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Pavillion
24 Brookes Street, Bowen Hills
Acoustic Report

Blue Sky Private Real Estate

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May, 2013

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1. Introduction

1.1. Background

The following report is in response to a request by Blue Sky Private Real Estate to prepare a revised environmental noise assessment for the proposed development located at 24 Brookes Street, Bowen Hills. This report will form part of the development application for consideration by the ULDA.

1.2. Scope

This report investigates the acoustic aspects associated with the residential component of the proposed development. The scope of the acoustic aspects investigated includes:

- Utilise existing unattended noise monitoring at the site from the 24th August to the 2nd September, 2010;
- Statement of the assessment criteria relating to environmental noise emissions in relation to the:
  - Brisbane City Council City Plan (2000) *Noise Impact Assessment Planning Scheme Policy* (*NIAPSP*);
- Noise modelling to determine predicted noise impacts at sensitive receivers for both imission and emission;
- Details of treatments recommended for the site predicted to comply with ULDA criteria; and

The assessment is based upon the plans provided by *AG Architects* dated 16th April, 2013 as follows:

Plan Number	Revision	Plan Reference
A-DA-01-03	P1	Development Summary & Location Plan
A-DA-02-01	P5	Ground Floor Plan
A-DA-02-02	P6	Level 1 Floor Plan
A-DA-02-03	P6	Level 2-3 Floor Plan
A-DA-02-04	P5	Level 4 Floor Plan
A-DA-02-05	P5	Level 5-8 Floor Plan
A-DA-02-06	P5	Roof Terrace
A-DA-03-01	P2	West and East Elevations
A-DA-03-02	P2	North and South Elevations

1.3. Site Location

The site is described by the following:

24 Brookes Street, Bowen Hills, Lots 4 and 5 on RP9985.

Refer to Figure 1 for the site location.

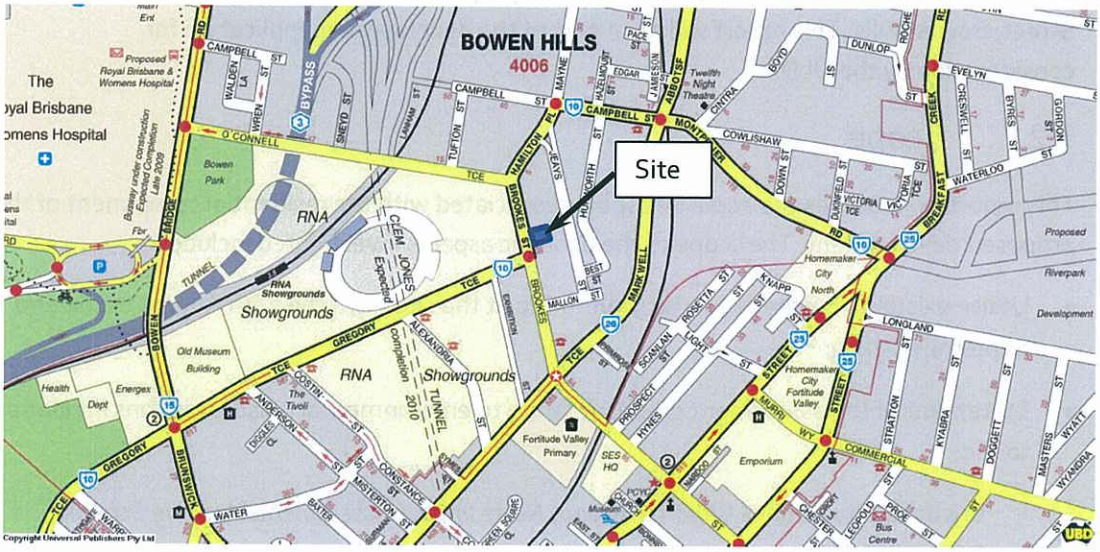


Figure 1: Site location

1.4. Current Conditions Surrounding the Site

A comprehensive site survey was conducted on the 24th of August, 2010. The survey identified the following:

- Bowen Street is located adjacent to the western boundary.
- The RNA showground is located across Bowen Street.
- The Australian Solenoid Co P/L is adjacent to the northern site boundary.
- An art dealer is adjacent to the southern site boundary.
- Adjacent to the eastern boundary, the three nearest commercial premises are Labels Direct, Drawing and Drafting Australia, and PA Architects.

A site visit was performed on the 28th of May, 2013 and determined that the above is still accurate. There appears to be no residential receivers in the immediate vicinity.

1.5. Current Acoustic Environment

The site is primarily affected by road traffic noise associated with Brooke Street. Commercial office/retail premises surrounding the site may also affect the acoustic amenity. Activities associated with these premises are addressed in this assessment with the results presented in Section 6.

An additional site survey was conducted on the 9th of September, 2010 between 10pm and 10:30pm to determine the potential noise impacts from offsite mechanical plant. During the survey, mechanical plant associated with the commercial buildings to the north, east, and south were inaudible at the site.

It should also be noted that the proposed development is highly unlikely to impact existing residential premises. The nearest identified dwelling is 60m to the east and is screened by a row of existing commercial premises.

2. The Proposed Development

2.1. Development Profile

The proposal is to develop the site into a 9 storey mixed-use building with a roof terrace. The site comprises the following:

- Ground Floor:
  - 30m² shop,
  - Visitor, tenant and bicycle parking,
  - Pump room, lobby and designated refuse storage area;
- Levels 1 - 8:
  - 36 residential units as a mixture of 1 and 2 bedroom apartments;
- Roof Terrace:
  - A communal recreation area including a vegetable garden and barbeque

2.2. Access

The development plans propose access from Brookes Street at the western boundary.

