NOISE IMPACT ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT

15 ANDERSON STREET

FORTITUDE VALLEY

Prepared for:
Property Link

Prepared by:
MWA Environmental

24 March 2014

Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 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 94 010 833 084

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: Fortitude Valley

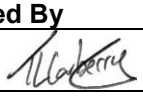
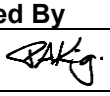
Job No: 13-089

Original Date of Issue: 24 March 2014

DOCUMENT DETAILS

Title:	Noise Impact Assessment – Proposed Residential Development – 15 Anderson Street, Fortitude Valley
Principal Author:	Mr Travis Carberry
Client:	Property Link
Client Address:	GPO Box 4569, Sydney NSW 2001
Client Contact:	Mr Matthew McQueen

REVISION/CHECKING HISTORY

Version Number	Date	Issued By		Checked By	
1 Report	24.03.14	TLC		PAK	
2					
3					
4					
5					
6					
7					
8					

DISTRIBUTION RECORD

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

CONTENTS **PAGE**

1.0 INTRODUCTION

MWA Environmental has been engaged by Property Link to prepare a Noise Impact Assessment for a proposed residential development at Fortitude Valley.

The proposed development is located at 15 Anderson Street, Fortitude Valley (see **Figure 1**). The development comprises a 12 storey residential unit building and a 10 storey residential unit building located above a 4 storey podium that contains some retail uses at ground level, residential units at ground level and levels 1 to 3 with car parking at ground level and levels 1 to 3. Two levels of basement car parking and a podium level (level 4) common outdoor recreation pool area are also proposed.

The report considers noise amenity impacts with respect to traffic noise from surrounding roadways, noise impacts from surrounding land uses 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 15 Anderson Street, Fortitude Valley. The site location is shown on **Figure 1**.

The surrounding land includes a mix of residential, commercial and office uses. Surrounding car parking areas are located at adjacent land uses and along Anderson Street and Costin Street. Adjacent and nearby commercial / office uses are considered to be low noise impact with little potential to adversely impact upon residential amenity at the development. The Tivoli Theatre is located approximately 70 metres to the northwest of the site.

Anderson Street adjoins the site to the west, Costin Street adjoins the site to the east and Water Street adjoins the site to the south. Other surrounding roadways include Brunswick Street located further to the east of the site, Gregory Terrace located further to the north of the site and St Pauls Terrace located further to the south of the site, all beyond existing development.

The surrounding land uses are shown on the aerial photo included as **Figure 2**.

Site inspections reveal that the predominant existing noise at the site is road traffic on surrounding roadways. The noise from use of surrounding car parking areas, adjacent commercial / office land uses and that of plant and equipment at surrounding land uses were not noted to be significant at the development site and were observed to be within the level of more frequent traffic noise impacts.

3.0 PROPOSED DEVELOPMENT

The proposed development is for two residential towers to be located above a four level podium at the site.

Tower 1 (stage 1) is 10 stories (above podium) and is to be located on the southern portion of the site. Tower 2 (stage 2) is 12 stories (above podium) and is to be located on the northern portion of the site. The podium is to contain some ground level retail uses, car parking for the development at ground level and at levels 1 to 3 and residential units at ground level and levels 1 to 3. Two basement levels of car parking are also proposed. The site is to be accessed from a driveway off Anderson Street.

A common outdoor recreation area is proposed at the podium level 4 on the centre portion of the site.

Indicative design drawings for the project 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;
- Entertainment noise from The Tivoli;
- 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 AS2107:2000[1], determined in accordance with AS3671–1989[2].

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-		
Living areas	*35*	*45*
Sleeping areas	*30*	*40*
Work areas	*35*	*45*
Apartment common areas (e.g. foyer, lift lobby)	*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*
>
> *AS2107 does not include limits for outdoor recreation areas. A reasonable level of outdoor amenity must be maintained for residential*

[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*

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 OTHER NOISE SOURCES

The NIAPSP outlines assessment methodologies that should be used based upon 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.

Appropriate noise criteria for any amplified entertainment are those of Brisbane City Council, as follows:

<u>7am to 10pm</u>

Emissions of noise from amplified music must not cause the average maximum adjusted sound pressure level ($L_{Amax,adj,T}$) when measured at a sensitive receptor to exceed the following levels:

Time Period Level
0700 to 1800 Average background sound pressure level ($L_{A,bg,T}$) + 10 dB(A)
1800 to 2200 Average background sound pressure level ($L_{A,bg,T}$) + 10 dB(A)

10pm to 7am

Emissions of noise from amplified music must not cause the linear sound pressure level equalled or exceeded for 10 percent of the time in any octave band with centre frequencies 31.5 Hz to 4 kHz ($L_{oct,10,T}$) when measured at a sensitive receptor to exceed the background linear sound pressure level equalled or exceeded for 90 percent of the time in any corresponding octave band with centre frequencies 31.5 Hz to 4 kHz ($L_{oct,10,T}$) by more than 3 dB(A) during the night time period (2200 to 0700).

The criterion after 10pm is commonly simplified to a limit that the LA_{10} does not exceed the LA_{90} by more than 0 dB(A) internal to a residence after 10pm in respect of amplified music.

5.0 AMBIENT NOISE LEVELS

To enable an assessment of the existing noise exposure of the subject site detailed noise measurements have been undertaken. A noise datalogger was placed at the site over a 4 day period from 25 to 28 November 2013. The noise datalogger was located on the north western part of the site as shown on **Figure 2**. Weather conditions during the monitoring period were predominantly fine.

The datalogger recorded noise levels are included as graphical traces of noise level versus time in ***Attachment 2***. The noise datalogger used was an Acoustic Research Laboratories noise datalogger, model EL-316, programmed to provide statistical analysis results based on 15-minute sampling periods. The datalogger was pre-calibrated to 94 dB at 1kHz using a Bruel & Kjaer Sound Level Calibrator, Type 4231, and displayed a deviation of less than ±0.5 dB from this level at post-calibration.

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

L_1: Noise level exceeded for 1 percent of the measurement period, referred to as the adjusted maximum sound pressure level.

L_{10}: Noise level exceeded for 10 percent of the measurement period, referred to as the averaged maximum sound pressure level.

L_{90}: Noise level exceeded for 90 percent of the measurement period. AS1055.1–1997[3] notes that the L_{90} 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.

The results of the noise datalogger measurements are summarised in **Table 1** below.

