



# **NOISE MANAGEMENT PLAN**

**LOT 103 BOYANUP ROAD WEST, STRATHAM**

**September 2023**

Telephone +61 418 950 852

[info@accendoaustralia.com.au](mailto:info@accendoaustralia.com.au)

PO Box 5178 West Busselton WA 6280

ABN 11 160 028 642

[www.accendoaustralia.com.au](http://www.accendoaustralia.com.au)

## Document Control

Version	Date	Author	Reviewer
V1	20/9/2023	PN	KMT
Filename	2311_Lot 103 Boyanup Rd W NMP_v1		

## Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

# CONTENTS

<b>1</b>	<b>INTRODUCTION</b> .....	<b>4</b>
1.1	BACKGROUND .....	4
1.2	PURPOSE AND SCOPE .....	4
<b>2</b>	<b>EXISTING ENVIRONMENT</b> .....	<b>5</b>
2.1	LAND USE .....	5
2.2	TOPOGRAPHY AND SOILS .....	5
2.3	CLIMATE .....	5
<b>3</b>	<b>EXTRACTION ACTIVITIES</b> .....	<b>6</b>
3.1	OPERATIONAL WORKS.....	6
3.1.3	Final Contours .....	7
3.1.4	Rehabilitation.....	7
3.2	PROPOSED OPERATING TIMES.....	7
3.3	EQUIPMENT.....	8
<b>4</b>	<b>NOISE IMPACTS AND MANAGEMENT</b> .....	<b>9</b>
4.1	SENSITIVE RECEPTORS .....	9
4.2	NOISE GENERATING ACTIVITIES .....	9
4.3	NOISE MANAGEMENT MEASURES .....	10
	<b>REFERENCES</b> .....	<b>13</b>
	<b>FIGURES</b> .....	<b>14</b>
	<b>APPENDIX A – SITE CONTOUR SURVEY</b> .....	<b>15</b>
	<b>APPENDIX B - NOISE ASSESSMENT</b> .....	<b>16</b>
	<b>APPENDIX C - COMPLAINTS REGISTER</b> .....	<b>17</b>

## TABLES

Table 1. Equipment.....	8
Table 2. Residential dwellings within 1,500m of the subject site.....	9
Table 3. Noise generating activities.....	10
Table 4. Noise management measures.....	11

## FIGURES

Figure 1. Regional Location of the Subject Site
Figure 2. Extent of the subject Site
Figure 3. Haulage Route
Figure 4. Sensitive Receptors

# 1 INTRODUCTION

## 1.1 Background

Leeuwin Civil Pty Ltd (the applicant) is proposing to extract sand from a 7.4 hectare (ha) area within Lot 103 Boyanup Road West, Stratham (herein referred to as the subject site) (refer to **Figure 1** and **Figure 2**).

The available volume of sand (*insitu* volume of approximately 400,000 m<sup>3</sup>) is to be extracted, commencing to the north of the subject site and moving in a southerly direction.

The slope of the final contours of the quarry will be an undulating surface at approximately 12.6 m AHD which is consistent with the adjoining land.

Slopes of the batters at the end of excavation will be retained at 1:4 vertical to horizontal.

## 1.2 Purpose and Scope

This Noise Management Plan (NMP) has been prepared to fulfil the relevant requirements provided within the Shire of Capel's *Local Planning Scheme No. 8* and the Shire of Capel's *Local Planning Policy No. 6.2 Extractive Industries*. It is intended to provide the Shire of Capel, the public and relevant government agencies with an understanding of the proposal and the environmental strategies and commitments proposed to address noise emissions associated with the proposed land use. This document has been prepared to support and should be read in conjunction with, the *Extractive Industry Operations Plan* prepared by Accendo Australia (2023) for sand extraction within the subject site.

The Plan will describe the proposed management measures necessary to ensure noise impacts on surrounding receptors will be managed in accordance with best practice and the *Environmental Protection (Noise) Regulations 1997*.

## 2 EXISTING ENVIRONMENT

### 2.1 Land Use

The subject site is zoned “Rural” under the Shire of Capel’s *Local Planning Scheme No. 8*. The subject site is located within the “Special Control Area – Basic raw materials” under the *Local Planning Scheme No. 8*. The proposed extractive industry is a permitted land use within this zone subject to development approval from the Shire of Capel.

Land use abutting the boundaries of the subject site is Rural based to the north, east and south. Properties to the west of the subject site on the other side of Bussell Highway are zoned ‘Special Rural’.

The subject site is currently used for the grazing of cattle.

### 2.2 Topography and Soils

The current topography of the subject site can be described as sloping with the elevation ranging from 13 m Australian Height Datum (AHD) in the west to 30 m AHD in the south eastern corner of the subject site (refer to **Appendix A**).

The subject site is located on the Perth Coastal Zone consisting of coastal sand dunes and calcarenite within the Spearwood system. The Spearwood systems consists of “*Sand dunes and plains with yellow deep sands, pale deep sands and yellow/brown shallow sands*” (Tille 2006).

The subject site is located within the Spearwood S1b phase consisting of ‘dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%’ (Natural Resource Information (NRInfo) (DPIRD 2023).

### 2.3 Climate

The climate of the locality is classified as Mediterranean with warm to hot summers and cool wet winters.

The closest weather recording station is Bunbury (Station 9965). Temperatures are highest on average in February, at approximately 30°C. July has the lowest average temperature of the year of 7.3°C.

Rainfall for the area is approximately 730 mm per annum with approximately 90% of the rain falling during the winter months, April to October inclusive.

During the summer months the dominant wind in the mornings is from the south-east at 10-14 knots, swinging to the south-west at 20-25 knots in the afternoon. During winter, the winds are most commonly 10-14 knots with no dominant prevailing direction. During storms winds from the west and north-west can reach 40 knots (BoM 2020).

Rainfall intensity has been calculated using the Bureau of Meteorology (BoM) Intensity-Frequency-Duration (IFD) data system which yields the two hour 1 in 10 (10%) annual exceedance probability storm event for the subject site as 40.2 mm/hr.

## 3 EXTRACTION ACTIVITIES

The sand quarry will cover an area of approximately 7.4 ha, with a current maximum elevation ranging from 13 m AHD to 30 m AHD. It will be excavated to a maximum depth of approximately 12.6 m AHD commencing in the north east and moving initially in a southerly direction in stages less than 2 ha in size (refer to **Figure 2**). The proposal does not include any crushing or screening of material.

It is estimated that the total maximum volume of sand to be removed will be approximately 400,000 m<sup>3</sup> with up to approximately 200,000 m<sup>3</sup> excavated each year, depending on supply and demand.

The planned end use of the quarry is to restore a natural soil profile and return the area to pasture, ensuring that there is no net loss of agricultural land.

### 3.1 Operational Works

Using a loader, the topsoil (where available) will be stripped and placed in stockpiles. Overburden, if present, will be removed using a dump truck and stockpiled to the perimeter of the proposed pit area.

#### 3.1.1 Truck Movements

Access from the property will be via Boyanup Road West (a RAV -4 classified road), travelling west to Bussell Highway (refer to **Figure 3**). The road intersection will be asphalt, with sealing up to the length of a vehicle followed by a gravel access track. Signage will be erected on both the West and East extents of the road access advising of trucks entering.

It is proposed to extract a maximum of approximately 200,000 m<sup>3</sup> or bank cubic metres (BCM) per year. The average daily extraction rate:

$$\begin{aligned} &= 200,000 \text{ BCM} / 52 \text{ weeks} / 5 \text{ working days per week} \\ &= 769 \text{ BCM per day.} \end{aligned}$$

It is estimated that approximately 70% of the haulage is proposed to be undertaken from October to May (8 months). Therefore, the average daily extraction rate (main season):

$$\begin{aligned} &= 200,000 \text{ BCM} \times 70\% / 32 \text{ weeks} / 5 \text{ working days} \\ &= 875 \text{ BCM per day.} \end{aligned}$$

The average daily extraction rate (LCM):

$$\begin{aligned} &= 875 \text{ BCM} \times 1.15 \\ &= 1006 \text{ LCM} \end{aligned}$$

It is proposed to utilise 22 tonne semi-trailers with a capacity of approximately 39.6 LCM of gravel. Accordingly, the average daily truck movements during the main season are as follows:

$$\begin{aligned} &= 1006 \text{ LCM} / 39.6 \text{ LCM truck capacity} \\ &= 25 \text{ truck movements per day} \times 2 \text{ (to and from)} \\ &= 50 \text{ trips per day} \times 2 \text{ (peak fluctuations)} \\ &= 100 \text{ trips per day maximum.} \end{aligned}$$

Given the highly variable nature of the campaigns, these calculations are estimates only, there may be periods in which these daily truck numbers are exceeded.

### 3.1.2 Sand Extraction

The sand will be excavated by a bulldozer to a stockpile or loaded directly to waiting trucks for transport. A summary of the proposed sand extraction activities is provided below:

- Prior to excavation commencing the site will be ground surveyed, the excavation footprint marked out and a 1 m contour plan developed.
- The topsoil and overburden (if present) will be stripped and stockpiled using a loader.
- An excavator or front-end loader will be used to dig the sand and transport it to a stockpile.
- The sand will then be picked up by a loader and loaded to trucks for transport.
- All static and other equipment, will be located on the floor of the quarry to provide visual and acoustic screening.
- Excavation will commence in the north of the quarry and then move in a southerly direction. The face and walls of the pit will act as noise barriers.
- Upon completion of each section of quarry, the section will be reformed and back filled, where subgrade material is available, to achieve the proposed final contours.
- At the end of excavation, the floor of the quarry will be deep ripped, covered by overburden and topsoil, and rehabilitated to a constructed soil.

### 3.1.3 Final Contours

The slope of the final contours of the quarry will be an undulating surface at approximately 12.6 m AHD which is consistent with the adjoining land.

Slopes of the batters at the end of excavation will be retained at 1:4 vertical to horizontal.

### 3.1.4 Rehabilitation

Progressive rehabilitation will be undertaken as far as practicable. Works will commence in the north east of the site with the excavation at higher elevations being undertaken first. This will then be rehabilitated while the works at lower elevation to the west are being completed. Rehabilitation will be completed upon the completion of the quarry.

Upon completion of quarrying, the following broad completion criteria will be achieved:

- A self-sustaining cover of pasture;
- Weed levels that are not likely to impact on the viability of the reconstructed soils; and
- A safe and stable landform suitable for the proposed future land use which will be productive, grazing pasturelands.

## 3.2 Proposed Operating Times

Typical operating hours for quarries will be adopted for the subject site which involves 7am to 6pm each Monday to Friday and Saturdays 7am to 1pm (for rehabilitation works only), excluding public holidays. The subject site will be worked by 2 - 3 persons, depending on market demand.

Boyanup Road West is a designated bus route. Correspondence with the bus company indicates there are school buses in the area which traverse Boyanup Road West at 7:50 to 8:15 in the morning and 3:35 to 4:10 (two services) in the afternoon. To ensure that trucks are not operating on designated school bus routes at the same time as the bus, trucks will not operate on Boyanup Road West between 7:40am – 8:25am and 3:25 pm – 4:20pm, Monday to Friday, during school periods. The pit operators will be careful to ensure compliance with these requirements.



### 3.3 Equipment

All operational equipment will work on the quarry floor to provide maximum sound and visual screening. All equipment and infrastructure will be fully portable to facilitate movement throughout the site required for staged quarrying operations. The site will be secured by locked gates when it is not being actively worked. The boundary fencing will be maintained to prevent inadvertent and unauthorised entry.

Equipment and facilities that may be used onsite are provided in the Table below.

**Table 1. Equipment**

Equipment	Description
Site office and/or containers	May be required for the management and security of small items.
Toilet	A portable toilet may be required on site.
Water tanker	Used for dust suppression on the access roads and working floors when required.
Loader (938/330)	Loaders will be used for the movement of sand and loading road trucks.
Excavator (325/330)	An excavator may be used for the removal of sand material.
Anaconda Radial Stockpiler	Used for stockpiling sand.
Fuel storage	No fuel will be stored onsite.
Light vehicles	Access to and around the site.
Tip truck	Removal of sand from site.

## 4 NOISE IMPACTS AND MANAGEMENT

### 4.1 Sensitive Receptors

The subject site has been designed to maximise setbacks to the closest sensitive receptors. This has involved extensive analysis of the local landform, environmental characteristics, land uses and location of sensitive receptors.

The Environmental Protection Authority's (EPA) *Guidance for the Assessment of Environmental Factors* (June 2005) provides generic separation distances to assist in the determination of suitable buffers where industry may have the potential to affect the amenity of a sensitive land use. In particular, for extractive industries, a buffer distance of 300 m to 500 m is recommended from sensitive land uses.

The closest residential dwellings to the subject site are provided below and shown in **Figure 4**.

**Table 2. Residential dwellings within 1,000 m of the subject site.**

Resident No.	Distance to subject site (m)
1	140 m
2	648 m
3	779 m
4	786 m
5	880 m
6	936 m
7	987 m

The closest residential dwelling to the subject site is located 140 m from the southern boundary. This dwelling is periodically uninhabited and therefore it is proposed to undertake excavation activities within the south during these periods. The applicant has undertaken extensive consultation with Resident No. 1 to ensure that all concerns and potential impacts are adequately addressed. Ongoing consultation will be undertaken for the life of the quarry.