3. Equipment

The following equipment was used to record road traffic and ambient noise levels in the vicinity of the site:

- ARL EL316 Environmental Noise Monitor (SN# 16-707-045);
- BSWA Technology Co.Ltd CA106 Acoustical Calibrator (SN # 44095);

All equipment used is in calibration and evidence of current NATA Laboratory Certification is available on request. The logger was calibrated before and after the monitoring session with no significant drift from the reference signal recorded.

4. Measurement Procedure

4.1. Unattended Road Traffic Noise Monitoring

An ARL EL316 environmental noise monitor was placed in the front yard of 40 Brookes Street to measure ambient noise levels. The microphone was in a free field position approximately 1.4 metres above ground level and 6 metres from the nearest lane of traffic.

Refer Figure 2 for unattended noise monitoring location.

Figure 2: Unattended Noise Monitoring Location

The noise monitor was set to record noise levels from the 24th August to the 2nd September 2010 as follows:

- "A" weighting;
- "Fast" response; and
- 15 minute statistical interval.

The statistical interval was chosen to allow application of *AS/NZS 2107:2000 Acoustics – Recommended Design Sound Level and Reverberation Times for Building Interiors* (*AS2107*).

Road traffic noise levels were conducted in accordance with Australian Standard *AS2702:1984 Acoustics – Methods for the measurement of road traffic noise*.

4.2. Onsite Activity Noise Measurements

Noise levels associated with typical onsite activities were taken from similar investigations conducted by TTM Acoustics. All measurements were conducted in accordance with Australian Standard AS1055:1997 *Acoustics – Description & Measurement of Environmental Noise*.

5. Noise Assessment Criteria

As the Urban Land Development Authority (ULDA) does not have specific noise criteria, we recommend the application of the *NIAPSP*.

5.1. Road Traffic Noise – Brisbane City Council

The road traffic noise criteria applied to the proposed development is pursuant to *NIAPSP*. The assessment methodology requires that future traffic volumes are taken into account. This assessment has utilised traffic volume predictions for the year 2020.

The internal noise limits are the recommended design sound levels from *AS2107* and are presented in Table 1.

Since *AS2107* does not include limits for outdoor recreation areas, *NIAPSP* states that the L_{Aeq} averaged over a 24 hour period should not exceed 55 dB(A). The maximum L_{Aeq} 1hr for any hour should not exceed 60 dB(A).

Table 1: Internal noise limits for residential dwellings from *AS 2107*.

Type of Occupancy / Activity	Recommended Design Sound Level, LAeq dB(A)
7. RESIDENTIAL BUILDINGS	
Houses and apartments near major roads –	
Living areas	35 – 45
Sleeping areas	30 – 40
Work areas	35 – 45

Table 2 outlines the assessment criteria based upon achieving the noise level objectives for Brisbane City Council.

Table 2: Road traffic Noise Assessment Criteria.

Description	Predicted SPL dB(A)
Communal Recreational Areas	55dB(A) $L_{eq,24Hour}$ (Free Field)
Private Recreational Areas	55dB(A) $L_{eq,24Hour}$ (Façade Corrected)
External façade	60dB(A) $L_{eq,1Hour}$ (Façade Corrected)
Internal noise limits	As per Table 1

5.2. Commercial Activity Noise – Brisbane City Council

Brisbane City Council require that noise associated with commercial activities (i.e. vehicle movements excluding mechanical plant) are assessed in accordance with *NIAPSP*. The assessment should detail the location, extent and construction specifications for proposed attenuation measures including all assumptions and methodologies used.

Noise criteria associated with the proposed site activities are pursuant to the *NIAPSP*. In essence, *NIAPSP* requires the following:

Assessment of imission[1] and emission[2].

Assessment of imission and emission levels are grouped into 3 fundamental methodologies:

- Comparison of like parameters or descriptors – Comparison, using a suitable sound descriptor, of the ambient sound character of an area without the development to that resulting with the development;
- Application of *AS2107* – Comparison with a defined set of sound pressure levels, for specified indoor areas occupied by people set out in Table 1 of *AS2107;*
- Sleep awakenings – Comparison with sleep levels. This type of assessment can be conducted using sound exposure levels (LAE) to compare to the FICAN 1997 SEL(LAE)/percentage awakening curve;

We recommend applying the comparison of like parameters for assessment of noise from all noise sources associated with the development as follows:

LA10[3] Vs LA10 for transient noise sources (i.e. waste collection, car parking and loading dock). *NIAPSP* allows the existing LA10 level to be exceeded by 3 dB by any proposed activities (taking into account the number of discreet noise events, character of the noise and time of occurrence);

Application of *AS2107* for control of mechanical plant noise.

The use of L_{A10} levels is recommended as it reflects the average maximum level of noise associated with a source. The use of average maximum is referenced as an acceptable assessment method of transient noise sources in the *Noise Measurement Manual* produced by the Queensland Department of Environment & Heritage (2nd Edition, 1995). For short duration noise events, the application of *AS2107* (see point (2) above) is not considered appropriate, as it applies to continuous noise, such as mechanical plant.

Based on the above assessment requirements, the assessment criteria for residential receivers in the vicinity of the site are detailed in Tables 3 and 4.

[1] Immission is the noise received by the development when it is immersed in an ambient sound environment.

[2] Emission is the noise emitted by activities within the development.

[3] L10 level is the level exceeded for 10% of the measurement time, and often termed the "average maximum"

Table 3: Assessment criteria for residential receiver 1.

