

NOISE IMPACT ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT

44 BROOKES STREET

BOWEN HILLS

Prepared for:
Blue Sky Private Real Estate

Prepared by:
MWA Environmental

6 February 2014

DOCUMENT CONTROL SHEET

MWA Environmental

Level 15 241 Adelaide Street
GPO Box 3137 Brisbane 4001

Telephone: 07 3002 5500
Facsimile 07 3002 5588
Email: mail@mwaenviro.com.au

Job Name: Bowen Hills

Job No: 13-129

Original Date of Issue: 06/02/14

DOCUMENT DETAILS

Title: Noise Impact Assessment – Proposed Residential Development – 44 Brookes Street, Bowen Hills

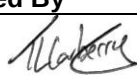
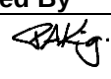
Principal Author: Mr Travis Carberry

Client: Blue Sky Private Real Estate

Client Address: PO Box 15515, Brisbane QLD 4002

Client Contact: Mr Edan Norris

REVISION/CHECKING HISTORY

Version Number	Date	Issued By		Checked By	
1 Final Report	06.02.14	TLC		PAK	
2					
3					
4					
5					
6					
7					
8					

DISTRIBUTION RECORD

Destination	Version Number								
	1	2	3	4	5	6	7	8	9
Client (electronic)	1								
File Copy	1								
MWA Library	1								

CONTENTS PAGE

1.0	INTRODUCTION	1
2.0	SITE DESCRIPTION	2
3.0	PROPOSED DEVELOPMENT	3
4.0	STUDY BRIEF.....	4
4.1	TRAFFIC NOISE	4
4.2	RAIL NOISE	5
4.3	OTHER NOISE SOURCES.....	5
5.0	EXISTING NOISE ENVIRONMENT.....	6
6.0	ASSESSMENT OF NOISE IMPACT ON DEVELOPMENT	8
6.1	TRAFFIC NOISE IMPACT ASSESSMENT	8
6.1.1	<i>Traffic Volume Data</i>	<i>8</i>
6.1.2	<i>Traffic Noise Model Validation.....</i>	<i>8</i>
6.1.3	<i>Predicted Future Traffic Noise Levels</i>	<i>9</i>
6.1.4	<i>Building Componentry Calculations.....</i>	<i>12</i>
6.2	RAIL NOISE ASSESSMENT	13
7.0	SITE NOISE IMPACT ASSESSMENT.....	14
7.1	PLANT AND EQUIPMENT NOISE.....	14
7.2	CAR PARKING NOISE	15
8.0	CONCLUSIONS	16

FIGURES**ATTACHMENTS**

1.0 INTRODUCTION

MWA Environmental has been engaged by Blue Sky Private Real Estate to prepare a Noise Impact Assessment for a proposed residential development at Bowen Hills.

The proposed development is for a residential unit building, located at 44 Brookes Street, Bowen Hills (see **Figure 1**). The development comprises two levels of car parking and 10 levels of residential units.

The report considers noise amenity impacts with respect to traffic noise from surrounding roadways, rail noise and surrounding land use noise impacts upon the proposed development and also considers the impact upon surrounding residential development from plant and equipment and car parking activity noise as a result of the development.

The report has been prepared for submission to *Economic Development Queensland* and has been prepared in accordance with the requirements of applicable Australian Standards and with the requirements of the Brisbane City Council (BCC) *Brisbane City Plan 2000, Noise Impact Assessment Planning Scheme Policy* (NIAPSP).

2.0 SITE DESCRIPTION

The subject site is located at 44 Brookes Street, Bowen Hills. The location and extent of the subject site is shown on **Figure 1**.

The subject site is currently occupied by a two storey office building. Site topography slopes up to the north.

The site has frontage to Brookes Street to the west and Mallon Street to the north, with St Pauls Terrace located to the south beyond existing development. Railway lines are located to the south and east of the site, separated by a minimum of 125 metres from the subject site. Surrounding land uses include low noise impact commercial uses / office buildings and also residential development. From site inspections conducted, it was not considered that any existing surrounding land uses have potential to cause adverse noise impacts upon future residential amenity at the proposed development.

The nature of the existing on-site and surrounding land use is shown on the aerial photograph included as **Figure 2**.

Site inspections reveal that the primary influence on the existing acoustic environment at the subject site is road traffic noise from Brookes Street and St Pauls Terrace. The noise of trains on the railway lines to the south and east were not noted to be a significant noise source at the site. The noise of surrounding commercial land uses / office buildings were also not noted to be a significant noise source at the site.

3.0 PROPOSED DEVELOPMENT

The proposed development is for residential units in a twelve storey building. Car parking is to be provided at ground level and level one of the development, with site access from Mallon Street. Residential units are proposed over levels two to twelve with individual balcony areas provided for each unit. A retail tenancy is proposed at ground level fronting Mallon Street and Brookes Street. A communal outdoor recreation area is proposed at the roof level of the development.