### 4.2 Noise Generating Activities

The project works will involve the use of machinery and equipment that will generate noise during operation. Sources of noise from the subject site will included:

- Machinery noise from equipment use.
- Noise from safety equipment (beepers on machinery).
- Noise from trucks departing the site.

Reversing alarms can represent significant nuisance noise to sensitive receptors. There are a number of alternatives to alarms that maintain a safe work environment and also comply with occupational health and safety legislation. Reversing alarms alert pedestrians when a vehicle is moving, however, given that no pedestrians will be onsite (private property), the applicant has committed to suing flashing lights or a broadband alarm system as an alternative. The sound of a broadband alarm is much less intrusive by nature than the sound of a tonal alarm and tends to be masked by the background noise at a lesser distance. This will eliminate/reduce noise emissions associated with reversing alarms.

The proposed extraction activities will be low impact in nature and the noise emanating from the subject site will be indistinct from typical rural noises. Furthermore, extraction activities will only be undertaken

during standard hours of operation (in accordance with the conditions of the Extractive Industry Licence). A summary of potential noise generating activities is presented in **Table 3**.

**Table 3. Noise generating activities.**

Activity	Duration	Equipment to be used	Sound pressure Level (dB(A))	Comments
Topsoil stripping	3 weeks per year	CAT 972 Front end Wheel Loader (FEL) or similar	109	Initial impact to closest resident which will reduce as stockpiles increase.
Excavation and stockpiling of sand	80% of works undertaken within 6 months of the year	CAT 330F Excavator	105	Noise will be muffled by stockpiles present at edge of excavation areas.
Loading of trucks from stockpiles	A maximum of 5 years with up to 80 loads per day, dependent on demand.	Single Semi-loader, semi – tipper or road train	102	Noise will be muffled by stockpiles, vehicles are new and well maintained.
Rehabilitation of completed stages	To be undertaken in conjunction with excavation works where applicable.	CAT 16M Grader	108	Limited period of moderate noise levels, indistinguishable from excavation noise when undertaken concurrently.

Noise levels have been obtained from a combination of manufacturers’ specifications and from measurement of the plant undertaken at Nuttman Road, Walsall (Lloyd George Acoustics 2022).

A Noise Assessment was undertaken by Lloyd George Acoustics (Lloyd George 2023) (refer to **Appendix B**) which demonstrated that noise levels resulting from the extraction and crushing works and the noise from trucks entering the site, are predicted to exceed the assigned level of 45dB L<sub>A10</sub> at Resident 1. The noise to all other noise sensitive premises is predicted to comply. To address the noise exceedance, it is recommended to construct a 4.0 m high earth bund on the southern boundary as detailed within **Figure 5-1** of **Appendix B**.

The predicted noise levels for three typical scenarios (operations in north, centre and south) assuming that a front end loader and excavator are working on the pit floor behind the earth bund, are below the assigned level of 45dB L<sub>A10</sub> at Resident 1.

### 4.3 Noise Management Measures

The proponent will ensure that noise emissions comply with the requirements of the *Environmental Protection (Noise) Regulations 1997* at all times. In addition, the management measures prescribed within **Table 4** will be implemented to reduce noise emissions as far as practicable.

**Table 4. Management actions for noise.**

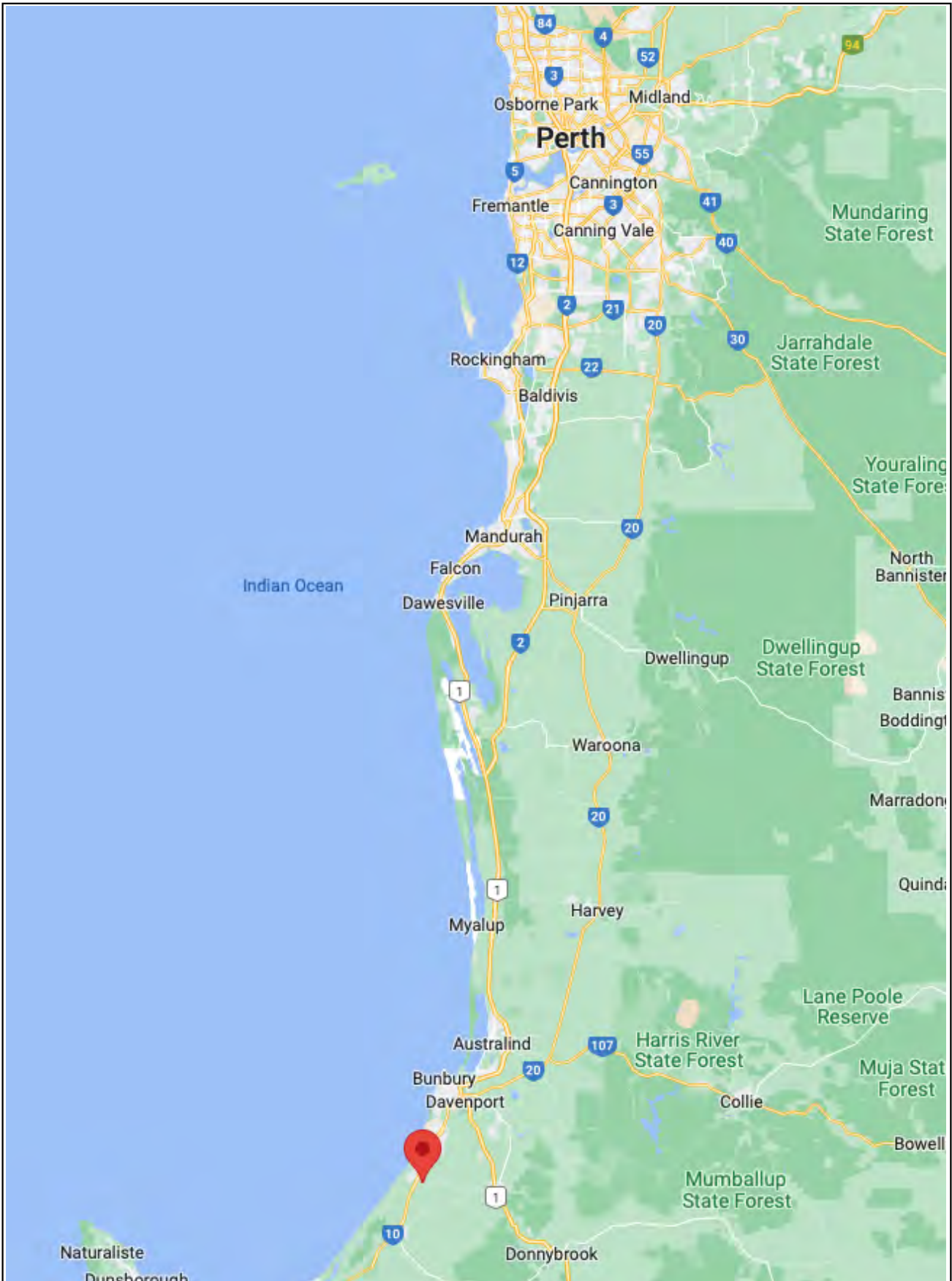
Item	Action	Trigger/Timing	Responsibility
<i>Inductions</i>			
1	As part of site inductions, employees, contractors and visitors to the site are reminded of their responsibility to undertake work activities in an environmentally sensitive manner, including minimising noise while on site, or entering and leaving the site.	Ongoing	Site Manager
<i>Planning Controls</i>			
2	<u>Daily Planning</u> <ul style="list-style-type: none"> <li>The use of significant noise generating equipment or activities simultaneously is avoided.</li> <li>The noisiest activities are scheduled to the least sensitive times of the day.</li> </ul>	Where possible	Site Manager
3	Regular review of meteorological data, specifically wind speed and direction, to guide decisions on quarrying activities.	As required, with consideration to the intensity of activities onsite and the prevailing weather conditions	Site Manager
<i>Operational Controls</i>			
4	<u>Equipment and Machinery</u> <ul style="list-style-type: none"> <li>Use machinery and equipment with minimal noise output levels.</li> <li>Ensure all machinery is regularly serviced as per the equipment's maintenance schedule to minimise noise generation.</li> <li>Where appropriate, all machinery and equipment will be shut off when not in use.</li> <li>Use flashing lights/broadband alarms instead of tonal reversing alarms on excavators/loaders.</li> <li>Apply speed restrictions (10 km/hr within site) and a ban on exhaust braking.</li> </ul>	Continuous	All employees & contractors
5	<u>Earth bunds</u> <ul style="list-style-type: none"> <li>Overburden and topsoil will be used to form perimeter bunds to assist with noise screening.</li> <li>Earth bunds on the southern boundary, as specified in <b>Figure 5-1 of Appendix B</b> will be constructed to reduce noise impacts to Resident 1.</li> </ul>	Prior to quarrying	Site Manager

Item	Action	Trigger/Timing	Responsibility
<i>Inductions</i>			
<i>Complaints Management</i>			
6	Erect on-site signage directing public to make complaints to the relevant person.	Prior to quarrying	Site Manager
7	<p>Maintain a complaints register (refer to <b>Appendix C</b>). A Complaints Register will be established for the site to record the following information:</p> <ul style="list-style-type: none"> <li>• Date, time, location and nature of the exceedance.</li> <li>• Identify the cause (or likely cause) of the exceedance and responsible parties.</li> <li>• Identify the activities that were occurring at the time of the non-compliance.</li> <li>• Determine the activities that were most likely contributing to the non-compliance.</li> <li>• Describe what action has been taken to date.</li> <li>• Describe the proposed measures to address the exceedance.</li> </ul> <p>If the complaint is verified as being due to a site source, remedial action will be undertaken within 2 hours. The Shire of Capel will be advised of all complaints as soon as they are received. If a complaint cannot be resolved within the 2 hour response period, it may be necessary to cease operations.</p>	Upon receiving complaint	Site Manager

## REFERENCES

- Beard J. S. (1990). *Plant life of Western Australia*, Kangaroo Press, Perth.
- Barnesby, B.A. and Proulx-Nixon, M.E. (2000). *Land resources from Harvey to Capel on the Swan Coastal Plain, Western Australia - Sheets 1 and 2*. Land Resources Maps No. 23/1 and 23/2. Agriculture Western Australia.
- Churchward, H.M. and McArthur, W.M. (1978). Landforms and soils of the Darling System, Western Australia. In '*Atlas of Natural Resources, Darling System, Western Australia*'. Department of Conservation and Environment, Western Australia.
- Davidson, W. A. (1995). *Hydrogeology and groundwater resources of the Perth Region, WA*. Geological Survey of Western Australia. Bulletin 142. 257 pp.
- Deeney, A. (1989) *Geology and Groundwater Resources of the superficial formations between Pinjarra and Bunbury, Perth Basin*.
- Department of Parks and Wildlife (DBCA) (2004). *Geomorphic Wetlands of the Swan Coastal Plain dataset*.
- Department of Water (DoW) (2014). *South West Region Guideline, Water resource considerations for extractive industries*. DoW, Perth WA.
- Environmental Protection Authority (EPA) (2006). *Guidance Statement No.10 for the Assessment of Environmental Factors (in accordance with the EP Act 1986: Levels of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region*.
- Environmental Protection Authority (EPA) (2009). *South West Regional Ecological Linkages*. Bulletin No 8. Retrieved from: [http://epa.wa.gov.au/EPADocLib/3040\\_SWREL\\_EPB821009.pdf](http://epa.wa.gov.au/EPADocLib/3040_SWREL_EPB821009.pdf)
- Geological Survey of Western Australia (1978). *Geology and mineral resources of Western Australia, memoir 3*. Geological Survey of Western Australia, Perth, WA.
- Hedde, E.M., Loneragan, O.W. and Havel, J.J. (1980). *Darling Systems – Vegetation Complexes, In: Atlas of Natural Resources Darling System*, Western Australia, Department of Conservation and Environment, Perth.
- Molly, S., Wood, J. Hall, S., Wallrodt, S. & Whisson, G. (2009). *South West Regional Ecological Linkages Technical Report*. Available from: <http://walga.asn.au/AboutWALGA/Policy/SouthWestBiodiversityProject/SouthWestRegionalEcologicalLinkagesTechnicalReport.aspx>
- Semeniuk, C. A. & Semeniuk, V. (1995). *A geomorphic approach to global classification for inland wetlands*. Vegetation, 118, 103-124.
- Thackway, R, and Cresswell, ID, (Eds) (1995). *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves*, Version 4.0. Australian Nature Conservation Agency, Canberra.
- Tille, P (2006). *Soil-Landscape Zones of the WA Rangelands and Interior*.
- Western Australian Planning Commission (WAPC) (2007). *Planning Bulletin No. 64: Acid Sulfate Soils*, Western Australian Planning Commission, Western Australia.

