



# ARCHITECTURAL ACOUSTICS

## DEVELOPMENT APPROVAL REPORT

LOT 11 YANCHEP BEACH ROAD  
PROPOSED BP CONVENIENCE STORE

18<sup>th</sup> July 2018



For

**HARLEY DYKSTRA**

Unit 15, 2 Hensbrook Loop  
FORRESDALE WA 6112

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## ATTACHMENTS

- APPENDIX A - Noise Contour Diagrams (x8)

Report Version	Author	Notes	Date
Initial Report	Michael Ferguson		16 <sup>th</sup> July 2018
Rev A	Michael Ferguson	General updates to report as per 18/07/18 email	18 <sup>th</sup> July 2018



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## 1. INTRODUCTION

As requested, this report summarises all potential environmental noise issues applicable to the Development Approval stage of the proposed BP Convenience Store at Lot 11 Yanchep Beach Road, Yanchep.

This report is based upon the drawings received 2<sup>nd</sup> of July, 2018. This report outlines the following:

- Demonstrates that the project team is aware of their Regulatory obligations with regards to noise emissions,
- Establishes the project specific Assigned Noise Level criteria in accordance with the Regulations,
- Identifies the relevant Noise Sources and the Assigned Noise Levels applicable to each source,
- Identifies acoustic issues that will be addressed in detail during design and documentation stages, to ensure compliance with the Environmental Protection (Noise) Regulations (EPNR),
- Provides an initial assessment and recommendations to ensure compliance with the EPNR.

## 2. ENVIRONMENTAL NOISE EMISSIONS

Noise emissions generated by the use of the proposed facilities must comply with the Environmental Protection (Noise) Regulations, 1997 (as amended Dec 2013). The criteria for noise emissions from this development to neighbouring premises are called the Assigned Noise Levels, and vary depending on time of day, receiver location, duration of the noise source etc. The site specific criteria are set out in Section 2 of this report.

The neighbouring highly noise sensitive premises are:

- Existing residences located to the East of the proposed development, across Newman Rd.

Our current calculations and recommendations are based upon these above mentioned properties.

The site specific Assigned Noise Level criteria takes into account the land zoning and traffic flows within 100m and 450m of the relevant receiver locations. This has been based on the land zoning information obtained from the City of Wanneroo Intramaps website.

### Land Zoning Influencing Factor

There is approximately 19% of the inner circle and that is deemed to be commercial in nature, with no commercial properties present in the outer circle. Therefore the Influencing Factor for land use is a +1dB(A) adjustment to the Assigned Noise Levels.

### Transport Influencing Factor

Typically, the amount of traffic on nearby roads has an influencing factor on the assigned noise levels. In this case however there are no Major or Secondary roads within the 100m of 450m radii. Therefore, there are no influencing factors applied to the assigned noise levels for Transport.

## 2.1 Assigned Noise Levels

Based on the above, there is an Influencing Factor +1dB(A) relevant to the residences in the surrounding area to the proposed development. On this basis, the regulatory Assigned Noise Level criteria to be applied to this development are:

Type of premises receiving noise	Time of day	Assigned Noise Level (dB)		
		L <sub>A10</sub>	L <sub>A1</sub>	L <sub>Amax</sub>
Noise sensitive premises; highly sensitive area. (i.e. within 15m of a residential building)	0700 to 1900 hours Monday to Saturday	46	56	66
	0900 to 1900 hours Sunday and public holidays	41	51	66
	1900 to 2200 hours all days	41	51	56
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays.	36	46	56

Table 01 - Assigned Noise Levels

The sound level parameters used for the various environmental noise criteria are described below, based on an assessment period of 15 minutes up to 4 hours:

- L<sub>A10</sub>** is the 'A' weighted noise level which is not to be exceeded for more than 10% of the time, e.g. for more than 10 minutes in 100 minutes. This is the parameter relevant to most HVAC equipment, and emissions from other longer term noise sources that run for extended duration (such as fuel bowsers, mechanical units, etc.).
- L<sub>A1</sub>** is the 'A' weighted noise level which is not to be exceeded for more than 1% of the time, e.g. for more than 1 minute in 100 minutes, or up to 24 minutes in 4 hours. This is the parameter relevant to noise sources that only occur occasionally, for short durations, (e.g. vehicle movements).
- L<sub>Amax</sub>** is the 'A' weighted noise level for individual events (e.g. car door closes) which is not to be exceeded at any time.

## 2.2 Adjustments for Noise Character

In accordance with Regulation 9, sounds with tonal, modulating or impulsive characteristics are deemed to be more annoying, and therefore an adjustment of +5dB is required to be added to the measured level for tonal and modulating characteristics, and +10dB for impulsive characteristics; where measurable at the point of reception.

In accordance with the noise assessment techniques described in the Regulations, noise emission from most mechanical equipment such as condensing units etc. are considered tonal and therefore a +5dB adjustment is required to be added the measured (or predicted) level.

Based on the documentation, we have also assumed that the car parking bays are for the sole use of the proposed Convenience Store. Thus, any noise emissions from car doors closing must also be assessed against the Regulations. In our experience there is typically a +10 penalty for impulsiveness applied to vehicle door closes.

### 3. NOISE SOURCES

All noise emissions from the proposed development are to be in full compliance with the requirements of the Environmental Protection (Noise) Regulations 1997. All noise generated by the various activities and building services must meet the Assigned Noise Levels at neighbouring premises, as determined by the Regulations. Noise sources to be addressed include:

- Fuel bowser operations
- Refuelling truck idling
- Mechanical units (e.g. condensing units / exhaust fans / air compressors etc.)
- Vehicle door closes
- Refrigeration units on trucks during refuelling
- Air compressor audible 'beeper'
- Typical 'worst case' scenario

We were advised by the project developers that the proposed Convenience Store will operate from 5am to 8pm, 7 days a week.

#### Vehicle Movements

It should be noted that with the proposed Convenience Store being open to the public, it is our understanding that the main trafficable areas are considered 'road'. In accordance with clause 3 of the EPNR:

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;*

Therefore propulsion and braking noise associated with vehicle movements has not been assessed.

#### Waste Collection & Site Cleaning

Waste collection and other similar works are covered by Regulation 14A of the EPNR. The regulation states that the collection of rubbish etc. is exempt from meeting the regulations, provided that:

- 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; and*
- c) *is carried out during day time hours, defined as 7am to 7pm Monday to Saturday, and 9am to 7pm Sundays and Public Holidays.*

#### 3.1 EPNR Noise Specific Criteria

Based on the above, the relevant EPNR criteria are shown against the noise emissions listed above. The most stringent Assigned Noise Level criteria applicable to these periods will therefore be applied (as seen below).

Noise Emissions from Fuel Bowser Operations		
	Time of Day	Relevant Assigned Noise Level
Daytime - Monday to Saturday	7am to 7pm	L <sub>A10</sub> 46 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L <sub>A10</sub> 41 dB(A)
Evening - All Days	7pm to 10pm	L <sub>A10</sub> 41 dB(A)
Overnight - All Days	All other times from above	L <sub>A10</sub> 36 dB(A)

Table 02 - Relevant Assigned Noise Levels - Fuel Browsers

Noise Emissions from Refuelling Truck Idling		
	Time of Day	Relevant Assigned Noise Level
Daytime - Monday to Saturday	7am to 7pm	L <sub>A1</sub> 56 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L <sub>A1</sub> 51 dB(A)
Evening - All Days	7pm to 10pm	L <sub>A1</sub> 51 dB(A)
Overnight - All Days	All other times from above	L <sub>A1</sub> 46 dB(A)

Table 03 - Relevant Assigned Noise Levels - Refuelling Truck Idling

Noise Emissions from Mechanical Plant		
	Time of Day	Relevant Assigned Noise Level
Daytime - Monday to Saturday	7am to 7pm	L <sub>A10</sub> 46 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L <sub>A10</sub> 41 dB(A)
Evening - All Days	7pm to 10pm	L <sub>A10</sub> 41 dB(A)
Overnight - All Days	All other times from above	L <sub>A10</sub> 36 dB(A)

Table 04 - Relevant Assigned Noise Levels - Mechanical Plant

Noise Emissions from Vehicle Doors		
	Time of Day	Relevant Assigned Noise Level
Daytime - Monday to Saturday	7am to 7pm	L <sub>Amax</sub> 66 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L <sub>Amax</sub> 66 dB(A)
Evening - All Days	7pm to 10pm	L <sub>Amax</sub> 56 dB(A)
Overnight - All Days	All other times from above	L <sub>Amax</sub> 56 dB(A)