Indicative design drawings for the development are included as ***Attachment 1***.

4.0 STUDY BRIEF

The proposed development requires a Noise Impact Assessment report to ensure that there are no resultant adverse acoustic amenity impacts at on-site or surrounding residences.

The noise sources considered for the assessment are the following:

- Road traffic noise;
- Railway noise;
- Plant and equipment noise, e.g. air-conditioning, exhaust vents; and,
- Site traffic noise, i.e. car parking activity.

The report has been prepared for submission to *Economic Development Queensland* and has been prepared in accordance with the requirements of applicable Australian Standards and with the requirements of the Brisbane City Council (BCC) *Brisbane City Plan 2000, Noise Impact Assessment Planning Scheme Policy* (NIAPSP).

4.1 TRAFFIC NOISE

The NIAPSP requires that the design of residential developments in locations adjacent to roadways with over 15,000 vehicles per day (vpd) to consider internal noise levels as contained in Australian Standard AS2107:2000¹, determined in accordance with AS3671–1989².

Table 1 of AS2107:2000 includes for houses and apartments near major roads the following:

This Standard requires the following Design Sound Levels (L_{Aeq} (dB(A)):

Type of occupancy/activity	Recommended design sound level, L_{Aeq}, dB(A)	
	Satisfactory	Maximum
7 RESIDENTIAL BUILDINGS		
Houses and apartments near major roads-		
<i>Living areas</i>	35	45
<i>Sleeping areas</i>	30	40
<i>Work areas</i>	35	45
<i>Apartment common areas (e.g. foyer, lift lobby)</i>	45	55

For external noise amenity the following is taken from the NIAPSP Guidelines as the relevant criteria:

B.2.3 Special Notes about Outdoor Recreation Areas

¹ Australian Standard AS2107:2000 *Acoustics – Recommended design sound levels and reverberation times in building interiors*

² Australian Standard AS3671 –1989 *Acoustics – Road traffic noise intrusion – Building Siting and construction*

AS2107 does not include limits for outdoor recreation areas. A reasonable level of outdoor amenity must be maintained for residential and other similar uses in areas where outdoor recreation may occur. In such areas the maximum L_{eq} in any one hour period should not exceed 60dB(A) and the L_{eq} averaged over a 24 hour period should not exceed 55 dB(A).

4.2 RAIL NOISE

The BCC adopted assessment criteria for rail noise impacts on residential developments are:

- (i) *Rail noise peaks. L_{Amax} external not to exceed 80 dB(A)*
- (ii) *External L_{Aeq} (24 hour) of 55 dB(A).*

Internal rail noise peak L_{max} noise levels of 50 dB(A) for habitable rooms are considered to be acceptable.

4.3 OTHER NOISE SOURCES

The NIAPSP outlines assessment methodologies that should be used based on the noise source(s) characteristics and the time of day at which they occur.

The range of noise sources and the potential for noise impacts upon on-site and surrounding residences to occur over a 24-hour per day period dictates that several noise assessment methodologies are required. (The following paragraphs contain assessment methodologies in **bold** type that are taken from titled assessment methodologies in the NIAPSP and the accompanying *NIAPSP Guidelines*.)

For plant and equipment noise, an appropriate assessment is using Australian Standard **AS2107 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors** as a basis for determining the potential for noise intrusion into adjacent habitable dwellings from steady-state noise sources that operate during all hours of the day.

The noise from vehicle related activities and from general car park activity are typically noise events of a short duration and are best assessed using a **Comparison of like parameters or descriptors**, with the aim being not to exceed the existing ambient noise environment by more than 3 dB(A) for the appropriate noise parameter used. Such an assessment applies for the periods 7am to 6pm (Daytime) and 6pm to 10pm (Evening). As there is the potential for vehicle related activities in the period 10pm to 7am (Night-time) potential for noise amenity impacts also uses an **Assessment of sleep disturbance for sources other than aircraft noise**, which also considers the resultant internal noise level within habitable dwellings from the intrusive source.

5.0 EXISTING NOISE ENVIRONMENT

Site inspections and noise measurements demonstrate that the primary influence on the existing acoustic environment at the subject site is road traffic noise from Brooks Street and St Pauls Terrace.

In order to characterise the site noise exposure, a noise datalogger was located on the western portion of the site, as shown on **Figure 2**. The noise datalogger was programmed to provide a statistical noise level analysis based on 15-minute sampling periods, and monitored continually for a 5 day period over 6 to 10 January, 2014. Weather conditions during the noise monitoring period were predominantly fine with moderate winds.