## FIGURES



PROJECT Lot 103 Boyanup Rd W, Stratham

DRAWING TITLE Figure 1 – Site Locality

CLIENT Leeuwin Civil Pty Ltd



Project Number 2311 Drawing Number Figure 1 Revision A

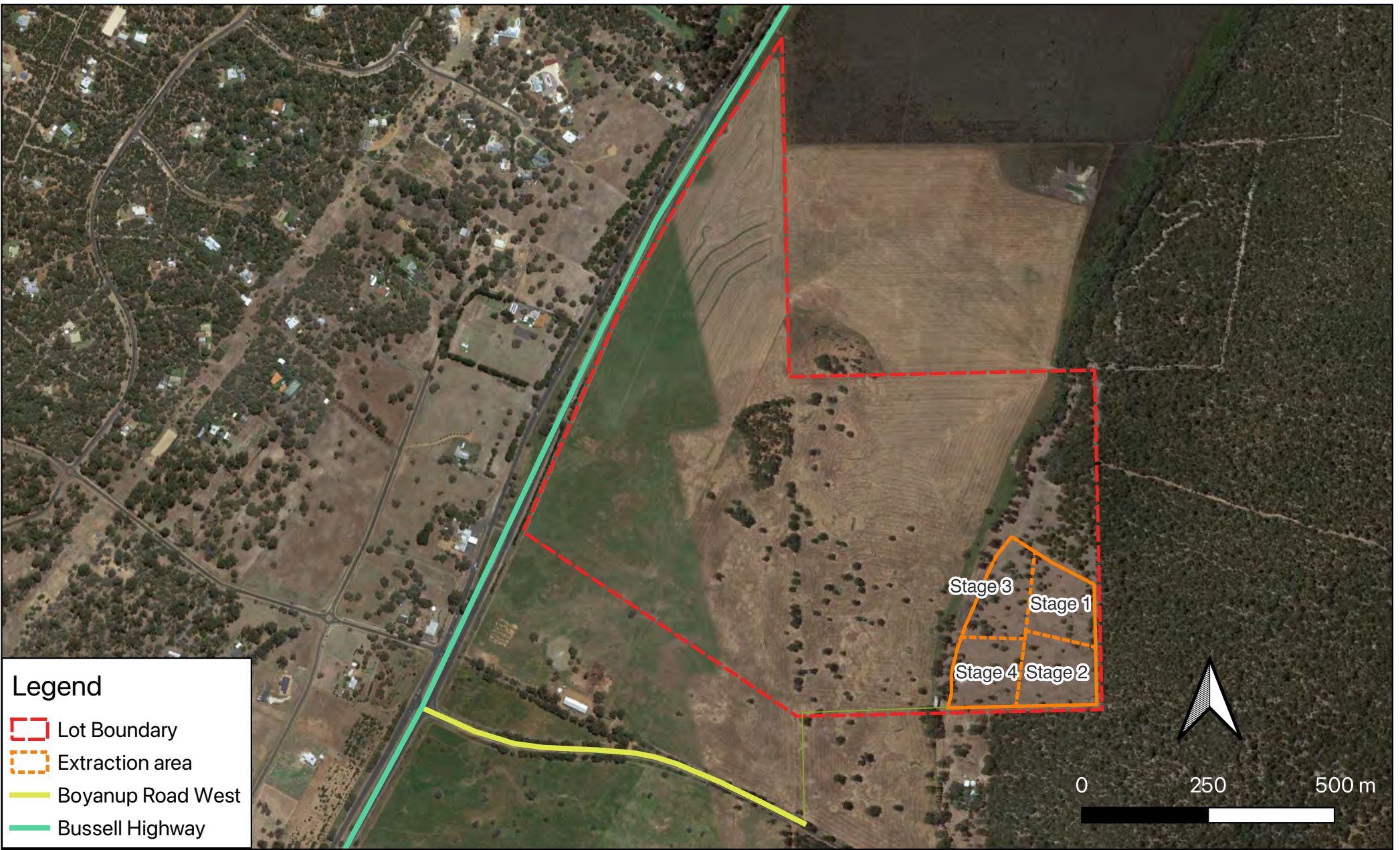
Designed PN Checked Approved  
 Drawn PN

Date 26/09/2023  
 Local Authority Shire of Capel  
 Sheet 1 of 1

This drawing has been prepared by, and remains the property of Accendo Australia Pty Ltd. This drawing shall not be used without permission. The drawing shall be preliminary only and/or not for construction until signed approved.

PO Box 5178  
 West Busselton  
 Western Australia 6280  
 Mobile 0418 950 852





**Legend**

- Lot Boundary
- Extraction area
- Boyanup Road West
- Bussell Highway

PROJECT 103 Boyanup Road West, Stratham

DRAWING TITLE Figure 2 - Site Extent

CLIENT Leeuwin Civil Pty Ltd

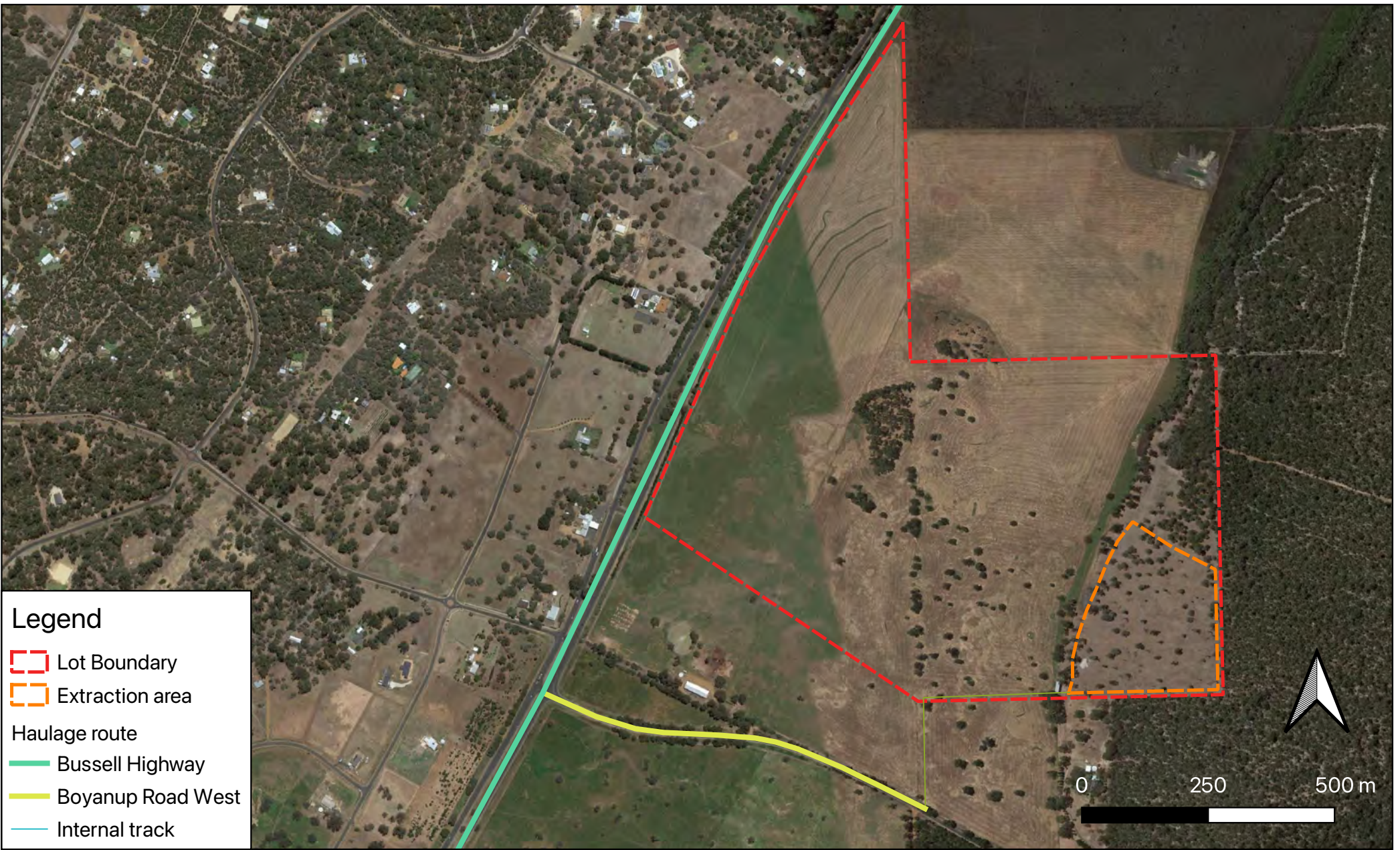
**accendo**  
AUSTRALIA

PO Box 5178  
West Busselton  
Western Australia 6280  
Mobile 0418 950 852

Project Number	2311	Designed	PN
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	20/09/2023	Approved	
Sheet 1 of 1		Local Authority	Shire of Capel

This drawing has been prepared by and remains the property of Accendo Australia Pty Ltd. This drawing shall not be used without permission. The drawing shall be preliminary only and/or not for construction until signed approved.





**Legend**

- Lot Boundary
- Extraction area
- Haulage route
- Bussell Highway
- Boyanup Road West
- Internal track

PROJECT 103 Boyanup Road West, Stratham

DRAWING TITLE Figure 3 - Haulage Route

CLIENT Leeuwin Civil

**accendo**  
AUSTRALIA

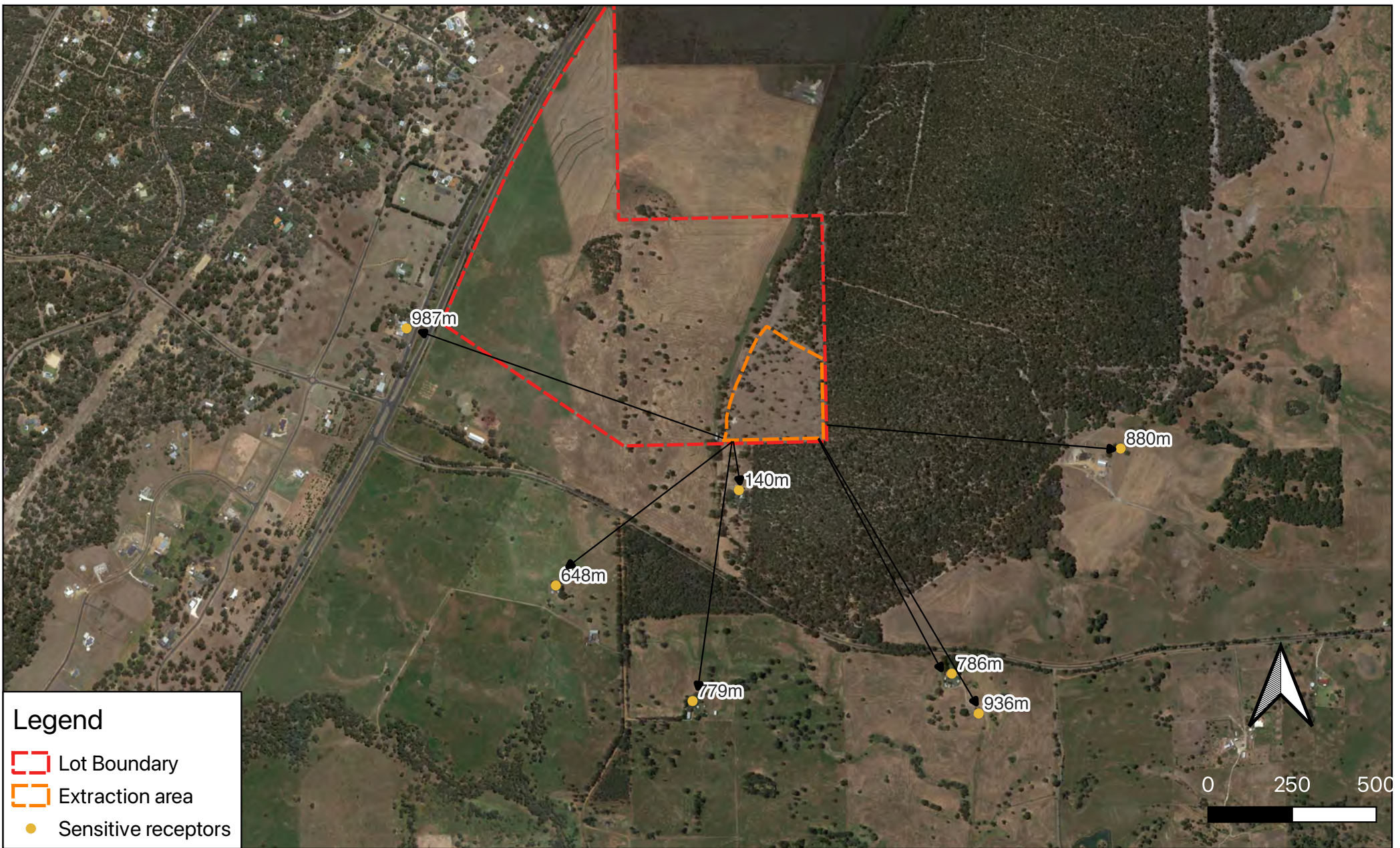
PO Box 5178  
West Busselton  
Western Australia 6280  
Mobile 0418 950 852

Project Number 2311  
Drawing Number Figure 3  
Revision A  
Date 21/06/2023  
Sheet 1 of 1

Designed PN  
Drawn PN  
Checked  
Approved  
Local Authority Shire of Capel

This drawing has been prepared by and remains the property of Accendo Australia Pty Ltd. This drawing shall not be used without permission. The drawing shall be preliminary only and/or not for construction until signed approved.





