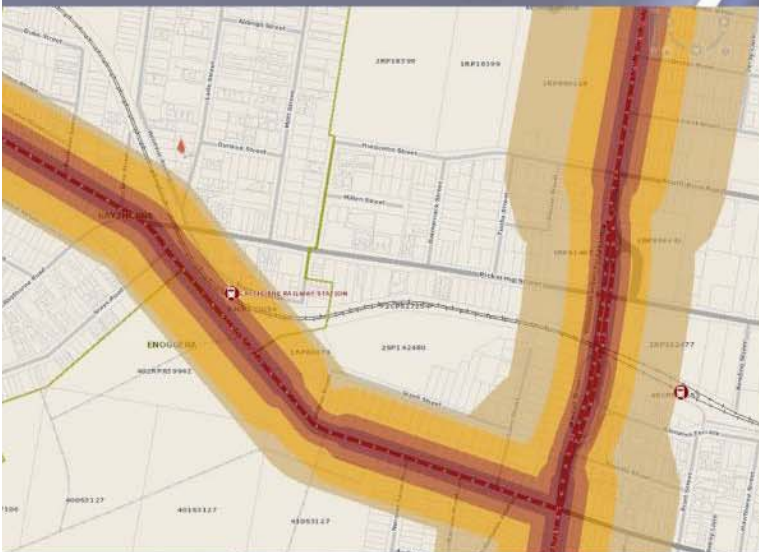




**PLANS AND DOCUMENTS**  
referred to in the PDA  
**DEVELOPMENT APPROVAL**

Approval no: DEV2019/1006  
Date: 2 April 2019



## Document Control Page

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| 0           | 20/04/2018 | Report                     | GR     | MT     |
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**REPORT FOR**                      **House of Furberry Pty Ltd**

**Signed**



**Max Thorne**  
**(Director)**

**DISCLAIMER**

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## Contents

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|                                                                 |    |
|-----------------------------------------------------------------|----|
| Executive Summary .....                                         | 4  |
| Conclusions .....                                               | 4  |
| Recommendations .....                                           | 4  |
| 1. Introduction.....                                            | 5  |
| 2. Measurement of Ambient Noise Levels .....                    | 8  |
| 2.1 Measurement Procedures.....                                 | 8  |
| 2.2 Measurement Results .....                                   | 9  |
| 3. Noise Criteria and Limits .....                              | 11 |
| 3.1 Bowen Hills Urban Development Area Development Scheme ..... | 11 |
| 3.2 Brisbane City Council City Plan 2014 .....                  | 13 |
| 3.3 Air Conditioning - Noise Emissions – EPA 1994.....          | 14 |
| 4. Noise Impact Assessment.....                                 | 15 |
| 4.1 Noise Sources .....                                         | 15 |
| 4.2 Sensitive Receivers.....                                    | 15 |
| 4.3 Existing Building Envelope.....                             | 17 |
| 4.4 Noise Emission Forecasts .....                              | 18 |
| Appendix A: Plans.....                                          | 20 |
| Appendix B: Environmental Noise Model.....                      | 21 |
| Appendix C: Glossary .....                                      | 24 |

## Executive Summary

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This Report is in response to a request from House of Furber Pty Ltd for a noise impact assessment report for proposed dog day care activities at 10 Campbell Street, Bowen Hills (Lots 4 & 5 on RP10074). The site is located within an EC Emerging Community zone, and is within the Bowen Hills Priority Development Area (PDA). The site and neighbouring properties are also within the gazetted *Transport Noise Corridor* for the Inner City railway line, and the designated *Transport Noise Corridor* for Markwell Street.

The proposal is to refurbish the existing building for dog day care activities. Proposed hours of operation are 6am to 8pm.

The purpose of this report is to assess potential noise impacts onto nearby sensitive uses with regards to the following standards and policy documents:

- *Bowen Hills Urban Development Area Development Scheme*
- *Brisbane CityPlan 2014 – Centre or Mixed Use Code*
- *Brisbane CityPlan 2014 – Noise Impact Assessment Planning Scheme Policy*
- *Environmental Protection Act 1994*
- *Environmental Protection (Noise) Policy 2008*
- *Australian Standard AS1055:1 – Acoustics: Description and measurement of environmental noise*

## Conclusions

---

It is concluded that:

- The site and neighbouring properties are exposed to significant levels of road traffic and railway noise from existing transport infrastructure.
- Dog day care activities are to be conducted within the building, and noise emissions will be contained within the building envelope. The existing building is calculated to provide a significant degree of noise attenuation.
- Forecast emissions from noise breakout is forecast to meet criteria at all nearby sensitive uses.
- Subject to the considerations and recommendations of this report, it is the opinion of this consultancy that expected activities at the site can comply with the requirements of *Bowen Hills Urban Development Area Development Scheme*, and be otherwise compliant with relevant regulatory obligations.

## Recommendations

---

It is recommended that:

- Hours of operation be limited to 6am – 8pm, as per Acceptable **AO1.1** of the *Brisbane CityPlan 2014 – Centre or Mixed Use Code*.

## 1. Introduction

This Report is in response to a request from House of Furberry Pty Ltd for a noise impact assessment report for proposed dog day care activities at 10 Campbell Street, Bowen Hills (Lots 4 & 5 on RP10074). The site is located within an EC Emerging Community zone, and is within the Bowen Hills Priority Development Area (PDA). The site and neighbouring properties are also within the gazetted *Transport Noise Corridor* for the Inner City railway line, and the designated *Transport Noise Corridor* for Markwell Street.

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- *Environmental Protection Act 1994*
- *Environmental Protection (Noise) Policy 2008*
- *Australian Standard AS1055:1 – Acoustics: Description and measurement of environmental noise*

The development site and locality are presented in the following **plates**. Development plans are presented in **Appendix A**, while terms and definitions used in this Report are found in **Appendix C**.

**Plate 1:** Showing the development site and locality (source: Google; Queensland Government)



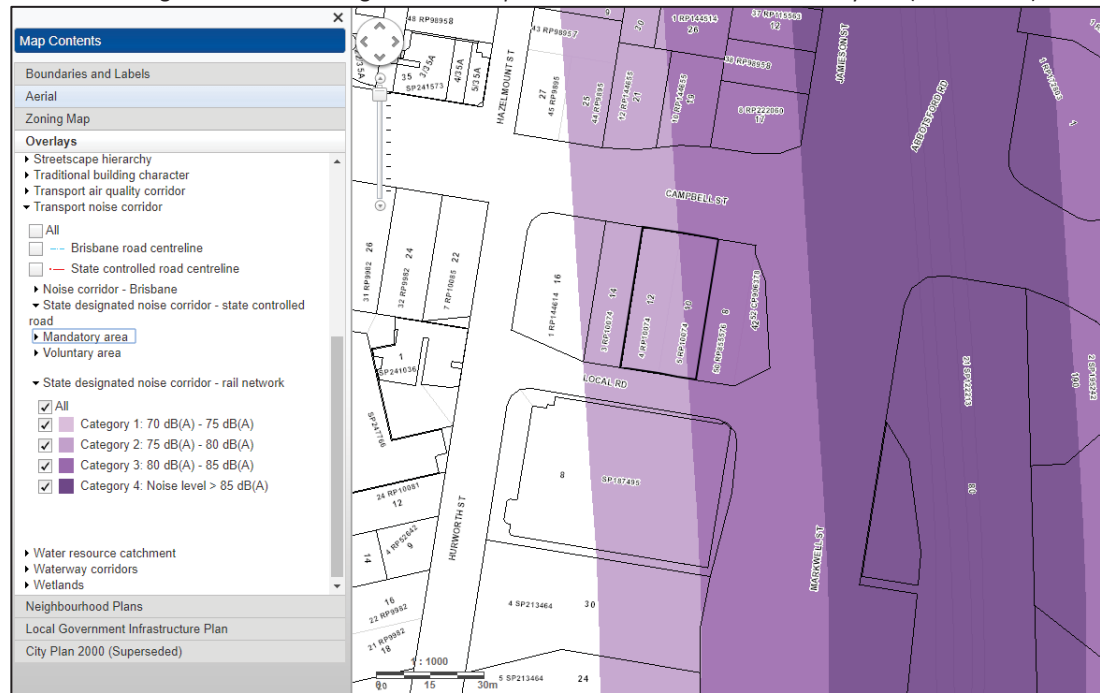
**Plate 2:** Showing the site and locality within an EC Emerging Community zone (source: BCC)