Time Period	Criteria LA10 dB(A)
Daytime (7am – 6pm)	74 (71 LA10 +3dB(A))
Evening (6pm – 10pm)	71 (68 LA10 +3dB(A))
Night time (10pm – 7am)	65 (62 LA10 +3dB(A))

Sleep Disturbance Criteria

Criteria for sleep disturbance is addressed under the is addressed in the *User's Guide to the Environmental Protection (Noise) Policy*, and states the following:

'In the case of fluctuating noise, the maximum level is correlated to sleep disturbance, rather than the ambient level. For good sleep, maximum noise levels of 45 dB(A) to 50 dB(A) should not be heard in a bedroom more than 10 to 15 times a night.

'Where noise is continuous, the ambient level during the sleeping period should not exceed 30 – 35 dB(A) indoors in a bedroom.'

The research concerning the effect of maximum noise levels of 45 to 50 dB(A) and the number of events is not complete and there is still a lot of discussion about their application. This is because people are extremely variable in their reactions to noise and how well they acclimatise to new activities. The maximum level does not mean a person is awakened at these levels, but sleep may be disturbed.

Intrusiveness Criteria

Further to the above, we recommend applying a limit of L_{max} 45dB(A) inside dwellings for fluctuating noise as the World Health Organisation's *Guidelines for Community Noise 1999* states that "speech in relaxed conversation" can be "understood fairly well in background levels of 45dBA". The L_{Amax} level is therefore considered unlikely to interfere with normal speech levels, watching television and other typical household activities.

5.3. Mechanical Plant – Brisbane City Council

Application of *AS2107* for control of mechanical plant noise is in accordance with *NIAPSP*, and takes into account the acceptable R category for potentially affected premises as defined in Australian Standard AS1055.2 1997 *Acoustics – Description & Measurement of Environmental Noise*. By categorising the dwellings adjacent to the development as being R3 (areas with medium density transportation or some commerce or industry), the noise design target level defined in *AS2107* for dwellings near major roads is 40dB(A) Leq (15 min) in sleeping areas.

Further to this, to prevent background creep, plant must be designed to not exceed the measured background noise levels. These various criteria equate to a design target for mechanical plant of the following levels:

Table 4: Mechanical plant assessment criteria for onsite receivers.

Time Period	Criteria L90 dB(A)
Daytime (7am – 6pm)	54
Evening (6pm – 10pm)	47
Night time (10pm – 7am)	44

Refer to Appendix B for graphical representation of measured noise levels

The above levels are quoted as a measured level, not a component level; hence, all plant proposed must be included in assessment. By designing plant noise to a measured level rather than a component level, the additive effect of multiple plant is taken into account.

6. Road Traffic Noise Assessment

6.1. Measured Noise Levels

Table 5 presents the road traffic noise levels measured at the unattended monitoring location.

Table 5: Measured Road Traffic Noise Levels.

Road Traffic Noise Descriptor	Time Period	Measured Level dB(A)
$L_{10,18hr}$	6am to midnight	70
Noisiest day time $L_{eq,1hour}$	2pm – 3pm	68
Noisiest night time $L_{eq,1hour}$	5am – 6am	64
$L_{Aeq,24Hour}$	Midnight to Midnight	70

Graphical presentation of the measured road traffic noise levels are presented in Appendix A.

6.2. Road Traffic Volumes

Traffic volumes were obtained from a traffic count performed in 2009 at the intersection of Gregory Terrace and Brookes Street (i.e. in front of the subject site) and was conducted by TTM Data. A 4% annual growth rate was applied to predict the future traffic volumes and are presented in Table 6.

Table 6: Road Traffic Volumes for Brookes Street.

Road	Year	Traffic Volume (AADT)	Heavy Vehicles % AADT
Brookes Street (North of Gregory Terrace)	Surveyed 2009	7,240	3.0
	Predicted 2010	7,530	
	Predicted 2024	13,039	
Brookes Street (South of Gregory Terrace)	Surveyed 2009	7,395	3.0
	Predicted 2010	7,691	
	Predicted 2024	13,318	

The CoRTN methodology requires the input of 18 hour traffic volumes and is approximated as 95% of the Average Annual Daily Traffic.

6.3. Verification of Existing Road Traffic Levels (2009)

Road traffic noise predictions were conducted using TNoise, a CoRTN based noise modelling program. To verify the accuracy of TNoise, current road conditions were entered into the model and a prediction to the microphone of the unattended noise monitor was conducted. The comparison of the measured and predicted noise level is presented in Table 7.

Table 7: Comparison of Measured and Predicted Road Traffic Noise Levels.

Location	Measured $L_{A10,18hr}$	Predicted $L_{A10,18hr}$	Required Correction
Brookes Street	69	70	0

Note that rounding of the predicted level is presented above and was performed post calculations. The measured level was also rounded.

Corrections are applied to the model to ensure the predicted noise levels are within ±2dB(A) of the measured levels. If the model exceeds the ±2dB(A) tolerance, a correction is required.

As the modelled levels are within the allowable tolerance of ±2dB(A) of the measured levels, no correction is required.

6.4. Traffic Noise Modelling Parameters

The following parameters were used in the calculation of future road traffic noise impacts.

Table 8: Computer modelling parameters

Description	Value
Segmentation Angle:	10
Road Surface Correction	+2 dB(A)
Survey Plan	None available
Development Plan	AG Architects
Traffic Speed:	60km/hr
Noise Source Height above grade:	0.5m
Façade Correction:	+2.5dB(A)
Receiver height	1.6m above FFL

6.5. Predicted Impact Noise Levels (2024)

Predicted road traffic noise impacts for the year 2024 were calculated using TNOISE and are based on the assumptions presented in Section 6.4.