Table 05 - Relevant Assigned Noise Levels - Vehicle Doors

Noise Emissions from Refrigeration Units on Trucks		
	Time of Day	Relevant Assigned Noise Level
Daytime - Monday to Saturday	7am to 7pm	L <sub>A1</sub> 56 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L <sub>A1</sub> 51 dB(A)
Evening - All Days	7pm to 10pm	L <sub>A1</sub> 51 dB(A)
Overnight - All Days	All other times from above	L <sub>A1</sub> 46 dB(A)

Table 06 - Relevant Assigned Noise Levels - Refrigeration Trucks

Noise Emissions from Air Compressor 'Beeper'		
	Time of Day	Relevant Assigned Noise Level
Daytime - Monday to Saturday	7am to 7pm	L <sub>Amax</sub> 66 dB(A)
Daytime - Sundays & Public Holidays	9am to 7pm	L <sub>Amax</sub> 66 dB(A)
Evening - All Days	7pm to 10pm	L <sub>Amax</sub> 56 dB(A)
Overnight - All Days	All other times from above	L <sub>Amax</sub> 56 dB(A)

Table 07 - Relevant Assigned Noise Levels - Vehicle Doors

The noise assessment calculations below have been performed with SoundPLAN 8.0 noise modelling software and is based upon the following assumptions:

- The proposed construction of the new Convenience Store and Showrooms is 4.45m from ground level, with a FFL of 8.5m above sea level.
- The proposed canopy over the refuelling bowsers is connected to the convenience store building, creating an air tight seal along its length. This has been modelled at a height of 5.35m above ground level.
- The toilet exhaust fan will be roof mounted directly above the toilet
- Any external mechanical units, including the air compressor will be located to the south of the Convenience Store in the back-of-house area.
- The current location of houses and surrounding buildings.

### 3.2 Noise Sources Used in Modelling

Based on in house data and other previous measurements, the following noise sources have been used in the modelling process:

Sound Power Level of Noise Sources								
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	dB(A)
Fuel Bowser Operation	64	65	68	65	67	65	57	71
Refuelling Truck Idling	99	94	91	90	86	82	76	91
Top Discharge Condenser	86	84	82	77	72	68	61	79
Air Compressor	70	73	71	69	65	62	57	71
Coolroom Condenser	66	65	64	65	65	65	65	71
Toilet Exhaust Fan	70	69	64	63	53	55	54	64
Vehicle Door Closes	94	92	85	81	80	74	70	85
Refrigeration Trucks	69	87	91	97	97	92	80	100
Air Compressor 'beeper'	-	-	-	-	60	91	96	99

Table 07 – Sound Power Level of Noise Sources used in the Modelling Procedure

### 3.3 Penalties Applied to Noise Sources

As per Section 2.2 of this report, any 'annoying' characteristics of noise emissions from the proposed development are subject to penalties. Based on our experience, and in the interest of being conservative, the following penalties have been applied to the above noise sources:

- Fuel Bowser Operation                      Tonal                      +5 dB(A)
- Refuelling Truck Idling                      Tonal                      +5 dB(A)
- All Mechanical Units                      Tonal                      +5 dB(A)
- Vehicle Door Closes                      Impulsive                      +5 dB(A)
- Refrigeration Trucks                      Tonal                      +5 dB(A)

## 4. MODELLING METHODOLOGY

The noise emissions from the proposed Convenience Store have been modelled using the *SoundPLAN* v8.0 software with the *Concawe* algorithm. This software allows the input of topographical data, building heights and forms, meteorological conditions, and noise source data. The software produces noise contour plans, indicating the predicted noise level over a given area.

Note – the output noise levels from *SoundPLAN* are base noise levels not including adjustment for noise character.

### 4.1 Meteorological Conditions

The meteorological conditions used in the calculations were as follows (based on the requirements of the Department of Environment Regulation):

#### Day-time Assessment

- Temperature – 20°C
- Relative Humidity – 50%
- Wind – 4 m/s in all directions simultaneously
- Pasquill Stability Class - E

#### Night-time Assessment

- Temperature – 15°C
- Relative Humidity – 50%
- Wind – 3 m/s in all directions simultaneously
- Pasquill Stability Class - F

### 4.2 Topography and Building Form

The building form, height, and configuration were input into the noise model, based on the architectural drawings and the information available on the City of Wanneroo's Intramaps system.

All roads and carpark areas were input into the noise model as hard reflecting ground surface.



## 5. RESULTS OF ACOUSTIC MODELLING

### 5.1 Noise Emissions from Fuel Bowser Operation

It is expected that the operation of fuel bowzers will occur at all times. Therefore the most stringent criteria of  $L_{A10}$  36 dB(A) is applied to any noise emission before 7am (9am Sundays and Public Holidays). Three out of the six bowzers were selected to be running during this time as a representative 'scenario' of the bowzers being use simultaneously.

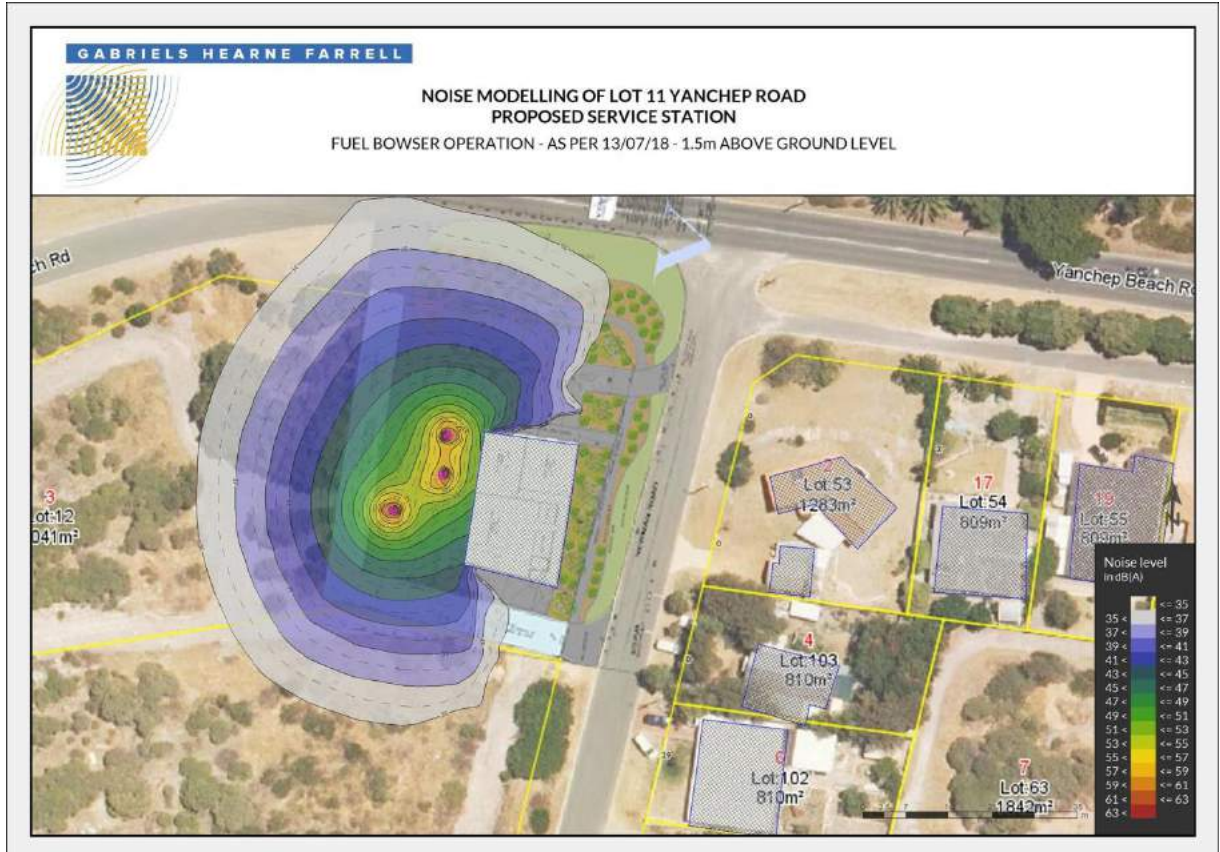


Image 01 - Noise Emissions from Facility - Fuel Bowzers

The most affected receiver position is indicating a predicted noise level of approximately 29 dB(A). Including a +5 penalty for tonality this increases to 34 dB(A), which is below the most stringent criteria. Therefore compliance is achieved from the fuel bowser operations.



## 5.2 Noise Emissions from Refuelling Truck Idling

It is expected that during the refuelling process the truck may be left idling. As this is likely only for a short period of time this has been assessed against an  $L_{A1}$  criteria.