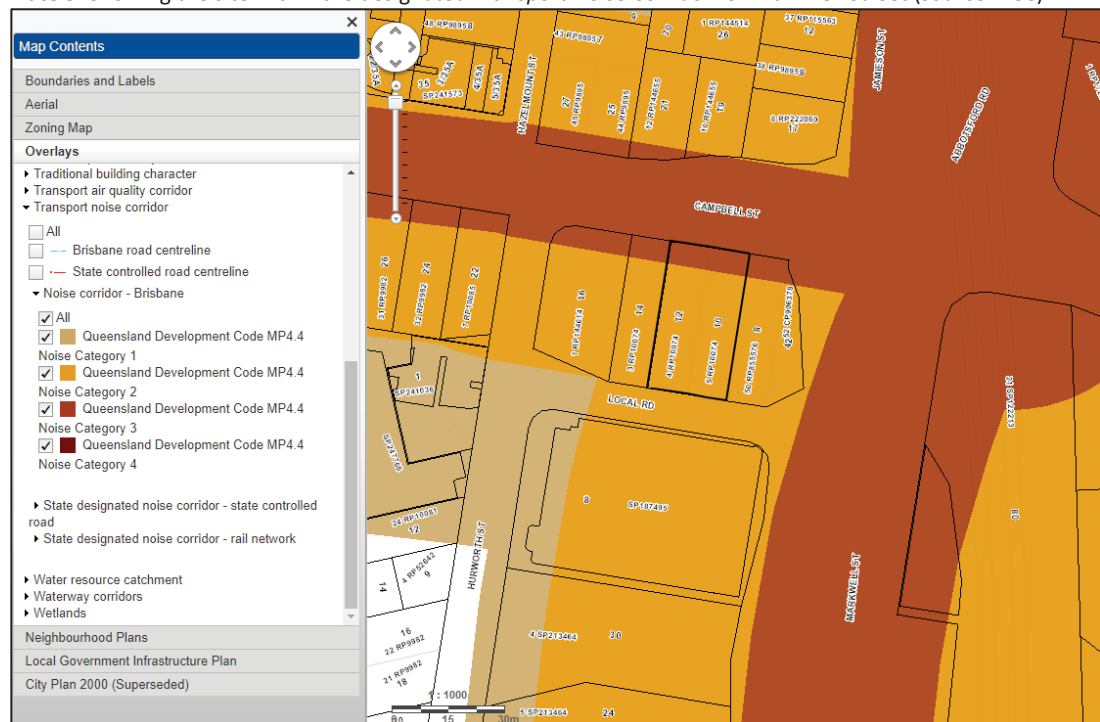
**Plate 3:** Showing the development layout (source: Google; Queensland Government, client)



**Plate 4:** Showing the site within the gazetted *Transport Noise Corridor* for the Inner City line (source: BCC)



**Plate 5:** Showing the site within the designated *Transport Noise Corridor* for Markwell Street (source: BCC)



## 2. Measurement of Ambient Noise Levels

### 2.1 Measurement Procedures

In order to assess the potential impact of noise from all sources of noise in the locality, an ambient noise survey was conducted on-site. The environmental noise logger was installed at a location 1m from the western boundary, and 3m from the southern boundary. The microphone was at a height of 4.3m and is considered façade affected. The location is referred to as ML1 in this report, and is presented in the **Plate** and **Photos** below.

**Plate 6:** Showing location ML1



**Photos 1 and 2:** Showing location ML1 (source: NMS)

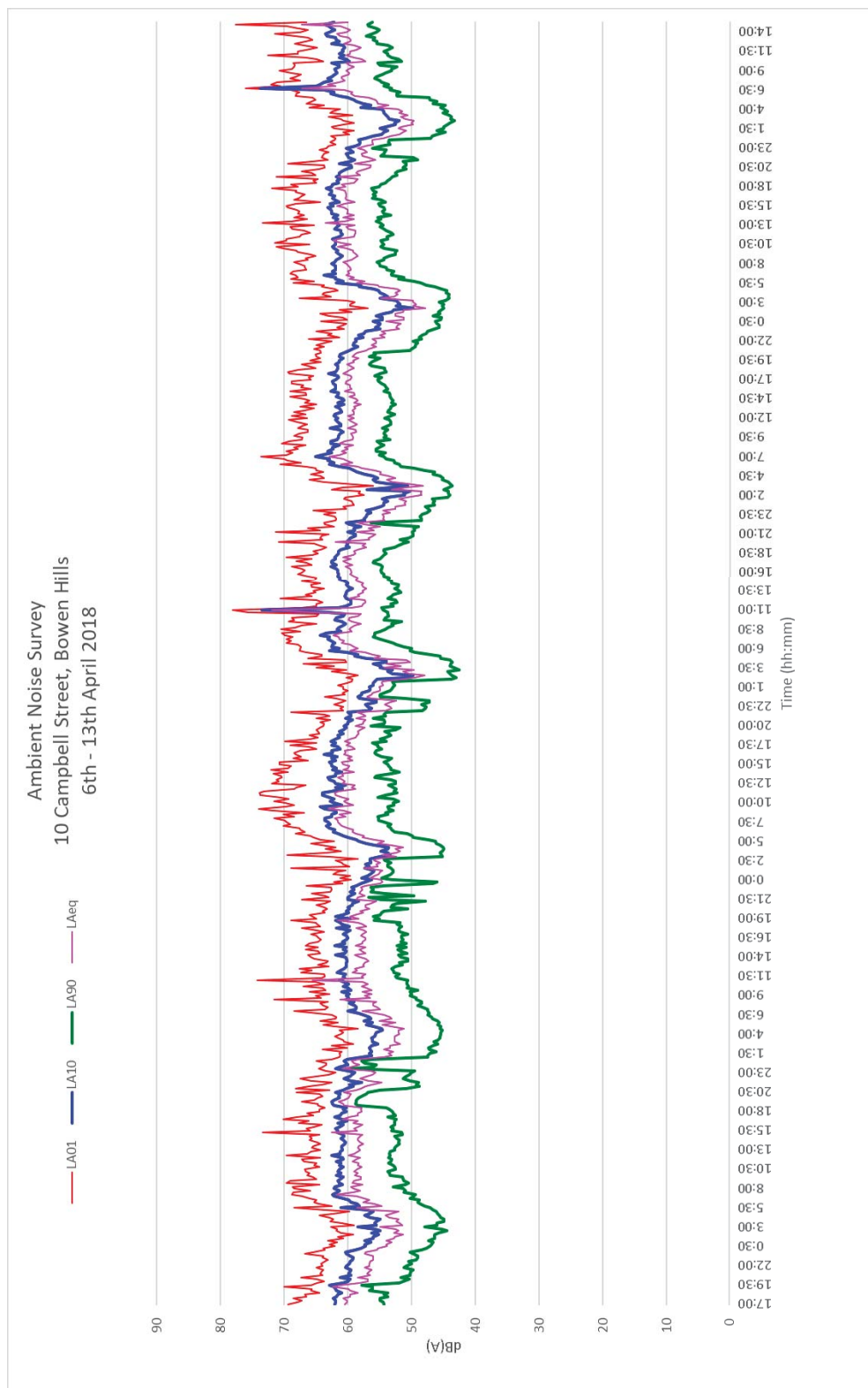


The sound level measuring equipment was field calibrated before and after each measurement session, and no significant drift from the reference signal was observed. All instruments used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels-

- 1 x ARL EL-315 type 2 environmental noise logger
- 1 x Quest CA-22 calibrator

## 2.2 Measurement Results

Ambient sound pressure levels were measured generally in accordance with Australian Standard AS1055.1:1997 - *Acoustics-Description and measurement of environmental noise - Part 1: General procedures*. Ambient noise levels were recorded at 15 minute intervals between the 6<sup>th</sup> and the 13<sup>th</sup> of April 2018. Levels are presented graphically in **Figure 1** below, and in tabular format in **Table 1** following



**Figure 1:** Ambient noise levels at ML1, 6<sup>th</sup> – 13<sup>th</sup> April 2018. Levels are in dB(A), façade affected.