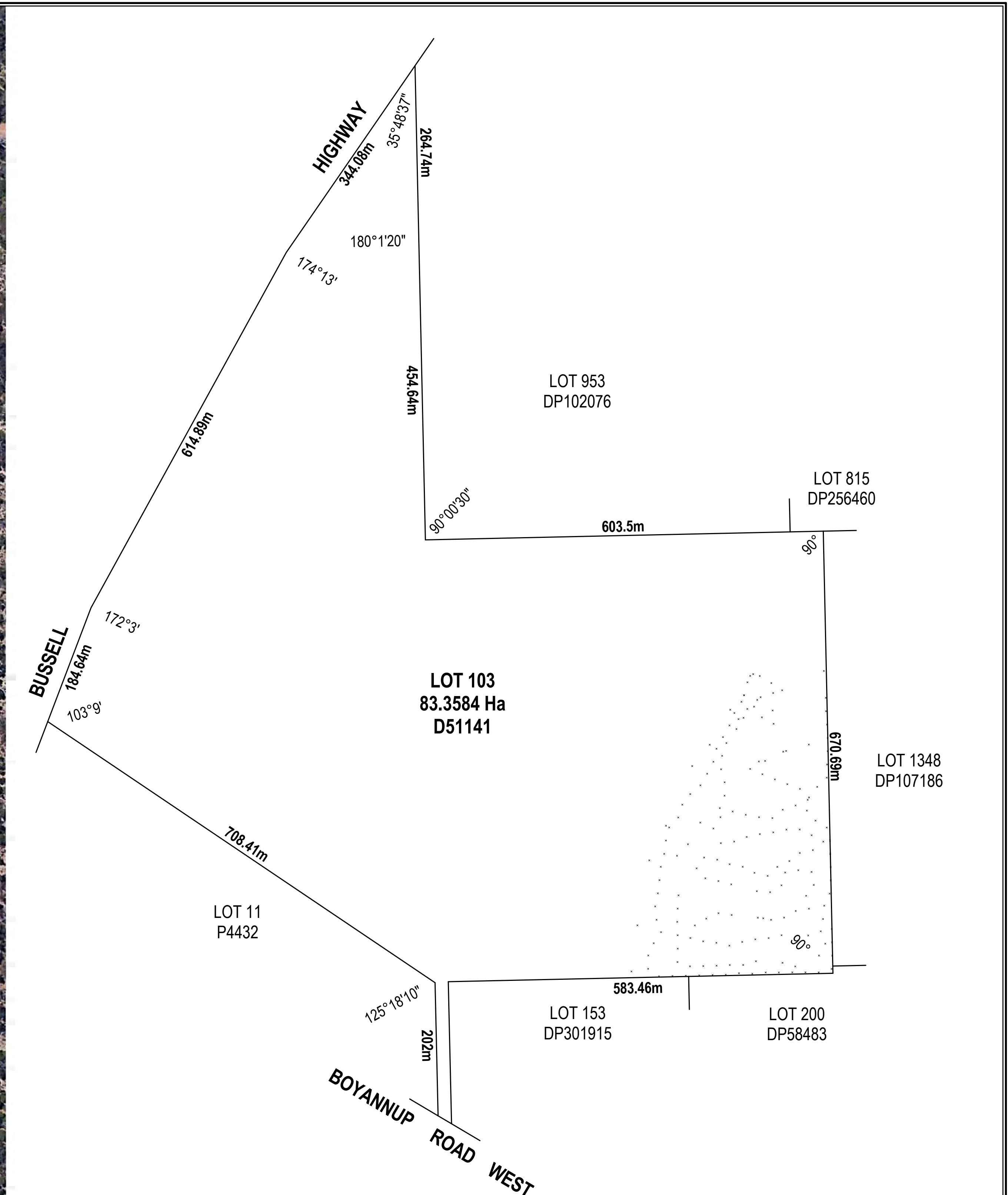
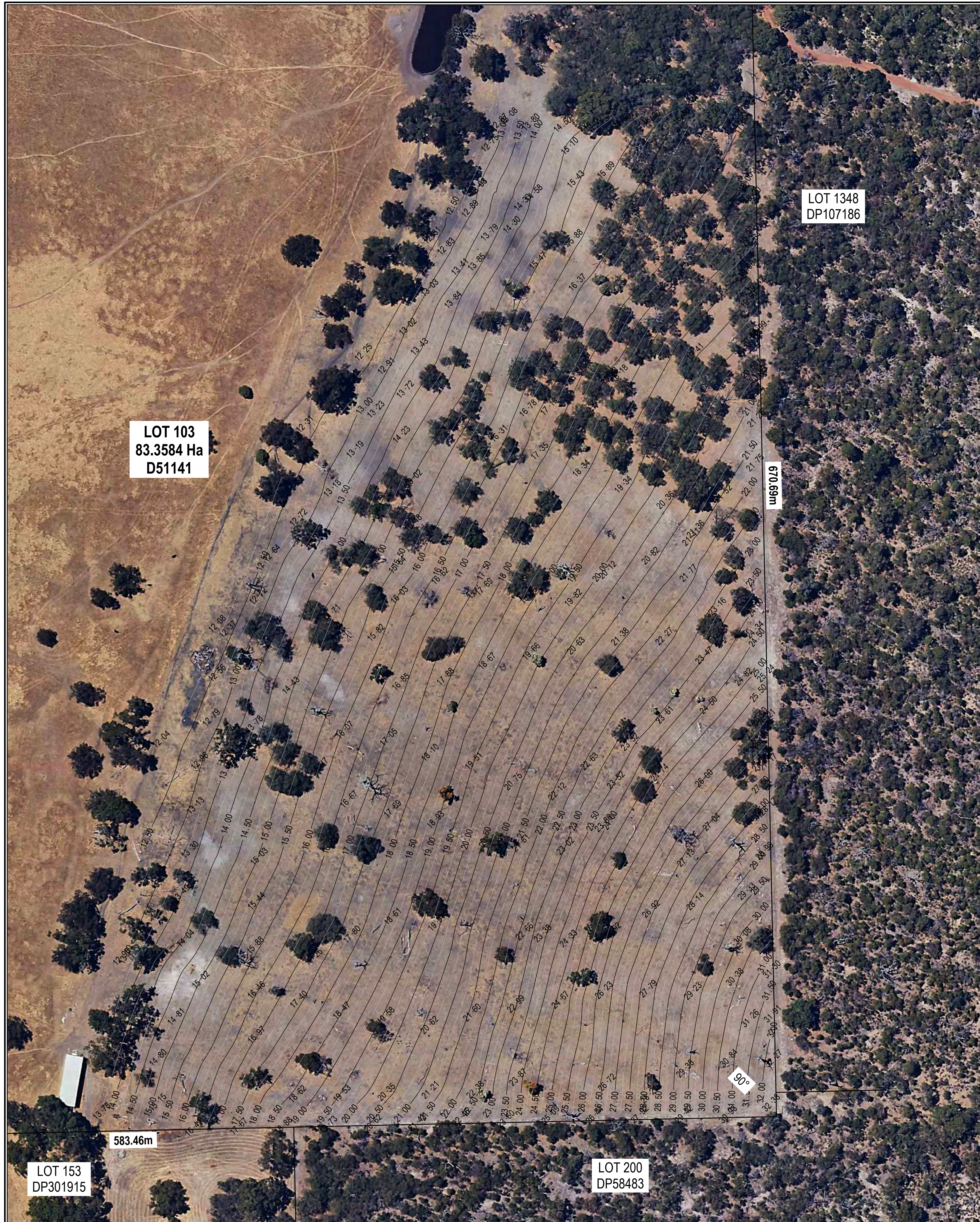
**Legend**

- Lot Boundary
- Extraction area
- Sensitive receptors

<b>PROJECT</b>	103 Boyanup Road West, Stratham	 PO Box 5178 West Busselton Western Australia 6280 Mobile 0418 950 852	<b>Project Number</b>	2311	<b>Designed</b>	PN
<b>DRAWING TITLE</b>	Figure 4 - Sensitive Receptors		<b>Drawing Number</b>	Figure 4	<b>Drawn</b>	PN
<b>CLIENT</b>	Leeuwin Civil Pty Ltd		<b>Revision</b>	A	<b>Checked</b>	
<small>This drawing has been prepared by and remains the property of Accendo Australia Pty Ltd. This drawing shall not be used without permission. The drawing shall be preliminary only and/or not for construction until signed approved.</small>			<b>Date</b>	21/09/2023	<b>Approved</b>	
		<b>Sheet 1 of 1</b>		<b>Local Authority</b>	Shire of Capel	

## APPENDIX A – SITE CONTOUR SURVEY





LOCALITY DIAGRAM (NOT TO SCALE)

LEGEND  
 27.13 EXISTING SURFACE HEIGHT  
 BOUNDARY

- NOTES:
- Limited boundary marks found. Boundary resurvey recommended if building on or close to boundary.
  - Datum is AHD established from VRS / GPS.
  - Above ground services located by survey. Underground services plotted from plans supplied by the relevant authorities. No liability is accepted for errors in underground service locations. All services to be located on site prior to any work being done.
  - No boundary marks found unless otherwise noted.
  - Contour interval is 0.25m.
  - PDF to be used in conjunction with DWG file supplied. Some point heights may have been omitted for clarity; see DWG file.

Scale: 1:1000 0 10 20 30 40 50 ALL DISTANCES IN METRES		Surveyor: MR Survey date: 18/7/2023 Precal/Cad: N/A	The contents of this plan are dated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of the plan's currency by contacting Survecon.
<b>FEATURE AND CONTOUR SURVEY</b> <b>LOT 103 ON DIAGRAM 51141,</b> <b>BOYANUP ROAD, STRATHAM</b>		Client: <b>LEEUWIN CIVIL</b>	The boundaries depicted on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.
		PO Box 365 Duneborough WA 6281 Australia Tel: (08) 9754 1188 Fax: (08) 9756 8000 mail@survecon.com.au www.survecon.com.au	PROJ: Michael CHECKED: [ ] DATE: [ ] DATUM: GDA2011 DRAWN: [ ] <b>9238 SS A</b>



## APPENDIX B - NOISE ASSESSMENT

# Environmental Noise Assessment - Sand Extraction Pit

Lot 103 Boyanup Rd West, Stratham

Reference: 23058082-01 draft 2

Prepared for:  
Accendo Australia

## Reference: 23058082-01 draft 2

### Lloyd George Acoustics Pty Ltd

ABN: 79 125 812 544

PO Box 717

Hillarys WA 6923

[www.lgacoustics.com.au](http://www.lgacoustics.com.au)

Contacts	General	Daniel Lloyd	Terry George	Matt Moyle
E:	<a href="mailto:info@lgacoustics.com.au">info@lgacoustics.com.au</a>	<a href="mailto:daniel@lgacoustics.com.au">daniel@lgacoustics.com.au</a>	<a href="mailto:terry@lgacoustics.com.au">terry@lgacoustics.com.au</a>	<a href="mailto:matt@lgacoustics.com.au">matt@lgacoustics.com.au</a>
P:	9401 7770	0439 032 844	0400 414 197	0412 611 330
Contacts	Rob Connolly	Daryl Thompson	Hao Tran	Matt Nolan
E:	<a href="mailto:rob@lgacoustics.com.au">rob@lgacoustics.com.au</a>	<a href="mailto:daryl@lgacoustics.com.au">daryl@lgacoustics.com.au</a>	<a href="mailto:hao@lgacoustics.com.au">hao@lgacoustics.com.au</a>	<a href="mailto:matt.nolan@lgacoustics.com.au">matt.nolan@lgacoustics.com.au</a>
P:	0410 107 440	0420 364 650	0438 481 207	0448 912 604

This report has been prepared in accordance with the scope of services described in the contract or agreement between Lloyd George Acoustics Pty Ltd and the Client. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client, and Lloyd George Acoustics Pty Ltd accepts no responsibility for its use by other parties.