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

Table 1: Ranges of Site Recorded Noise Levels 25 to 28 November, 2013

PARAMETER	PERIOD	RECORDED NOISE LEVELS - dB(A)		
		MINIMUM	MAXIMUM	AVERAGE
L_1	Daytime (7am-6pm)	66.5	82.5	72.2
	Evening (6pm-10pm)	59.0	72.5	68.0
	Nighttime (10pm-7am)	38.5	76.0	58.4
L_{10}	Daytime (7am-6pm)	56.5	77.5	62.4
	Evening (6pm-10pm)	46.5	61.5	54.6
	Nighttime (10pm-7am)	36.5	63.0	45.9
L_{90}	Daytime (7am-6pm)	47.0	53.0	50.2
	Evening (6pm-10pm)	39.0	48.5	44.0
	Nighttime (10pm-7am)	35.0	50.0	38.5
L_{eq}	Daytime (7am-6pm)	56.0	71.5	60.5
	Evening (6pm-10pm)	48.5	60.0	55.2
	Nighttime (10pm-7am)	36.0	65.0	48.2

Other recorded statistical noise level parameters included:

- Recorded L_{10} (18 hour) = 58.6 dB(A)
- Recorded L_{eq} (24 hour) = 54.9 dB(A)
- Maximum Recorded L_{eq} (1 hour) (7am-10pm) = 62.1 dB(A)
- Maximum Recorded L_{eq} (1 hour) (10pm-7am) = 59.9 dB(A)

In addition to the long term datalogging, short term noise measurements were conducted at the site. 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	DATE	TIME	RECORDED STATISTICAL NOISE LEVEL - dB(A)					COMMENTS
				L_1	L_{10}	L_{50}	L_{90}	L_{eq}	
1	Southwest Site Boundary – On Anderson Street	25/11/13	1420 – 1430	81.4	65.5	58.0	55.3	67.2	Traffic noise Construction noise from Water Street (roadworks)
		28/11/13	1500 – 1510	67.3	59.0	55.4	53.3	58.4	
2	Northeast Site Boundary – On Costin Street	25/11/13	1435 – 1445	79.3	70.8	63.5	59.1	68.0	Traffic noise Construction noise from Water Street (roadworks)
		28/11/13	1515 – 1525	70.2	61.8	55.7	54.2	59.7	
3	Southeast Site Boundary – On Water Street	25/11/13	1450 – 1500	79.2	67.8	63.9	59.2	67.2	Traffic noise Construction noise from Water Street (roadworks)
		28/11/13	1530 – 1540	71.3	65.9	62.3	58.6	63.5	

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 ASSESSMENT

6.1.1 Traffic Volume Data

Existing and ultimate projection traffic count data for Gregory Terrace, Costin Street, Brunswick Street and St. Pauls Terrace adjacent the site was provided by the Brisbane City Council on the 6th December 2013. Gregory Terrace was supplied as an existing and ultimate (10 year design horizon) traffic volume of 9,000 vehicles per day (vpd) and 13,000 vpd respectively, and a commercial vehicle content of 3%. Costin Street was supplied as an existing and ultimate (10 year design horizon) traffic volume of 2,000 vpd and 5,000 vpd respectively, and a commercial vehicle content of 2%. Brunswick Street was supplied as an existing and ultimate (10 year design horizon) traffic volume of 33,000 vpd and 37,000 vpd respectively, and a commercial vehicle content of 6%. St. Pauls Terrace was supplied as an existing and ultimate (10 year design horizon) traffic volume of 19,000 vpd and 21,000 vpd respectively, and a commercial vehicle content of 4%.

In addition, MWA Environmental have conducted manual peak hour traffic counts for other surrounding roadways as follows:

- Anderson Street was counted as an average peak hour traffic volume of 96 vehicles per hour with a commercial vehicle content of 7.14%.
- Water Street was counted as an average peak hour traffic volume of 52 vehicles per hour with a commercial vehicle content of 10.34%.
- Misterton Street was counted as an average peak hour traffic volume of 74 vehicles per hour with a commercial vehicle content of 8.96%.

The 18 hour (6am to Midnight) traffic volume is generally approximated as 94% of the daily volume. From advice of the traffic engineers, it is estimated that the peak hour traffic volumes are 10% of the daily volume. The existing and ultimate (10-year design horizon) traffic volumes for Gregory Terrace, Costin Street, Brunswick Street, St. Pauls Terrace, Anderson Street, Water Street and Misterton Street, as determined from the data provided by Brisbane City Council and from the traffic volume counts conducted by MWA Environmental, are listed in **Table 3** below.

Table 3: Existing and Ultimate Traffic Volume Data

Road	VPD		VP18hr		%CV
	Existing	Ultimate	Existing	Ultimate	
Gregory Terrace	9,000	13,000	8,460	12,220	3
Costin Street	2,000	5,000	1,880	4,700	2
Brunswick Street	33,000	37,000	31,020	34,780	6
St. Pauls Terrace	19,000	21,000	17,860	19,740	4
Anderson Street*	960	1,354	902	1,273	7.14
Water Street*	520	734	489	690	10.34
Misterton Street*	740	1,044	696	981	8.96

**A traffic growth rate of 3.5% per annum has been adopted for these roadways for calculation of ultimate traffic volumes.*

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 ±2dB of the recorded level, with selected parameters used in the future traffic (ten year horizon) 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 the noise datalogger location was recorded to be 58.6 dB(A) as the free-field L_{10} (18 hour). The model prediction for the monitoring location was an L_{10} (18 hour) of 59.0 dB(A), thus the model is well validated.

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

The NIAPSP requires that the design of residential developments in locations near to roadways with over 15,000 vehicles per day ultimate to consider internal noise levels as contained in Australian Standard *AS 2107 Acoustics – Recommended Design Sound Levels and Reverberation Times in Building Interiors*.

In order to determine the traffic noise amelioration measures that are required for the proposed development, ultimate design horizon traffic noise predictions have been made external to the proposed residential towers. The

future 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 flow conditions. A table of the results, predicting ultimate L_{10} (18 hour) noise levels at each residential level of the proposed development buildings was produced (**Tables 4 to 6**). 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) = 54.9 – 58.6 = -3.7 dB(A)

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

Recorded L_{10} (18hr) to Recorded L_{Aeq} (1hr) = 62.1 – 58.6 = +3.5 dB(A)

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

Recorded L_{10} (18hr) to Recorded L_{Aeq} (1hr) = 59.9 – 58.6 = +1.3 dB(A)

Table 4: Ultimate Traffic Noise Predictions – Podium and Tower 1

Building	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)
Podium	West Façade	Ground	59.9	63.4	61.2	56.2
		1	60.2	63.7	61.5	56.5
		2	60.0	63.5	61.3	56.3
		3	59.9	63.4	61.2	56.2
	South Façade	Ground	57.9	61.4	59.2	54.2
		1	58.7	62.2	60.0	55.0
		2	59.1	62.6	60.4	55.4
		3	59.4	62.9	60.7	55.7
	East Façade	2	63.6	67.1	64.9	59.9
		3	62.9	66.4	64.2	59.2
Tower 1 (Stage 1)	East Façade	4	51.3	54.8	52.6	47.6
		5	53.9	57.4	55.2	50.2
		6	55.2	58.7	56.5	51.5
		7	55.9	59.4	57.2	52.2
		8	56.2	59.7	57.5	52.5
		9	56.4	59.9	57.7	52.7
		10	56.5	60.0	57.8	52.8
		11	56.6	60.1	57.9	52.9
		12	56.7	60.2	58.0	53.0
		13	56.8	60.3	58.1	53.1
	North Façade	4	50.5	54.0	51.8	46.8
		5	53.8	57.3	55.1	50.1
		6	55.4	58.9	56.7	51.7
		7	56.3	59.8	57.6	52.6
		8	56.7	60.2	58.0	53.0
		9	56.8	60.3	58.1	53.1
		10	56.9	60.4	58.2	53.2
		11	56.9	60.4	58.2	53.2
		12	57.0	60.5	58.3	53.3
		13	57.1	60.6	58.4	53.4
	South Façade	4	58.4	61.9	59.7	54.7
		5	58.8	62.3	60.1	55.1
		6	58.9	62.4	60.2	55.2
		7	59.1	62.6	60.4	55.4
		8	59.2	62.7	60.5	55.5
		9	59.2	62.7	60.5	55.5
		10	59.1	62.6	60.4	55.4
		11	59.1	62.6	60.4	55.4
		12	59.1	62.6	60.4	55.4
		13	59.2	62.7	60.5	55.5