The recorded noise levels are presented as statistical components, which are described as:

- L₁: Noise level exceeded for 1 percent of the measurement period, referred to as the adjusted maximum sound pressure level.
- L₁₀: Noise level exceeded for 10 percent of the measurement period, referred to as the averaged maximum sound pressure level.
- L₉₀: Noise level exceeded for 90 percent of the measurement period. AS1055.1–1997³ notes that the L₉₀ is described as the background sound pressure level.
- L_{eq}: An “average” measurement, and as per AS1055.1–1997 defined as the value of the sound pressure level of a continuous steady sound state, that within a measurement period, has the same mean square sound pressure as a sound under consideration whose level varies with time.

Table 1 below provides the minimum, maximum and average statistical noise levels recorded by the noise datalogger.

Table 1: Ranges of Recorded Noise Levels – 6 to 10 January, 2014

PARAMETER	PERIOD	RECORDED NOISE LEVELS – dB(A)		
		MINIMUM	MAXIMUM	AVERAGE
L ₁	Daytime (7am-6pm)	70.5	79.5	73.7
	Evening (6pm-10pm)	70.5	76.0	72.2
	Night-time (10pm-7am)	63.5	77.5	70.2
L ₁₀	Daytime (7am-6pm)	67.0	72.0	69.5
	Evening (6pm-10pm)	65.0	71.5	67.9
	Night-time (10pm-7am)	43.5	71.5	59.8
L ₉₀	Daytime (7am-6pm)	49.5	57.5	53.4
	Evening (6pm-10pm)	41.5	57.0	47.2
	Night-time (10pm-7am)	37.0	56.0	41.9
L _{eq}	Daytime (7am-6pm)	63.0	73.5	65.6
	Evening (6pm-10pm)	59.5	67.0	63.0
	Night-time (10pm-7am)	48.5	67.0	57.9

³ Australian Standard AS 1055.1-1997 *Acoustics – Description and measurement of environmental noise, Part 1: General procedures*

Other recorded statistical noise level parameters included:

- Average Recorded L_{10} (18 hour) = 68.5 dB(A)
- Average Recorded L_{eq} (24 hour) = 62.2 dB(A)
- Maximum L_{eq} (1 hour) 7am to 10pm = 68.6 dB(A)
- Maximum L_{eq} (1 hour) 10pm to 7am = 65.8 dB(A)

The complete datalogger results are presented as a trace of noise level versus time for the statistical noise level descriptors L_1 , L_{10} , L_{90} and L_{eq} as **Attachment 2**.

The datalogger used was an Acoustic Research Laboratories noise datalogger, model EL-215, pre-calibrated to 94 dB at 1kHz using a Bruel & Kjaer Sound Level Calibrator, Type 4231. At post-calibration the datalogger exhibited less than ± 0.5 dB deviation.

In addition to the long term datalogging, short term noise measurements were conducted at the site on the 6th January 2014. The results of the short term noise monitoring are provided in **Table 2** below, with noise measurement locations shown on **Figure 2**.

Table 2: Recorded Short-Term Noise Levels

#	LOCATION	TIME	RECORDED STATISTICAL NOISE LEVEL - dB(A)					COMMENTS
			L_1	L_{10}	L_{50}	L_{90}	L_{eq}	
1	North Eastern Site Corner	1500 – 1515	65.6	60.3	53.8	49.4	57.0	Traffic noise from Brooks Street Some traffic noise from Mallon Street No train noise audible during test
2	South Western Site Corner	1520 – 1535	77.3	70.9	60.7	51.5	67.5	Traffic noise from Brooks Street No train noise audible during test

The short-term noise monitoring was undertaken with a Rion NL-21 Precision Sound Level Meter, internally pre-calibrated to 94 dB at 1kHz. There was no deviation from this level at post-calibration.

6.0 ASSESSMENT OF NOISE IMPACT ON DEVELOPMENT

6.1 TRAFFIC NOISE IMPACT ASSESSMENT

6.1.1 Traffic Volume Data

Existing and ultimate projection traffic count data for Brookes Street and St Pauls Terrace adjacent the site was provided by the Brisbane City Council on the 8th of January 2014. Brookes Street was supplied as an existing and ultimate (10 year design horizon) traffic volume of 11,000 vehicles per day (vpd) and 21,000 vpd respectively, and a commercial vehicle content of 4%. St Pauls Terrace was supplied as an existing and ultimate (10 year design horizon) volume of 16,000 vehicles per day (vpd) and 18,000 vpd respectively, and a commercial vehicle content of 3%.

The 18 hour (6am to Midnight) traffic volume is generally approximated as being 94% of the daily volume. The existing and ultimate (10-year design horizon) traffic volumes for Brookes Street and St Pauls Terrace, as determined from the data provided, are listed in **Table 3** below.