When referring to the measured traffic noise levels in Table 9: Predicted Road Traffic Noise Impacts at the Proposed Residential Units, there is a -2dB(A) difference between the $L_{10,18Hour}$ and the Day $L_{eq,1Hour}$, and a -6dB(A) difference between the $L_{10,18Hour}$ and the Night $L_{eq,1Hour}$. These differences are applied as corrections to the predicted 2024 $L_{10,18Hour}$ levels in Table 9, to produce future Day and Night $L_{eq,1Hour}$ values that are used in the determination of building treatments.

The model input variables and results are presented in Appendix B.

Table 9: Predicted Road Traffic Noise Impacts at the Proposed Residential Units

Assessment Location: Worst Affected Façade - West	Predicted SPL (dB(A)) in 2024 (Façade Corrected)		
	$L_{10,18Hour}$	Noisiest Daytime $L_{eq,1Hour}$	Noisiest Night Time $L_{eq,1Hour}$
Level 1-2	73	71	67
Level 3-4	72	70	66
Level 5-8	71	69	65

Based on the predicted impact levels the residential component of the development is predicted to exceed the criteria and requires further treatment as detailed in Section 8.

7. Commercial Activity Noise Analysis

This section incorporates the assessment of noise emanating from both offsite and onsite commercial premises with the potential to affect onsite receivers.

7.1. Source Noise Levels

An assessment of onsite and offsite activities impacting the proposed onsite residential receivers was conducted considering the activities presented in Table 10. The noise sources were selected as they represent the likely activities that have the potential to impact the proposed development. It should be noted that noise levels were calculated to one metre and include corrections for tonality and impulsiveness as per *AS 1055*.

Table 10: Source Noise Levels for Transient Activities

Noise Source:	Measured Level L_{max} (dB(A))	Correction Factor	Corrected Level L_{max} (dB(A))
Car door closure	77	+ 2 (impulsive)	79
Car starting	79	+ 2 (impulsive)	81
Car bypass @ 5 km/h	78	N/A	78
Goods Delivery	85	N/A	85
Waste collection	92	+ 2 (impulsive)	94
Conversation	75	N/A	75

*Correction due to tonality and impulsiveness as per *AS1055*.

7.2. Predicted Levels

The source noise levels from Table 10 were used to determine the predicted noise levels at the nearest onsite receivers. The following corrections were used in calculating the predicted noise impacts:

- A distance correction at -6dB per doubling of distance from the source (i.e. 20 × Log(source distance m /receiver distance m).
- Barrier reductions were determined with a path difference calculation.
- A noise reduction of 20dB(A) through a closed window. It should be noted that receivers fronting commercial premises will be acoustically treated for road traffic noise.

Noise predictions assessing noise from onsite commercial activity that may affect onsite receivers is presented in Section 7.2.1.

Noise predictions assessing noise from offsite commercial activity that may affect onsite receivers is shown in Section 7.2.2.

Point source calculations are presented in Appendix B.

7.2.1. Predicted Noise Levels – Onsite Activity Affecting Onsite Receivers

The predicted noise levels in Table 11 are from onsite activities affecting the nearest proposed apartment.

Table 11: Predicted noise impact levels from onsite activity

Noise Source:	Predicted Level L_{max} dB(A)		Assessment Criteria Complies (Yes/No)		
	Façade	Internal	Day 74dB(A)	Evening 71dB(A)	Sleep 45dB(A)
Car door closure	60	40	Yes	Yes	Yes
Car starting	62	42	Yes	Yes	Yes
Car bypass @ 5 km/h	64	44	Yes	Yes	Yes
Goods Delivery	66	46	Yes	Yes	+1 dB(A)
Waste collection	80	60	+6 dB(A)	+9 dB(A)	+15 dB(A)
Conversation	56	36	Yes	Yes	Yes

7.2.2. Predicted Noise Levels – Offsite Activity Affecting Onsite Receivers

The predicted noise levels in Table 12 are from offsite commercial activities impacting the nearest affected proposed apartment.

Table 12: Predicted noise impact levels from offsite activity

Noise Source:	Predicted Level L_{max} dB(A)		Assessment Criteria Complies (Yes/No)		
	Façade	Internal	Day 74dB(A)	Evening 71dB(A)	Sleep 45dB(A)
Car door closure	58	38	Yes	Yes	Yes
Car starting	60	40	Yes	Yes	Yes
Car bypass @ 5 km/h	62	42	Yes	Yes	Yes
Goods Delivery	64	44	Yes	Yes	Yes
Waste collection	78	58	+4 dB(A)	+7 dB(A)	+13 dB(A)
Conversation	54	34	Yes	Yes	Yes

Waste collection is predicted to exceed the criteria. Noise impacts from waste collection is an unlikely cause of annoyance, given that it is an infrequent occurrence (i.e. usually once or twice per week) and is of short duration.

All remaining commercial activities are predicted to comply with the day, evening and sleep disturbance criteria at onsite receivers on the condition the recommendations in section 7 are implemented.

8. Recommendations

8.1. Road Traffic Noise

It is predicted most apartments shall exceed the external criteria and therefore internal noise criteria. Based on the predicted road traffic noise levels from Brookes Street, acoustic treatments will be required to meet the relevant internal noise criteria detailed in Table 1.

Building shell treatments were determined using calculation methods detailed in Australian Standard *AS3671:1989 Road Traffic Noise Intrusion – Building Siting and Construction*.