Table 5: Ultimate Traffic Noise Predictions – Tower 1 and Tower 2

Building	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)
Tower 1 (Stage 1)	West Façade	4	55.9	59.4	57.2	52.2
		5	58.9	62.4	60.2	55.2
		6	59.0	62.5	60.3	55.3
		7	58.9	62.4	60.2	55.2
		8	58.8	62.3	60.1	55.1
		9	58.7	62.2	60.0	55.0
		10	58.5	62.0	59.8	54.8
		11	58.4	61.9	59.7	54.7
		12	58.3	61.8	59.6	54.6
		13	58.3	61.8	59.6	54.6
Tower 2 (Stage 2)	East Façade	4	57.8	61.3	59.1	54.1
		5	61.0	64.5	62.3	57.3
		6	60.8	64.3	62.1	57.1
		7	60.5	64.0	61.8	56.8
		8	60.1	63.6	61.4	56.4
		9	59.8	63.3	61.1	56.1
		10	59.5	63.0	60.8	55.8
		11	59.2	62.7	60.5	55.5
		12	59.0	62.5	60.3	55.3
		13	58.9	62.4	60.2	55.2
		14	58.7	62.2	60.0	55.0
		15	58.7	62.2	60.0	55.0
	North Façade	4	52.7	56.2	54.0	49.0
		5	55.3	58.8	56.6	51.6
		6	56.1	59.6	57.4	52.4
		7	56.4	59.9	57.7	52.7
		8	56.6	60.1	57.9	52.9
		9	56.8	60.3	58.1	53.1
		10	56.9	60.4	58.2	53.2
		11	57.0	60.5	58.3	53.3
		12	57.0	60.5	58.3	53.3
		13	57.1	60.6	58.4	53.4
		14	57.2	60.7	58.5	53.5
		15	57.3	60.8	58.6	53.6

Table 6: Ultimate Traffic Noise Predictions – Tower 2

Building	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)
Tower 2 (Stage 2)	South Façade	4	59.0	62.5	60.3	55.3
		5	60.1	63.6	61.4	56.4
		6	60.0	63.5	61.3	56.3
		7	59.8	63.3	61.1	56.1
		8	59.6	63.1	60.9	55.9
		9	59.5	63.0	60.8	55.8
		10	59.4	62.9	60.7	55.7
		11	59.3	62.8	60.6	55.6
		12	59.2	62.7	60.5	55.5
		13	59.1	62.6	60.4	55.4
		14	59.1	62.6	60.4	55.4
		15	59.1	62.6	60.4	55.4
	West Façade	4	45.8	49.3	47.1	42.1
		5	47.8	51.3	49.1	44.1
		6	49.2	52.7	50.5	45.5
		7	50.1	53.6	51.4	46.4
		8	50.8	54.3	52.1	47.1
		9	51.4	54.9	52.7	47.7
		10	52.1	55.6	53.4	48.4
		11	52.6	56.1	53.9	48.9
		12	53.1	56.6	54.4	49.4
		13	53.6	57.1	54.9	49.9
		14	54.2	57.7	55.5	50.5
		15	55.1	58.6	56.4	51.4

A common outdoor recreation and pool area is proposed at the common podium level 4 of the development. The SoundPLAN model predicted an ultimate L_{10} (18hr) traffic noise level of 48.1 dB(A) at the common outdoor recreation area. This relates to a L_{eq} (24 hour) traffic noise level of 44.4 dB(A) and a L_{eq} (1 hour) traffic noise level of 51.6 dB(A) at the outdoor recreation area. Thus, the 55 dB(A) L_{eq} (24 hour) and 60 dB(A) L_{eq} (1 hour) criteria limits are satisfied at the common outdoor recreation area and all residents will have access to outdoor recreation space that satisfies the BCC noise criteria.

6.1.4 Building Componentry Rw Values

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 have been based upon the architectural drawings included in ***Attachment 1***.

The internal traffic noise calculations were based on predicted ultimate maximum 1 hour L_{Aeq} 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, indicative Weighted Sound Reduction Indices (R_W's) have been identified for the building components as required for traffic noise attenuation to achieve the internal traffic noise levels. The required Rw values for the proposed development are included as ***Attachment 5*** to this report.

The required acoustic ratings are achievable using readily available residential unit construction and facade elements. Glazing ratings of up to Rw 31 are required for the proposed development. If any changes are proposed for the residential unit layouts, these Rw requirements should be reviewed at the detailed design phase of the development to ensure appropriate acoustic amenity is achieved.

The provision of building components achieving the specified R_w Values (as per ***Attachment 5***) will ensure satisfactory internal traffic noise amenity within the proposed residential units.

6.2 SURROUNDING LAND USES NOISE ASSESSMENT

Surrounding land uses include surrounding some commercial / office uses and predominantly residential uses surrounding the site.

From site inspections, the adjacent commercial / office uses are considered to be low noise impact and have little potential to adversely impact upon residential amenity at the proposed development.

The RNA Showgrounds are located in excess of 200 metres to the north of the site. Given the significant separation to the Showgrounds and the fact that events at the Showgrounds are an occasional occurrence, it is not considered that there is potential for adverse noise impacts to occur at the proposed residential uses from events at the RNA Showgrounds.

Noise impacts from the car parking at surrounding land uses and on Anderson Street and Costin Street were noted to be within the level of more frequent traffic noise peaks. Additionally, it is likely that the surrounding car parking activities would typically take place during the daytime and evening periods only. Hence it is considered that surrounding car parking activities do not have significant potential to adversely impact upon residential amenity at the proposed development.

From site inspections conducted, the noise of surrounding plant and equipment was generally inaudible at the subject site over the prevailing traffic noise. There was noted to be some minor air-conditioning plant and equipment surrounding the site, associated with the surrounding commercial, office and residential uses. It is considered that the design internal noise limits of AS2107:2000, i.e. an internal noise level of 40 dB(A) to bedrooms and 45 dB(A) to living areas, would be readily achieved at the development with standard residential building façade construction.

As such, considering the existing low noise impact uses surrounding the site and the design of the development to ameliorate traffic noise impacts, the noise of surrounding land uses will not adversely impact residential amenity at the proposed development.

6.3 TIVOLI NOISE IMPACT ASSESSMENT

It is considered that amplified entertainment at the Tivoli located approximately 70 metres to the northwest of the site needs to be assessed in terms of noise impact upon proposed on site residences.