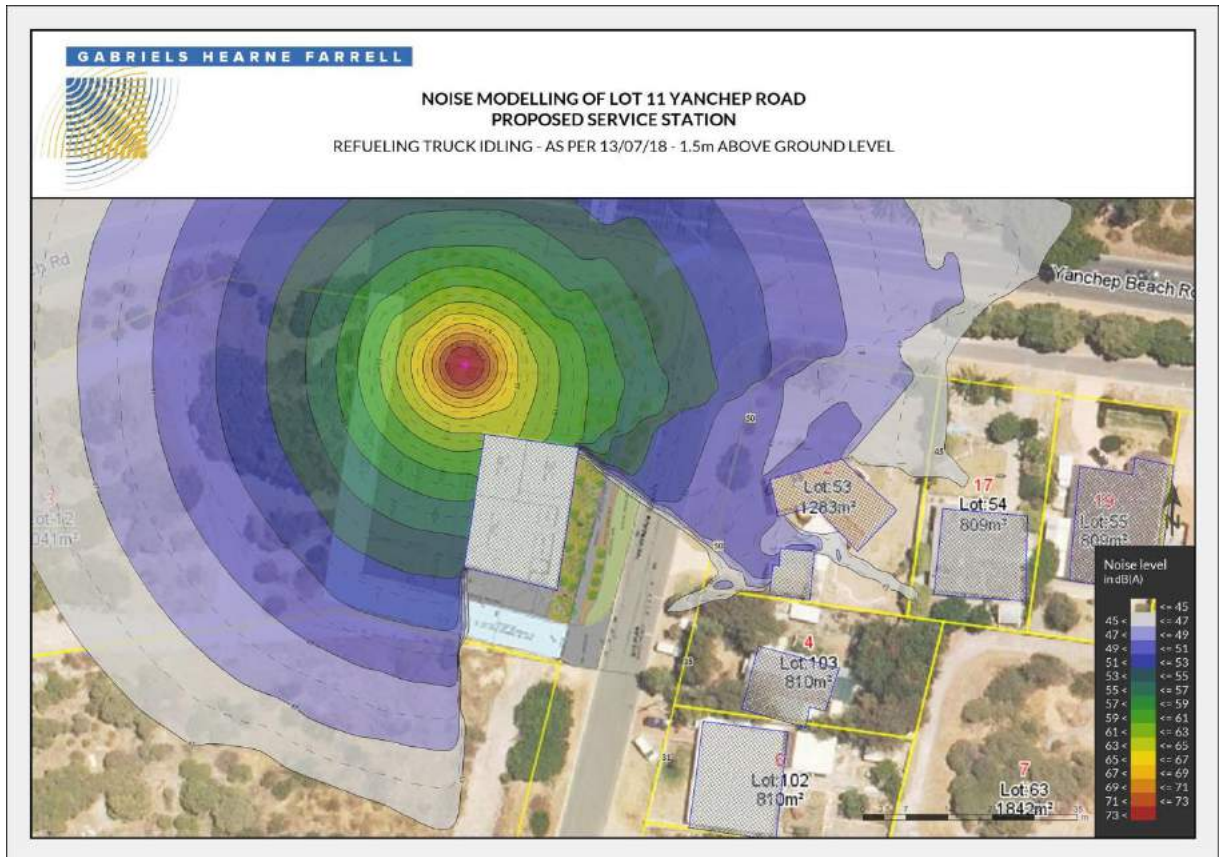


Image 02 - Noise Emissions from Facility - Refuelling Truck Idling

The results of this modelling is indicating that the predicted noise level at the most affected receiver position is approximately 50 dB(A). Including a +5 penalty for tonality this increases to 55 dB(A). Based on this noise level, if a truck is left idling in this position this will only comply with the regulations during daytime hours between 7am and 7pm Monday to Saturday. If refuelling occurs outside of these hours then it is a requirement that the truck is switched off. Signage should be provided to ensure vehicles are switched off during these hours.

### 5.3 Noise Emissions from Mechanical Plant

The mechanical plant assessment includes a typical top discharge condensing units, a typical coolroom condensing unit, the air compressor tank and associated pump, and a typical roof mount toilet exhaust fan for a single cubicle bathroom. As the majority of these units will run for extended periods of time, during all opening hours, this has been assessed against the most stringent night time criteria of  $L_{A10}$  36 dB(A).

Given the noise associated with the mechanical plant a model was run with a solid noise barrier to the East of this mechanical plant area, returning along the Southern line of the vehicle entry (as seen in the modelling results below). The height of this barrier is 0.5m above the top of the tallest unit, which is assumed to be approximately 1.8m above ground height. During this calculation the noise level of the condensing unit was lowered by 5 dB(A) to account for a 'Night Setback Mode', which is typically 5-8 dB(A) lower than the daytime noise level when under full load. The noise barrier is assumed to be of a solid construction with no air gaps and as a minimum a material consisting of approximately  $10\text{kg/m}^2$ , such as 9mm fibre cement.

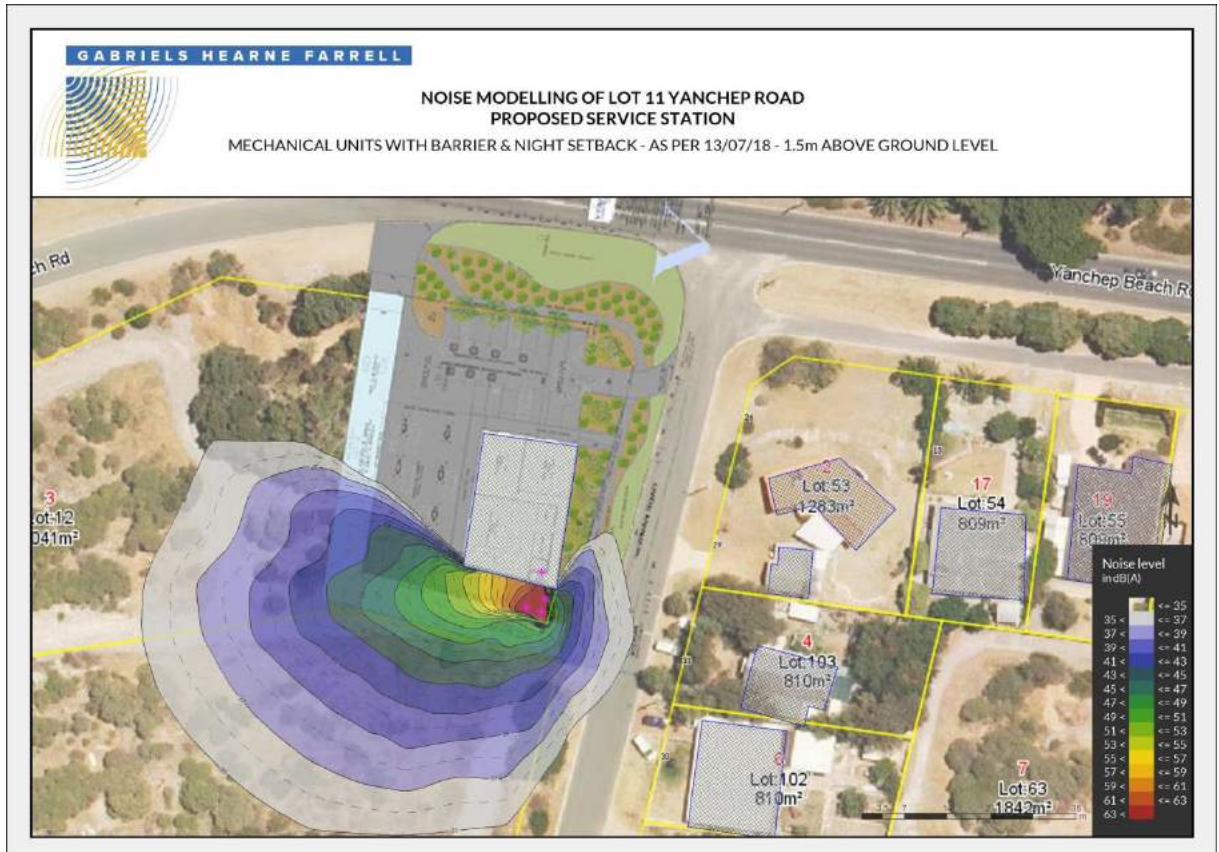


Image O4 - Noise Emissions from Facility - Mechanical Plant with Barrier and Night Setback

The results of this modelling is indicating that the predicted noise level at the most affected receiver position is approximately 31 dB(A). Including a +5 penalty for tonality this increases to 36 dB(A). Therefore with this configuration the mechanical plant will achieve full compliance with the most stringent night time noise criteria of the EPNR.

It should also be noted that with the barrier required above, but with the units being run at full load, compliance is still achieved during the more stringent day time period of 9am to 7pm Sundays and Public Holidays.



