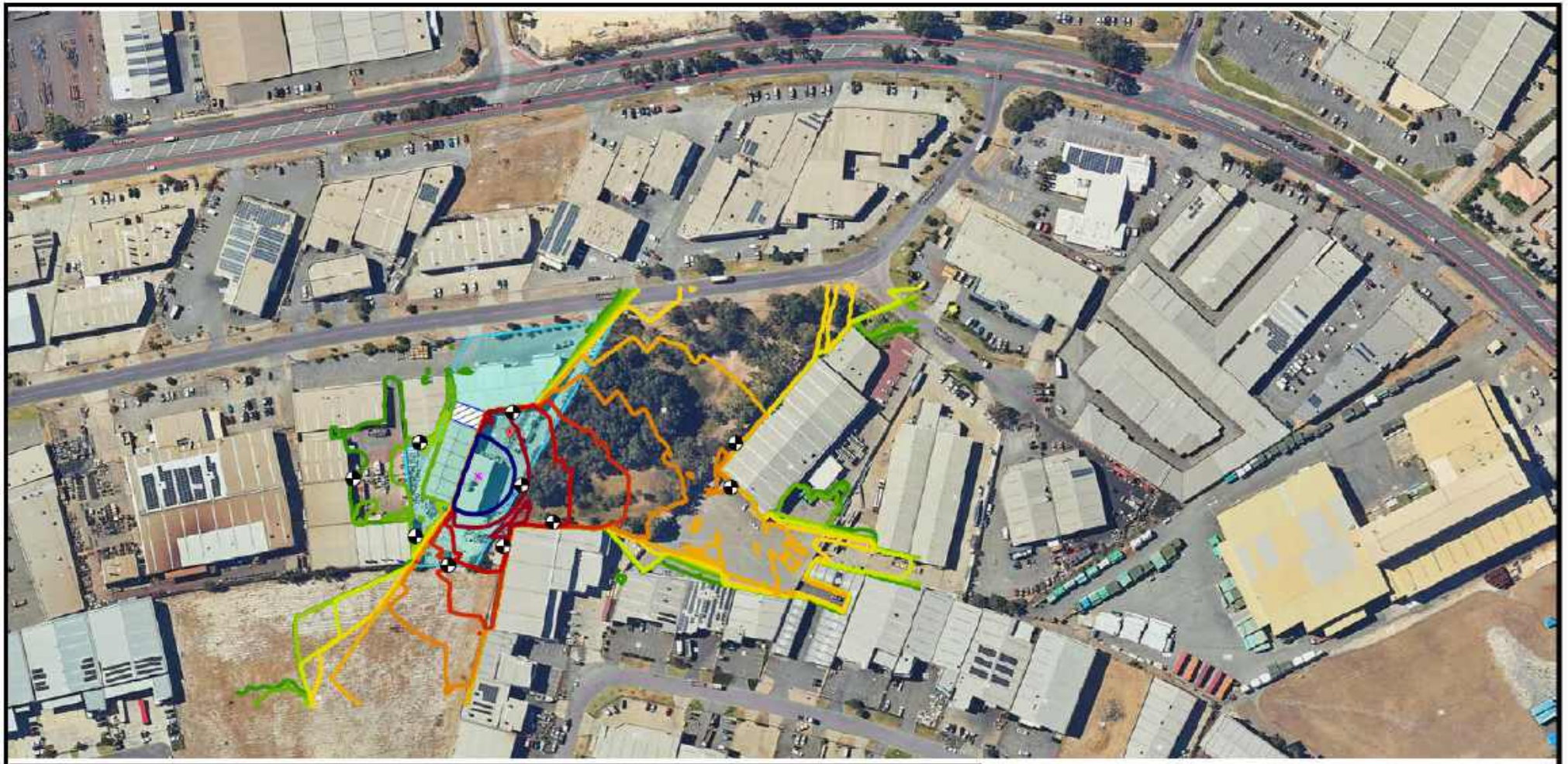
4.3.2. Tyre Unloading Noise (L_{AMAX})

The results for unloading tyre (L_{AMAX}) noise emissions are provided in *Table 4-4*. Unloading tyres noise (incl. forklifts) is likely to be considered *Impulsive* under *the Regulations* intrusive noise characteristics criteria, hence a +10 dB penalty is applied.