The Tivoli is located in the Brisbane City Council Special Entertainment Precinct Core Area B (Amplified Music Venues Local Law) and the relevant noise limit is:

LC_{eqT} 88 dB (approximately 85 dB(A))

This limit applies at any point one metre external to the licensed premises.

As per ***Section 4.2***, the relevant noise criteria for the assessment of entertainment noise are as follows:

Time Period	**Noise Limit**
7am to 10pm	L_{90} + 10 dB(A) = 44 + 10 = **54 dB(A)**
10pm to 7am	Internal L_{90} + 0 dB(A) = 35 + 0 = **35 dB(A)**

Note that we have adopted an internal L_{90} noise level of 35 dB(A) within proposed residential units. This corresponds will with the existing background noise levels of average 39 dB(A) during the night period as measured by the noise datalogger located on site and is appropriate give the design of the development to achieve internal L_{eq} noise levels of 40 dB(A) to bedrooms on account of traffic noise.

The following calculation considers the noise impact of amplified entertainment at the Tivoli upon the site:

Distance attenuation: = 20log (70/1)
= 37 dB(A)

Noise external to nearest proposed residential unit at the development site:

= 85 – 37
= **48 dB(A)**

The predictions indicate that the external entertainment noise limit of 54 dB(A) prior to 10pm will be satisfied at the nearest proposed residential units at the site. Further, the predictions indicate that if 13 dB(A) of noise reduction is applied to all residential units, the internal 35 dB(A) noise criterion will be achieved within proposed future residences. The 13 dB(A) noise reduction will be readily achieved with residential grade construction and by providing air-conditioning or mechanical ventilation to proposed residential units.

Thus, with the provision that residential grade construction (already required to account for traffic noise impacts with minimum Rw 20 ratings required for the development) and air-conditioning / mechanical ventilation are provided to proposed residential units, entertainment noise from the Tivoli is not considered to have the potential to adversely impact upon residential amenity at the proposed development site.

7.0 NOISE IMPACT OF PROPOSED DEVELOPMENT

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 the residential units, ground level retail air-conditioning and minor refrigeration plant for the retail tenancies, car park exhaust fans, pool pumps and lift plant.

For plant and equipment noise, an appropriate assessment is to use 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, L_{Aeq}, 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 most limiting 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 facades.

The 45 dB(A) noise limit does not necessarily apply to a single item of plant, but rather should constitute the additive noise component levels of all plant and equipment proposed and in operation during the assessed period, measured at the nearest residential receptor(s).

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 tenancies 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 park enclosures 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 pool pumps 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 pool pumps 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.

More detailed assessment of acoustic treatments required for the major plant and equipment installations should be undertaken at the detailed design stage of the development. 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. Plant selection and acoustic design will form an integral part of the detailed design process for future development on the site.

7.2 SERVICE VEHICLE ACTIVITIES AND LOADING NOISE

Considering the nature of the proposed retail tenancies, it is likely that servicing would occur during the daytime and evening periods only (7am to 10pm) when ambient traffic noise peaks are highest. Servicing for the proposed retail tenancies would also be anticipated to be relatively infrequent due to the small nature of the tenancies, and would generally include relatively quiet small trucks or vans. The smaller delivery vehicles will typically use the ground level MRV Bay loading area which will be well shielded by the proposed development buildings and sufficiently separated to on site and surrounding residential areas.

Thus, the servicing requirements for the proposed retail tenancies will be minimal with no potential to adversely impact on amenity at on-site or surrounding residences.

7.3 CAR PARKING NOISE IMPACTS

Car parking for the development will be at two basement levels, ground level and at levels one to three. All proposed car parking levels are enclosed and hence are suitably screened to on-site and surrounding residential uses. Additionally, the majority of car parking activities at the development would take place during the daytime and evening periods and typically fall within the more frequent traffic noise peaks. As such, it is not considered that car parking activities at the site have the potential to adversely impact upon the acoustic amenity of on-site and surrounding residential land uses.

8.0 CONCLUSIONS

MWA Environmental has been engaged by Property Link to prepare a Noise Impact Assessment for a proposed residential development at Fortitude Valley.

The report considers noise amenity impacts with respect to traffic noise from surrounding roadways, noise impacts from surrounding land uses 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 noise measurements taken to characterise the existing noise exposure of the site.

A traffic noise assessment demonstrated that the proposed podium level 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 BCC traffic noise criteria.

The noise assessment provides R_w values 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. Calculations demonstrate that the required acoustic standards are achievable using readily available building components. The provision of building components achieving the specified R_w Values 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 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 minimal as compared to the more frequent traffic noise peaks. The noise of minor servicing activities for the proposed retail tenancies will be infrequent and generally contained to within the daytime and evening periods (7am to 10pm) with little potential to impact on on-site or surrounding residential amenity.

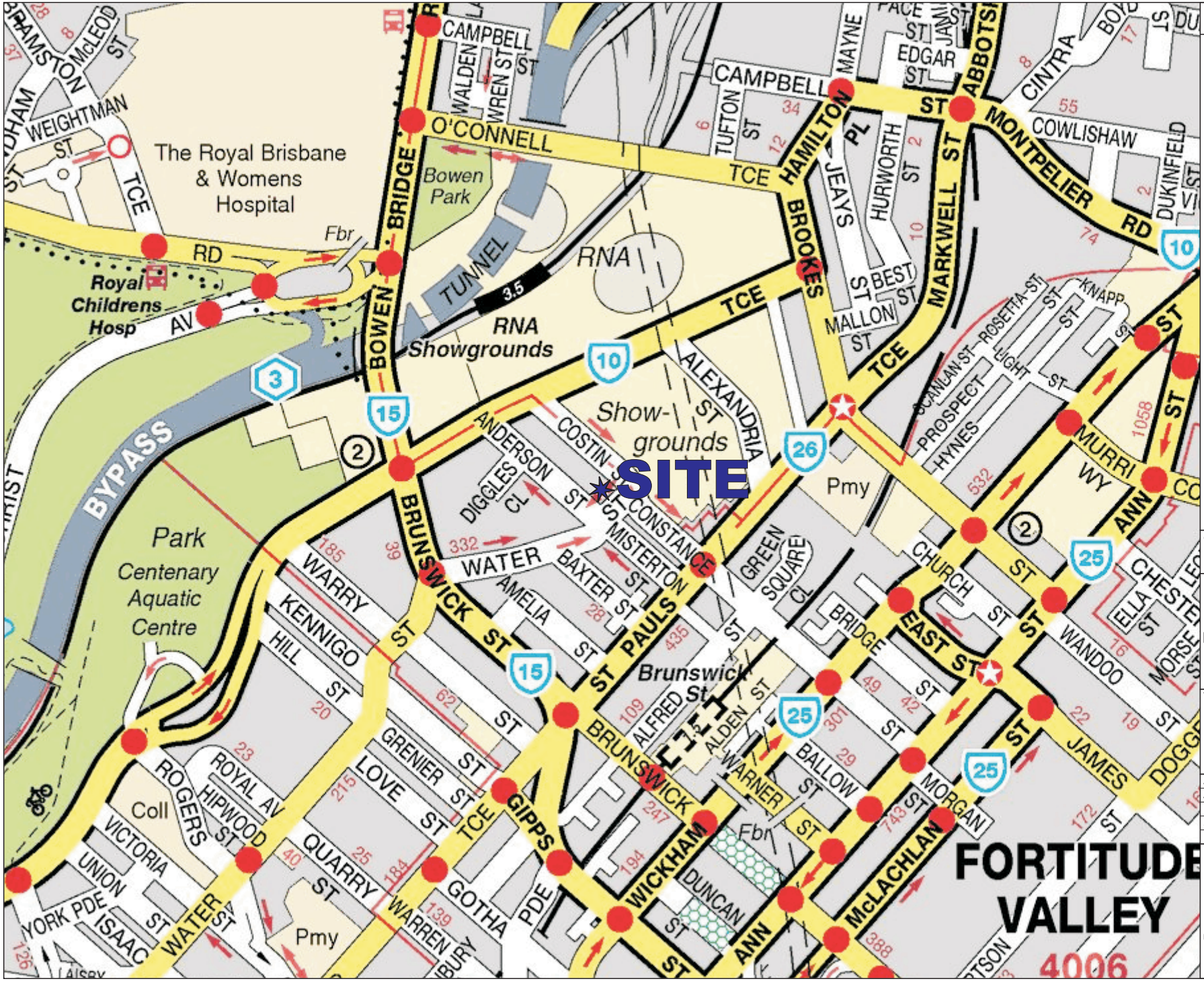
The assessment has also determined that the noise of surrounding land uses, including commercial and office uses, car parking, surrounding plant and equipment and the Tivoli, will not adversely impact on future residential amenity at the proposed development.