### 5.4 Noise Emissions from Vehicle Doors

a typical scenario for the closing of vehicle doors was modelled. Two noise sources were placed amongst the fuel bowzers, with an additional two being placed in the dedicated car parking spaces to the North of the lot. One of the receivers was placed in the close bays to the residential receiver positions so as to emulate a 'worst case' scenario. As these are a very short noise source, but can occur at all times of operation, these have been assessed against a night time criteria of  $L_{Amax}$  56 dB(A).

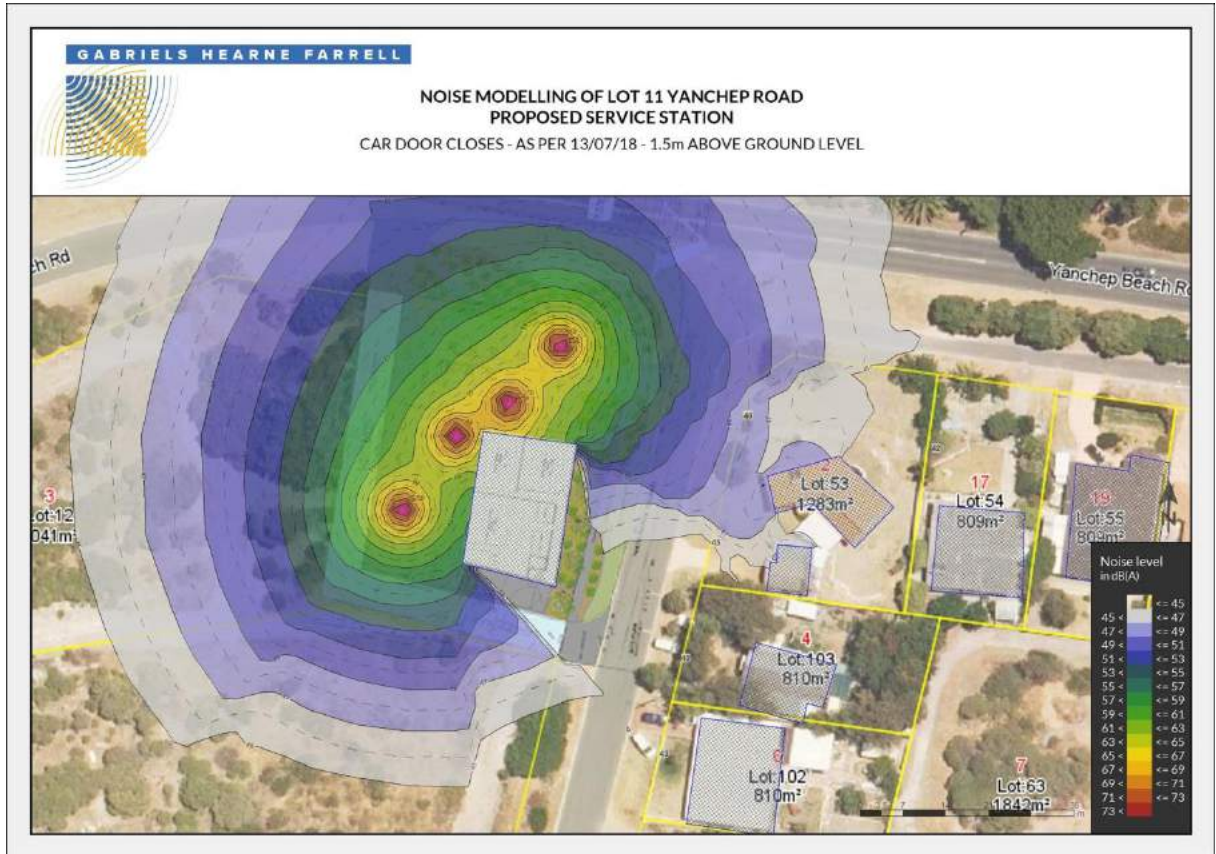


Image 05 - Noise Emissions from Facility - Vehicle Door Closes

It must be noted that the above 'scenario' with four car doors closing at the same time is for indicative purposes only. This is modelled with four typical car positions throughout the complex, however individual noise sources are analysed from this data.

With this in mind the highest noise level from the 'worst case' noise source position (the noise source located in the North car parking bays, closest bay to the residences) recorded a noise level of approximately 46 dB(A) at the neighbouring receiver position. Including a +10 penalty for impulsiveness this increases to 56 dB(A). This meets the relevant L1 Assigned Noise Level at all times of the day.

### 5.5 Noise Emissions from Refrigeration Trucks

Some trucks have particularly noisy dedicated refrigeration units located above the cabin. It is plausible that these trucks may require refuelling during the early morning “night time” period. Due to the infrequent nature and short interval of this occurring we have assessed this against an  $L_{A1}$  criteria.

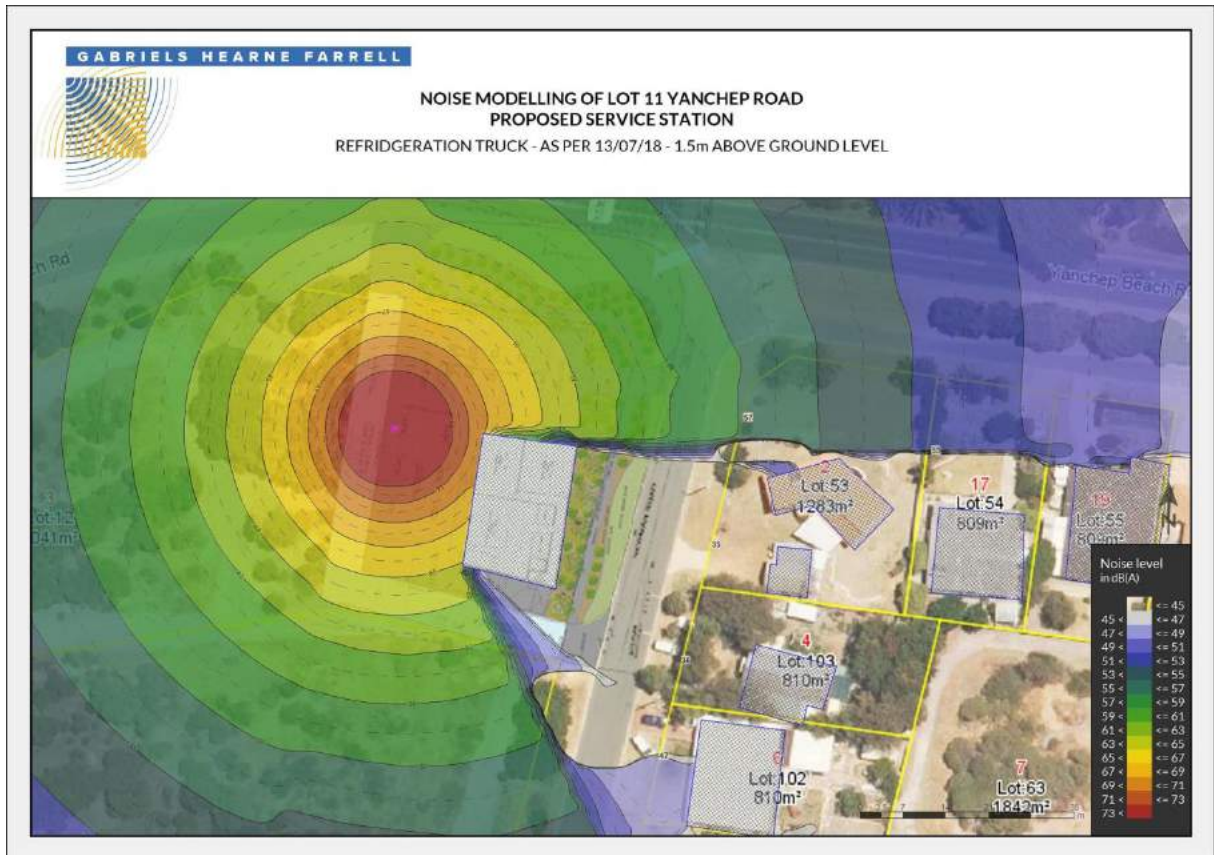


Image 06 - Noise Emissions from Facility - Refrigeration Trucks

The results of this modelling is indicating that the predicted noise level at the most affected receiver position is approximately 57 dB(A). Including a +5 penalty for tonality this increases to 62 dB(A). Due to this exceedance it is recommended that the units are switched off in order to maintain compliance with the regulations. Adequate signage must be displayed on bowsers and/or at all entrances to the Convenience Store instructing drivers to do so. This must be undertaken at all times of the day.

### 5.6 Noise Emissions from Air Compressor 'Beeper'

Many air compressor facilities contain an audible beeping noise to alert the user that the tyre has been inflated to the correct pressure. Due to the infrequent and very short noise emissions from this facility, this has been assessed against an  $L_{Amax}$  criteria.