Table 4-4: Scenario 2 Cumulative Delivery Truck (L_{A1}) Noise: Predicted Levels, L_{AMAX} dB

Receiver	Predicted Noise Level	+10dB *Impulsive* Penalty	Fixed Limit L_{AMAX}	Assessment
R1 Adjacent Warehouse to Office Bldg (Outside Leased Area)	59	69	**90**	*COMPLIES*
R2 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg (Adjacent Bldg Facade)	38	48	**90**	*COMPLIES*
R3 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg	34	44	**90**	*COMPLIES*
R4 Lot 982, 18 Vinnicombe Dr, Warehouse Bldg (Adjacent Bldg Facade)	37	47	**90**	*COMPLIES*
R5 Leased Area, South Lot Boundary (Free Field)	57	67	**90**	*COMPLIES*
R6 33 Tacoma Circuit (Warehouse Bldg W Facade)	59	69	**90**	*COMPLIES*
R7 33 Tacoma Circuit (Warehouse Bldg N Facade)	58	68	**90**	*COMPLIES*
R8 Lot 804, 1-3 Martin Place (Commercial Bldg, SW Facade)	51	61	**90**	*COMPLIES*
R9 Lot 804, 1-3 Martin Place (Commercial Bldg, NW Facade)	50	60	**90**	*COMPLIES*
R10 Leased Area, West Lot Boundary (Free Field)	63	73	**90**	*COMPLIES*

Table 4-4 shows that tyre cargo unloading noise including forklifts (incl. +10 dB *Impulsive* penalty) is predicted to comply at all receivers at all times, with no mitigation required. A noise contour plot is also provided in *Figure 4-6* showing noise levels at ground floor.



23118574 Tyre Processing Facility 14, Vinnicombe Dv, Canning Vale
Noise Level Contours @ 1.4m Above Ground Level

Scenario 3 - L_{AMAX} Tyre Unloading Noise (Incl. Forklifts)

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CONCAWE Algorithms

20 December 2023

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(08) 9401 7770

Length Scale 1:3000
0 15 30 60 90 120 m

Figure 4-6

Signs and symbols
- Noise Source
- Point receiver

Noise levels
L_{AMAX} - dB
- = 35
- = 38
- = 41
- = 44
- = 47
- = 50
- = 53
- = 56
- = 59
- = 62
- = 65

N

5. RECOMMENDATIONS

The proposed tyre processing facility basic design has been assessed for compliance against the *Environmental Protection (Noise) Regulations 1997* limits at adjacent industrial Lots. Fixed limits of L_{A10} 65dB, L_{A1} 80dB and L_{AMAX} 90dB apply at Industrial receiver locations at all times of the day.

Regards the proposed specialist tyre processing machinery, this report assesses the operation of equipment operating indoors as per plant layout, with West roller door closed and with no absorptive linings to internal workshop surfaces.

- Internal reverberant sound levels are predicted at 77dB(A) with equipment operating*;
- Resultant noise levels at all predicted Industrial building receiver locations are <65dB(A) inclusive of *Tonality* penalty hence the operations fully comply with West roller doors closed.

  * *Note, noise levels will be above 85dB(A) in proximity to the tyre recycling plant hence OH&S signage and use of ear defenders will be an operational requirement.*