In summary, the assessment has determined that with appropriate noise controls the proposed development will provide a suitable level of amenity for

future residents and shall not adversely impact upon the amenity of surrounding residential areas.

MWA Environmental
24 March 2014

FIGURES



DRAWING REFERENCE
UBD : UNIVERSAL PUBLISHERS PTY LTD

CLIENT
PROPERTY LINK

PROJECT
FORTITUDE VALLEY
Noise Impact Assessment
Proposed Residential Development
15 Anderson Street
Fortitude Valley Qld

TITLE
GENERAL SITE LOCATION

JOB	FORTITUDE VALLEY
JOB NO.	13-089
DATE	24/03/14
SCALE	NOT TO SCALE
REV.	

FIGURE 1
DRAWING NUMBER
13-089-1

Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 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 94 010 833 084

LEGEND

- SITE BOUNDARY
- D — NOISE DATALOGGER LOCATION
- 3 — SHORT TERM NOISE MONITORING LOCATIONS (1-3)

DRAWING REFERENCES

- © THE STATE OF QLD (DNRM) DCDB.
- © THE STATE OF QLD 2013 QLDGLOBE.
- GOOGLE EARTH PRO, 25/04/13.

CLIENT
PROPERTY LINK

PROJECT
FORTITUDE VALLEY
Noise Impact Assessment
Proposed Residential Development
15 Anderson Street
Fortitude Valley Qld

TITLE
NOISE MONITORING LOCATIONS

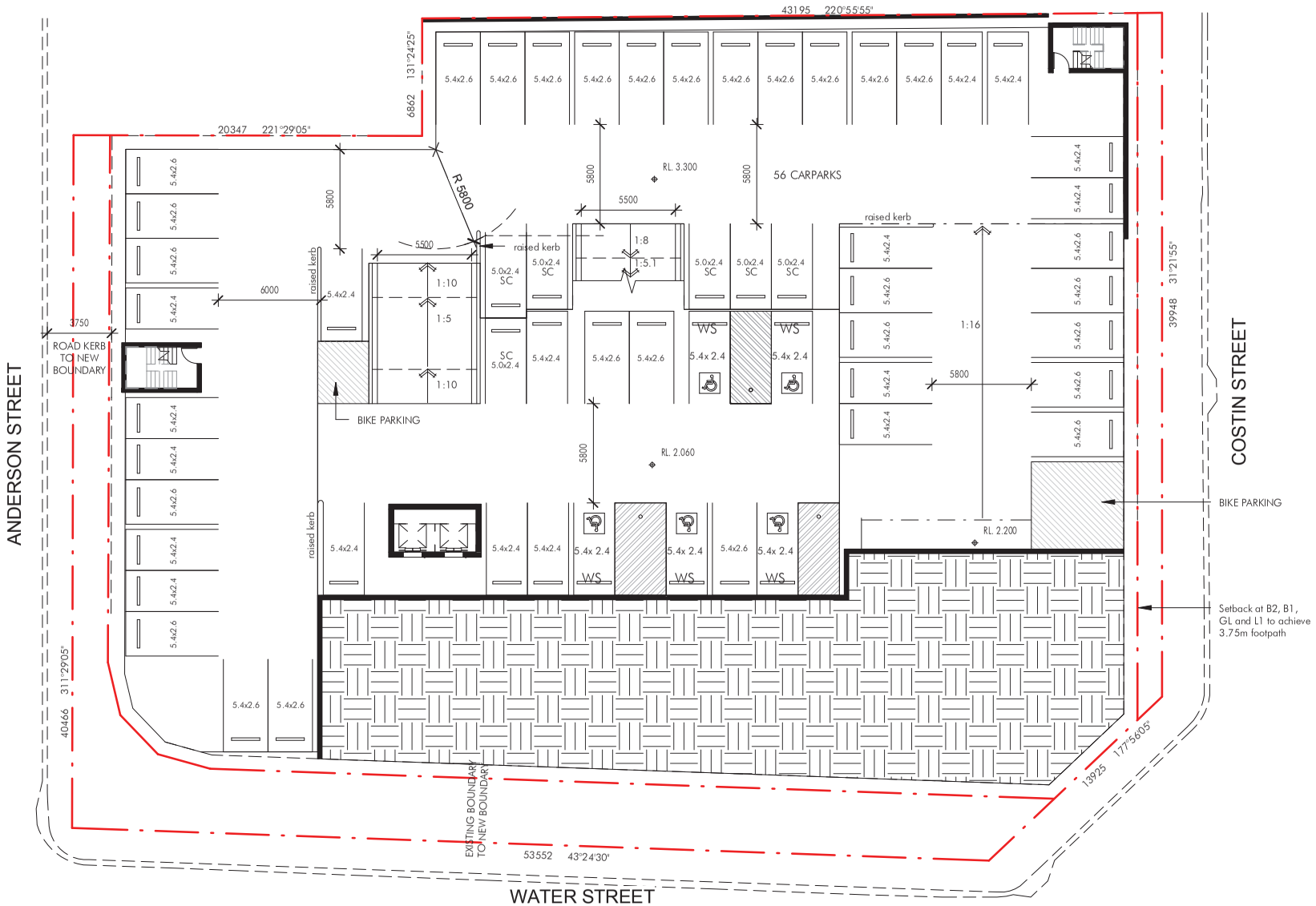
JOB	FORTITUDE VALLEY
JOB NO.	13-089
DATE	24/03/14
SCALE	1:3,500 (A4)
REV.	