Date	Rev	Description	Author	Verified
22-08-23	Draft 1	Issued to Client for review	Daniel Lloyd	



## CONTENTS

1. INTRODUCTION.....	1
2. CRITERIA.....	3
2.1. Construction Works.....	3
2.2. Extraction Works.....	3
2.2.1. Regulations 7, 8 & 9.....	3
2.2.2. Regulation 3.....	6
3. METHODOLOGY.....	8
3.1. Site Measurements.....	8
3.2. Noise Modelling.....	8
3.2.1. Ground Absorption.....	8
3.2.2. Topographical Data.....	8
3.2.3. Meteorological Conditions.....	8
3.2.4. Topographical Data.....	9
3.2.5. Source Sound Levels.....	9
4. RESULTS.....	10
4.1. Noise Measurements.....	10
4.2. Noise Modelling.....	12
4.2.1. Construction Phase.....	12
4.2.2. Extraction Phase.....	12
4.3. Truck Noise.....	15
5. ASSESSMENT & RECOMMENDATIONS.....	17
5.1. Extraction Works.....	17
6. CONCLUSION.....	22

## List of Tables

Table 2-1 Adjustments Where Characteristics Cannot Be Removed .....	4
Table 2-2 Baseline Assigned Levels .....	5
Table 2-3 Calculated Assigned Levels .....	6
Table 3-1: Modelling Meteorological Conditions .....	9
Table 3-2: Source Sound Power Levels, dB.....	9
Table 4-1: Predicted Levels during Construction Phase, dB(A) .....	12
Table 4-2: Predicted Levels during Extraction Phase without Noise Mitigation, dB(A) .....	13
Table 4-3: Predicted Levels from Trucks Accessing the Site without Noise Mitigation, dB(A) .....	16
Table 5-1: Predicted & Adjusted (+5dB) Noise Levels with Proposed Mitigation, dB(A) .....	17

## List of Figures

Figure 1-1: Subject Site Location (Source: Google Earth).....	1
Figure 1-2 Site location and Sensitive Receivers .....	2
Figure 4-1 Results of Ambient Noise Measurements.....	10
Figure 4-2 Results of Spectral Analysis .....	11
Figure 4-3: Noise Contour Plot without Noise Mitigation.....	14
Figure 4-4: Truck Access Route.....	15
Figure 4-5: Predicted Noise Levels from Truck Pass-by at Nearest Noise Sensitive Premises .....	16
Figure 5-1: Noise Bund Location and Height .....	18
Figure 5-2: Scenario 1 Noise Contour Plot with Mitigation.....	19
Figure 5-3: Scenario 2 Noise Contour Plot with Mitigation.....	20
Figure 5-4: Scenario 3 Noise Contour Plot with Mitigation.....	21

## Appendices

Appendix A – Terminology .....	23
--------------------------------	----

## 1. INTRODUCTION

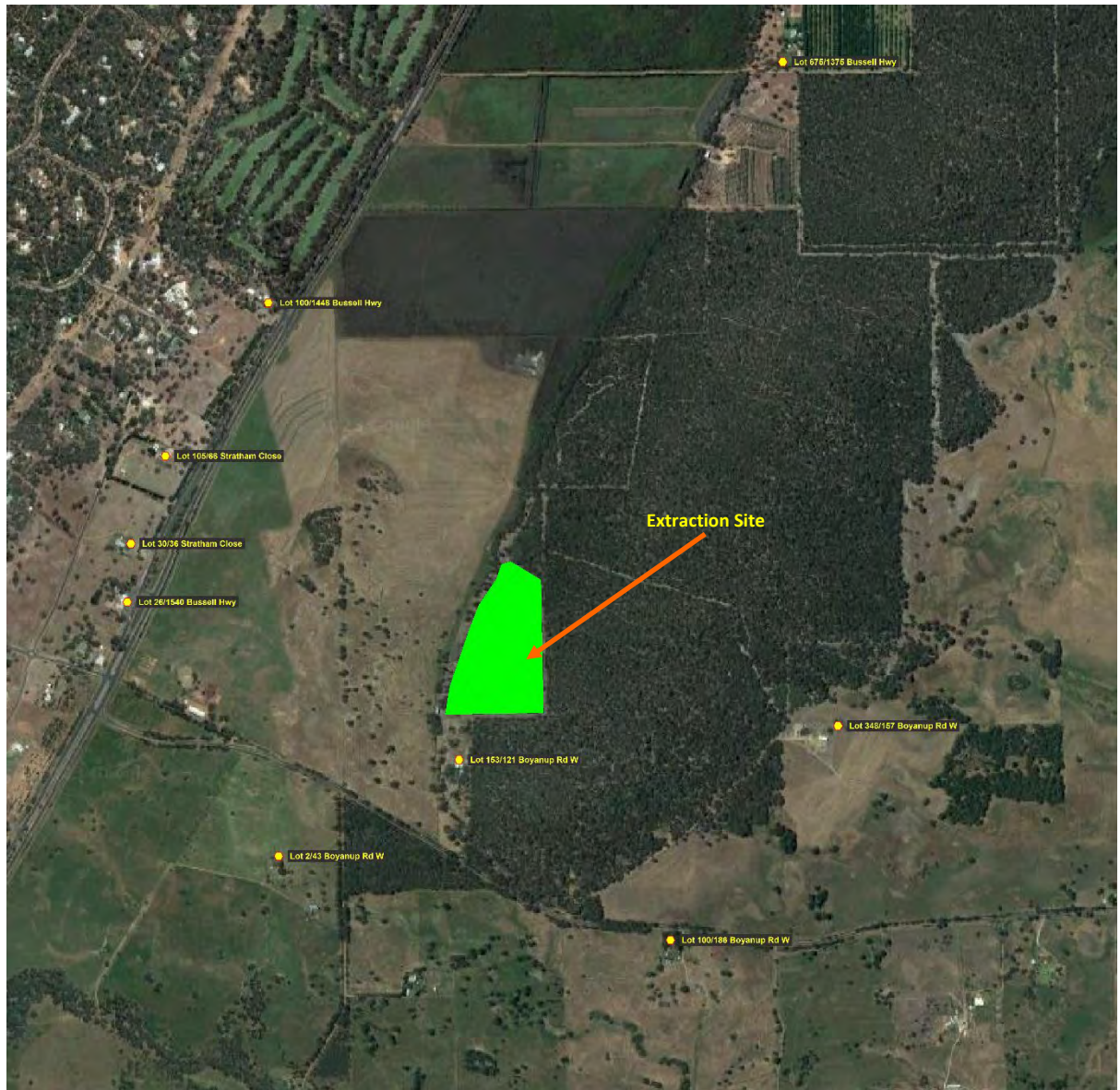
Lloyd George Acoustics has been commissioned to assess the noise from a proposed sand extraction pit at Lot 103 Boyanup Rd West, Stratham to provide recommendations on noise management in order to achieve compliance with the relevant criteria.

*Figure 1-1*, shows the location of the site together and *Figure 1-2* shows the closest noise sensitive receivers in relation to the site.



**Figure 1-1: Subject Site Location (Source: Google Earth)**





**Figure 1-2 Site location and Sensitive Receivers**

With regard to noise emissions, consideration is given to the noise from the extraction plant on the site as well as trucks entering the site to cart the material away. The noise is assessed at neighbouring properties and compared to the prescribed standards of the *Environmental Protection (Noise) Regulations 1997*.

Typical operating hours of the quarry will be from 7.00 a.m. to 7.00 p.m. Monday to Friday and 7.00 a.m. to 1.00 p.m. on Saturdays. The site will be closed on Sundays and Public Holidays.

*Appendix A* contains a description of some of the terminology used throughout this report.

## 2. CRITERIA

### 2.1. Construction Works

Construction activities are covered under Regulation 13 of the *Environmental Protection (Noise) Regulations 1997, (the Regulations)* and provide the noise requirements that are to be satisfied. Regulation 13 is considered appropriate for the removal of topsoil, which means that the normally prescribed assigned noise levels under regulation 7 of the *Regulations* are not applicable to this phase of the operations as described below.

*Regulation 7 does not apply to noise emitted from a construction site as a result of construction work carried out between 0700 hours and 1900 hours on any day which is not a Sunday or public holiday if the occupier of the premises ... shows that –*

- a) *The construction work was carried out in accordance with control of environmental noise practices set out in section 4 of AS 2436-2010 Guide to noise and vibration control on construction, maintenance and demolition sites; and*
- b) *The equipment used on the premises was the quietest reasonably available; and*
- c) *If the occupier was required to prepare a noise management plan ... in respect of the construction site –*
  - i. *The noise management plan was prepared and given in accordance with the requirement, and approved by the Chief Executive Officer; and*
  - ii. *The construction work was carried out in accordance with the noise management plan, excluding any ancillary measure.*

### 2.2. Extraction Works

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

#### 2.2.1. 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 A). 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 [Table 2-1] ... 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 noise 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 <sub>A10</sub>	L <sub>A1</sub>	L <sub>Amax</sub>
Noise sensitive premises: highly sensitive area <sup>1</sup>	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 building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
  - any other part of the premises within 15 metres of that building or that part of the building.

As there are no commercial or industrial premises within 450m of the affected receivers, the influencing factor (IF), in relation to noise received at noise sensitive premises, has been calculated as 0 dB. However, some receivers are within 450m of Bussell Highway and will therefore have a transport factor added. The assigned levels (0700 to 1900 hours Monday to Saturday) are provided in *Table 2-3*.

**Table 2-3 Calculated Assigned Levels**

Receiver	Influencing Factor	Transportation Factor	Assigned Level dB L <sub>A10</sub>	Comment
Lot 100/1448 Bussell Hwy	0	6	51	Within 100m of a major road
Lot 105/66 Stratham Close	0	6	51	Within 100m of a major road
Lot 30/36 Stratham Close	0	6	51	Within 100m of a major road
Lot 26/1540 Bussell Hwy	0	6	51	Within 100m of a major road
Lot 153/121 Boyanup Rd W	0	0	45	No adjustment
Lot 2/43 Boyanup Rd W	0	0	45	No adjustment
Lot 100/186 Boyanup Rd W	0	0	45	No adjustment
Lot 348/157 Boyanup Rd W	0	0	45	No adjustment
Lot 675/1375 Bussell Hwy	0	0	45	No adjustment

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.

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.

### 2.2.2. 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;”*
  - noise emissions from –*
  - (b) *a reversing alarm fitted to a motor vehicle, mobile plant, or mining or earthmoving equipment;*
- If -*
- it is a requirement under another written law that such an alarm be fitted; and*
  - it is not practicable to fit an alarm that complies with the written law under which it is required to be fitted and emits noise that complies with these regulations;*



It is considered that any reversing alarms fitted to the mobile plant and transport trucks are not necessarily exempt under the Regulations, since they are not specifically required under another written law.

The commonly used fixed noise output tonal reversing alarms also known as 'reversing beeper' emit, by their very nature, tonal and modulating noise at high levels. As such, this type of reversing alarm generally cannot comply with the Regulations even at distant receivers. Alternative alarms such as broadband alarms are commonly used to minimise the impact.

DRAFT

## 3. METHODOLOGY

### 3.1. Site Measurements

Under the Regulations, there are certain requirements that must be satisfied when undertaking measurements and are defined in Regulations 19, 20, 22 and 23 and Schedule 4. In undertaking the measurements, these have been satisfied, specifically noting the following:

- The noise data logger used was an ARL Type Ngara (S/N: 8780F7).
- All equipment holds current laboratory certificates of calibration that are available upon request. The equipment was also field calibrated before and after and found to be within +/- 0.5 dB.
- The microphone was fitted with a standard wind screen.
- The microphone was at least 1.2 metres above ground level and at least 3.0 metres from reflecting facades (other than the ground plane).

Measurements were recorded from the 19<sup>th</sup> June to 1<sup>st</sup> July 2023. The sample period was set to 15-minutes and various percentile data recorded.

### 3.2. Noise Modelling

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 algorithms (ISO 171534-3 improved method) selected, as they include the influence of meteorological conditions. Input data required in the model are listed below and discussed in *Section 3.2.1* to *Section 3.2.4*:

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

#### 3.2.1. Ground Absorption

The ground absorption has been assumed to be 0.2 (20%) for the extraction area, assuming a mainly sand and 1.0 (100%) elsewhere assuming grass paddocks, noting that 0.0 represents hard reflective surfaces such as concrete and 1.0 represents absorptive surfaces such as grass.

#### 3.2.2. Topographical Data

Topographical data for the quarry area natural ground surface was sourced from *GoogleEarth* in the form of spot heights.

#### 3.2.3. 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) <sup>2</sup>
Temperature (°C)	20
Humidity (%)	50
Wind Speed (m/s)	4
Wind Direction <sup>1</sup>	All
Pasquil Stability Factor	E

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.

### 3.2.4. Topographical Data

Topographical data for the quarry area natural ground surface was sourced from *GoogleEarth* in the form of spot heights.

### 3.2.5. 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)
	31.5	63	125	250	500	1k	2k	4k	
Mobile Sand Screen	64	83	86	86	98	102	100	98	<b>106</b>
CAT D8 Dozer	66	81	96	101	107	108	108	100	<b>113</b>
CAT 966 Front End Loader	59	84	86	87	103	106	103	97	<b>109</b>
CAT 330 Excavator	50	75	96	103	93	95	95	91	<b>105</b>
Truck moving at low speed	90	90	97	97	94	92	93	90	<b>103</b>

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

- Sources are assumed to be 2m above the ground;
- Data obtained from manufacturer's data and on-site measurements (sand screen);
- Location of noise sources represent worse-case scenario and are indicated within the noise contour plots in *Section 4*.