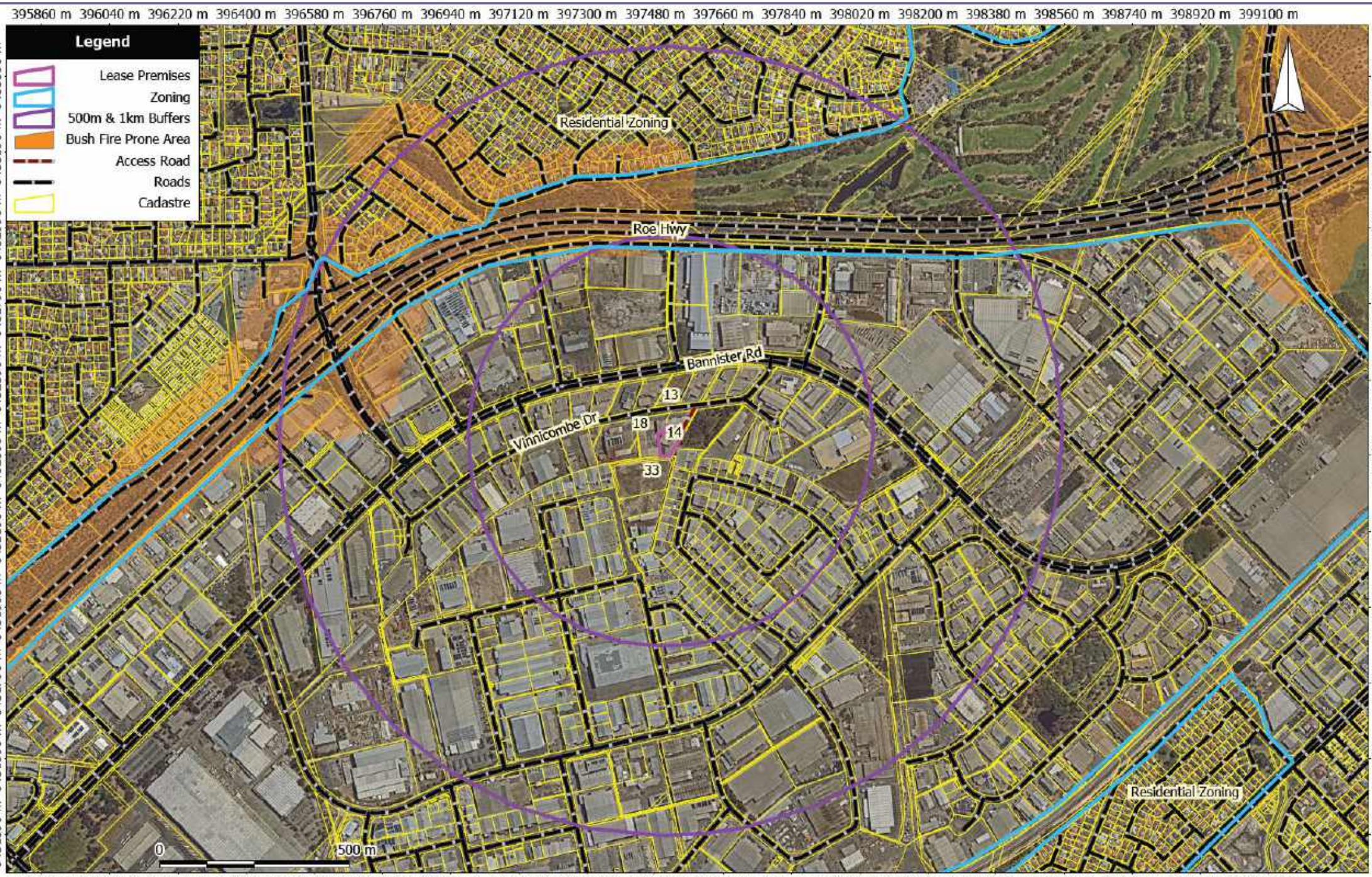
NB – predicted compliance assumes Sound Power Level (SWL) data interpreted, compared and correlated with Lloyd George Acoustics' previous assessments of tyre recycling facility(s) using on-site measurement methods based upon internal reverberant sound pressure level measurements of ~85dB(A):

It is recommended the manufacturer supply more detailed noise measurement results which may be used to calibrate and confirm the noise modelling predictions in this report during Detailed Design stage, to ensure compliance with *the Regulations* once the facility is constructed.