FIGURE 2
DRAWING NUMBER
13-089-2

Max Winders & Associates Pty Ltd tas MWA Environmental
Level 15, 241 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 94 010 833 084

Attachment 1

Indicative Design Drawings



Client

Propertylink
thinking property

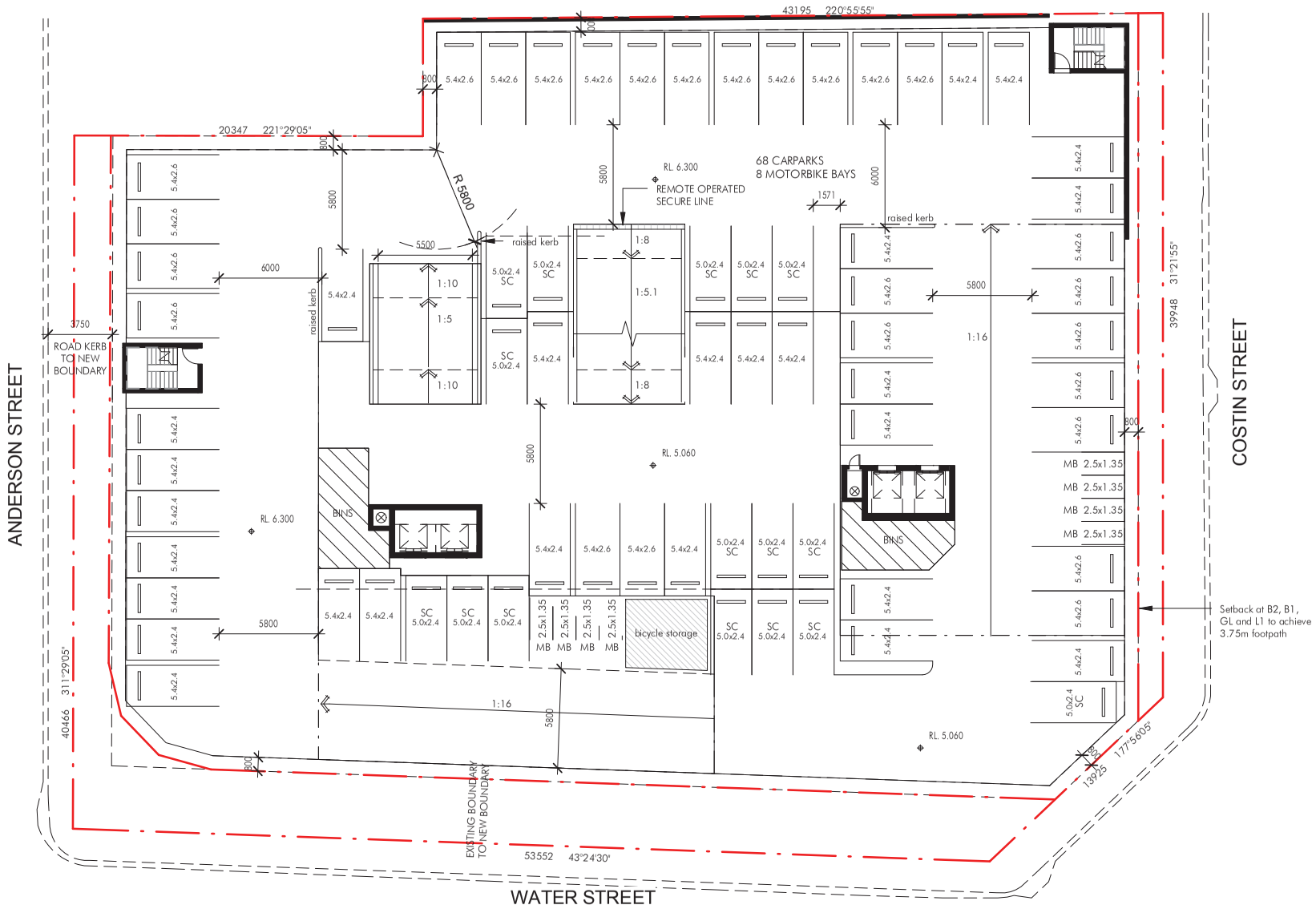
Project

Residential Development
15 Anderson Street, Fortitude Valley

Title	BASEMENT 2
Scale	1:250
Date	24/03/14
Number	3400_DA15

Architectural Consultant

nettletontribe
netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2444 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au