**Table 1:** Average ambient noise levels at ML1, 6<sup>th</sup> – 13<sup>th</sup> April 2018. Levels are in dB(A), façade affected.

| Day                | Date                                     | Period           | L <sub>01</sub> | L <sub>10</sub> | L <sub>90</sub> | L <sub>eq</sub> |
|--------------------|------------------------------------------|------------------|-----------------|-----------------|-----------------|-----------------|
| Friday             | 6 <sup>th</sup> / 13 <sup>th</sup> April | 7:00am – 6:00pm  | 71.2            | 62.1            | 54.6            | 60.0            |
|                    |                                          | 6:00pm – 10:00pm | 67.1            | 60.9            | 52.9            | 58.8            |
|                    |                                          | 10:00pm – 7:00am | 67.9            | 57.6            | 48.5            | 57.0            |
| Saturday           | 7 <sup>th</sup> April                    | 7:00am – 6:00pm  | 69.0            | 61.3            | 52.4            | 58.9            |
|                    |                                          | 6:00pm – 10:00pm | 67.7            | 60.9            | 54.9            | 59.2            |
|                    |                                          | 10:00pm – 7:00am | 65.4            | 57.8            | 47.5            | 55.1            |
| Sunday             | 8 <sup>th</sup> April                    | 7:00am – 6:00pm  | 67.2            | 60.6            | 51.4            | 58.3            |
|                    |                                          | 6:00pm – 10:00pm | 66.7            | 60.2            | 53.5            | 58.2            |
|                    |                                          | 10:00pm – 7:00am | 64.8            | 57.6            | 48.8            | 56.0            |
| Monday             | 9 <sup>th</sup> April                    | 7:00am – 6:00pm  | 72.1            | 62.5            | 53.9            | 60.6            |
|                    |                                          | 6:00pm – 10:00pm | 67.5            | 60.6            | 54.1            | 58.4            |
|                    |                                          | 10:00pm – 7:00am | 67.6            | 57.6            | 50.8            | 56.3            |
| Tuesday            | 10 <sup>th</sup> April                   | 7:00am – 6:00pm  | 70.3            | 61.6            | 53.9            | 61.0            |
|                    |                                          | 6:00pm – 10:00pm | 70.3            | 60.2            | 51.8            | 58.3            |
|                    |                                          | 10:00pm – 7:00am | 67.5            | 56.8            | 48.5            | 55.5            |
| Wednesday          | 11 <sup>th</sup> April                   | 7:00am – 6:00pm  | 69.3            | 61.9            | 54.1            | 59.7            |
|                    |                                          | 6:00pm – 10:00pm | 67.5            | 60.7            | 53.7            | 58.6            |
|                    |                                          | 10:00pm – 7:00am | 67.1            | 56.7            | 47.7            | 55.4            |
| Thursday           | 12 <sup>th</sup> April                   | 7:00am – 6:00pm  | 70.1            | 62.0            | 54.5            | 60.2            |
|                    |                                          | 6:00pm – 10:00pm | 69.2            | 60.9            | 52.2            | 58.6            |
|                    |                                          | 10:00pm – 7:00am | 68.0            | 56.3            | 46.9            | 54.9            |
| Arithmetic Average |                                          | Day              | 70              | 62              | 54              | 60              |
|                    |                                          | Evening          | 68              | 61              | 53              | 59              |
|                    |                                          | Night            | 67              | 57              | 48              | 56              |

The levels presented above include measured noise from all sources in the locality, including road traffic, railway activity and meteorology. Road traffic noise was observed to be the dominant source in the locality, and the levels presented above are considered to be consistent with an acoustic environment generally controlled by road traffic noise.

The Rating Background Levels (RBL) at ML1 have been calculated in accordance with the BCC *Noise Impact Assessment Planning Scheme Policy*, and are presented in **Table 2** below.

**Table 2:** Rating Background Levels (RBL) at ML1.

| Location | Day (7am – 6pm) | Evening (6pm – 10pm) | Night (10pm – 7am) |
|----------|-----------------|----------------------|--------------------|
| ML1      | 53              | 51                   | 44                 |

### 3. Noise Criteria and Limits

#### 3.1 Bowen Hills Urban Development Area Development Scheme

The site is within the Bowen Hills Priority Development Area (PDA), and the proposed development is therefore subject to considerations under the *Bowen Hills Urban Development Area Development Scheme*. Relevant acoustic guidance under the scheme is reproduced below:

**“ General noise requirements**

The design, siting and layout of development must address noise impacts and where necessary incorporate appropriate noise mitigation measures.

Development is to achieve acceptable noise levels for noise sensitive uses in affected areas<sup>8</sup>

Where determined necessary by the ULDA, an acoustic report will be required to evaluate and address potential noise impacts and recommend appropriate noise mitigation measures.

<sup>8</sup> Refer to the *Environmental Protection (Noise) Policy 2008*. “

It is noted that the scheme does not mandate specific assessment criteria, and instead references the *Environmental Protection (Noise) Policy 2008*.

The *Environmental Protection (Noise) Policy 2008* (EPP Noise 2008) establishes acoustic quality objectives (AQO) to protect or enhance stated environmental values. The environmental values to be enhanced or protected under the policy are the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and the qualities of the acoustic environment that are conducive to human health and well-being, including ensuring a suitable acoustic environment for individual's to sleep, study and learn, to be involved in recreation including relaxation and conversation; and the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

**Table 3:** Environmental Protection (Noise) Policy 2008 Acoustic Quality Objectives (in part)

| Type of Occupancy / Activity          | Recommended Acoustic Quality Objective |              |              |
|---------------------------------------|----------------------------------------|--------------|--------------|
|                                       | LAeq,adj,1hr                           | LA10,adj,1hr | LA01,adj,1hr |
| Dwelling, outdoors, daytime & evening | 50                                     | 55           | 65           |
| Dwelling, indoors, daytime & evening  | 35                                     | 40           | 45           |
| Dwelling, indoors, night-time         | 30                                     | 35           | 40           |

The policy also sets recommended criteria for the control of background creep. To the extent that it is reasonable to do so, noise from an activity must not be—

- for noise that is continuous noise measured by LA90,T—more than nil dB(A) greater than the existing acoustic environment measured by LA90,T; or
- for noise that varies over time measured by LAeq,adj,T—more than 5dB(A) greater than the existing acoustic environment measured by LA90,T

It is noted that the Acoustic Quality Objectives (AQO) are to be progressively achieved over the long term, to meet the stated purpose of the Noise Policy:

- (a) identifying environmental values to be enhanced or protected; and
- (b) stating acoustic quality objectives for enhancing or protecting the environmental values; and
- (c) providing a framework for making consistent, equitable and informed decisions about the acoustic environment.

Noise management strategies – including background creep criteria – are required to the extent it is reasonable to do so. It is therefore concluded that the AQO are not intended to be necessarily limiting criteria, as reasonableness and equity are fundamental precepts of the policy.

It is furthermore understood that the policy is not intended to override specific Council noise policies, and that application of relevant Council noise criteria (where formally established) are considered to satisfy the policy intent of protecting environmental values within a consistent and equitable framework.

Due to significant noise from transport infrastructure in the locality (which is explicitly not assessed under EPP Noise 2008), the existing acoustic environment is in substantial exceedance of the AQO. Application of the AQO as limiting criteria is therefore not considered a reasonable design methodology in this case. While the background creep criteria does take the existing acoustic environment into account, it is noted that the applicable criteria are less stringent than those that would be applicable under the *Brisbane City Plan 2014* (discussed in **Section 3.2** below).

It is therefore concluded that application of Brisbane City Council noise emission criteria represents a more conservative assessment methodology that can meet the policy intent of the *Environmental Protection (Noise) Policy 2008*, and thereby meet the general noise requirements of the *Bowen Hills Urban Development Area Development Scheme*.