Table 3: Traffic Volume Data

Road	VPD		VP18hr		%CV
	Existing	Ultimate	Existing	Ultimate	
Brookes Street	11,000	21,000	10,340	19,740	4
St Pauls Terrace	16,000	18,000	15,040	16,920	3

6.1.2 Traffic Noise Model Validation

The first step in the predictive traffic noise process is to validate the model to the recorded noise levels, i.e. the aim being to predict within ± 2 dB of the recorded level, with selected parameters used in the ultimate (ten year design horizon) traffic noise modelling scenarios.

The model used in the traffic noise modelling process was SoundPLAN 7.3. This model uses the CoRTN methodology for traffic noise prediction, a method accepted by regulatory bodies in Queensland.

The existing level of traffic noise exposure recorded at noise datalogger location was recorded to be 68.5 dB(A) as the average L_{10} (18 hour).

The model prediction for the monitoring location was an L_{10} (18 hour) of 70.3 dB(A), thus the model is considered well validated, conservative and suitable for future traffic noise projections.

The model layout and receiver location used in the SoundPLAN model validation is provided as **Attachment 3**.

6.1.3 Predicted Future Traffic Noise Levels

In order to determine the traffic noise amelioration measures that are required for the proposed development, ultimate (10-year design horizon) traffic noise predictions have been made across the site. The ultimate traffic noise modelling has considered proposed building location and finished floor levels as per the architectural drawings included in **Attachment 1**. The modelling considered receivers at finished floor level plus 1.5 metres.

The SoundPLAN 7.3 model was setup to predict the external L_{10} (18 hour) traffic noise levels under ultimate 10 year design horizon traffic conditions. A table of the results, predicting ultimate L_{10} (18 hour) noise levels at each residential level of the building was produced (**Tables 4 and 5**). See **Attachment 4** for the model layouts and modelling results.

As SoundPLAN predicts traffic noise levels as the L_{10} (18 hour), predictions were converted to the relevant 1-hour L_{Aeq} and 24-hour L_{Aeq} traffic noise levels by the application of the following conversion factors based on recorded noise level statistics detailed in **Section 5.0** of this report:

L_{eq} (24 hour) Adjustment:

Recorded L_{10} (18hr) to Recorded L_{Aeq} (24hr) = $62.2 - 68.5 = -6.3$ dB(A)

L_{eq} (1 hour) Adjustment (7am – 10pm):

Recorded L_{10} (18hr) to Recorded L_{Aeq} (1hr) = $68.6 - 68.5 = +0.1$ dB(A)

L_{eq} (1 hour) Adjustment (10pm – 7am):

Recorded L_{10} (18hr) to Recorded L_{Aeq} (1hr) = $65.8 - 68.5 = -2.7$ dB(A)

Table 4: Ultimate Traffic Noise Level Predictions

Prediction Location	Floor Level	L ₁₀ 18hr	L _{eq} (1hr) 7am - 10pm	L _{eq} (1hr) 10pm - 7am	L _{eq} (24hr)
		dB(A)	dB(A)	dB(A)	dB(A)
Unit 1 South Façade	Level 2	61.7	61.8	59.0	55.4
	Level 3	63.6	63.7	60.9	57.3
	Level 5	64.6	64.7	61.9	58.3
	Level 6	64.7	64.8	62.0	58.4
	Level 7	64.7	64.8	62.0	58.4
	Level 8	64.6	64.7	61.9	58.3
	Level 9	64.5	64.6	61.8	58.2
	Level 10	64.4	64.5	61.7	58.1
	Level 11	64.4	64.5	61.7	58.1
	Level 12	64.4	64.5	61.7	58.1
Unit 1 East Façade	Level 2	49.5	49.6	46.8	43.2
	Level 3	51.4	51.5	48.7	45.1
	Level 5	53.2	53.3	50.5	46.9
	Level 6	54.4	54.5	51.7	48.1
	Level 7	55.6	55.7	52.9	49.3
	Level 8	56.7	56.8	54.0	50.4
	Level 9	57.6	57.7	54.9	51.3
	Level 10	58.5	58.6	55.8	52.2
	Level 11	59.3	59.4	56.6	53.0
	Level 12	60.0	60.1	57.3	53.7
Unit 1 North Façade	Level 2	55.2	55.3	52.5	48.9
	Level 3	56.2	56.3	53.5	49.9
	Level 5	56.7	56.8	54.0	50.4
	Level 6	57.2	57.3	54.5	50.9
	Level 7	58.2	58.3	55.5	51.9
	Level 8	59.4	59.5	56.7	53.1
	Level 9	60.1	60.2	57.4	53.8
	Level 10	60.4	60.5	57.7	54.1
	Level 11	60.5	60.6	57.8	54.2
	Level 12	60.7	60.8	58.0	54.4
Unit 2 North Façade	Level 2	62.6	62.7	59.9	56.3
	Level 3	63.3	63.4	60.6	57.0
	Level 5	63.2	63.3	60.5	56.9
	Level 6	63.1	63.2	60.4	56.8
	Level 7	63.4	63.5	60.7	57.1
	Level 8	63.6	63.7	60.9	57.3
	Level 9	63.5	63.6	60.8	57.2
	Level 10	63.4	63.5	60.7	57.1
	Level 11	63.2	63.3	60.5	56.9
	Level 12	63.1	63.2	60.4	56.8