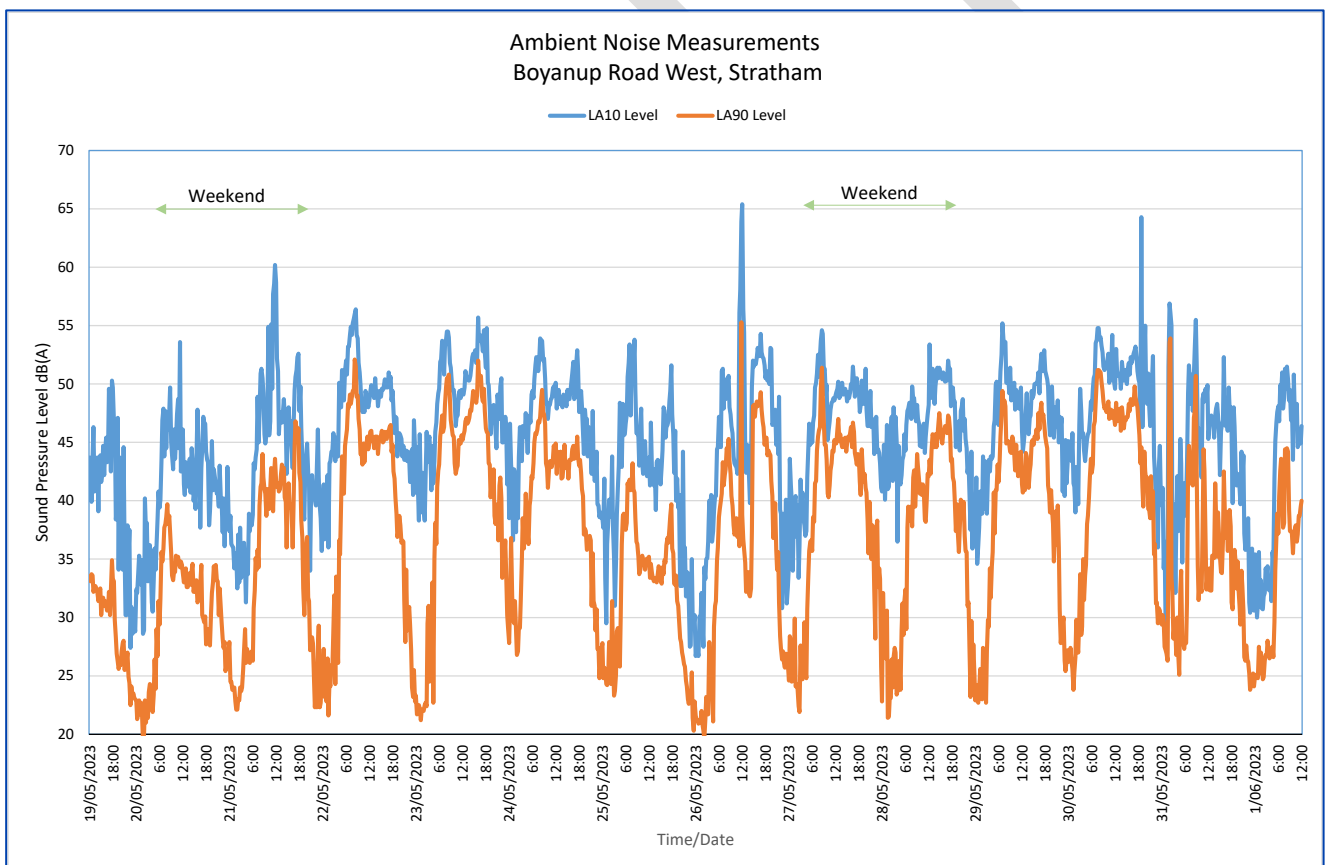
## 4. RESULTS

### 4.1. Noise Measurements

The purpose of undertaking ambient noise measurements is to determine whether the subject noise, particularly annoying characteristics such as tonality, is likely to be audible above background levels. To achieve this, the noise level that is exceeded for 90% of the time (lowest 10%) over a 15 minute period ( $L_{A90}$  level) is calculated and then the 90<sup>th</sup> percentile of that level is used as the background level over the corresponding time period.

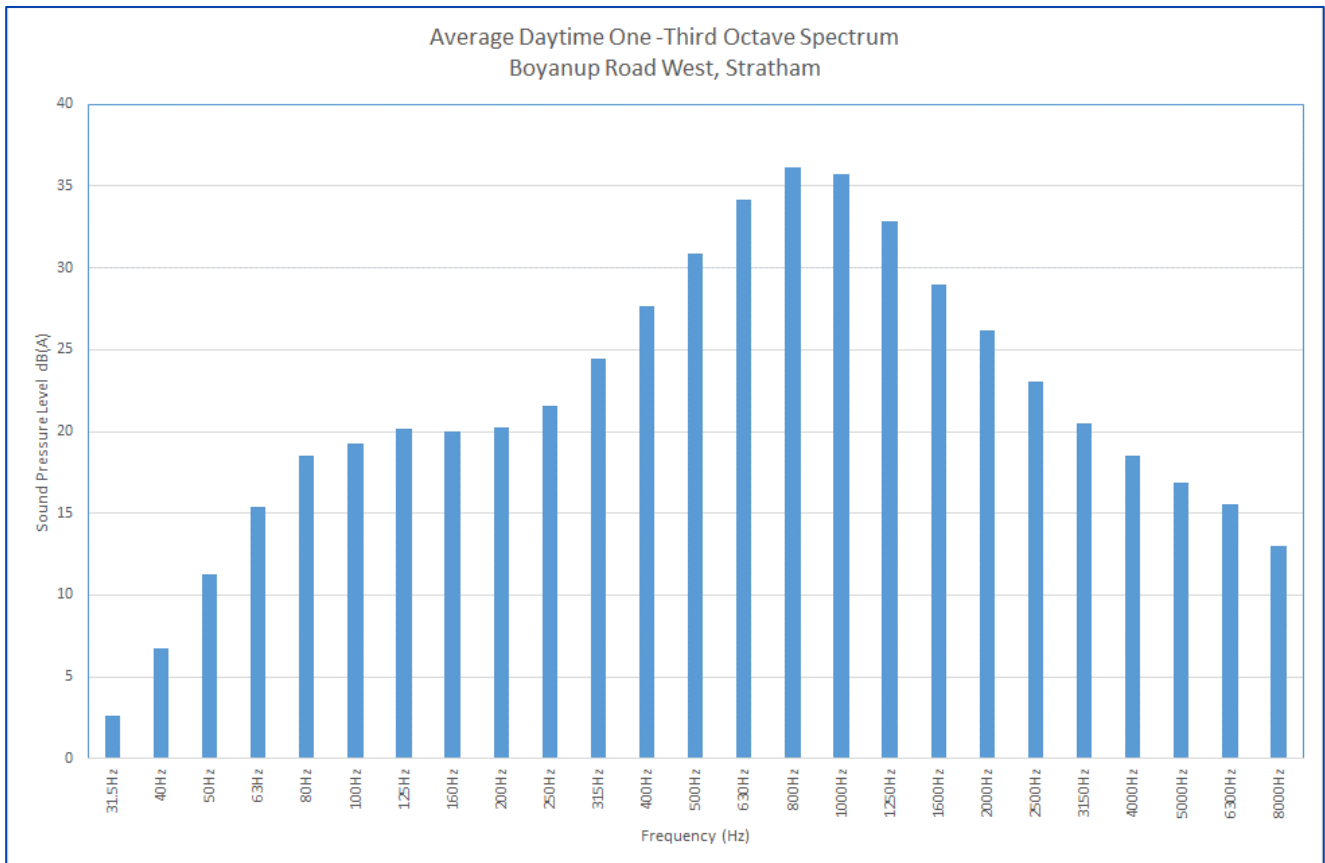
While the subject noise may not be audible at all times, due to short-term noise events such as traffic or farm machinery ( $L_{A10}$  level), the overall background level can be used to determine if the subject noise is likely to be audible during times when no other noise events are occurring.

The noise level in each 15-minute interval is shown *Figure 4-1*. The overall background noise level for the day period (when extraction works are proposed to be carried out) is calculated as 38.6 dB  $L_{A90}$ .



**Figure 4-1 Results of Ambient Noise Measurements**

Third octave analysis for the average of the day periods is presented in *Figure 4-2*.



**Figure 4-2 Results of Spectral Analysis**

The results show that the overall noise levels are not particularly low during the day, most likely as a result of traffic on Bussell Highway. It could therefore be argued that the noise impact from the proposed extraction pit would not be intrusive.

The spectral analysis does show that the levels are quite low between 63Hz and 100Hz, which would be the typical tonal component of earth moving equipment. Therefore a penalty for tonality (see Table 2-1) would need to be included in the assessment.

## 4.2. Noise Modelling

### 4.2.1. Construction Phase

The predicted noise levels during the construction phase of removing the topsoil and building the noise bunds on the southern boundary are provided below in *Table 4-1*. To ensure noise levels are kept to a minimum, only the excavator will be used wherever possible.

**Table 4-1: Predicted Levels during Construction Phase, dB(A)**

Receiver	Predicted Noise Level dB L <sub>A10</sub>	Assigned Level dB L <sub>A10</sub>
Lot 100/1448 Bussell Hwy	34	51
Lot 105/66 Stratham Close	36	51
Lot 30/36 Stratham Close	36	51
Lot 26/1540 Bussell Hwy	37	51
Lot 153/121 Boyanup Rd W	57	45
Lot 2/43 Boyanup Rd W	42	45
Lot 100/186 Boyanup Rd W	22	45
Lot 348/157 Boyanup Rd W	24	45
Lot 675/1375 Bussell Hwy	27	45

### 4.2.2. Extraction Phase

The noise levels were predicted to the closest noise sensitive premises for typical scenarios using the proposed plant. It is assumed the operations will start in the north of the site and work towards the south. The pit floor will be at 10m AHD.

The results, provided in *Table 4-2*, show the noise levels as the operations are in the south, which is considered to be the worst-case in terms of noise impacts to the nearest premises, being Lot 153/121 Boyanup Road West.

It can be seen that noise mitigation is required in order to achieve compliance with the assigned levels under the Regulations.

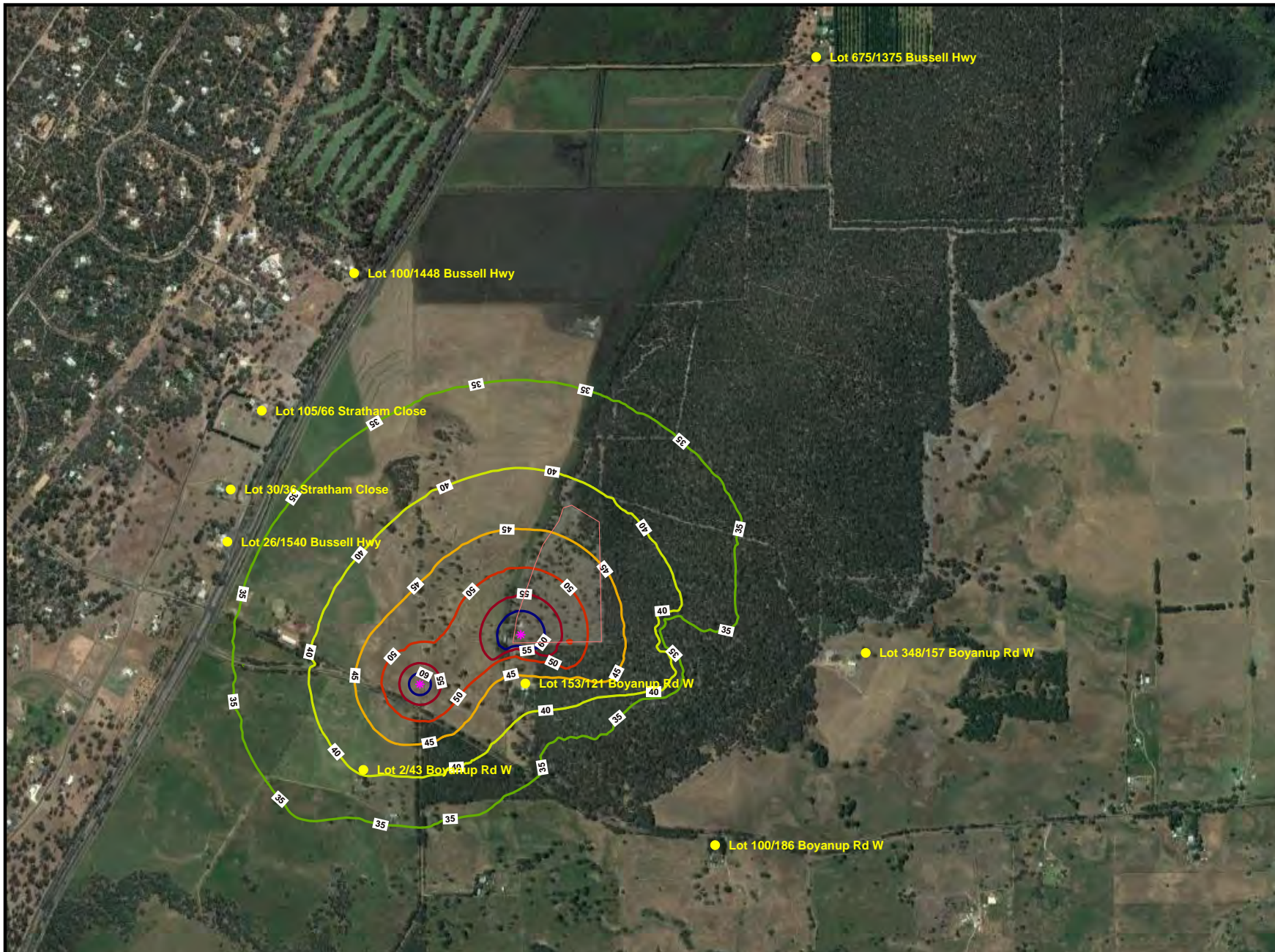
A noise contour plot is also provided in *Figure 4-3* showing noise levels at ground floor.