### 3.2 Brisbane City Council City Plan 2014

The City Plan 2014 Centre or Mixed Use Code provides guidance to assess the suitability of proposed centre use activities, and is summarized (in part) in **Table 4** below. Proposed uses do not include significant amplified music or other identified sources of low-frequency noise emissions, and the low-frequency noise emission criteria have therefore not been assessed.

**Table 4:** Centre or Mixed Use Code (in part)

| Performance Outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Acceptable Outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PO1</b><br>Development: <ul style="list-style-type: none"> <li>a) has hours of operation which are controlled so that the use does not detrimentally impact on the amenity of adjoining residents;</li> <li>b) where not located in a Special entertainment precinct identified in a neighbourhood plan, does not result in noise emissions that exceed the noise (planning) criteria in Table 9.3.3.F low frequency noise criteria in Table 9.3.3.3.G and night-time noise criteria in Table 9.3.3.3.H in a sensitive zone or a nearby sensitive use.</li> </ul> <p><b>Note</b>—A noise impact assessment report prepared in accordance with the Noise impact assessment planning scheme policy can assist in demonstrating achievement of this performance outcome</p> | <b>AO1.1</b><br>Development: <ul style="list-style-type: none"> <li>(c) for any other use:               <ul style="list-style-type: none"> <li>(iii) where in any other zone:                   <ul style="list-style-type: none"> <li>(A) has hours of operation, including for deliveries, which are limited to 6am to 8pm; or</li> <li>(B) does not generate noise which is clearly audible and disturbing in a dwelling or other sensitive use;</li> </ul> </li> </ul> </li> </ul> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>AO1.2</b><br>Development ensures mechanical plant or equipment is acoustically screened from an adjoining sensitive use.<br><p><b>Note</b>—Mechanical plant includes generators, motors, compressors and pumps e.g. air-conditioning, refrigeration or cold room motors</p>                                                                                                                                                                                                          |

**Table 9.3.3.3.F—Noise (planning) criteria**

| Criteria location                | Intrusive noise criteria                                                                                                                                                                                                                                             | Acoustic amenity criteria                                                                                                                                                                                                                                      |         |         |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|
|                                  | Day, evening and night $L_{Aeq,adj,T}$ are not greater than the RBL plus the value in this column for the relevant criteria location, where T equals: <ul style="list-style-type: none"> <li>• day – 11hr</li> <li>• evening – 4hr</li> <li>• night – 9hr</li> </ul> | Day, evening and night $L_{Aeq,adj,T}$ are not greater than the values in the columns below for the relevant criteria location, where T equals: <ul style="list-style-type: none"> <li>• day – 11hr</li> <li>• evening – 4hr</li> <li>• night – 9hr</li> </ul> |         |         |
|                                  |                                                                                                                                                                                                                                                                      | Day                                                                                                                                                                                                                                                            | Evening | Night   |
| Emerging community zone boundary | 5dB(A)                                                                                                                                                                                                                                                               | 55dB(A)                                                                                                                                                                                                                                                        | 50dB(A) | 45dB(A) |

**Table 9.3.3.3.H—Night-time noise criteria**

| Criteria location                                                                                     | Where the existing $L_{Aeq,9hr\ night}$ at the criteria location is: | Average of the highest 15 single $L_{Amax}$ events over a given night (10pm–7am) period is not greater than the following values at the relevant criteria location | The absolute highest single $L_{Amax}$ event over a given night (10pm–7am) period is not greater than the following values at the relevant criteria location |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| At the zone boundary of a <ul style="list-style-type: none"> <li>• Emerging community zone</li> </ul> | < 45 dB(A)                                                           | 50 dB(A)                                                                                                                                                           | 55 dB(A)                                                                                                                                                     |
|                                                                                                       | 45- 60 dB(A)                                                         | $L_{Aeq,9hr\ night} + 5\ dB(A)$                                                                                                                                    | $L_{Aeq,9hr\ night} + 10\ dB(A)$                                                                                                                             |
|                                                                                                       | >60 dB(A)                                                            | 65 dB(A)                                                                                                                                                           | 70 dB(A)                                                                                                                                                     |

The intrusive noise criteria have been calculated with reference to the Rating Background Levels (RBL) at ML1, as presented in **Section 2.2**. Night-time noise criteria have been calculated with reference to the 56 dB(A)  $L_{eq,9hr}$  measured at ML1 and presented in **Section 2.2**. A summary of criteria is presented in **Table 5** below.

**Table 5:** Summary of assessment criteria

| Policy                                                  | Descriptor                           | Day | Evening | Night |
|---------------------------------------------------------|--------------------------------------|-----|---------|-------|
| Intrusive Noise Criteria<br>(RBL + 5)                   | $L_{eq,adj,T}$                       | 58  | 56      | 49    |
| Acoustic Amenity Criteria                               | $L_{eq,adj,T}$                       | 55  | 50      | 45    |
| Night-time Noise Criteria<br>( $L_{eq,9hr} + 5$ dB(A))  | $L_{max}$<br>(average of 15 highest) | -   | -       | 61    |
| Night-time Noise Criteria<br>( $L_{eq,9hr} + 10$ dB(A)) | $L_{max}$<br>(highest single event)  | -   | -       | 66    |

As shown above, the Acoustic Amenity Criteria are more stringent than the Intrusive Noise Criteria during all periods. The Intrusive Noise Criteria have therefore not been applied.

### 3.3 Air Conditioning - Noise Emissions – EPA 1994

It is not known at this stage whether the existing air conditioning on site is to be retained. Noise emission requirements are set out under the *Environmental Protection Act 1994*; in that Act noise from air conditioning must not exceed the following noise levels when measured as the  $LA_{90}$  dB(A) level over a period of 15 minutes at an affected building:

- Between 10pm and 7am: 3 dB(A) above the background level
- From 7am to 10pm: 5 dB(A) above the background level

Detailed assessment of air conditioning noise is not within the scope of this report, although due to the significant setback from sensitive uses, ready compliance is expected. Detailed assessment of air conditioning noise can be conducted – if required – once the specific model and installation of new plant has been determined. As the *Environmental Protection Act 1994* represents an ongoing legal obligation, it is recommended that plant be maintained to ensure compliance with criteria at all times.

## 4. Noise Impact Assessment

### 4.1 Noise Sources

Proposed dog day care activities are to be conducted internally, and noise breakout from internal activities are considered the source of substantive noise emissions. While some minor vehicle activity is expected, low volumes of traffic are predicted. As the vehicle movement areas are in close proximity to Campbell Street, noise emissions from on-site vehicle activity are predicted to be negligible in comparison to existing levels of road traffic noise in the locality.