8.2. Glazing Treatments

We recommend the glazing treatments listed in Table 13. Other glazing thickness may be used provided the specified R_W rating can be certified by the window manufacturer. The R_W rating relates to the full glazing system including the frame, seals and the glass. The recommendations refer to glazing on all facades of the room.

Table 13 – Recommended Minimum Glazing Treatments

Apartment #	Room	Component	Minimum R_W
1, 8, 9, 15 & 16	Kitchen/Dining/ Living	Sliding Door	28
	Bedroom 1	Window	27
2	Kitchen/Dining/ Living	Sliding Door	29
	Bedroom 1	Window	27
3	Kitchen/Dining/ Living	Sliding Door	29
	Bedroom 1	Window	27
	Bedroom 2	Window	27
10 & 17	Kitchen/Dining/ Living	Sliding Door	29
	Bedroom 1	Window	27
	Bedroom 2	Window	27
22	Kitchen/Dining/ Living	Sliding Door	29
	Bedroom 1	Sliding Door/Windows	29
	Bedroom 2	Window	29
23	Kitchen/Dining/ Living	Sliding Door	29
	Bedroom 1	Sliding Door/Windows	29
	Bedroom 2	Window	29

Apartment #	Room	Component	Minimum R_W
23	Kitchen/Dining/ Living	Sliding Door	30
		Door (North)	30
	Bedroom 1	Sliding Door/Windows	29
25, 28, 31 & 34	Kitchen/Dining/ Living	Sliding Door	29
	Bedroom 1	Windows	28
	Bedroom 2	Window	28
26, 29, 32 & 35	Kitchen/Dining/ Living	Sliding Door	30
		Door (North)	30
	Bedroom 1	Windows	27

All remaining glazing not specified within Table 13 will require a minimum of 4mm float for windows (STC/R_W 22) and 5mm toughened (STC/R_W 23) for sliding doors.

A glazing certificate or Form 16 should be obtained from the glazier demonstrating that the installed glazing system achieves the minimum weighted sound reduction index (R_W) requirements. The certificate should be retained for certification of the completed dwelling.

8.3. Wall Construction

The external walls are proposed to be constructed of minimum 150mm thick concrete and are predicted to achieve the required rating.

Penetrations through the external walls (i.e for electrical fittings, etc) should be adequately sealed to maintain the acoustic integrity of the wall system.

8.4. Roof/Ceiling Construction

The proposed roof/ceiling are proposed to be constructed of minimum 150mm thick concrete and are predicted to achieve the required rating.

Penetrations through the ceiling (i.e for electrical fittings, ventilation, etc) should be adequately sealed to maintain the acoustic integrity of the ceiling system.

8.5. Alternative Ventilation

A proposed dwelling that is affected by noise will require the architectural elements to be tightly fitting and properly sealed when closed. Therefore the provision of mechanical ventilation such as air-conditioning would be required to ensure occupants of affected rooms (refer to Table 13) have the option of closing windows and doors to exclude noise.

The design and installation of the plant should not reduce the acoustic performance of the building shell. All living rooms, bedrooms and study rooms will require the provision of air-

conditioning or mechanical ventilation that complies with BCA requirements for the 'provision of fresh air'.

8.6. Onsite Mechanical Plant Noise

Because detailed plant selections are not available at this stage, it is not possible to carry out a detailed examination of the ameliorative measures that may be required to achieve the noise criteria. Plant shall be acoustically treated to achieve the criteria detailed in Section 5.3 to prevent noise emissions from adversely impacting the surrounding properties. This may include selecting the quietest plant possible, or treating the plant equipment with enclosures, barriers, duct lining and silencers, etc if required to comply with the assessment criteria.

Experience with similar projects indicates it is possible to achieve the Council requirement with the appropriate plant selection and treatment. This treatment would be determined at the Building Approval/Construction Certificate stage.

A mechanical plant noise assessment should be conducted by a suitably qualified acoustic person once plant selections are finalised; and compliance tests conducted after the equipment is installed to ensure compliance with the criteria. Such measures should also be conditioned in the Development Approval.

8.7. Offsite Mechanical Plant Noise

The site may be affected by noise emissions from the roof top mechanical plant (e.g. air conditioning outdoor units) belonging to neighbouring commercial premises to the north, east, and south. Due to access constraints, attended noise measurements of the mechanical plant were unable to be conducted.

We recommend that attended noise measurements of roof top plant are conducted once construction of the proposed development begins. Likely acoustic treatments may include upgraded glazing, to ensure internal noise limits comply with the internal noise limits specified in Table 1.

9. Conclusions

A revised environmental noise assessment was conducted of the proposed development located at 24 Brookes Street, Bowen Hills.

On the condition the treatment recommendations and management controls presented in Section 8 are implemented, the development is predicted to comply with the BCC assessment criteria and therefore satisfy the requirements of the ULDA.

Note that this assessment does not imply that road traffic noise will be inaudible within a living or sleeping area.

Should have any further questions, please do not hesitate to contact us.