Table 5: Ultimate Traffic Noise Level Predictions

Prediction Location	Floor Level	L ₁₀ 18hr	L _{eq} (1hr) 7am - 10pm	L _{eq} (1hr) 10pm - 7am	L _{eq} (24hr)
		dB(A)	dB(A)	dB(A)	dB(A)
Unit 3 North Façade	Level 2	65.1	65.2	62.4	58.8
	Level 3	65.0	65.1	62.3	58.7
	Level 5	64.8	64.9	62.1	58.5
	Level 6	64.9	65.0	62.2	58.6
	Level 7	64.7	64.8	62.0	58.4
	Level 8	64.5	64.6	61.8	58.2
	Level 9	64.2	64.3	61.5	57.9
	Level 10	64.0	64.1	61.3	57.7
	Level 11	63.7	63.8	61.0	57.4
	Level 12	63.5	63.6	60.8	57.2
Unit 4 North Façade	Level 2	68.5	68.6	65.8	62.2
	Level 3	68.0	68.1	65.3	61.7
	Level 5	67.4	67.5	64.7	61.1
	Level 6	66.8	66.9	64.1	60.5
	Level 7	66.3	66.4	63.6	60.0
	Level 8	65.8	65.9	63.1	59.5
	Level 9	65.3	65.4	62.6	59.0
	Level 10	64.9	65.0	62.2	58.6
	Level 11	64.5	64.6	61.8	58.2
	Level 12	64.1	64.2	61.4	57.8
Unit 4 West Façade	Level 2	72.0	72.1	69.3	65.7
	Level 3	71.3	71.4	68.6	65.0
	Level 5	70.6	70.7	67.9	64.3
	Level 6	70.0	70.1	67.3	63.7
	Level 7	69.4	69.5	66.7	63.1
	Level 8	68.9	69.0	66.2	62.6
	Level 9	68.4	68.5	65.7	62.1
	Level 10	68.0	68.1	65.3	61.7
	Level 11	67.5	67.6	64.8	61.2
	Level 12	67.2	67.3	64.5	60.9
Unit 4 South Façade	Level 2	68.5	68.6	65.8	62.2
	Level 3	67.9	68.0	65.2	61.6
	Level 5	67.4	67.5	64.7	61.1
	Level 6	66.9	67.0	64.2	60.6
	Level 7	66.4	66.5	63.7	60.1
	Level 8	66.0	66.1	63.3	59.7
	Level 9	65.6	65.7	62.9	59.3
	Level 10	65.3	65.4	62.6	59.0
	Level 11	65.0	65.1	62.3	58.7
	Level 12	64.8	64.9	62.1	58.5

For outdoor recreation area noise amenity, the proposed roof level outdoor recreation area is well shielded from the noise of road traffic by the proposed development building structure. The SoundPLAN model predicted an ultimate L_{10} 18hr traffic noise level of 56.7 dB(A) which relates to a maximum L_{eq} (1 hour) traffic noise level at this outdoor area of 56.8 dB(A) and a L_{eq} (24 hour) traffic noise level of 50.4 dB(A). Thus, future residents will have access to an outdoor recreation area with suitable traffic noise amenity, satisfying the 60 dB(A) L_{eq} (1 hour) and 55 dB(A) L_{eq} (24 hour) criteria as required under the NIAPSP.

As Brookes Street and St Pauls Terrace carry more than 15,000 vehicles per day, the BCC criteria states (**Section 4.1**) that it is necessary to conduct an internal traffic noise assessment. The required acoustic ratings for proposed external façade elements of the proposed residential building (based upon the architectural drawings included in **Attachment 1**) are detailed in **Section 6.1.4**.

6.1.4 Building Componentry Calculations

The internal traffic noise calculations were based on predicted ultimate (10 year design horizon) 1 hour L_{Aeq} traffic noise levels with the design objective of providing suitable internal amenity for living areas during the daytime period and for sleeping areas during the night-time period:

Living Area: 45 dB(A) Maximum L_{Aeq} (1hr) 7am to 10pm

Sleeping Area: 40 dB(A) Maximum L_{Aeq} (1hr) 10pm to 7am

Using the noise levels predicted in the modelling and following the methodology of AS3671 in considering traffic noise exposure, the following indicative Weighted Sound Reduction Indices (R_w 's) have been identified for the proposed residential units.

The required R_w Values for the proposed development are summarised below in **Attachment 5** to this report.