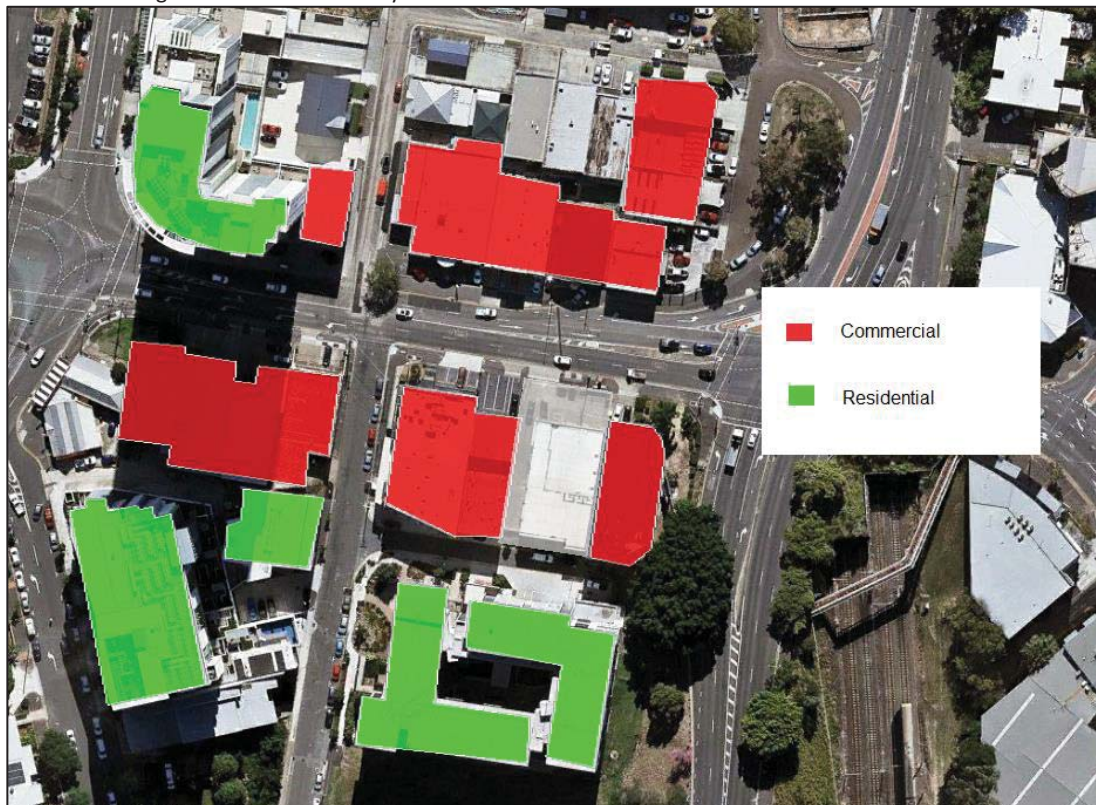
The precise level of noise emissions from dog day care activities will be highly variable, and dependent on the specific number, breed, and behaviour of dogs. It is expected that a typical day will consist of significant periods of low level noise generation, punctuated by intermittent periods of higher level activity. As a conservative design methodology, assessment has been conducted to a worst-case scenario of high intensity noise emissions occurring continuously over the entire daytime period.

To represent worst-case dog activity, sound power levels calculated from measurements previously undertaken by NMS have been applied. These measurements were of a group of 12 dogs barking in a highly agitated state, representing continuous activity. Typical dog noise emissions are predicted to be substantially lower.

### 4.2 Sensitive Receivers

The site is within a locality that includes both commercial and residential uses, as shown in **Plate 7** below.

**Plate 7:** Showing land uses in the locality



The most potentially affected noise sensitive uses are identified as the residential apartments to the south and north west of the site. Potential noise emissions have been calculated to these sensitive receivers (referred to as R1 to R6 in this report). These receivers represent the most exposed façade of the residential buildings, and have been modelled at different balcony heights. The locations of R1 to R6 – as modelled – are presented in **Plate 8** and **Table 6** below.

**Plate 8:** Showing sensitive receivers R1 to R6, as modelled



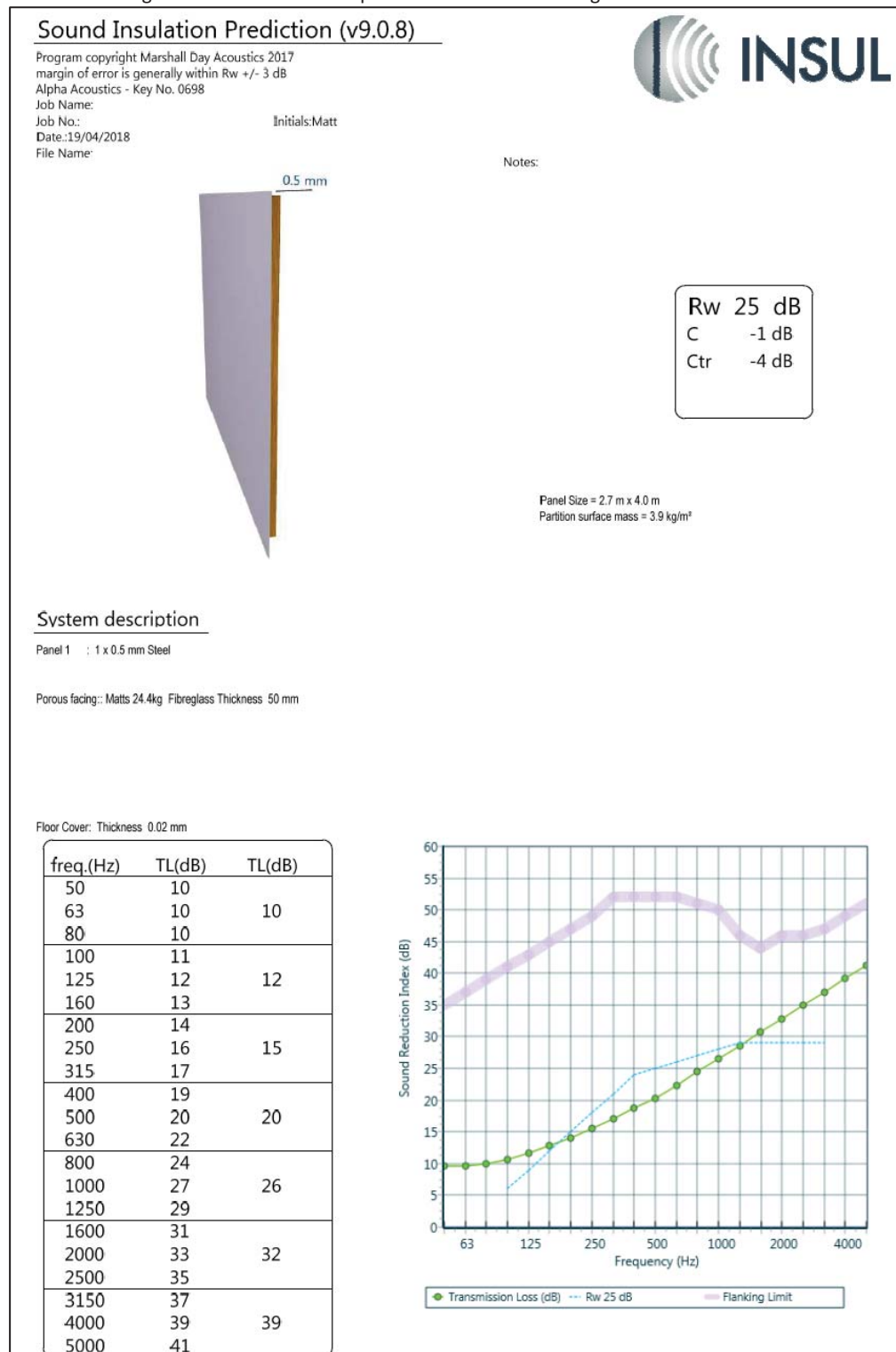
**Table 6:** Showing sensitive receivers R1 to R6, as modelled

| Receiver | Address            | Universal Transverse Mercator (UTM) |          | Receiver Height |
|----------|--------------------|-------------------------------------|----------|-----------------|
|          |                    | Easting                             | Northing |                 |
| R1       | 8 Hurworth Street  | 503654                              | 6963918  | 4.6m            |
| R2       | 8 Hurworth Street  | 503654                              | 6963918  | 7.6m            |
| R3       | 8 Hurworth Street  | 503654                              | 6963918  | 10.6m           |
| R4       | 35 Campbell Street | 503594                              | 6964012  | 4.6m            |
| R5       | 35 Campbell Street | 503594                              | 6964012  | 7.6m            |
| R6       | 35 Campbell Street | 503594                              | 6964012  | 10.6m           |

### 4.3 Existing Building Envelope

Noise emissions from internal activities will be substantively attenuated by the building envelope. To assess the acoustic performance of the existing construction, calculations have been conducted using the INSUL sound insulation prediction software, based upon a building inspection conducted on site. As sensitive receivers are located above the site, the roof is considered the most criteria sound transmission pathway. The brick construction of the walls is predicted to provide a far higher degree of noise attenuation.