**Table 4-2: Predicted Levels during Extraction Phase without Noise Mitigation, dB(A)**

Receiver	Predicted Noise Level L <sub>A10</sub> dB	Adjusted Noise Level L <sub>A10</sub> dB	Criterion L <sub>A10</sub> dB	Comment
Lot 100/1448 Bussell Hwy	30	35	51	Complies with Assigned Level
Lot 105/66 Stratham Close	32	37	51	Complies with Assigned Level
Lot 30/36 Stratham Close	33	38	51	Complies with Assigned Level
Lot 26/1540 Bussell Hwy	33	38	51	Complies with Assigned Level
Lot 153/121 Boyanup Rd W	44	49	45	Exceeds Assigned Level
Lot 2/43 Boyanup Rd W	37	42	45	Complies with Assigned Level
Lot 100/186 Boyanup Rd W	11	16	45	Complies with Assigned Level
Lot 348/157 Boyanup Rd W	18	23	45	Complies with Assigned Level
Lot 675/1375 Bussell Hwy	23	28	45	Complies with Assigned Level



# Figure 4-3



### Signs and symbols

Bund

● Point receiver

\* Point source



Length Scale



Sand Extraction Pit - Lot 103 Boyanup Rd West, Stratham  
Predicted  $L_{A10}$  Noise Levels Assuming No Mitigation - Wind from All Directions



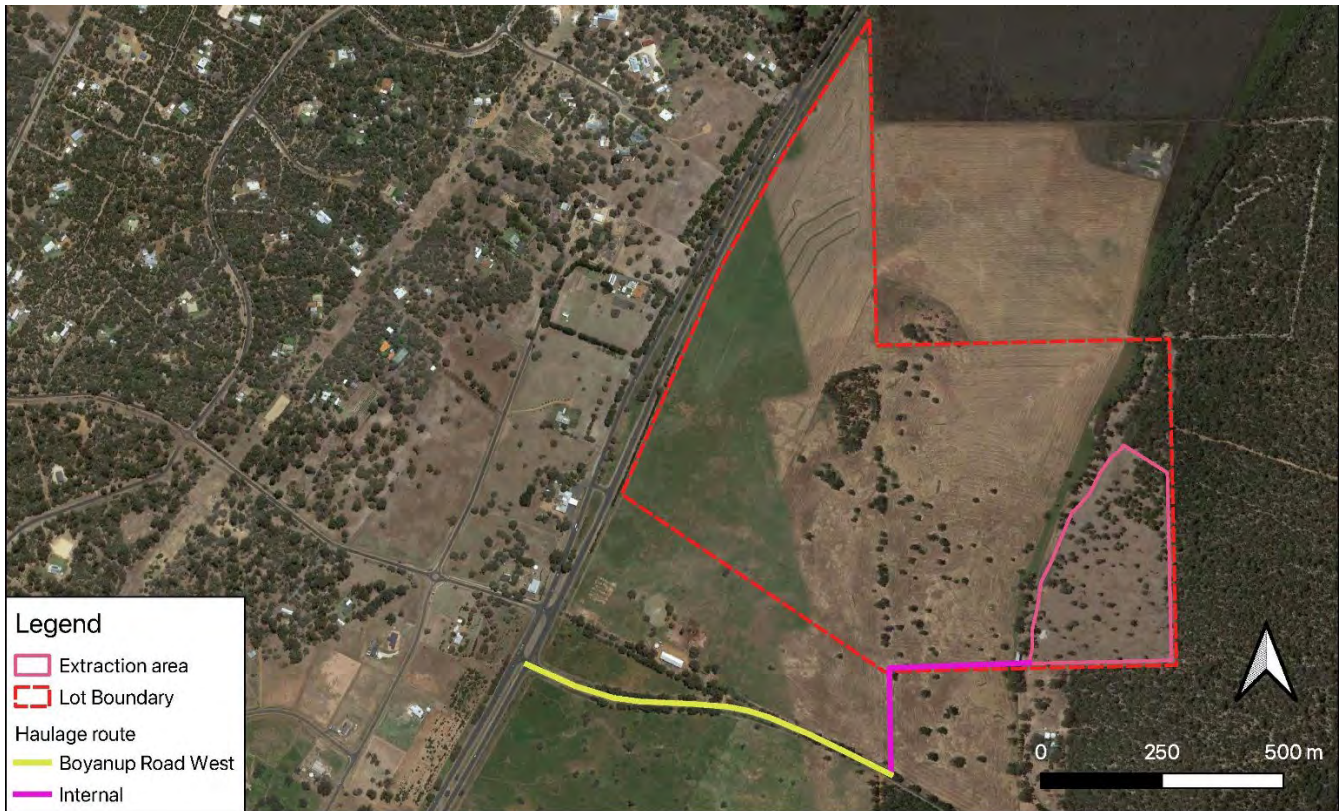
Lloyd George Acoustics

www.lgacoustics.com.au  
(08) 9401 7770



### 4.3. Truck Noise

Trucks will access the site using the access road as indicated in *Figure 4-4*. It is assumed that the trucks will travel at a speed of 30km/h. Due to the number of trucks entering the site in any four-hour period, the  $L_{A10}$  criteria would be applicable.



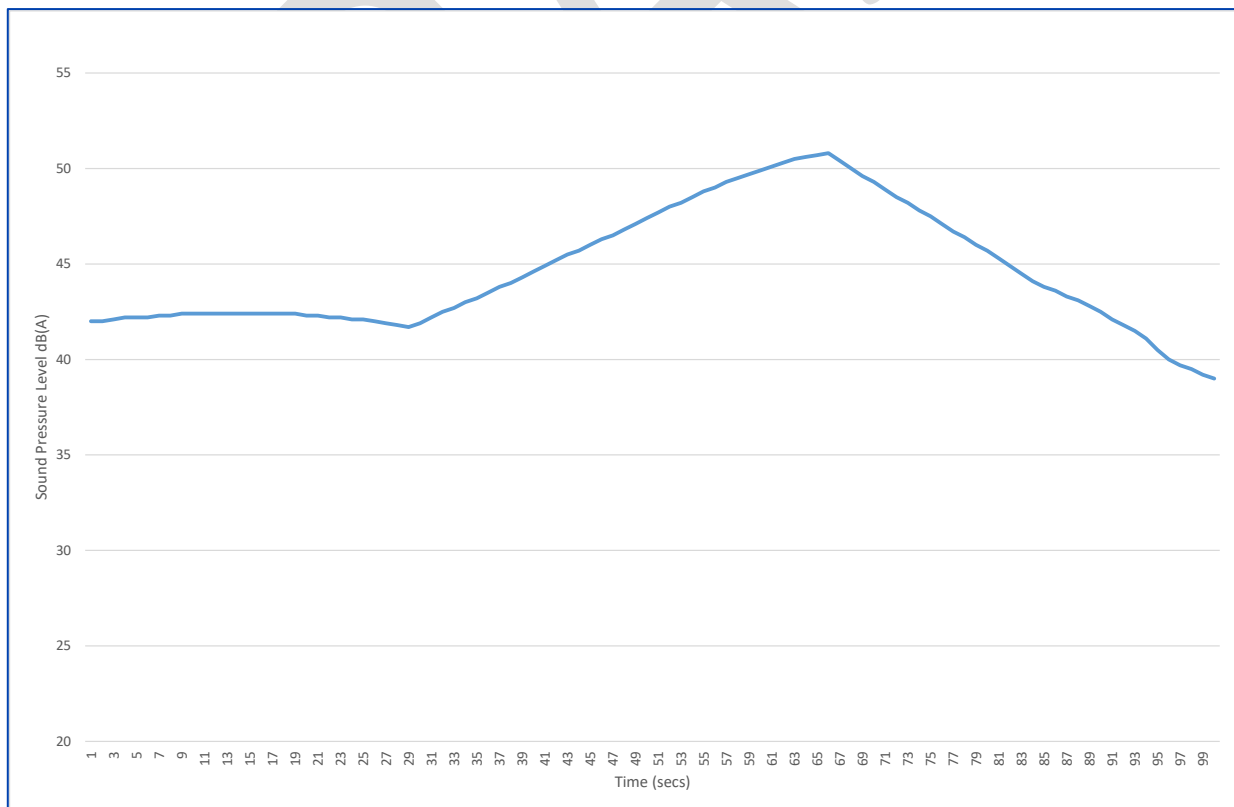
**Figure 4-4: Truck Access Route**

The predicted noise levels from trucks accessing the access road is presented in *Table 4-3*. Truck noise is generally not tonal, so adjustments would not be required.

**Table 4-3: Predicted Levels from Trucks Accessing the Site without Noise Mitigation, dB(A)**

Receiver	Predicted Noise Level L <sub>A10</sub> dB	Criterion L <sub>A10</sub> dB	Comment
Lot 100/1448 Bussell Hwy	31	51	Complies with Assigned Level
Lot 105/66 Stratham Close	33	51	Complies with Assigned Level
Lot 30/36 Stratham Close	35	51	Complies with Assigned Level
Lot 26/1540 Bussell Hwy	36	51	Complies with Assigned Level
Lot 153/121 Boyanup Rd W	51	45	Exceeds Assigned Level
Lot 2/43 Boyanup Rd W	44	45	Complies with Assigned Level
Lot 100/186 Boyanup Rd W	29	45	Complies with Assigned Level
Lot 348/157 Boyanup Rd W	30	45	Complies with Assigned Level
Lot 675/1375 Bussell Hwy	23	45	Complies with Assigned Level

The predicted noise levels from a truck pass-by to the nearest noise sensitive receiver, being Lot 153/121 Boyanup Road West, is shown in *Figure 4-5*.



**Figure 4-5: Predicted Noise Levels from Truck Pass-by at Nearest Noise Sensitive Premises**

## 5. ASSESSMENT & RECOMMENDATIONS

### 5.1. Extraction Works

Noise from mechanical plant, such as front-end loaders, generally exhibit tonal noise characteristics and therefore a penalty of +5 dB would apply to the predicted noise levels as detailed in *Table 2-1*.

From the background noise measurements presented in *Section 4.1*, it can be seen that the lowest background level is around 38 dB  $L_{A90}$ , so the highest predicted noise level of 39 dB  $L_{A10}$ , is not expected to be intrusive.

From the results (*Table 4-1*), it can be seen that with the addition of a +5 dB penalty, noise levels resulting from the extraction works, during the hours 7.00 a.m. to 7.00 p.m. Monday to Saturday, are predicted to exceed the assigned level of 45 dB  $L_{A10}$  at Lot 153/121 Boyanup Road West. The noise to all other noise sensitive premises is predicted to comply.

To address the noise, it is recommended to construct a 4.0m high earth bund on the southern boundary as detailed in *Figure 5-1*.

The noise from trucks entering the site is also shown to exceed the assigned level of 45 dB  $L_{A10}$  at Lot 153/121 Boyanup Road West. Taking into consideration the attenuation of the noise bund, shown in *Figure 5-1*, the predicted noise level at this receiver is reduced to 39 dB  $L_{A10}$ .

The predicted  $L_{A10}$  noise levels for three typical scenarios (operations in north, centre and south) are presented in *Table 5-1* and shown graphically in *Figures 5-2 to 5-4*. The predicted noise levels assume that a front end loader and excavator are working on the pit floor and a sand screen is operating close to the pit face. The predicted noise from trucks entering and leaving the site is also incorporated into the overall results.

**Table 5-1: Predicted & Adjusted (+5dB) Noise Levels with Proposed Mitigation, dB(A)**

Receiver	Scenario 1 Predicted & Adjusted Noise Level $L_{A10}$ dB	Scenario 2 Predicted & Adjusted Noise Level $L_{A10}$ dB	Scenario 3 Predicted & Adjusted Noise Level $L_{A10}$ dB	Comment
Lot 100/1448 Bussell Hwy	38	38	36	Complies with Assigned Level
Lot 105/66 Stratham Close	39	39	38	Complies with Assigned Level
Lot 30/36 Stratham Close	39	39	39	Complies with Assigned Level
Lot 26/1540 Bussell Hwy	39	40	39	Complies with Assigned Level
Lot 153/121 Boyanup Rd W	44	44	45	Complies with Assigned Level
Lot 2/43 Boyanup Rd W	40	41	34	Complies with Assigned Level
Lot 100/186 Boyanup Rd W	16	19	16	Complies with Assigned Level
Lot 348/157 Boyanup Rd W	24	24	24	Complies with Assigned Level
Lot 675/1375 Bussell Hwy	31	31	29	Complies with Assigned Level

**Figure 5-1**

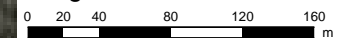


Signs and symbols

 Bund



Length Scale



Sand Extraction Pit - Lot 103 Boyanup Rd West, Stratham  
Proposed Noise Bund Location and Height