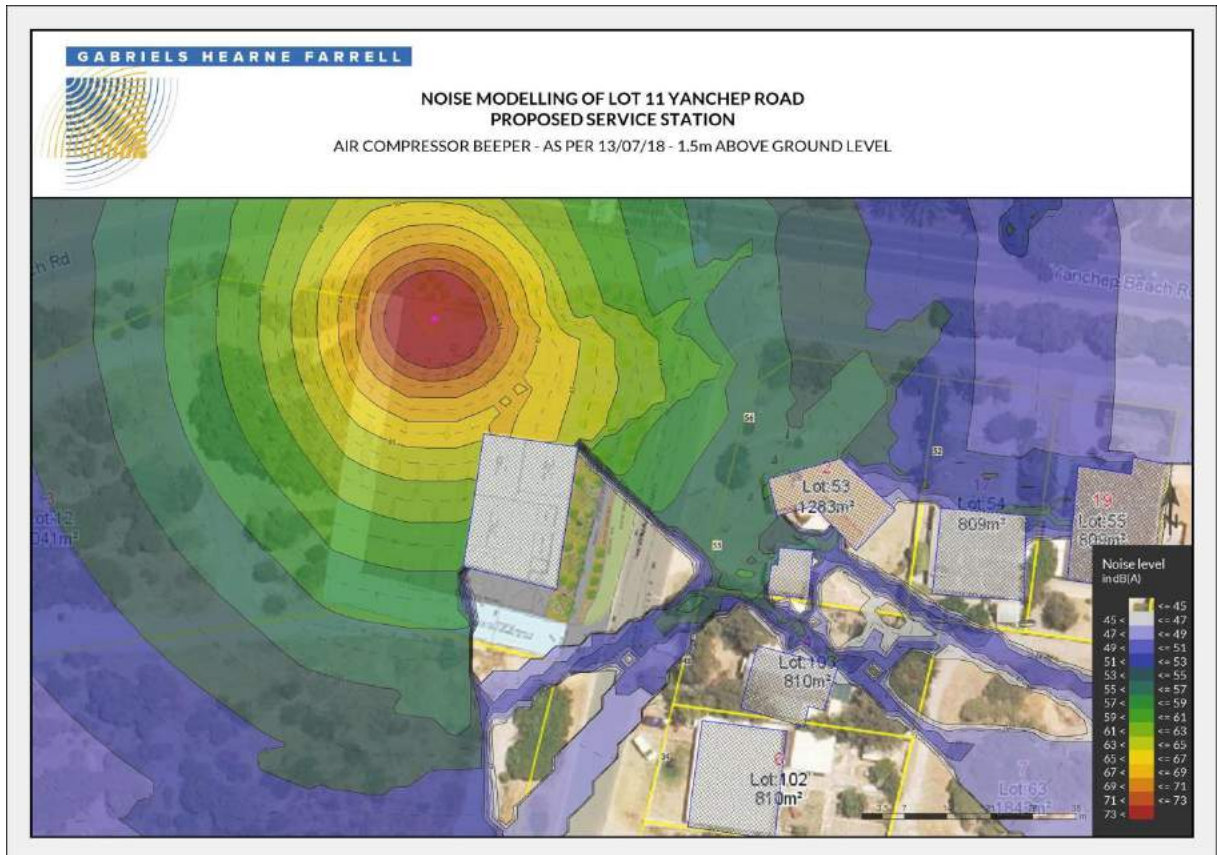


Image 07 - Noise Emissions from Facility - Air Compressor 'Beeper'

The results of this modelling is indicating that the predicted noise level at the most affected receiver position is approximately 56 dB(A). Including a +5 penalty for tonality this increases to 61 dB(A). Therefore the noise emissions from this facility will likely achieve compliance during day time operations from 7am to 7pm Monday to Saturday, as well as from 9am to 7pm Sundays and Public Holidays. Outside of these hours compliance is unlikely. We recommend the air hose is detached during this time so that the facilities cannot be used.



### 5.7 Noise Emissions from Typical Operating Scenario

All of the above noise sources have been individually modelled for compliance against the EPNR. A typical 'scenario' of a combination of noise sources has also been modelled. However it should be noted that due to the infrequent nature and different criteria of  $L_1$  and  $L_{Amax}$  noise sources, the typical scenario only contains  $L_{10}$  noise sources. This 'typical scenario' contains the following:

- All mechanical plant equipment, including:
  - A/C condensing unit
  - Air compressor
  - Coolroom condensing unit
  - Toilet exhaust fan
- Three fuel bowsers in simultaneous operation

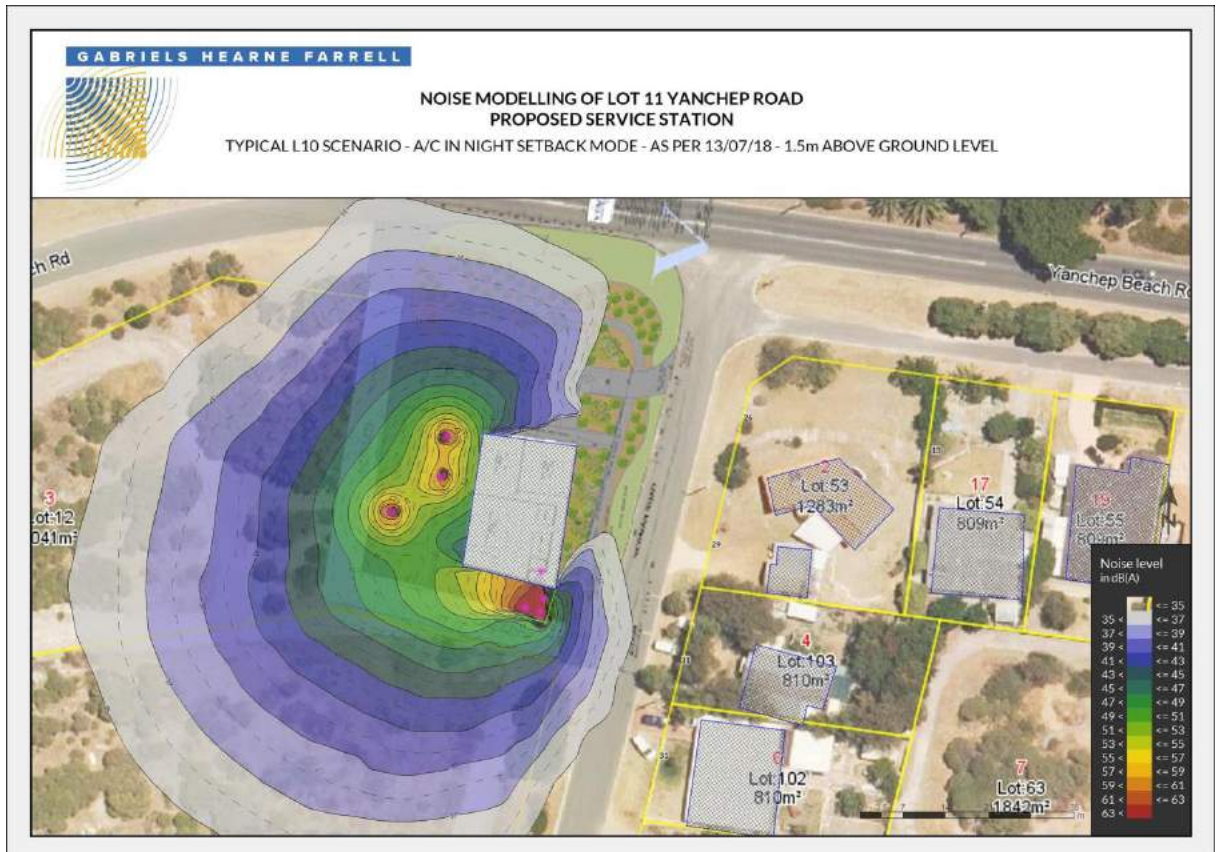


Image 08 - Noise Emissions from Facility - Typical Scenario

The results of this modelling is indicating that the predicted noise level at the most affected receiver position is approximately 31 dB(A). Including a +5 penalty for tonality this increases to 36 dB(A). This therefore achieve compliance at all times of the day. Note this scenario is predominately influenced by the mechanical condensing units (the main top discharge condensing units is still in night setback mode as described in Section 5.3 of this report).



## 6. CONCLUSION

This report summarises the project requirements in terms of compliance with the Environmental Protection (Noise) Regulations, 1997. This includes determination of the relevant site specific Assigned Noise Level criteria.

A description of each noise source and applicable noise level criteria has been provided, including acknowledgment of relevant adjustments required for noise sources with particular characteristics.

A preliminary acoustic assessment and construction has been provided based upon a review of the current architectural documented supplied. In short, these calculations indicate that:

### Noise Emissions from Fuel Bowser Operation

- Compliance is achieved at all times on any day of the week.