To minimise audible noise from day-to-day operations at nearby receiving premises, the following 'best practice' measures are suggested:

- Truck drivers are to be instructed to use good driving techniques and minimise excessive vehicle noise (no air brakes, excessive revving etc);
- Where reversing must occur, alternatives to tonal 'beeper' reversing alarms are to be implemented, whilst still maintaining a safe workplace such as:
  - Trucks and forklifts to be fitted with broadband style alarms; or
  - Reversing alarms are to be turned off and spotters used to ensure a safe environment.
- Delivery activities are to be undertaken in as careful and quiet a manner as practicable and this is to be advised to staff and delivery personnel;
- Areas where known impact noise will occur are to have suitable rubber impact matting installed;
- Service road area is to be smooth and free of gaps that may cause banging when driven over with vehicles, pallet jacks or the like. Control joints are to be filled with non-hardening mastic to provide a flat finish;
- Metal grates shall be secured with rubber gaskets or plastic grates used;
- Waste collection shall not occur outside of Monday to Saturday, 7.00am to 6.00pm and Sundays and public holidays, 9.00am to 7.00pm.

Appendix A – Development Plans



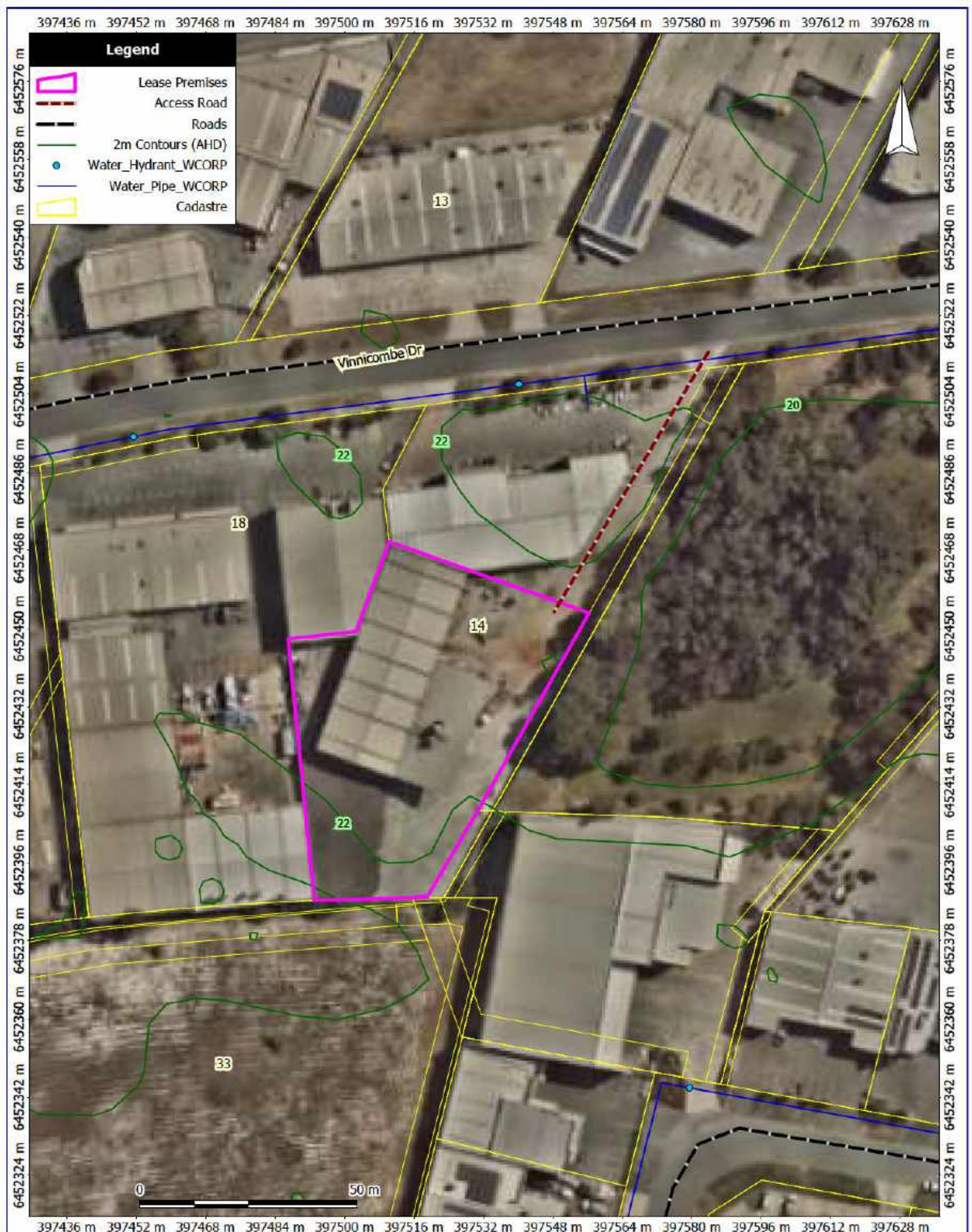
Lundstrom Environmental Consultants Pty Ltd
Leeming WA 6149
[redacted]