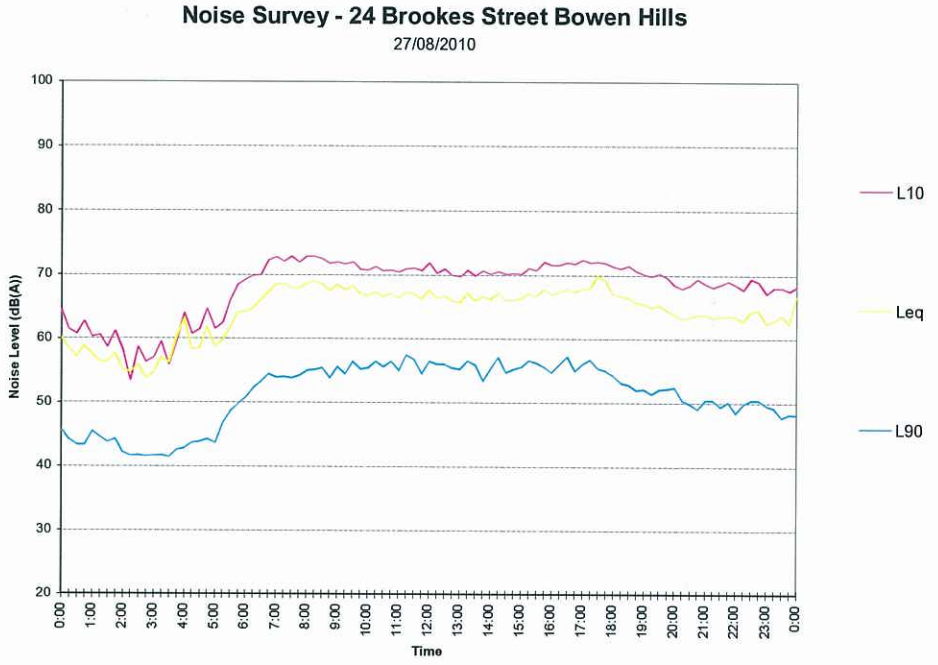
Appendix A Unattended Noise Monitoring Graphs

Noise Survey - 24 Brookes Street Bowen Hills

25/08/2010

Noise Survey - 24 Brookes Street Bowen Hills

26/08/2010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27/08/2010
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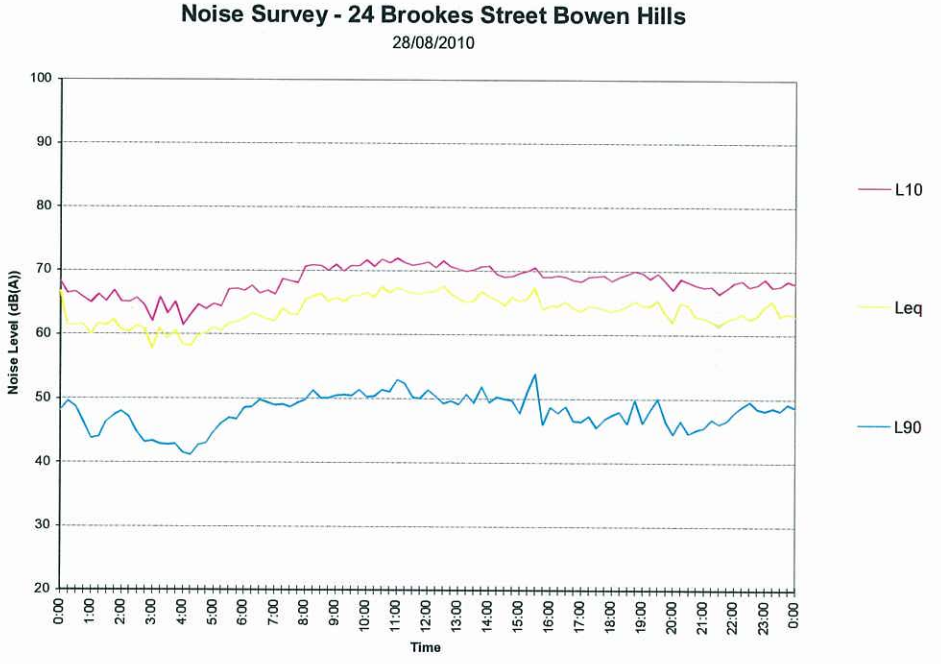
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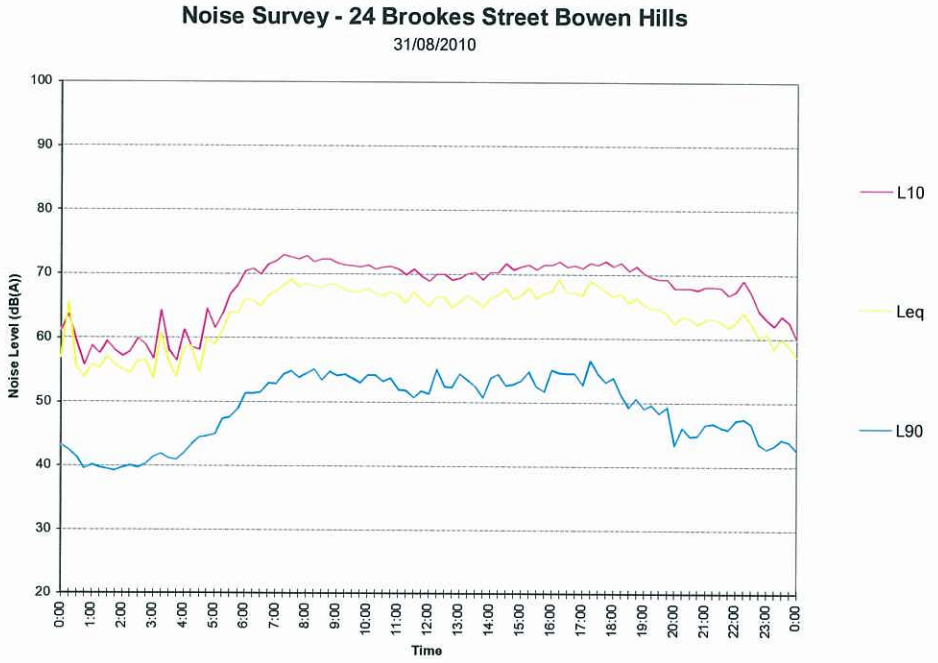
Noise Survey - 24 Brookes Street Bowen Hills