### Noise Emissions from Refuelling Truck Idling

- Compliance is achieved between 7am to 7pm Monday to Saturday. Outside of these hours any trucks must be turned off.

### Noise Emissions from Mechanical Plant

- A solid barrier is required to the East of the proposed plant area, returning along the South boundary of this plant area.
- Barrier is to be at least 0.5m above the top of the tallest mechanical unit in the compound
- Barrier is to be constructed from minimum 10kg/m<sup>2</sup> material, with no air gaps present
- Condensing units must be selected based on an available Night Setback Mode of at least -5 dB(A).

### Noise Emissions from Vehicle Door Closes

- Compliance is achieved at all times on any day of the week.

### Noise Emissions from Refrigeration Trucks

- Compliance is only achieved with adequate signage. This must be displayed instructing drivers to turn off refrigeration units prior to beginning refuelling at the bowsers, or parking in the dedicated car bays.

### Noise Emissions from a Typical Scenario

- Compliance is achieved at all times on any day of the week, provided the mechanical plant conditions are imposed as per above.

Hopefully this is all clear, however if you have any queries regarding this information please call the undersigned on 9474 5966.

Regards,

**Michael Ferguson**

Associate Director B.IntArch(Hons) M.A.A.S.



**GABRIELS HEARNE FARRELL PTY LTD**

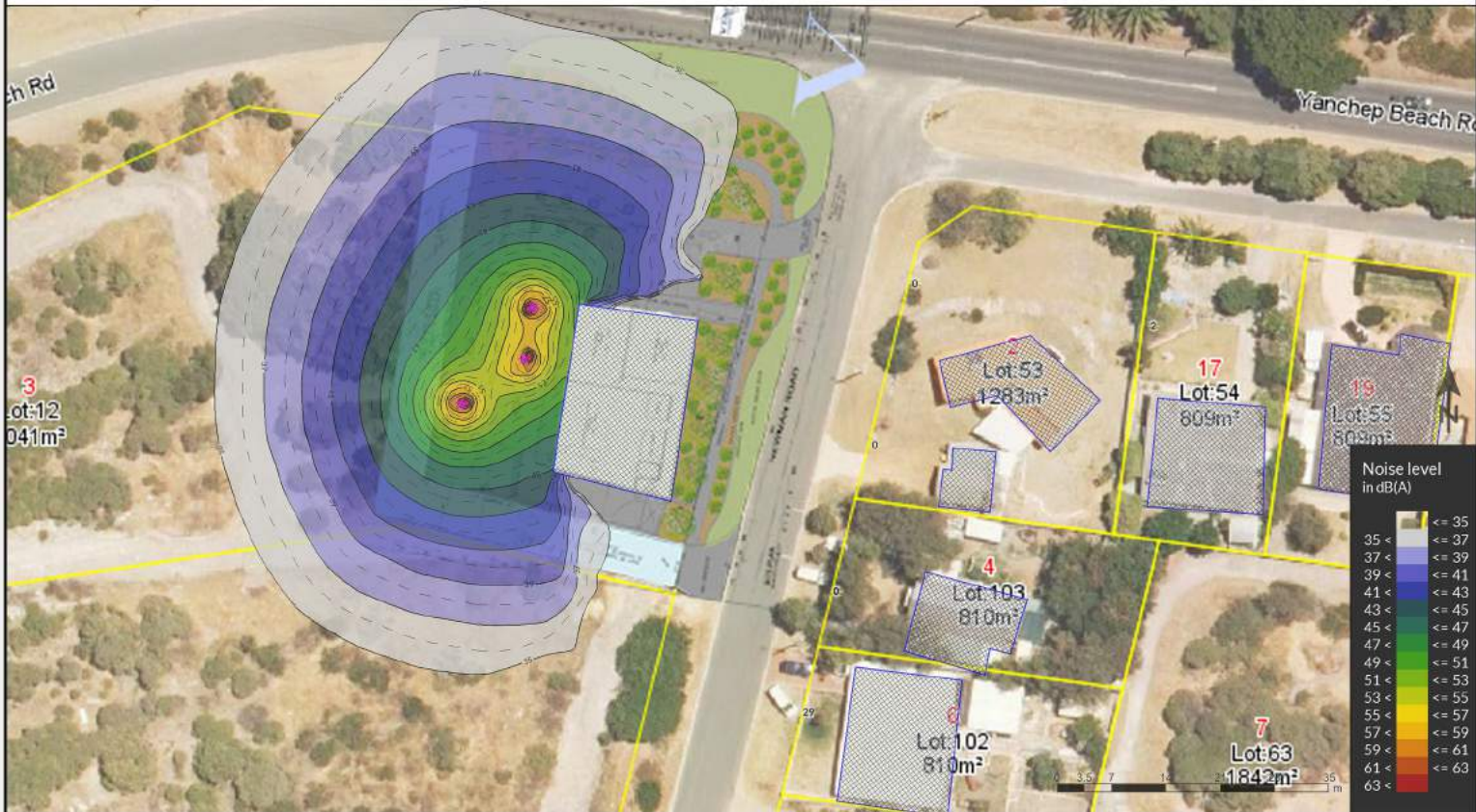
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A Unit 3 / 2 Hardy St South Perth WA 6151 P (08) 9474 5966  
E michael@gabriels.net.au W gabriels.net.au M 0423 880 388



### NOISE MODELLING OF LOT 11 YANCHEP ROAD PROPOSED SERVICE STATION

FUEL BOWSER OPERATION - AS PER 13/07/18 - 1.5m ABOVE GROUND LEVEL



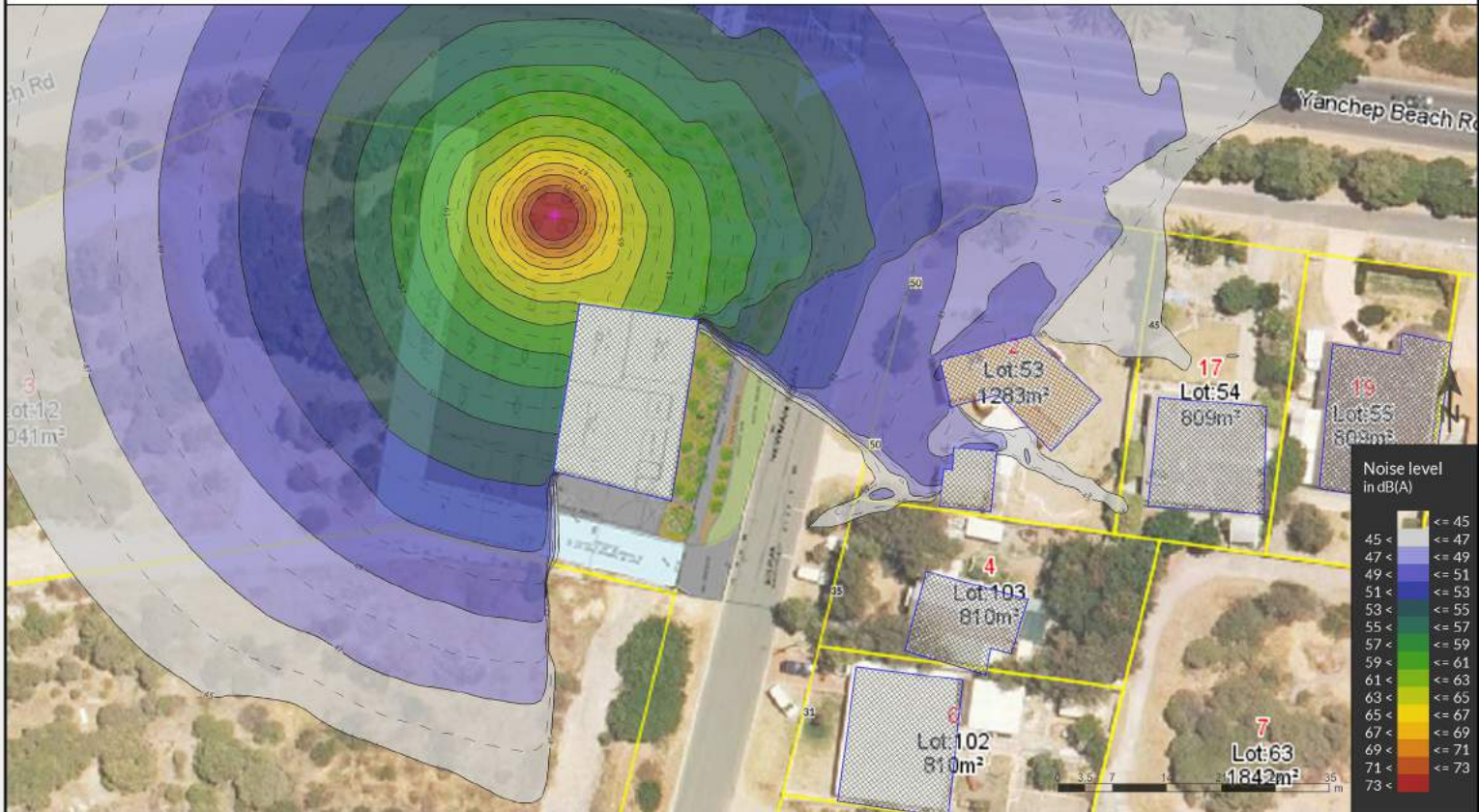
Noise level in dB(A)	
<= 35	Lightest color
35 <	
37 <	
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45 <	
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49 <	
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63 <	Darkest color