The required acoustic ratings are achievable with relatively standard unit building façade construction and using readily available glazing elements (i.e. windows, sliding glass doors etc.). If any changes are proposed for the residential unit layouts, these R_w Value requirements should be reviewed at the detailed design phase of the development to ensure appropriate internal acoustic amenity is achieved.

The provision of building components achieving the specified R_w Values will ensure satisfactory internal traffic noise amenity within the proposed residential units.

6.2 RAIL NOISE ASSESSMENT

Railway Lines are located to the south and east of the subject site. The nearest railway line is measured to be approximately 125 metres from the site. The railway line is shielded to the development site by intervening existing buildings and topography. From site inspections conducted, the noise of train movements was not a significant noise source.

MWA Environmental has conducted extensive railway noise monitoring in recent years. A maximum railway source noise level of 85 dB(A) at 30 metres from the track has been adopted for the purposes of this assessment. This source level corresponds well with information provided by Queensland Rail for a range of their rollingstock.

As such, the likely maximum noise level from train movements at the proposed development is calculated to be **79 dB(A)** (unshielded), as follows:

$$\begin{aligned}
 L_{p2} &= L_{p1} - 10 \cdot \log_{10}(r_2/r_1) & L_{p1} &= 85.0 \text{ dB(A)} \\
 & & r_1 &= 30 \text{ m} \\
 & & r_2 &= 125 \text{ m} \\
 &= 85 - 10 \cdot \log_{10}(125/30) \\
 &= 79 \text{ dB(A)}
 \end{aligned}$$

However, this calculation does not take into account any shielding that would be provided by the intervening buildings and topography. Hence, the noise of a majority of train movements will be lower than the 79 dB(A) calculated above.

As such, the resultant peak rail noise levels at the subject site are predicted to satisfy the 80 dB(A) external noise limit.

The datalogger recorded average L_{Aeq} (24 hour) was 62.2 dB(A) at the site. Therefore the external L_{Aeq} (24 hour) criterion of 55 dB(A) is currently exceeded at the site due to the additive effects of traffic noise and general inner city noise. From site inspections conducted and given the intermittent nature of train passbys, railway noise was not noted to be a significant influence upon L_{Aeq} noise levels at the development site. It is considered that the recorded L_{Aeq} (24 hour) would have been primarily due to traffic noise. As such, the current site L_{Aeq} (24 hour) at the site, due to railway noise only, is considered to be well below the 55 dB(A) criterion.

As such, given the significant separation distance to the nearest railway lines and the intervening building and topographic shielding from the site to the railway lines, it is considered that the noise of railway activities shall not adversely impact on acoustic amenity at the proposed residential development.

7.0 SITE NOISE IMPACT ASSESSMENT

7.1 PLANT AND EQUIPMENT NOISE

External plant and equipment associated with the proposed development is likely to include centrally located or balcony mounted air-conditioning plant for residential units, ground level retail air-conditioning and minor refrigeration plant for the retail tenancy, car park exhaust fans and lift plant.

For plant and equipment noise, an appropriate assessment is using Australian Standard **AS2107**, *AS2107:2000 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* as a basis for determining the potential for noise intrusion into adjacent habitable dwellings from steady-state noise sources that operate during all hours of the day.

The noise limits are:

The maximum recommended design sound levels stated in Table 1 of AS2107.

Table 1 of AS2107:2000 is as follows:

Type of occupancy/activity	Recommended design sound level, <i>L_{Aeq}</i> , dB(A)	
	Satisfactory	Maximum
7 RESIDENTIAL BUILDINGS		
Houses and apartments near major roads-		
Living areas	35	45
Sleeping areas	30	40
Work areas	35	40
Apartment common areas (e.g. foyer, lift lobby)	45	55

Due to the inner urban nature of the site and the proximity to major transport routes, 'Houses and apartments near major roads' is considered to be an appropriate description of the proposed development at the subject site. As such, the appropriate noise criteria for the assessment of plant noise impacts from the proposed development is an internal noise level of 40 dB(A) to bedrooms and 45 dB(A) to living areas. Considering a minimum noise attenuation of 5 dB(A) through an open window, the strictest plant and equipment noise criterion is **45 dB(A)** external to surrounding and on-site residential façades.

As such, any mechanical plant and equipment associated with the development should be located and acoustically treated and/or shielded to achieve the 45 dB(A) limit external to on-site or surrounding residential façades.

Experience dictates that appropriate noise controls are feasible to achieve the 45 dB(A) noise limit using modern plant, ensuring that residential amenity is not adversely impacted by the required air-conditioning plant and equipment.

Any refrigeration units required for the ground level retail tenancy should be selected, located and acoustically treated to achieve the 45 dB(A) limit external to on-site and neighbouring residential facades.