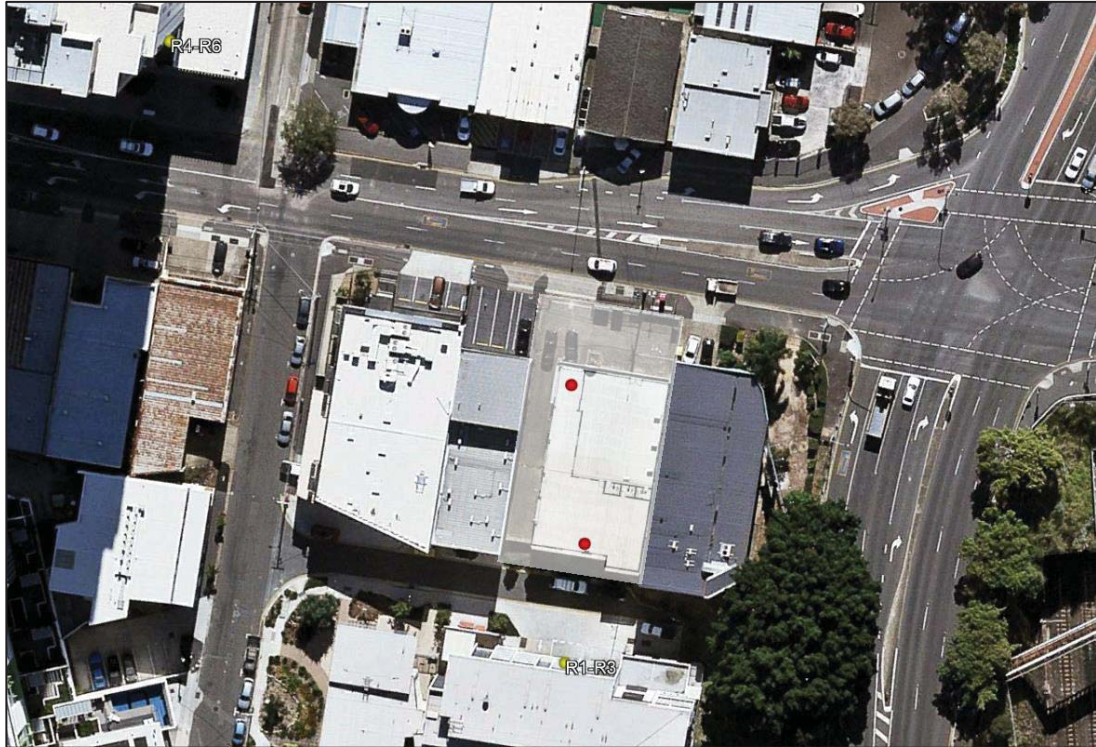
**Plate 9:** Showing the calculated acoustic performance of the existing roof



#### 4.4 Noise Emission Forecasts

Potential noise breakout from internal activities has been forecast to nearby sensitive receivers using the environmental noise model presented in **Appendix B**. Forecasts assume continuous high intensity dog barking activity over the entire daytime period. Noise breakout has been modelled from two locations, representing worst-case locations, as presented in **Plate 10** below. Results of environmental noise calculations are presented in **Tables 7 and 8** following, along with criteria. An adjustment of +4.8 dB(A) has been applied to account for impulsiveness, calculated as per the *Noise Impact Assessment Planning Scheme Policy*. Forecast  $L_{eq,1hr}$  has been converted to  $L_{eq,adj,T}$  assuming continuous activity between 6am and 8pm.

**Plate 10:** Showing worst-case noise breakout locations, as modelled



**Table 7:** Noise emission forecasts, internal noise breakout. Levels are in dB(A)  $L_{eq,adj,T}$

| Receiver | Daytime   |          | Evening   |          | Night     |          | Assessment |
|----------|-----------|----------|-----------|----------|-----------|----------|------------|
|          | Forecast* | Criteria | Forecast* | Criteria | Forecast* | Criteria |            |
| R1       | 50        | 55       | 47        | 50       | 40        | 45       | Pass       |
| R2       | 50        | 55       | 47        | 50       | 41        | 45       | Pass       |
| R3       | 50        | 55       | 47        | 50       | 41        | 45       | Pass       |
| R4       | 37        | 55       | 34        | 50       | 28        | 45       | Pass       |
| R5       | 37        | 55       | 34        | 50       | 27        | 45       | Pass       |
| R6       | 37        | 55       | 34        | 50       | 27        | 45       | Pass       |

\* Includes a +4.8 dB(A) adjustment for impulsiveness, as per the *Noise Impact Assessment Planning Scheme Policy*.

**Table 8:** Noise emission forecasts, internal noise breakout. Levels are in dB(A)  $L_{max}$ 

| Receiver | Forecast* | Night-time noise criteria |              | Assessment |
|----------|-----------|---------------------------|--------------|------------|
|          |           | Average of 15 highest     | Single Event |            |
| R1       | 55        | 61                        | 66           | Pass       |
| R2       | 55        | 61                        | 66           | Pass       |
| R3       | 55        | 61                        | 66           | Pass       |
| R4       | 42        | 61                        | 66           | Pass       |
| R5       | 42        | 61                        | 66           | Pass       |
| R6       | 42        | 61                        | 66           | Pass       |

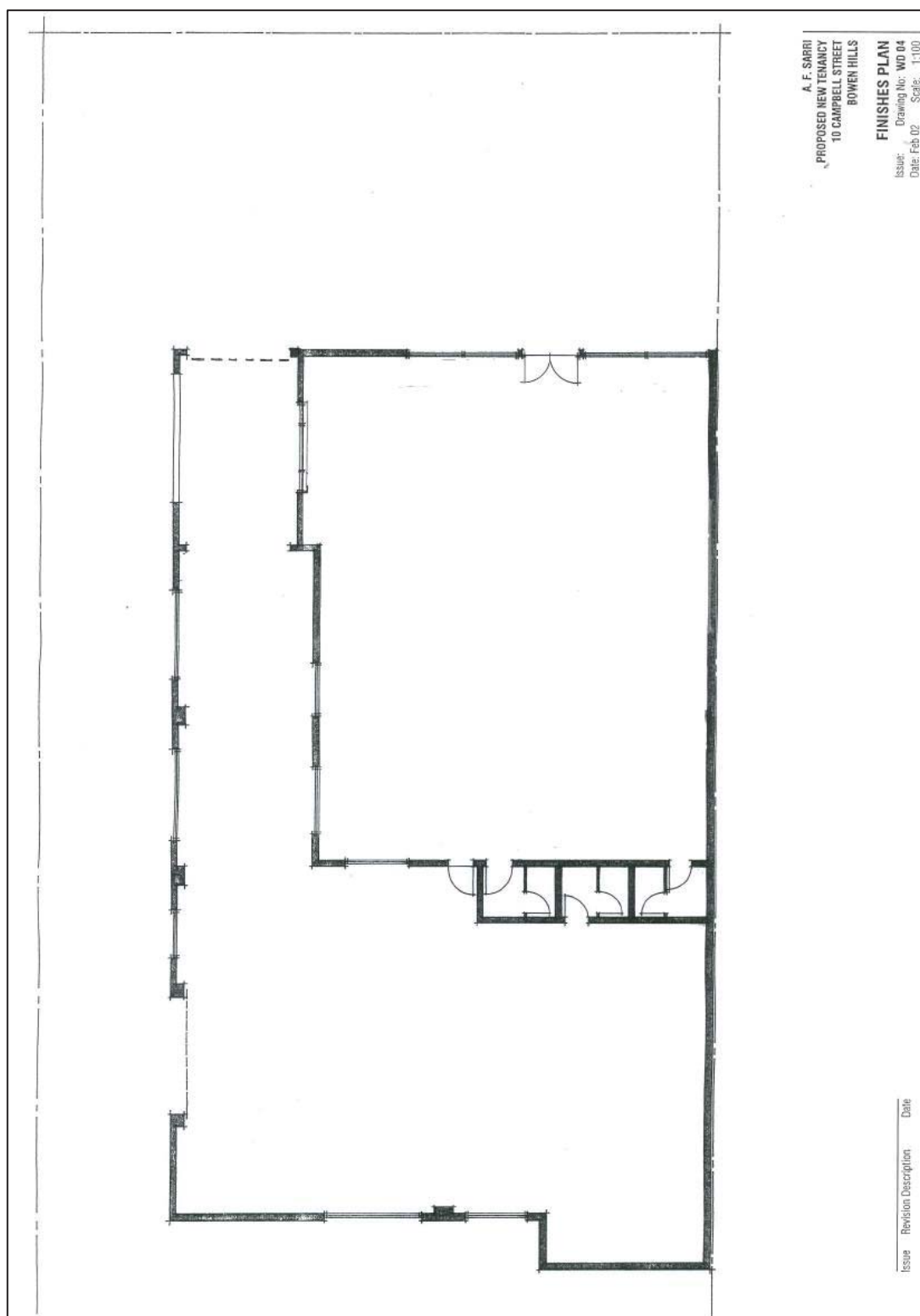
\* Includes a +4.8 dB(A) adjustment for impulsiveness, as per the *Noise Impact Assessment Planning Scheme Policy*.