## NOISE MODELLING OF LOT 11 YANCHEP ROAD PROPOSED SERVICE STATION

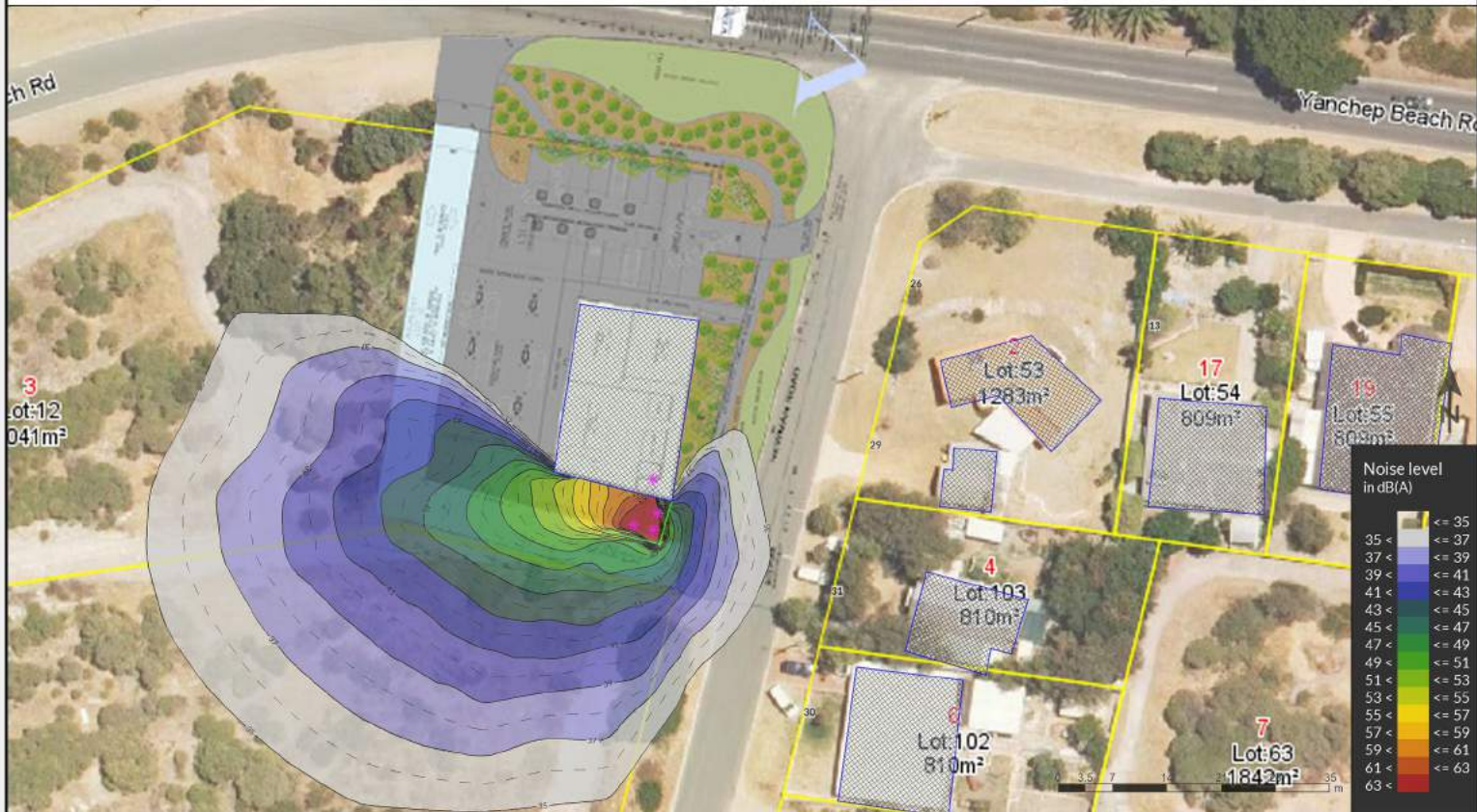
REFUELING TRUCK IDLING - AS PER 13/07/18 - 1.5m ABOVE GROUND LEVEL





## NOISE MODELLING OF LOT 11 YANCHEP ROAD PROPOSED SERVICE STATION

MECHANICAL UNITS WITH BARRIER & NIGHT SETBACK - AS PER 13/07/18 - 1.5m ABOVE GROUND LEVEL

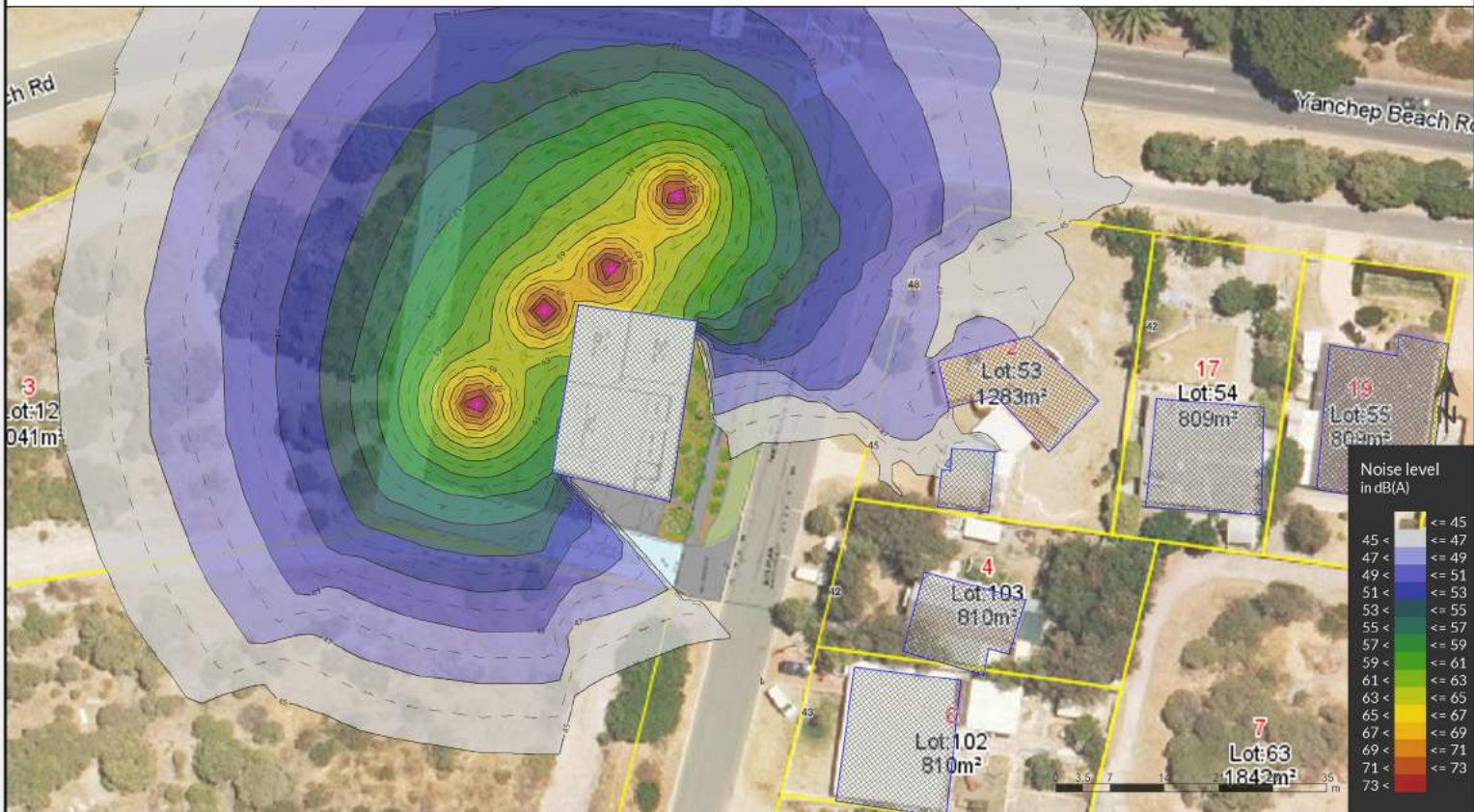






### NOISE MODELLING OF LOT 11 YANCHEP ROAD PROPOSED SERVICE STATION

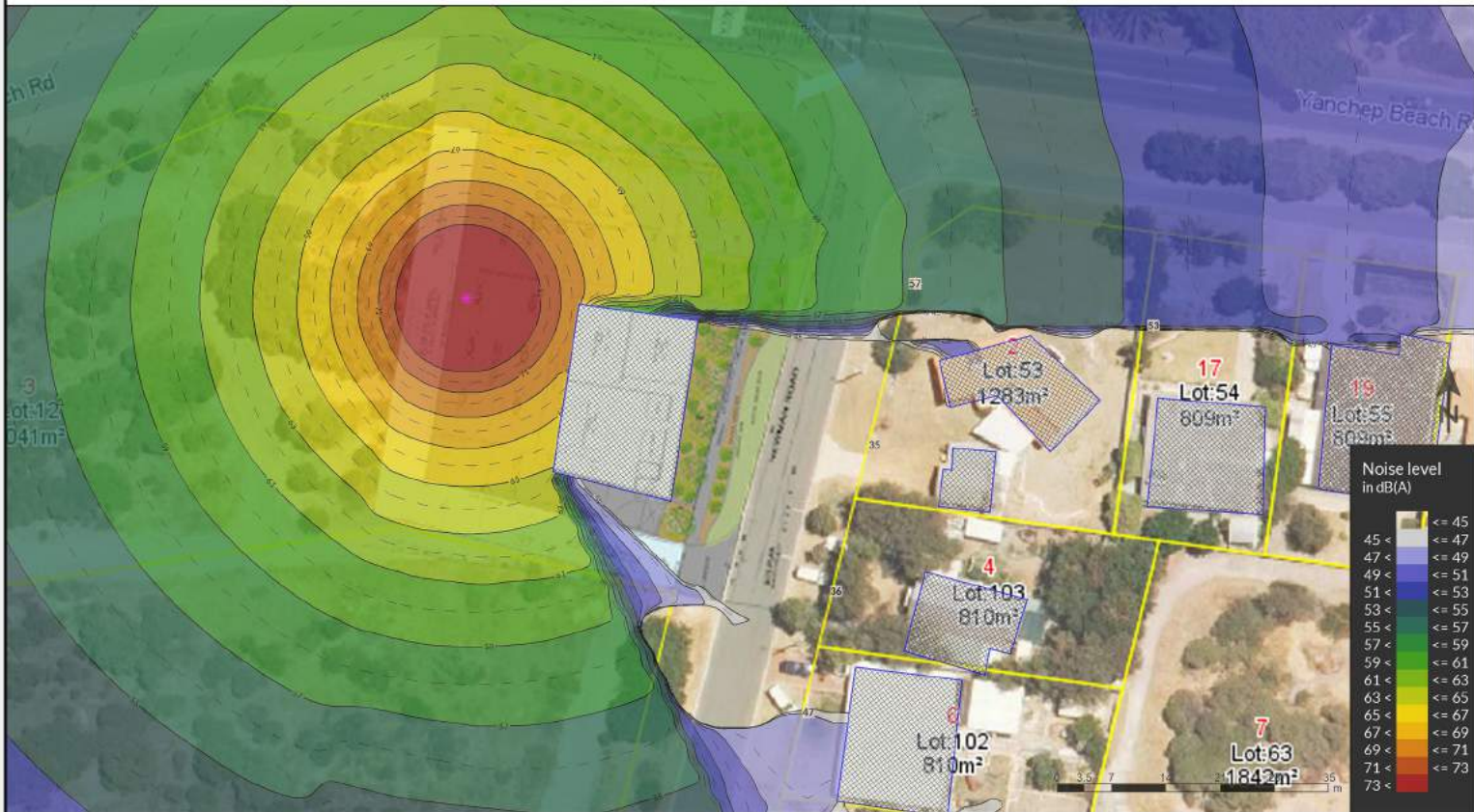