Any car park exhaust fans should be located within the car parking structure if practicable and discharged through appropriate acoustically designed outlets to achieve the 45 dB(A) limit external to on-site and surrounding residential facades. This design standard will ensure that the noise of the car park exhaust fans does not adversely impact on amenity at surrounding and on-site residential premises.

Any lift motors should be selected and acoustically enclosed if required in order to achieve the 45 dB(A) limit external to on-site and surrounding residential facades. This design standard will ensure that the noise of the lift motors does not adversely impact on amenity at surrounding and on-site residential premises.

No detailed design is available at this stage on the precise type or manufacturer of the plant and equipment required for the development, and as this becomes available, more detailed assessment of the plant noise attenuation required should be undertaken. Experience with many other similar developments in proximity to existing residential areas dictates that appropriate noise controls are feasible to ensure that plant and equipment can achieve the noise limits required and the plant selection and acoustic design will form an integral part of the detailed design process for future development on the site.

7.2 CAR PARKING NOISE

On site car parking is proposed to be located within an enclosed ground levels and level 1. Access to the car parking areas is via a driveway from Mallon Street.

The noise of car parking activities will generally be contained within the enclosed car park structures with little potential to adversely impact on surrounding land uses. It is also considered that the noise level of vehicles accessing the site and using the site car parking will be significantly lower than the noise level of more frequent vehicle movements on surrounding roadways and thus shall not significantly impact on the acoustic environment at the on-site or surrounding land uses.

In summary the noise of proposed car parking shall generally be within the ambient traffic noise peaks and also largely contained within the enclosed car park structures. Thus, site car parking will not adversely impact on amenity at the proposed on-site residences and existing surrounding land uses.

8.0 CONCLUSIONS

MWA Environmental has been engaged by Blue Sky Private Real Estate to prepare a Noise Impact Assessment for a proposed residential development at 44 Brookes Street, Bowen Hills.

The report considers noise amenity impacts with respect to traffic noise from surrounding roadways, rail noise and surrounding land use noise impacts upon the proposed development and also considers the impact upon surrounding residential development from plant and equipment and car parking activity noise as a result of the development.

The report has been prepared for submission to *Economic Development Queensland* and has been prepared in accordance with the requirements of applicable Australian Standards and with the requirements of the Brisbane City Council (BCC) *Brisbane City Plan 2000, Noise Impact Assessment Planning Scheme Policy* (NIAPSP).

The assessment has included detailed long-term and short-term noise measurements taken to characterise the existing noise exposure of the site.

The traffic noise assessment has determined that the proposed rooftop communal outdoor recreation area will achieve a suitable level of traffic noise amenity. Thus, all residents will have access to outdoor recreation space that satisfies the relevant traffic noise criteria.

The noise assessment provided R_w Ratings that will be required of the residential building components so as to achieve the design internal noise levels of AS2107:2000 considering the noise of vehicular traffic on the surrounding road network. The required acoustic ratings are achievable with relatively standard unit building façade construction and using readily available glazing elements (i.e. windows, sliding glass doors etc.). The provision of building components achieving the specified R_w requirements will ensure satisfactory internal traffic noise amenity within the proposed residential units.

The assessment has concluded that the required fixed plant and equipment at the development may be suitably selected, located and/or acoustically treated to achieve the appropriate noise limits at on-site and surrounding residences. Experience with similar developments dictates that the required ameliorative measures are feasible at the site.

The noise of proposed car parking has been assessed with the conclusion that noise impacts at on-site and surrounding residences will be largely contained to within the enclosed car park structures and will be minimal as compared to the more frequent traffic noise peaks from surrounding roadways.

It is recommended that the development be approved with reasonable and relevant conditions with respect to acoustic amenity.

MWA Environmental
6 February 2014

FIGURES

DRAWING REFERENCE
UBD : UNIVERSAL PUBLISHERS PTY LTD



CLIENT
THE 44 BROOKES STREET BOWEN HILLS TRUST

PROJECT
BOWEN HILLS
Noise Impact Assessment
Proposed Residential Development
44 Brookes Street Bowen Hills Qld

TITLE

GENERAL SITE LOCATION

FIGURE 1
JOB NO. 13-129
DATE 10/02/14
DRAWING NUMBER
SCALE NOT TO SCALE
REV. 13-129-1



Max Winders & Associates Pty Ltd has MWA Environmental
Level 15 24 Adelaide St, Brisbane, GPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
W www.mwaenviro.com.au
ABN 94 010 833 064



LEGEND

SITE BOUNDARY

NOISE DATALOGGER LOCATION

SHORT TERM NOISE

MONITORING LOCATIONS (1-2)