As shown above, noise breakout is forecast to meet criteria at all receivers during all periods. On this basis it is concluded that noise from internal activities can meet noise emission requirements, and not pose an undue risk to acoustic amenity in the locale.

It is noted that forecasts do not include potential barking activity outside of the building envelope, which is possible when dogs are being dropped off or picked up. The carpark is located directly adjacent to the building, and it is expected that the duration of drop-off/pick-up activities would be too brief to generate significant emissions as expressed through the  $L_{eq,adj,T}$  descriptor. This notwithstanding, it is not possible to exclude the possibility of single event dog barks outside of the building envelope prior to 7am. Under this scenario, a minor (+2 dB(A)) exceedance of the night time noise criteria is nominally forecast, assuming a 'worst-case' dog bark event. As minimal activity is expected before 7am (relating to occasional early drop-offs), the likelihood of such events is considered to be low. It is furthermore noted that the default hours of operation under Acceptable Outcome **A01.1** of the *Centre or Mixed Use Code* is 6am to 8pm (the proposed hours of operation for the development). It appears that the Code allows for minor noise exceedances to be acceptable during the "shoulder" 6am-7am period, in recognition of the fact that ambient noise levels during this period are typically elevated and community expectation for amenity is not the same as during the Midnight – 4am periods, for example.

Due to the low level of risk of "worst-case" single event dog barks outside of the building envelope during the 6am-7am period, the minor level of nominal exceedance, and the concession allowed in the *Centre or Mixed Use Code* for the 6am – 7am period, it is concluded that the possibility of exceeding the night-time  $L_{max}$  criteria from pre-7am drop-off activity should not be used as limiting criteria for development approval in this case.

## Appendix A: Plans



## Appendix B: Environmental Noise Model

Noise predictions been prepared with PEN3D, a software program implementing a prediction model based on the method described in Bies & Hansen, *ISO 9613-2 (1996) Acoustics – Attenuation of sound propagation outdoors Part 2: General Method of Calculation* and *CONCAWE*. The model takes into account meteorological factors, and predictions assume neutral conditions. The basic equation adopted is-

$$L_p = L_w - 20 \log_{10}(r) - 10 \log_{10}(4\pi) + AE$$

Where:

- $L_p$  is the sound pressure level at an observer
- $L_w$  is the sound power level of the source
- $20 \log_{10}r - 10 \log_{10}(4\pi)$  is the Distance attenuation (spherical)
- AE is the excess attenuation factors and is determined as the sum of the contributions

All prediction models have limits to their accuracy of prediction. This is due to the inherent nature of the calculation algorithms that go into the design of the models, the assumptions made in the implementation of the model, and the availability of good source sound power data. Various researchers have suggested that an un-calibrated model has an accuracy of  $\pm 5$  dB while a calibrated model has an accuracy of  $\pm 2$  dB. ISO 9613-2 has an estimated accuracy for broadband noise of  $\pm 3$  dB at 1000 metres. Calibration means that the model has been established with reference to measured sound levels at a receiver, known source levels and tightly defined propagation variables. Alternatively a series of predictions with different programs but the same assumption variables can be used for verification purposes. Meteorological effects are included in calculations, but are not considered significant at the distances involved. Topographic data was sourced from Geosciences Australia.

Sound power levels are presented in **Table B1** below. Noise breakout sound power levels include transmission loss from the existing building envelope, as presented in **Section 4.3**. Sound power levels do not include adjustments for impulsiveness, which have been subsequently applied to the forecasts presented in **Section 4.4**.

**Table B1:** Source sound power levels.

| Name                      | Descriptor | 1/1 Octave Sound Power Levels in dB(Z) |        |        |        |       |       |       |       | Total in dB(A) |
|---------------------------|------------|----------------------------------------|--------|--------|--------|-------|-------|-------|-------|----------------|
|                           |            | 63 Hz                                  | 125 Hz | 250 Hz | 500 Hz | 1kHz  | 2 kHz | 4 kHz | 8 kHz |                |
| 12 dogs (highly agitated) | $L_{Aeq}$  | 67.3                                   | 106.1  | 75.0   | 96.5   | 105.3 | 95.5  | 82.7  | 72.9  | 106.1          |
| Noise breakout            | $L_{Aeq}$  | 57.3                                   | 80.4   | 60.0   | 76.5   | 79.3  | 63.5  | 43.7  | 32.9  | 80.4           |
| 12 dogs (highly agitated) | $L_{max}$  | 69.8                                   | 76.9   | 78.0   | 101.6  | 110.3 | 100.7 | 88.2  | 77.5  | 111.2          |
| Noise breakout            | $L_{max}$  | 59.8                                   | 64.9   | 63.0   | 81.6   | 84.3  | 68.7  | 49.2  | 37.5  | 85.4           |
|                           |            | Sound Pressure Levels at 1m in dB(Z)   |        |        |        |       |       |       |       | Total in dB(A) |
| 12 dogs (highly agitated) | $L_{Aeq}$  | 59.5                                   | 98.3   | 67.2   | 88.7   | 97.5  | 87.7  | 75.0  | 65.2  | 98.3           |
| Noise breakout            | $L_{Aeq}$  | 49.5                                   | 72.6   | 52.2   | 68.7   | 71.5  | 55.7  | 36.0  | 25.2  | 72.6           |
| 12 dogs (highly agitated) | $L_{max}$  | 62.0                                   | 69.1   | 70.2   | 93.8   | 102.5 | 92.9  | 80.4  | 69.8  | 103.4          |
| Noise breakout            | $L_{max}$  | 52.0                                   | 57.1   | 55.2   | 73.8   | 76.5  | 60.9  | 41.4  | 29.8  | 77.6           |

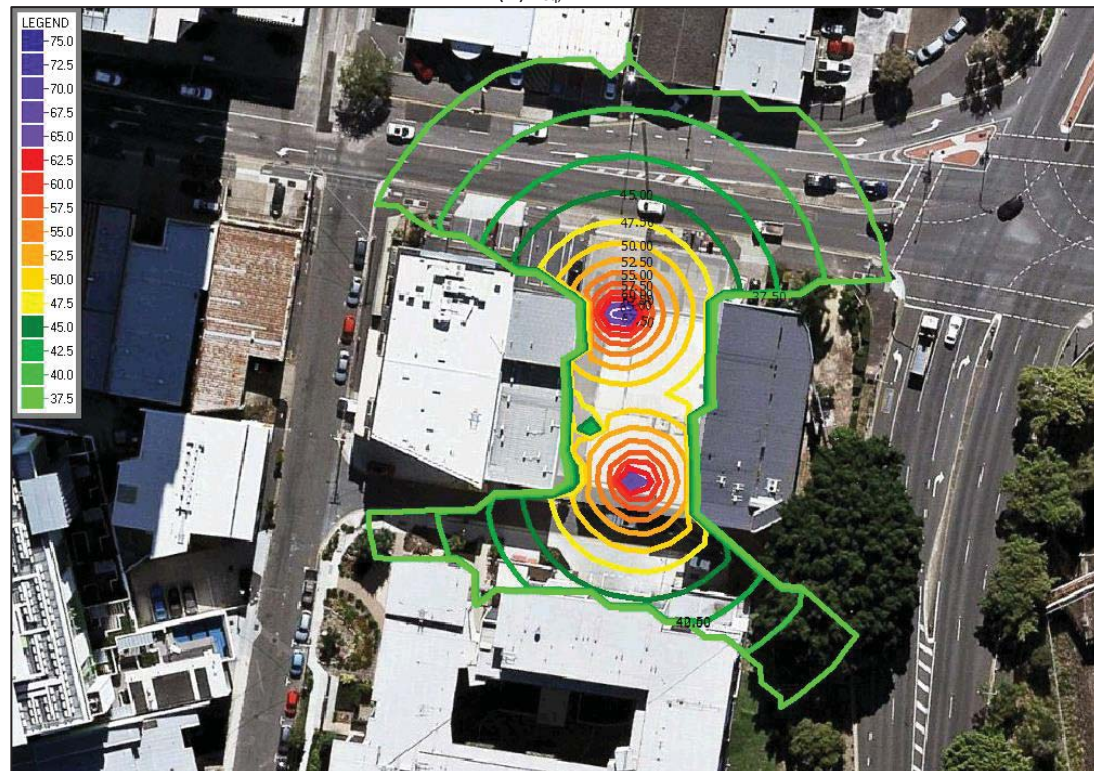
Results from the environmental noise model are presented in the following **plates** and **table**.