CAR DOOR CLOSES - AS PER 13/07/18 - 1.5m ABOVE GROUND LEVEL





### NOISE MODELLING OF LOT 11 YANCHEP ROAD PROPOSED SERVICE STATION

REFRIDGERATION TRUCK - AS PER 13/07/18 - 1.5m ABOVE GROUND LEVEL

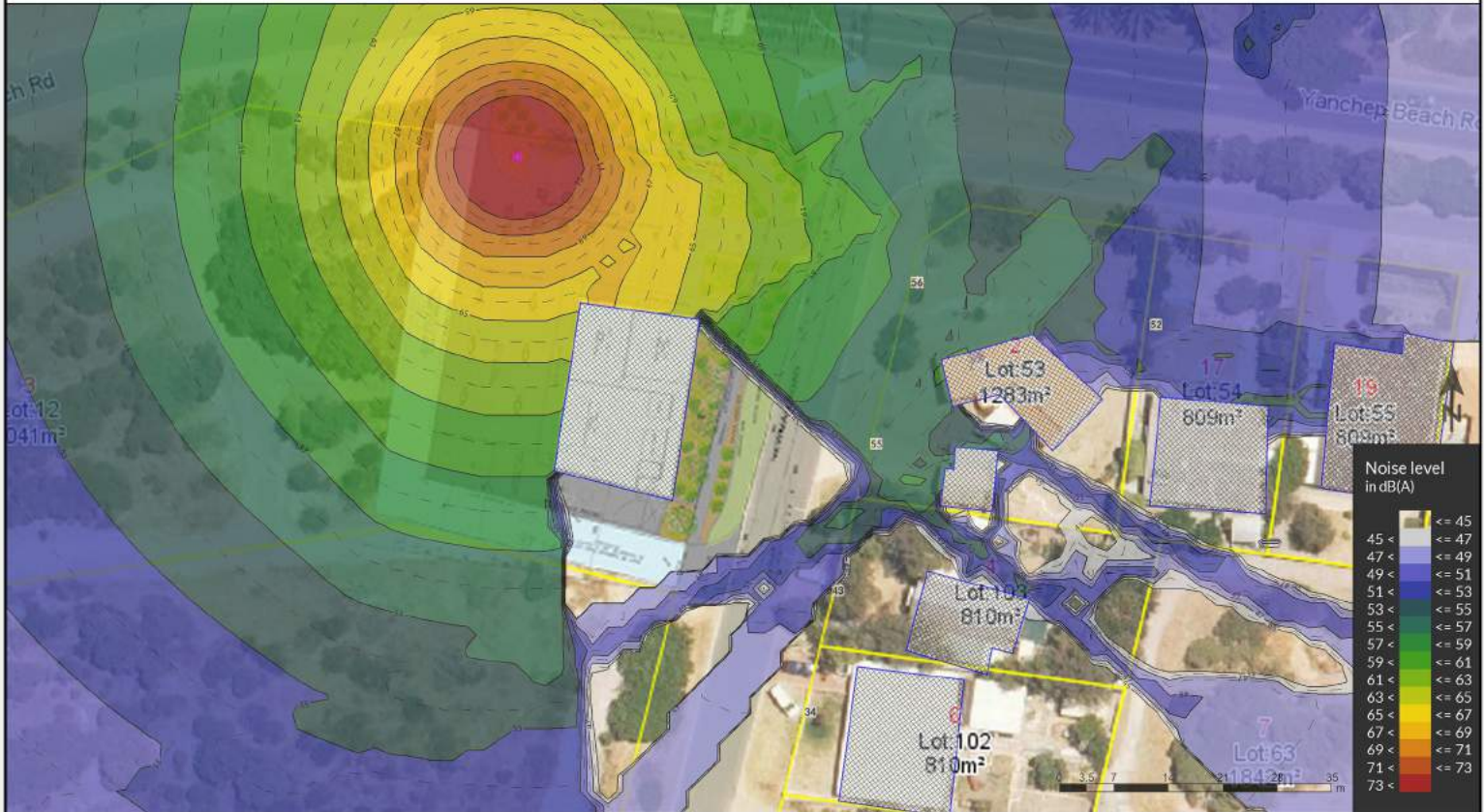






### NOISE MODELLING OF LOT 11 YANCHEP ROAD PROPOSED SERVICE STATION

AIR COMPRESSOR BEEPER - AS PER 13/07/18 - 1.5m ABOVE GROUND LEVEL





NOISE MODELLING OF LOT 11 YANCHEP ROAD  
PROPOSED SERVICE STATION

TYPICAL L10 SCENARIO - A/C IN NIGHT SETBACK MODE - AS PER 13/07/18 - 1.5m ABOVE GROUND LEVEL