D

2

DRAWING REFERENCES

© THE STATE OF QUEENSLAND 2013 OLDGLOBE

GOOGLE EARTH PRO 2012

CADASTRAL OVERLAYS ARE BEST FIT

CLIENT
THE 44 BROOKES STREET BOWEN HILLS TRUST

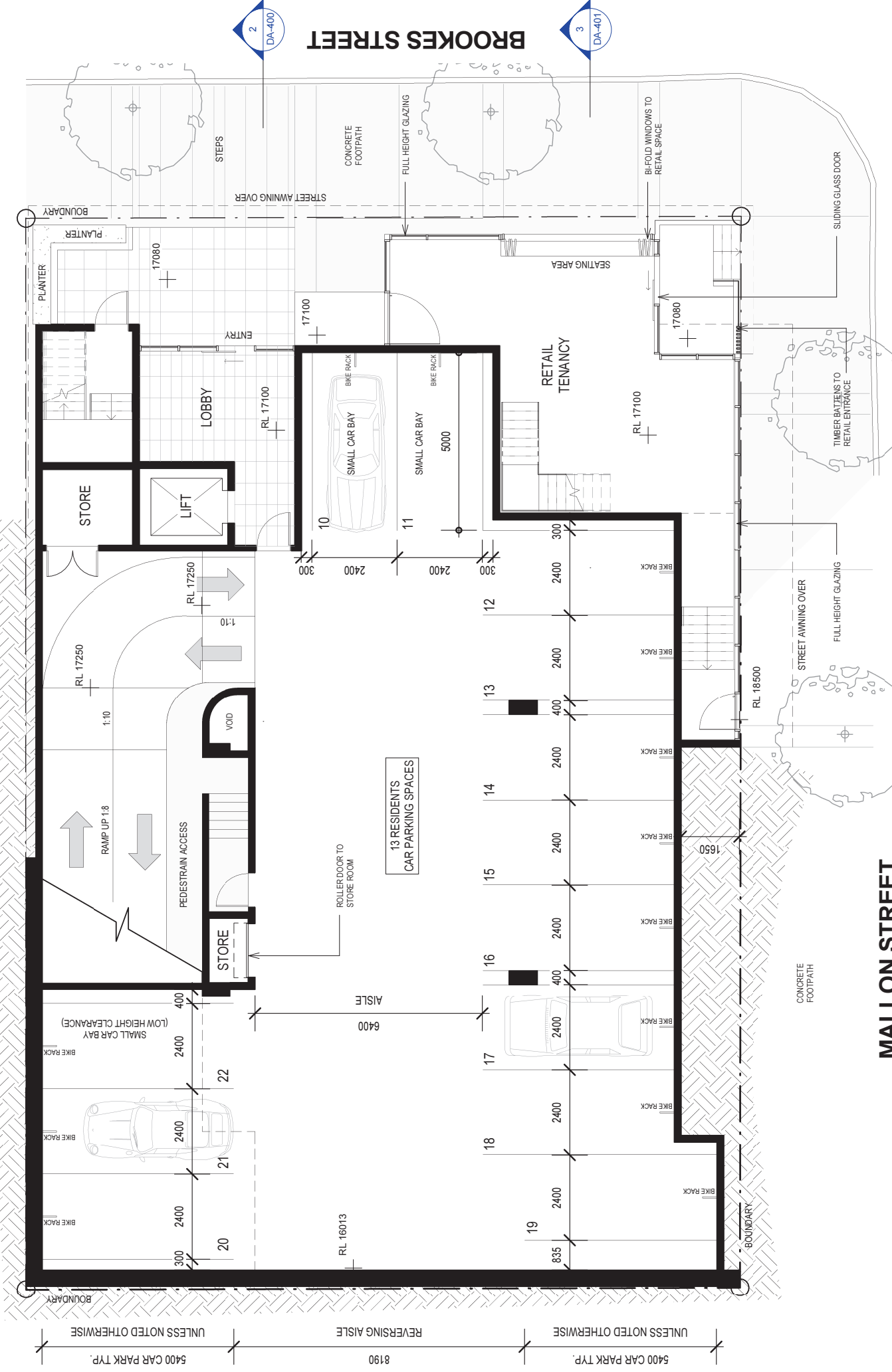
PROJECT
BOWEN HILLS
Noise Impact Assessment
Proposed Residential Development
44 Brookes Street Bowen Hills Qld

TITLE
**NOISE MONITORING
LOCATIONS**

FIGURE 2	
JOB NO.	BOWEN HILLS
JOB NO.	13-129
DATE	06/02/14
SCALE	1:2000 (A4)
REV.	13-129-2

Max Winders & Associates Pty Ltd has MWA Environmental
Level 15 241 Adelaide St, Brisbane, QPO BOX 3137, Brisbane Qld 4001
P 07 3002 5500 F 07 3002 5588 E mai@mwaenviro.com.au
www.mwaenviro.com.au
ABN 94 010 833 064

ATTACHMENT 1
Indicative Architectural Drawings



3000