**Table B2:** Receiver point calculations, noise breakout. Levels are in dB(A)  $L_{eq,1hr}$ 

| POINT CALCULATIONS                                                                                                                               |               |               |               |               |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|------------------------|
| Pen3D2000 V 1.9.32                                                                                                                               |               |               |               |               |                        |
| Project Code: 4486                                                                                                                               |               |               |               |               |                        |
| Project Description: Noise assessment of 10 Campbell Street, Bowen Hills                                                                         |               |               |               |               |                        |
| File: D:\VZ Drive\4486 10 Campbell St, Bowen Hills - dog daycare\Model\4486 breakout.PEN                                                         |               |               |               |               |                        |
| Friday 20 Apr, 2018 at 11:39:28                                                                                                                  |               |               |               |               |                        |
| Environmental Calculations                                                                                                                       |               |               |               |               |                        |
| All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.                         |               |               |               |               |                        |
| Noise level results are the maximum of all the noise sources Noise level results incorporate the incoherent ground reflection algorithm          |               |               |               |               |                        |
| Meteorology: Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m) Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%) |               |               |               |               |                        |
| Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)                                                                   |               |               |               |               |                        |
| Receptor                                                                                                                                         | X Posn<br>(m) | Y Posn<br>(m) | Height<br>(m) | Ground<br>(m) | Noise Level<br>(dB(A)) |
| R1                                                                                                                                               | 503653.0      | 6963918.3     | 4.6           | 16.0          | 45.0                   |
| R2                                                                                                                                               | 503653.0      | 6963918.0     | 7.6           | 16.0          | 45.3                   |
| R3                                                                                                                                               | 503653.0      | 6963917.8     | 10.6          | 16.0          | 45.3                   |
| R4                                                                                                                                               | 503593.6      | 6964008.2     | 4.6           | 19.5          | 32.2                   |
| R5                                                                                                                                               | 503593.2      | 6964008.0     | 7.6           | 19.5          | 32.0                   |
| R6                                                                                                                                               | 503593.4      | 6964008.2     | 10.6          | 19.5          | 32.0                   |

**Table B3:** Receiver point calculations, noise breakout. Levels are in dB(A)  $L_{max}$ 

| POINT CALCULATIONS                                                                                                                               |               |               |               |               |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|------------------------|
| Pen3D2000 V 1.9.32                                                                                                                               |               |               |               |               |                        |
| Project Code: 4486                                                                                                                               |               |               |               |               |                        |
| Project Description: Noise assessment of 10 Campbell Street, Bowen Hills                                                                         |               |               |               |               |                        |
| File: D:\VZ Drive\4486 10 Campbell St, Bowen Hills - dog daycare\Model\4486 breakout lmax.PEN                                                    |               |               |               |               |                        |
| Thursday 26 Apr, 2018 at 14:58:17                                                                                                                |               |               |               |               |                        |
| Environmental Calculations                                                                                                                       |               |               |               |               |                        |
| All point and line sources included. Line source segmentation angle: 10 degrees. Calculations for specified meteorology.                         |               |               |               |               |                        |
| Noise level results are the maximum of all the noise sources Noise level results incorporate the incoherent ground reflection algorithm          |               |               |               |               |                        |
| Meteorology: Wind speed 0.0 (m/s) Wind direction 0 Mast height 10.0 (m) Temperature 20.0 (C) Temperature Gradient 0.0 (C/100m) Humidity 50.0 (%) |               |               |               |               |                        |
| Surface Roughness of terrain 0.023000000 (m) Zero plane offset 0.080000000 (m)                                                                   |               |               |               |               |                        |
| Receptor                                                                                                                                         | X Posn<br>(m) | Y Posn<br>(m) | Height<br>(m) | Ground<br>(m) | Noise Level<br>(dB(A)) |
| R1                                                                                                                                               | 503653.0      | 6963918.3     | 4.6           | 16.0          | 50.0                   |
| R2                                                                                                                                               | 503653.0      | 6963918.0     | 7.6           | 16.0          | 50.3                   |
| R3                                                                                                                                               | 503653.0      | 6963917.8     | 10.6          | 16.0          | 50.3                   |
| R4                                                                                                                                               | 503593.6      | 6964008.2     | 4.6           | 19.5          | 37.2                   |
| R5                                                                                                                                               | 503593.2      | 6964008.0     | 7.6           | 19.5          | 37.0                   |
| R6                                                                                                                                               | 503593.4      | 6964008.2     | 10.6          | 19.5          | 37.0                   |

**Plate B1:** Noise contours at 4.6m. Levels are in dB(A)  $L_{eq,1hr}$ 

**Plate B2:** Noise contours at 7.6m. Levels are in dB(A)  $L_{eq,1hr}$



**Plate B3:** Noise contours at 10.6m. Levels are in dB(A)  $L_{eq,1hr}$



## Appendix C: Glossary

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### ***“Peak” maximum level ( $L_{Amax,T}$ ).***

The peak maximum level is the absolute highest (1 second or less) sound level within the whole of the measurement time.

### ***Event maximum sound pressure level ( $L_{A\%,adj,T}$ ), $L_{01}$***

The  $L_{01}$  level is calculated as the noise level equalled and exceeded for 1% of the measurement time, for example 9 seconds in any 15 minute interval.  $L_{01}$  is an appropriate level to characterise single events, such as from train bypass.

In this Report, the measured  $L_{01}$  levels for day/evening/night are not averaged but are arranged from low to high in the relevant day/evening/night interval and the value that is found at the 90th percentile ( $L_{10}$  of  $L_{01}$  sample) in the interval is recorded as its “ $L_{01}$ ” level.

### ***Average maximum sound pressure level ( $L_{A\%,adj,T}$ ), $L_{10}$***

The “ $L_{10}$ ” level is an indicator of “steady-state” noise or intrusive noise conditions from traffic, music and other relatively non-impulsive noise sources. The  $L_{10}$  level is calculated as the noise level equalled and exceeded for 10% the measurement time, for example 90 seconds in any 15 minute interval. The measured  $L_{10}$  time-intervals for day/evening/night are arithmetically averaged to present the “average maximum” levels of the environment for day/evening/night. The level can be adjusted for tonality or impulsiveness.

### ***Background sound pressure level ( $L_{A90,T}$ ), $L_{90}$***

Commonly called the “ $L_{90}$ ” or “background” level and is an indicator of the quietest times of day, evening or night. The  $L_{90}$  level is calculated as the noise level equalled and exceeded for 90% the measurement time. The measured  $L_{90}$  time-intervals are arithmetically averaged to present the “average background” levels of the environment for day/evening/night. The level is recorded in the absence of any noise under investigation. The level is not adjusted for tonality or impulsiveness.

### ***Equivalent Continuous or time average sound pressure level ( $L_{Aeq,T}$ ), $L_{eq}$***

Commonly called the “ $L_{eq}$ ” level it is the logarithmic average noise level from all sources far and near. The maximum 1-hour levels within the day/evening/night time intervals are referenced for building design. The level can be adjusted for tonality.

### ***Façade-adjusted level***

A sound level that is measured at a distance of 1.0 metre from a wall or facade. The level is nominally 2.5 dB higher than the free-field level.

### ***Free-field level***

A sound level that is measured at a distance of more than 3.5 metres from a wall or facade.