29/08/2010

Noise Survey - 24 Brookes Street Bowen Hills

30/08/2010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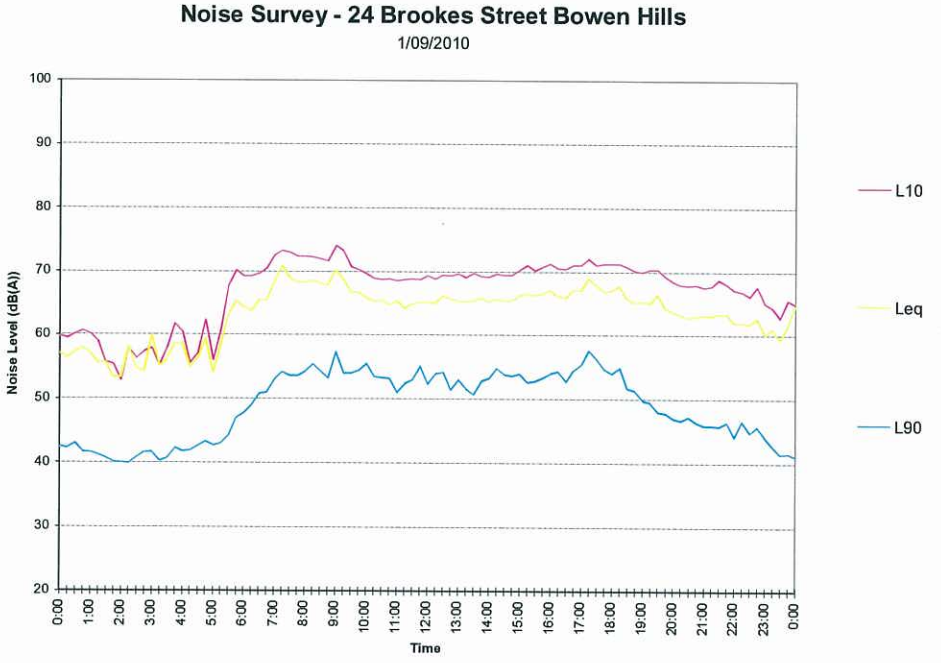
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1/09/2010
Noise Level (dB(A))
100
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90

Appendix B Modelling Results

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Model Verification

Segment	Abbrev	L10	Seg Group	Group Total
1 Brookes Street Southbound	BSS	68.2		
2 Brookes Street Northbound	BSN	66.1		

Total is the L10(18hour) = 70.3 dB(A)

INPUT DATA	Seg 1 BSS	Seg 2 BSN
Total Flow (veh/18h)	3845	3845
Heavy Vehicles (%)	3	3
SPEED:		
Average (km/h)	60	60
Origin (Zone or Est)	Z	Z
Road RL (m)	0	0
Road Gradient (%)	2	2
ROAD SURFACE:		
Surface Type (User)	b	b
Correction (±dBA)	2	2
Dist Road-Rec (m)	6	12
Absorbing Ground (%)	0	0
Av Prop Ht (m)	1.5	1.5
Angle View (deg)	180	180
SPECIAL ADJUSTMENT?		
Value (±dBA)		
Comment		
BARRIERS ?		
1:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
2:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
3:Dist Road-Barr (m)		
Barrier RL (m)		
Description		
REFLECTORS ONLY ?		
Refl Angle View (deg)		
COMBINED REFL/BARR?		
Reflector RL (m)		
Reflector Tilt (deg)		
DistanceBetween (m)		
Either on Embankment?		

Ground RL at Receiver:	0.5
Height of Receiver above ground:	1.4
Road Surface Corrections supplied by:	User
Building Facade at Receiver:	No
User's overall adjustment to CRTN:	0.0

30 May 13 14:11 TNOISE -- L1_W

Level 1 West Facade

Segment		Abbrev	L10	Seg Group	Group Total
1	North Brookes Street Southbound	NBS	68.7		
2	North Brookes Street Northbound	NBN	67.4		
3	South Brookes Street Southbound	SBS	66.1		
4	South Brookes Street Northbound	SBN	64.8		

Total is the L10(18hour) = 73.0 dB(A)

INPUT DATA	Seg 1 NBS	Seg 2 NBN	Seg 3 SBS	Seg 4 SBN
Total Flow (veh/18h)	6520	6520	6659	6659
Heavy Vehicles (%)	3	3	3	3
SPEED:				
Average (km/h)	60	60	60	60
Origin (Zone or Est)	Z	Z	Z	Z
Road RL (m)	0	0	0	0
Road Gradient (%)	2	2	2	2
ROAD SURFACE:				
Surface Type (User)	b	b	b	b
Correction (±dBA)	2	2	2	2
Dist Road-Rec (m)	10	15.8	10	15.8
Absorbing Ground (%)	0	0	0	0
Av Prop Ht (m)	3	3	3	3
Angle View (deg)	109	109	58	58
SPECIAL ADJUSTMENT?				
Value (±dBA)				
Comment				
BARRIERS ?				
1:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
2:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
3:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
REFLECTORS ONLY ?				
Refl Angle View (deg)				
COMBINED REFL/BARR?				
Reflector RL (m)				
Reflector Tilt (deg)				
DistanceBetween (m)				
Either on Embankment?				