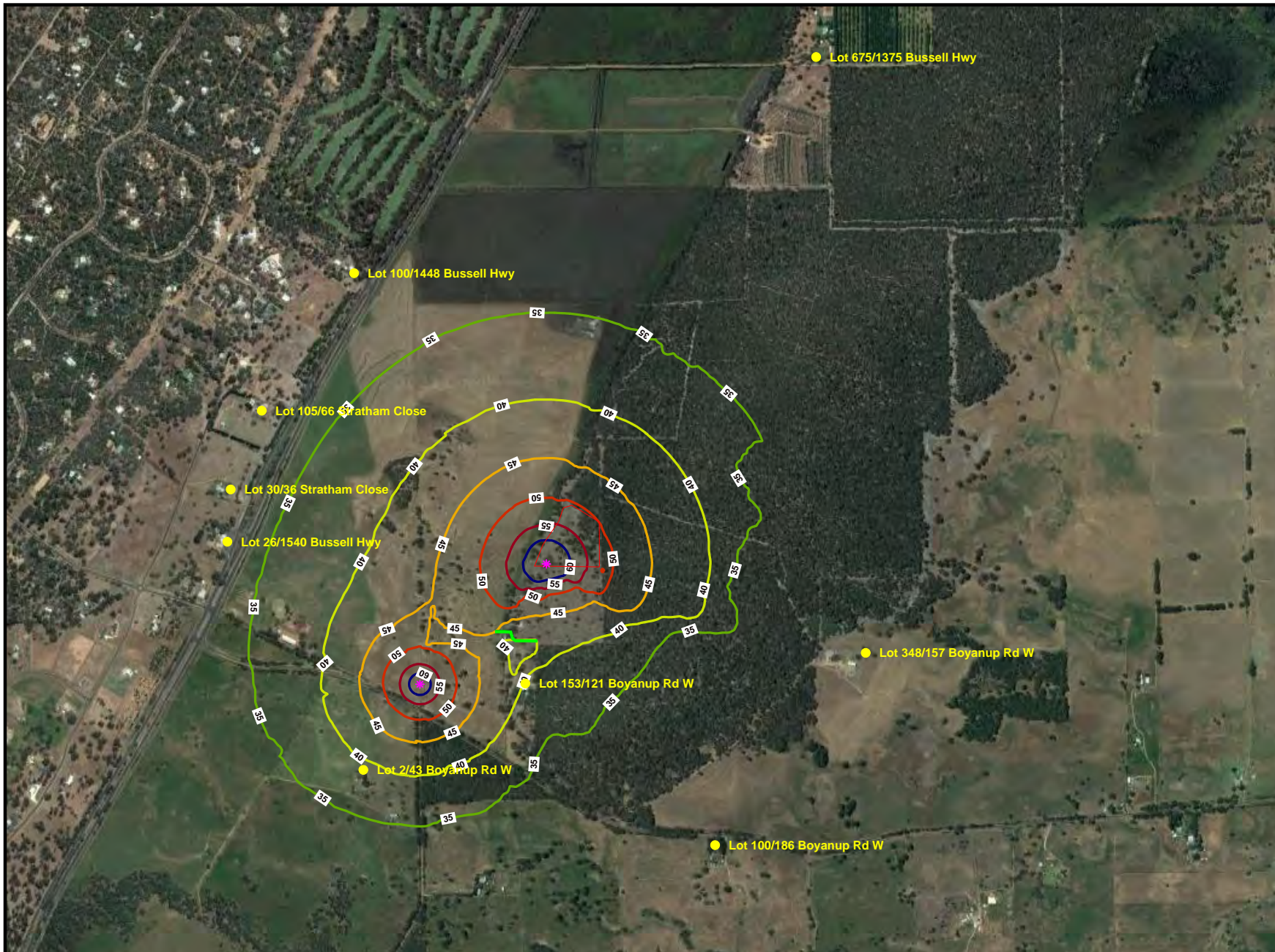


**Lloyd George Acoustics**




[www.lgacoustics.com.au](http://www.lgacoustics.com.au)  
(08) 9401 7770



Figure 5-2



Signs and symbols

-  Bund
-  Point receiver
-  Point source



Length Scale



Sand Extraction Pit - Lot 103 Boyanup Rd West, Stratham  
Predicted  $L_{A10}$  Noise Levels during Scenario 1 of Extraction Operations - Wind from All Directions

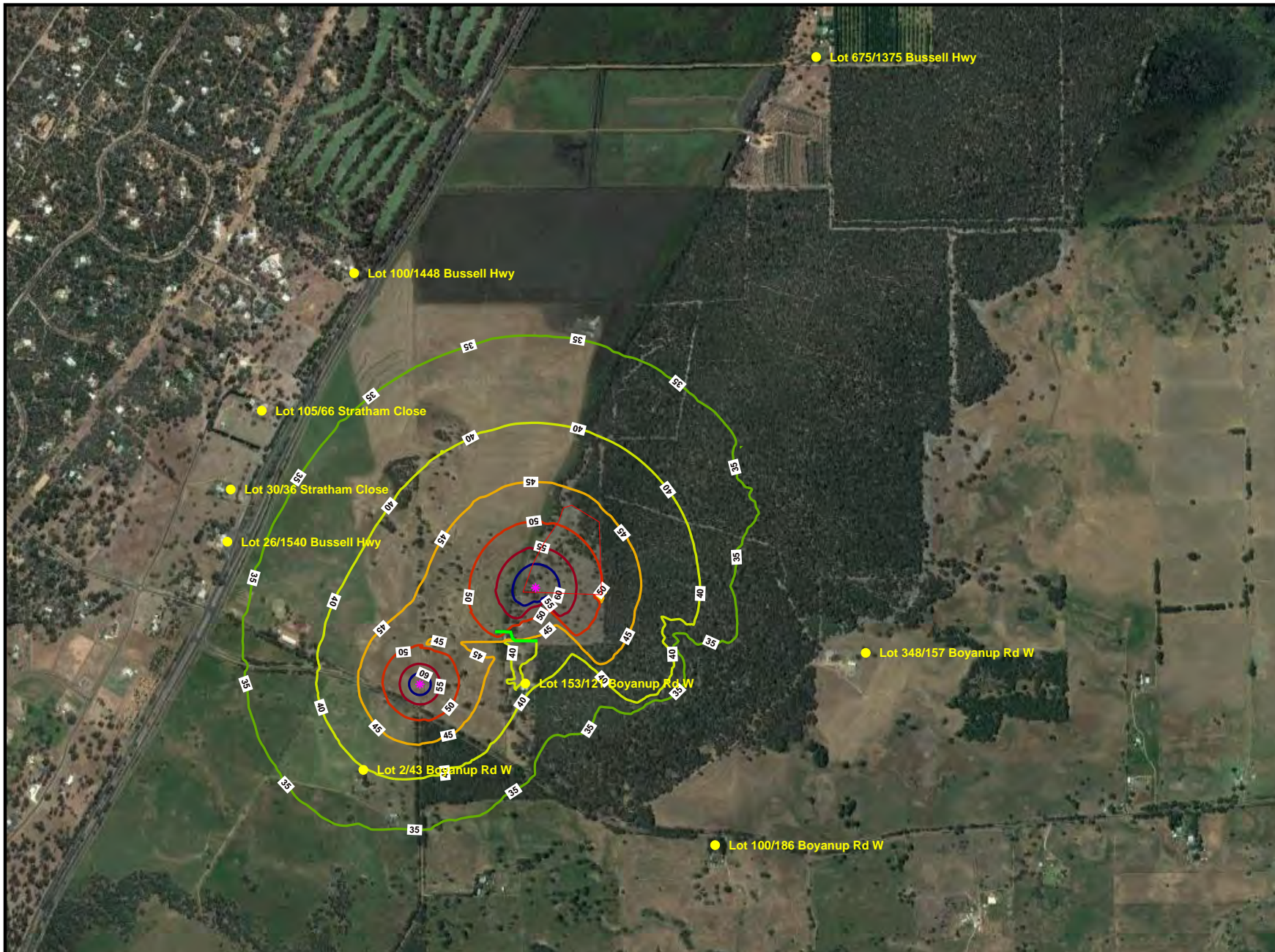


Lloyd George Acoustics




[www.lgacoustics.com.au](http://www.lgacoustics.com.au)  
(08) 9401 7770



# Figure 5-3

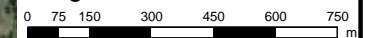


### Signs and symbols

-  Bund
-  Point receiver
-  Point source



### Length Scale



Sand Extraction Pit - Lot 103 Boyanup Rd West, Stratham  
Predicted  $L_{A10}$  Noise Levels during Scenario 2 of Extraction Operations - Wind from All Directions

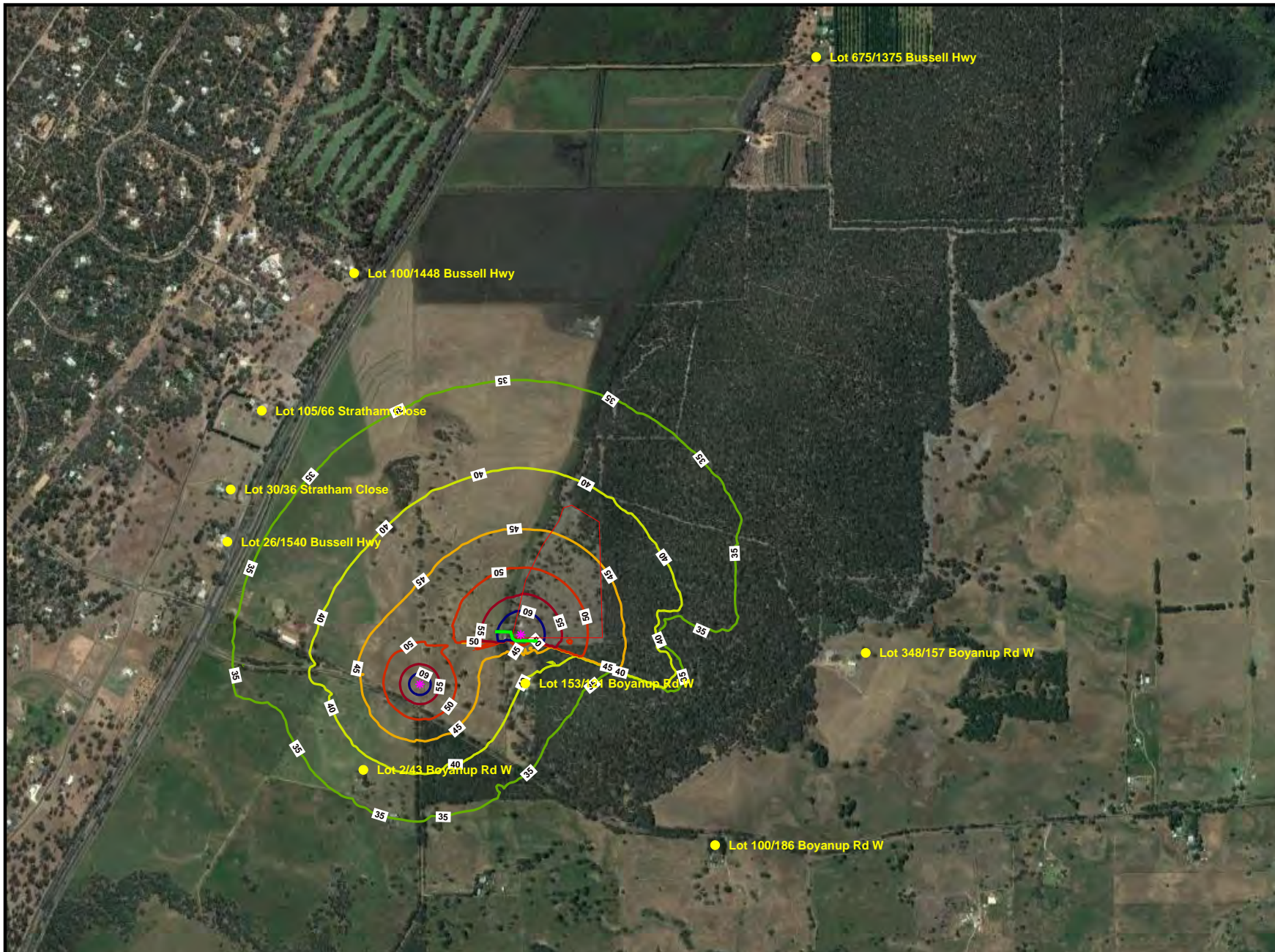


**Lloyd George Acoustics**




[www.lgacoustics.com.au](http://www.lgacoustics.com.au)  
(08) 9401 7770



# Figure 5-4

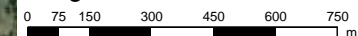


### Signs and symbols

-  Bund
-  Point receiver
-  Point source



### Length Scale



Sand Extraction Pit - Lot 103 Boyanup Rd West, Stratham  
Predicted  $L_{A10}$  Noise Levels during Scenario 3 of Extraction Operations - Wind from All Directions



**Lloyd George Acoustics**

[www.lgacoustics.com.au](http://www.lgacoustics.com.au)  
(08) 9401 7770

## 6. CONCLUSION

The noise emissions resulting from the proposed extraction and crushing operations at Lot 103 Boyanup Rd West, Stratham, Western Australia, have been assessed by means of predictive noise modelling and the results compared against the assigned levels within the *Environmental Protection (Noise) Regulations 1997*.

Based on the assumptions made, it is concluded that compliance with the applicable assigned noise level can be achieved at all noise sensitive receivers between 7.00 a.m. and 7.00 p.m. Monday to Saturday, providing the an earth bund is constructed on the southern boundary of the extraction area.

In addition, the following best practices should be implemented to further minimise noise impacts:

- Selection of the plant should be the quietest reasonably practicable;
- If reversing alarms are deemed necessary, all plant should to be fitted with broadband reversing alarms; and
- The road required for loading of trucks should be designed such that the trucks are not required to reverse, this ensures truck reversing alarms are minimised.



## Appendix A – Terminology

DRAFT

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<sub>A10</sub>**

The L<sub>A10</sub> 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<sub>A90</sub>**

The L<sub>A90</sub> 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<sub>Aeq</sub>**

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<sub>Amax</sub> assigned level**

Means an assigned level, which, measured as a L<sub>ASlow</sub> value, is not to be exceeded at any time.

- **L<sub>A1</sub> assigned level**

Means an assigned level, which, measured as a L<sub>ASlow</sub> value, is not to be exceeded for more than 1 percent of the representative assessment period.

- **L<sub>A10</sub> assigned level**

Means an assigned level, which, measured as a L<sub>ASlow</sub> 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.



## APPENDIX C - COMPLAINTS REGISTER



**Complaints Register**

Ref. No.	Date	Name & Address of Complainant	Time/Date of Complaint	Detail of Complaint	Summary of Actions Taken	Shire Notified	Person Responsible