Scale: 1:13000
Original Size: A4
Air Photo Source: Nearmap Dec 2017
Datum: GDA94
Projection: Australia MGA94 (50)

Client: B & J Catalano
Project: Sand Extraction
Location: 6 Wandena Road, Bullsbrook

Figure 1: Locality Plan

Z:\Other Clients and Projects\Guo Shenghu_Tyre Recycling\Drawings\14 Vinnicombe Dr_Tyre Recycling.map 24/11/2023 Map Layout Landscape



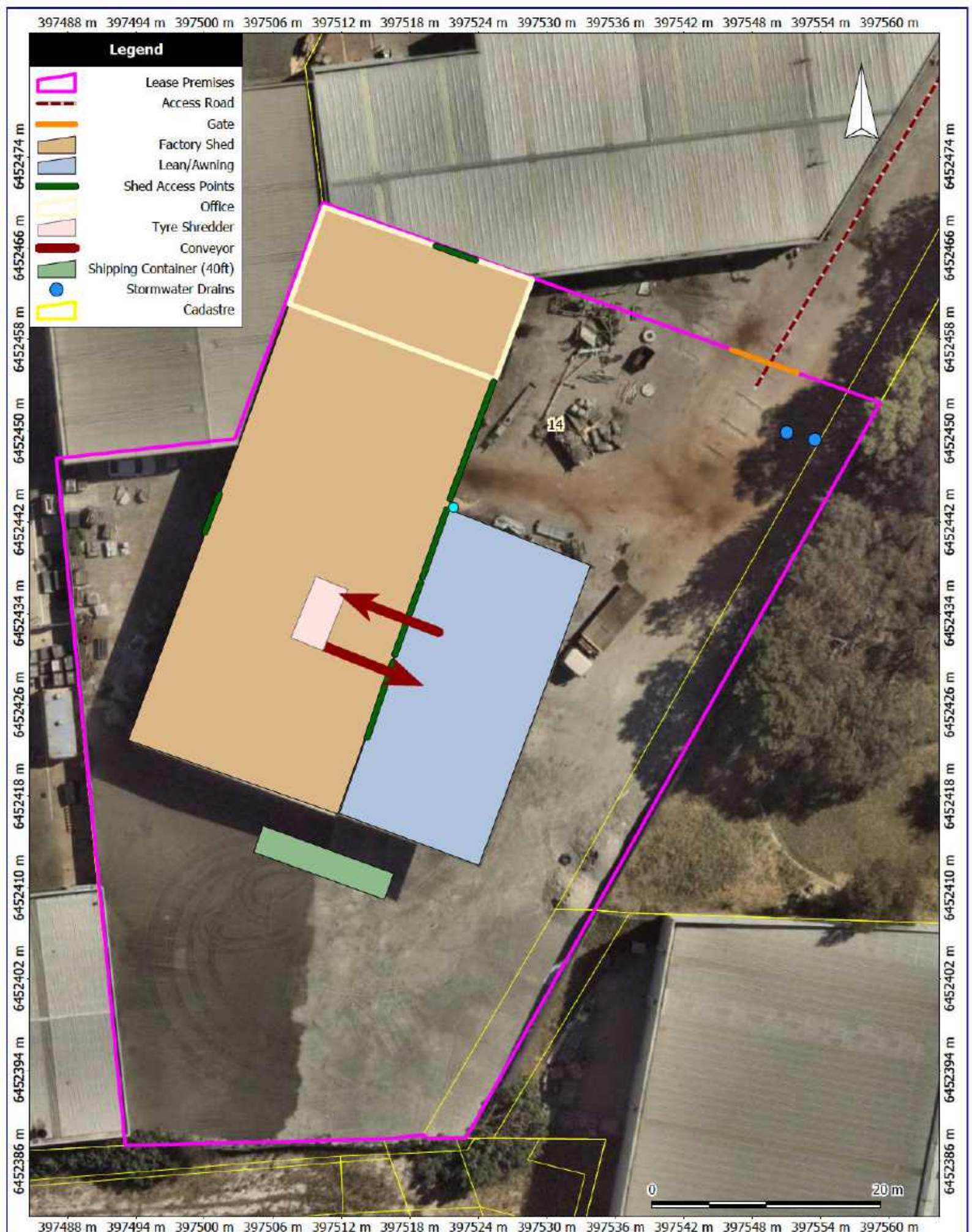
Lundstrom Environmental Consultants Pty Ltd
Leeming WA 6149
[redacted]