Ground RL at Receiver:	2.5
Height of Receiver above ground:	5.5
Road Surface Corrections supplied by:	User
Building Facade at Receiver:	Yes
User's overall adjustment to CRTN:	0.0

30 May 13 14:12 TNOISE -- L3_W Page 1.

Level 3 West Facade

Segment		Abbrev	L10	Seg Group	Group Total
1	North Brookes Street Southbound	NBS	67.9		
2	North Brookes Street Northbound	NBN	66.9		
3	South Brookes Street Southbound	SBS	65.3		
4	South Brookes Street Northbound	SBN	64.3		

Total is the L10(18hour) = 72.3 dB(A)

INPUT DATA	Seg 1 NBS	Seg 2 NBN	Seg 3 SBS	Seg 4 SBN
Total Flow (veh/18h)	6520	6520	6659	6659
Heavy Vehicles (%)	3	3	3	3
SPEED:				
Average (km/h)	60	60	60	60
Origin (Zone or Est)	Z	Z	Z	Z
Road RL (m)	0	0	0	0
Road Gradient (%)	2	2	2	2
ROAD SURFACE:				
Surface Type (User)	b	b	b	b
Correction (±dBA)	2	2	2	2
Dist Road-Rec (m)	10	15.8	10	15.8
Absorbing Ground (%)	0	0	0	0
Av Prop Ht (m)	5.8	5.8	5.8	5.8
Angle View (deg)	109	109	58	58
SPECIAL ADJUSTMENT?				
Value (±dBA)				
Comment				
BARRIERS ?				
1:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
2:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
3:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
REFLECTORS ONLY ?				
Refl Angle View (deg)				
COMBINED REFL/BARR?				
Reflector RL (m)				
Reflector Tilt (deg)				
DistanceBetween (m)				
Either on Embankment?				

Ground RL at Receiver:	2.5
Height of Receiver above ground:	11.1
Road Surface Corrections supplied by:	User
Building Facade at Receiver:	Yes
User's overall adjustment to CRTN:	0.0

30 May 13 14:13 TNOISE -- L7_W

Level 7 West Facade

Segment		Abbrev	L10	Seg Group	Group Total
1	North Brookes Street Southbound	NBS	66.0		
2	North Brookes Street Northbound	NBN	65.5		
3	South Brookes Street Southbound	SBS	63.4		
4	South Brookes Street Northbound	SBN	62.9		

Total is the L10(18hour) = 70.7 dB(A)

INPUT DATA	Seg 1 NBS	Seg 2 NBN	Seg 3 SBS	Seg 4 SBN
Total Flow (veh/18h)	6520	6520	6659	6659
Heavy Vehicles (%)	3	3	3	3
SPEED:				
Average (km/h)	60	60	60	60
Origin (Zone or Est)	Z	Z	Z	Z
Road RL (m)	0	0	0	0
Road Gradient (%)	2	2	2	2
ROAD SURFACE:				
Surface Type (User)	b	b	b	b
Correction (±dBA)	2	2	2	2
Dist Road-Rec (m)	12	17.8	12	17.8
Absorbing Ground (%)	0	0	0	0
Av Prop Ht (m)	4.55	4.55	4.55	4.55
Angle View (deg)	109	109	58	58
SPECIAL ADJUSTMENT?				
Value (±dBA)				
Comment				
BARRIERS ?				
1:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
2:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
3:Dist Road-Barr (m)				
Barrier RL (m)				
Description				
REFLECTORS ONLY ?				
Refl Angle View (deg)				
COMBINED REFL/BARR?				
Reflector RL (m)				
Reflector Tilt (deg)				
DistanceBetween (m)				
Either on Embankment?				

Ground RL at Receiver:	2.5
Height of Receiver above ground:	22.3
Road Surface Corrections supplied by:	User
Building Facade at Receiver:	Yes
User's overall adjustment to CRTN:	0.0

Noise Source Description	Noise Source Level dB(A)	Tonal or Impulsive Correcton dB(A)	Source Measurement Distance (metres)	Distance To Reciever (metres)	Distance Attenuation dB(A)	Barrier Noise Reduction dB(A)	Building Screening dB(A)	Calculated Noise Level dB(A)
Car Door Closure	77	2	1	5	-14	5		60
Car Start	79	2	1	5	-14	5		62
Car Passby	78	0	1	5	-14	0		64
Goods delivery	85		1	5	-14	5		66
Waste Collection	92	2	1	5	-14			80
Conversation	75		1	5	-14	5		56
Car Door Closure	77	2	1	5	-14	5	20	40
Car Start	79	2	1	5	-14	5	20	42
Car Passby	78	0	1	5	-14	0	20	44
Goods delivery	85		1	5	-14	5	20	46
Waste Collection	92	2	1	5	-14		20	60
Conversation	75		1	5	-14	5	20	36
Car Door Closure	77	2	1	6	-16	5		58
Car Start	79	2	1	6	-16	5		60
Car Passby	78	0	1	6	-16	0		62
Goods delivery	85		1	6	-16	5		64
Waste Collection	92	2	1	6	-16			78
Conversation	75		1	6	-16	5		54
Car Door Closure	77	2	1	6	-16	5	20	38
Car Start	79	2	1	6	-16	5	20	40
Car Passby	78	0	1	6	-16	0	20	42
Goods delivery	85		1	6	-16	5	20	44
Waste Collection	92	2	1	6	-16		20	58
Conversation	75		1	6	-16	5	20	34

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