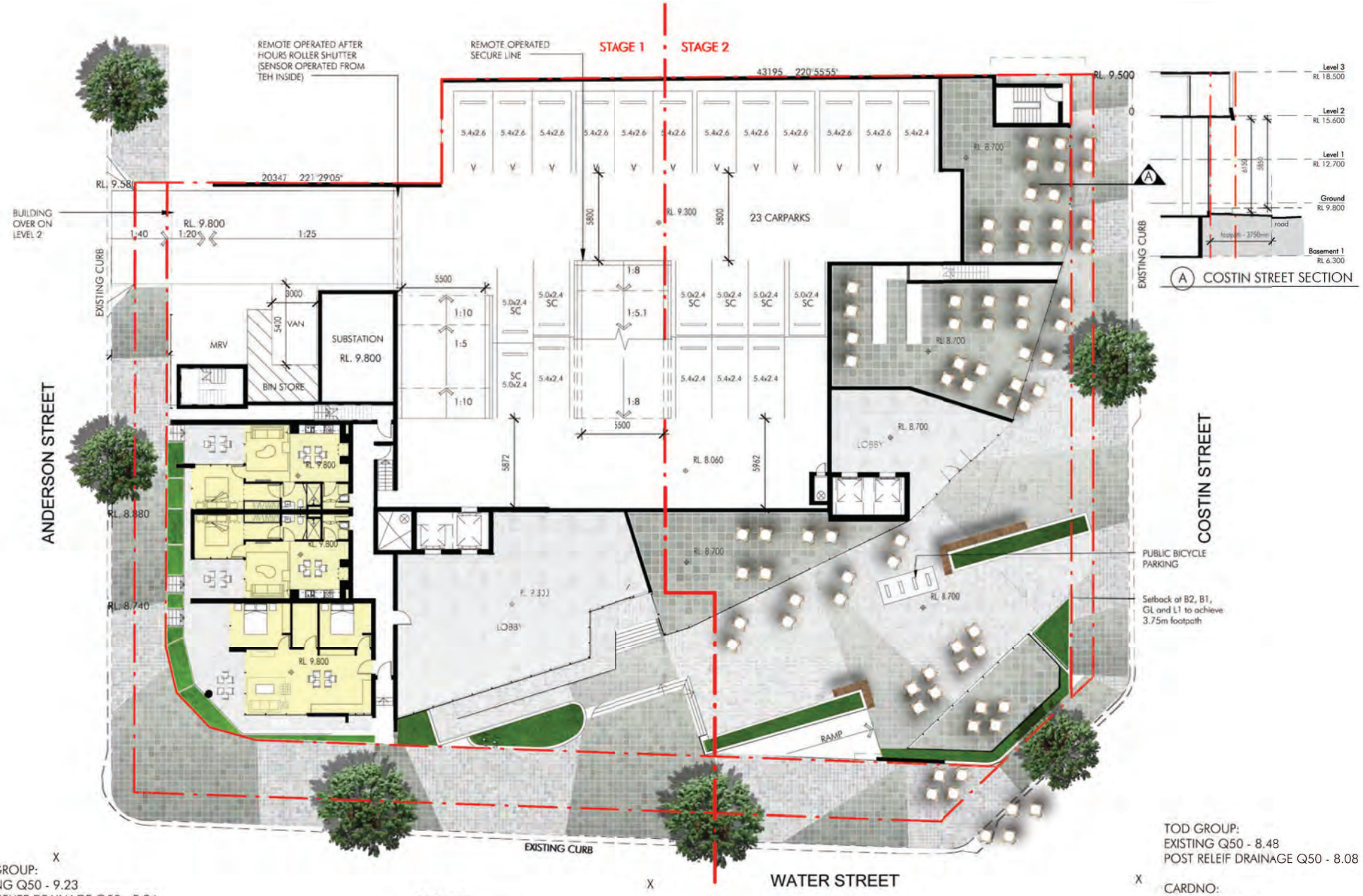
Client: Propertylink thinking property

Project: Residential Development
15 Anderson Street, Fortitude Valley

Title	BASEMENT 1
Scale	1:250
Date	24/03/14
Number	3400_DA16

Architectural Consultant

nettletontribe
netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2444 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au



TOD GROUP:
EXISTING Q50 - 9.23
POST RELIEF DRAINAGE Q50 - 8.24

CARDNO:
EXISTING Q50 - 8.68
EXISTING Q100 - 8.77
POST RNA Q50 - 8.61
POST RNA Q100 - 8.73

TOD GROUP:
EXISTING Q50 - 8.48
POST RELEIF DRAINAGE Q50 - 8.08

CARDNO:
EXISTING Q50 - 8.59
EXISTING Q100 - 8.71
POST RNA Q50 - 8.43
POST RNA Q100 - 8.68

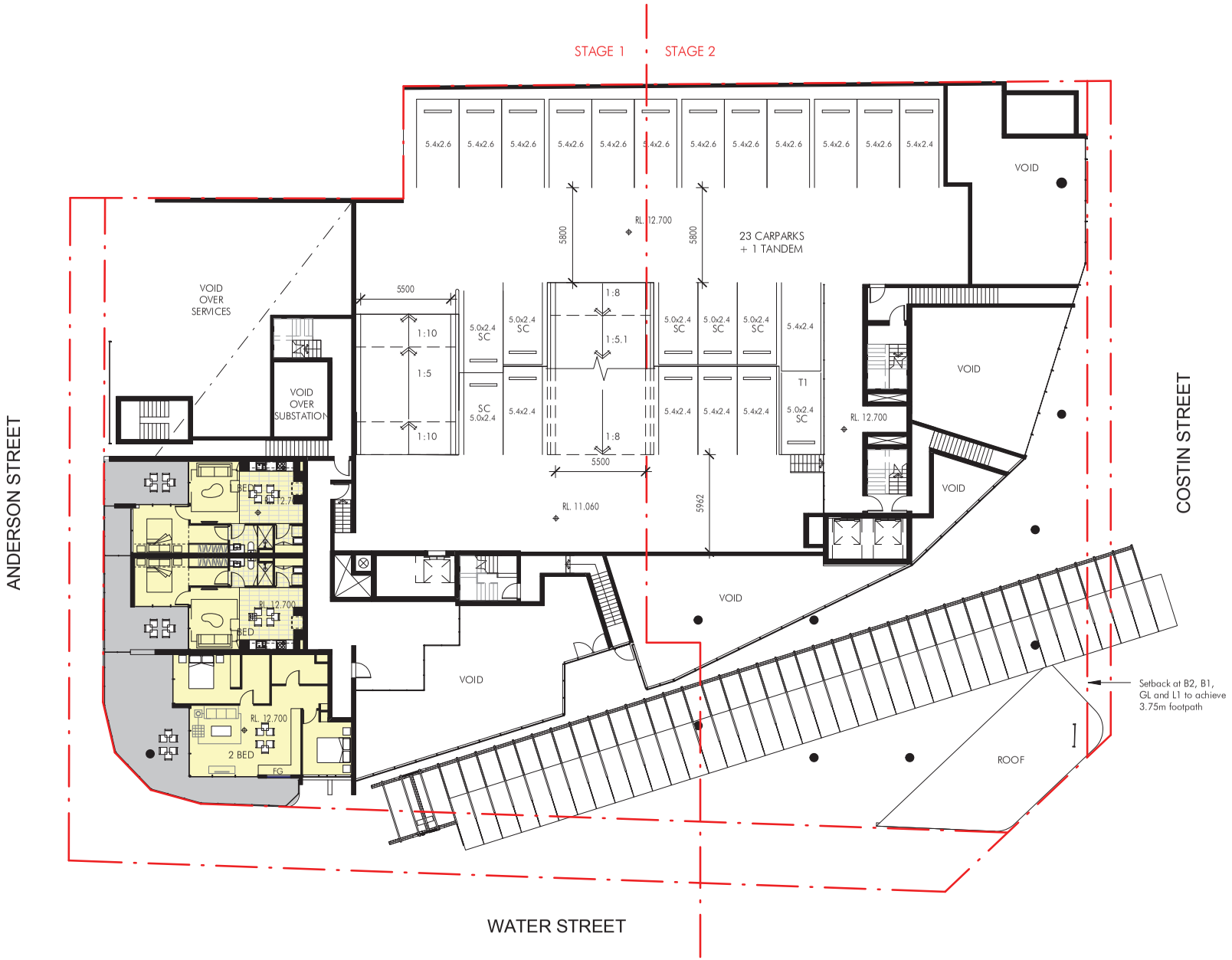
Client
Propertylink
thinking property

Project
Residential Development
15 Anderson Street, Fortitude Valley

Title	GROUND FLOOR PLAN
Scale	1:250
Date	24/03/14
Number	3400_DA17

Architectural Consultant
nettletontribe

nettleton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3259 2444 f 07 3259 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au