Scale: 1:1100
Original Size: A4
Air Photo Source: Nearmap Oct 2023
Datum: GDA94
Projection: Australia MGA94 (50)

Client: Quanxin Pty Ltd
Project: Tyre Recycling Facility
Location: 14 Vinnicombe Drive Canning vale

Figure 2: Premises

Z:\Other Clients and Projects\Guo Shenghu_Tyre Recycling\Drawings\14 Vinnicombe Dr_Tyre Recycling - Copy.map 24/11/2023 M



Lundstrom Environmental Consultants Pty Ltd Leeming WA 6149 [redacted]	Scale: 1:410 Original Size: A4 Air Photo Source: Nearmap Oct 2023 Datum: GDA94 Projection: Australia MGA94 (50)	Client: Quanxin Pty Ltd Project: Tyre Recycling Facility Location: 14 Vinnicombe Drive Canning vale	**Figure 3: Operations**

Appendix B – Proposed Tyre Recycling Machinery

Technical Specifications

Model	AL20
Engine	Changchai 3m78
Hydrostatic Pump	PWG Italy
Power	16kW/22HP
Fuel	Diesel
Transmission	4WD Hydrostatic
Drive Speed	0-10 km/h
Auxiliary Hydraulic Flow	33 L/min
Hydrostatic Oil Flow	50 L/min
Max. Lift Height (Extended)	2.75 m
Max. Lift Height (Retracted)	2.27 m
Rated Lifting Capacity	500 kg
Min. Turning Radius	1980 mm
Max. Turning Angle	40 degrees
Operating Weight	1100 kg
Fuel Tank Capacity	18 L
Battery Capacity	55 Ah
Standard Tires	23x8.5-12
Overall Dimensions (L*W*H)	2195x980x2150

Standard Features

- 4WD Direct Drive Hydrostatic Motors
- Articulating Build
- DBS (Dynamic Block System)
- Self-levelling Telescopic Boom
- Hydraulic Multiconnector/ Quick Hitch
- Hydraulic Joystick
- Removable Steel Canopy
- Counterweights (3x 36kg)
- Fully Adjustable Seat
- Electrical Output
- 4 in 1 Bucket
- Dingo/Kanga/Boxer Quick Hitch System

Optional Attachments

There are over 60 attachments to choose from; each with its own unique application.

*Terms and Conditions apply.

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Nanjing Fante Machinery Manufacture Co., Ltd.
Add:Mingjue zone, Lishui District,Nanjing, China MOBILE:+0086-13770963575

Quotation

NO.:FT230811

Buyer:

Co Name: Xenon recycle

Address:

Attn.:

Tel:

Email:

Seller:

Date: 11 Augest,2023

Co Name: [redacted]

Attn.:

Tel:

Email:

Marks	Specifications	Quantity	Unit Price	Amount
1	FT2S-1200 Shredder Machine	2	[redacted]	
2	1200 model debeader	4		
		Total Amount	[redacted]	

Machine Specification:

Name	Model	Qty	Marks
Casing	FT2S-1200	1	
Blade	Ø400*50	26	H13
Spacer	Ø240*50	26	45# heat treatment quenching
Main shaft	Ø200	2	40Cr heat treatment tempering
Control panel	Soft-start self-protection	1	
Motor	55KW-6	2	Famous brand - CHINA
Reducer	ZSY-400	2	
Effective size in the box	1220*860*550	1	
Dimension	4800*2500*2400	1	
Bearing	Self-aligning	4	Famous brand - CHINA
Output size: less than 15CM			

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Consumable parts replacement cycle: H13 blade, the replacement cycle is about one year, depending on the use.	
Voltage	380V or optional
Capacity	200-2500kg/h
Weight	About 9500kg

Machine Picture:

Features:

-Blades are H13 material (customized)
-Microcomputer technology incorporating rotator speed variations with start, stop and reverse features
-Automatic reverse sensors to protect the machine against over loading and jamming
-Engineered using split bearing block technology so the blades can be changed quickly and efficiently
-Utilizes high torque at low speed to maximize power and minimize noise
-Output size less than 150mm

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Heavy duty machine body ensure the stable and durable

Brand motor, stable power output and longer service life

The wallboard is thickened, which will not deform after long-term use and is more durable

ZSY reducer is adopted, with low noise and stable output

40Cr material spindle, manufactured by four axis machining center

Forged with high-quality steel, the blade is durable

Name	Tyre-debeader
Capacity	40-50pcs/h
Pulling force(T)	15 Tons
Max.tire diameter	1200mm
Power(KW)	7.5 KW
Operation way	hydraulic system
Cylinder quantity	1 set

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Stroke distance	1350mm
Oil pump model	Variable pump
Overall size	4100*980*1570mm
Weight	2600kg

Application: It is mainly use to extract the bead wire from tire rim.



1.Packing:To be packed in standard By sea transportation . The Sellers shall be liable for any damage of the commodity and expenses incurred on account of improper packing and for any rust attributable to inadequate or improper protective measures taken by the sellers in regard to the packing.

包装：标准海运包装。如果由于不适当的包装而导致的货物损坏和由此产生的费用，卖方应对此负完全的责任。

2. SHIPPING MARK: The Sellers shall mark on each package with fadeless paint the package number, gross weight, net weight, measurement and the wordings: "KEEP AWAY FROM MOISTURE" "HANDLE WITH CARE" "THIS SIDE UP" etc. and the shipping mark:

唛头：卖方应用不褪色的颜料在每个箱子外部 刷上箱号、毛重、净重、尺寸，并注明“防潮”、 “小心轻放”、“此面向上”等

3. PORT OF SHIPMENT（装运港）：

4.PORT OF DESTINATION（目的港）：

5.INSURANCE（保险）：Only applicable to the terms of CIF

6.PAYMENT（付款方式）：T/T 30% deposit ,70% paid before loading

7.TIME OF SHIPMENT（装运期）：the delivery time should be within 45-60 days, After receiving the deposit

8.DOCUMENTS:

8.1.Full set of Agent ocean bill in original.海运提单一套

8.2.Invoice in four copies. 发票一式肆份

8.3.Packing list in three copies issued by the Sellers. 装箱单一式叁份

8.4.Certificate of Quality issued by the Sellers. 制造厂家出具的质量证明书

8.5.Insurance Policy. 保险单一份 (Only applicable to the terms of CIF)

8.6.Certificate of origin issued by the Sellers. 原产地证书

8.7.Machine operate English manual including spare parts book 机器操作说明书以及零件手册

8.8.Providing all the machine control ,displays ,labels ,stickers,instruction manual in English .按钮和标签均是英文

9.Voltage 电压: 380V 3PHASE 50HZ

10.Trade terms 贸易方式: EXW

11.Warranty :12months since the machine shipped on board ,excluding the consumable parts humanly damaged parts .

质量保证 ： 在卖家发出机器后 12 个月内，易损件除外。

13 .After Sales Service:售后服务

B. During using, if any problem occurs, Fante after-sales service team will send parts, instruction, videos to help customer to solve, if necessary, send technician to customer's factory upon buyer's requirement.The Sellers guarantee that the Commodity hereof is made of the qualified materials with Advanced technology, brand new and unused, and complies in all respects with the quality and specification stipulated in this Contract.

在使用过程中，如果出现任何问题，Fante 售后服务团队将发送零件，说明，视频，帮助客户解决，必要时，根据买家的要求将技术人员送到客户的工厂。卖方保证本商品的商品由 合格的材料，先进的工艺，全新的和未使用的，并在各方面符合本合同规定的质量和规格。

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Nanjing Fante Machinery Manufacture Co.,Ltd

[redacted]

Appendix C – Terminology

The following is an explanation of the terminology used throughout this report:

- **Decibel (dB)**

The decibel is the unit that describes the sound pressure levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

- **A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A, dB.

- **Sound Power Level (L_w)**

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure level at known distances. Noise modelling incorporates source sound power levels as part of the input data.

- **Sound Pressure Level (L_p)**

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc. and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

- **L_{ASlow}**

This is the noise level in decibels, obtained using the A-frequency weighting and the S (slow) time weighting. Unless assessing modulation, all measurements use the slow time weighting characteristic.

- **L_{AFast}**

This is the noise level in decibels, obtained using the A-frequency weighting and the F (fast) time weighting. This is used when assessing the presence of modulation.

- **L_{APeak}**

This is the greatest absolute instantaneous sound pressure level in decibels using the A-frequency weighting.

- **L_{Amax}**

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

- **L_{A1}**

The L_{A1} level is the A-weighted noise level exceeded for 1 percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

- **L_{A10}**

The L_{A10} level is the A-weighted noise level exceeded for 10 percent of the measurement period and is considered to represent the "intrusive" noise level.

- **L_{A90}**

The L_{A90} level is the A-weighted noise level exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.

- **L_{Aeq}**

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

- **One-Third-Octave Band**

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20000 Hz inclusive.

- **Representative Assessment Period**

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

- **L_{Amax} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded at any time.

- **L_{A1} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 1 percent of the representative assessment period.

- **L_{A10} assigned level**

Means an assigned level, which, measured as a L_{ASlow} value, is not to be exceeded for more than 10 percent of the representative assessment period.

- **Tonal Noise**

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

– the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

- **Modulating Noise**

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

– a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band; and

(b) is present for at least 10% of the representative assessment period; and

(c) is regular, cyclic and audible.

- **Impulsive Noise**

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness means:

– a variation in the emission of a noise where the difference between L_{Apeak} and L_{Amax} is more than 15 dB when determined for a single representative event.

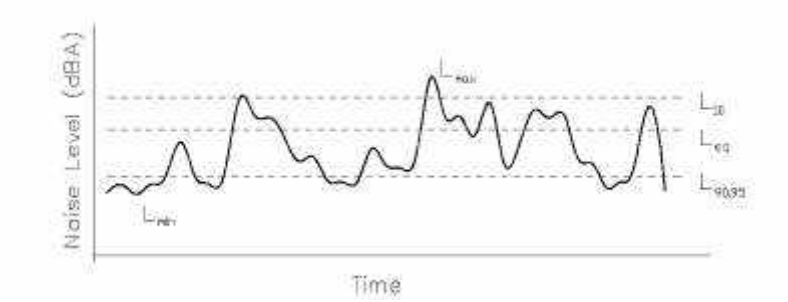
- **Major Road**

Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

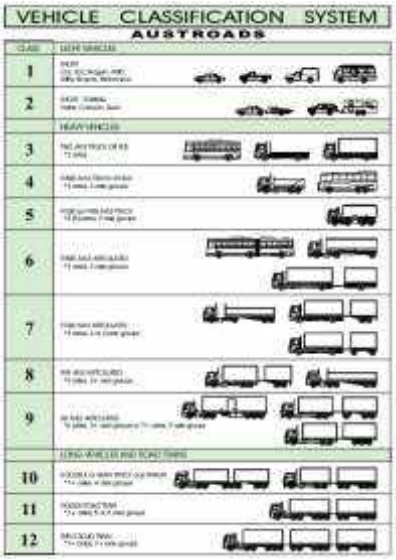
- **Secondary / Minor Road**

Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

- **Chart of Noise Level Descriptors**



- **Austroads Vehicle Class**



- **Typical Noise Levels**