Client

Propertylink
thinking property

Project

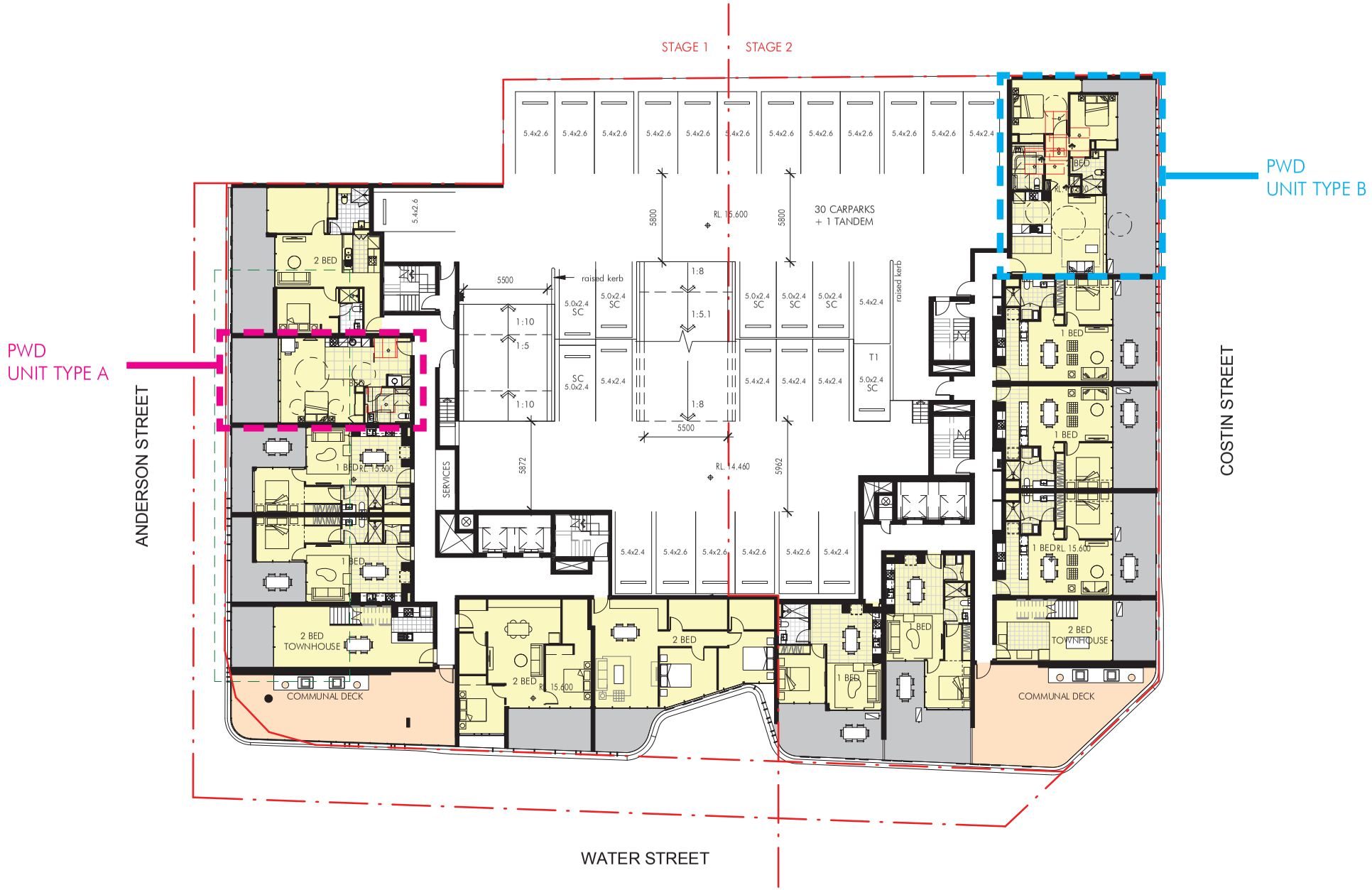
Residential Development
15 Anderson Street, Fortitude Valley

Title	LEVEL 1
Scale	1:250
Date	24/03/14
Number	3400_DA18

Architectural Consultant

nettletontribe

netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2444 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au



Client

Propertylink
thinking property

Project

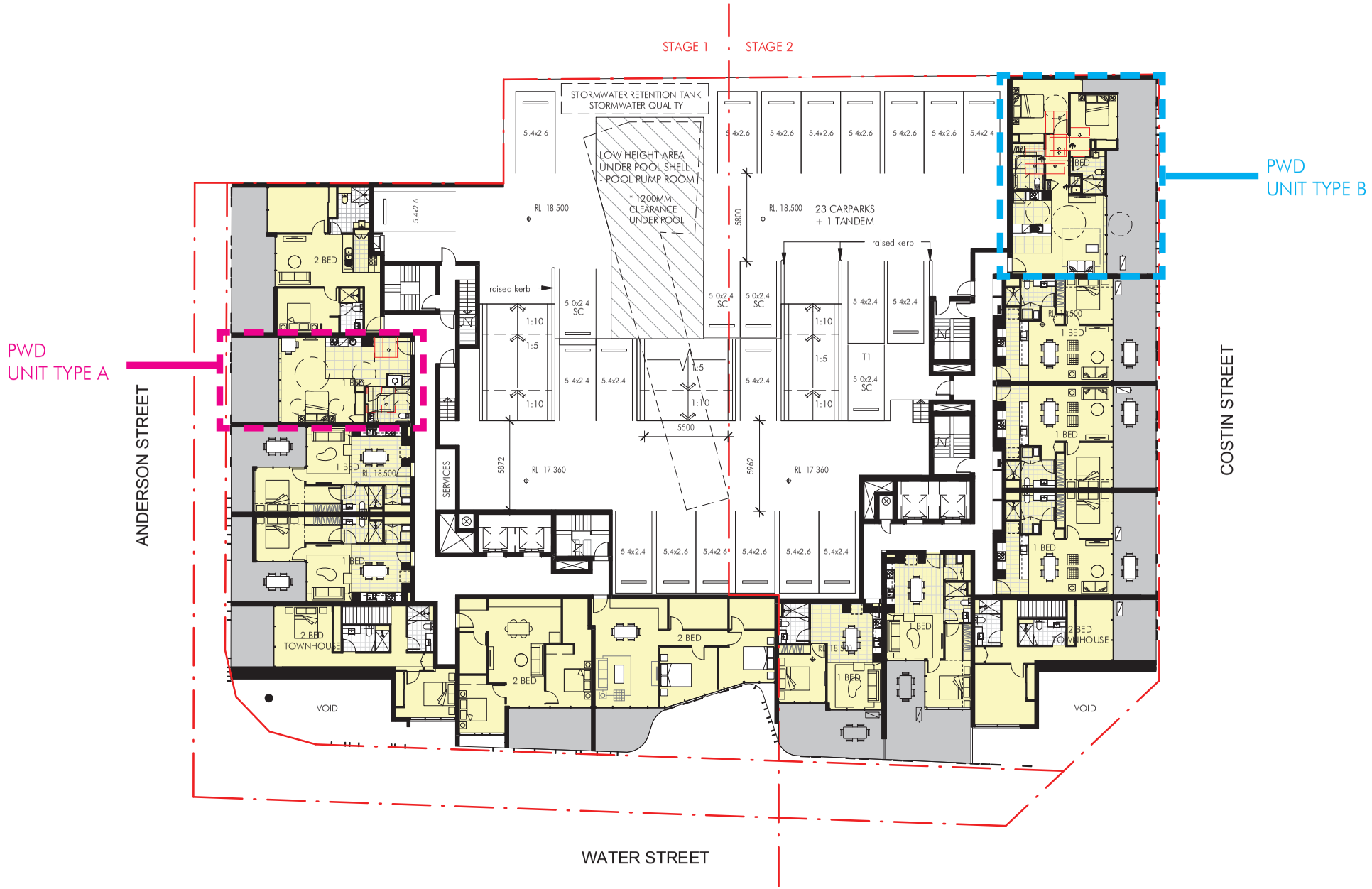
Residential Development
15 Anderson Street, Fortitude Valley

Title	LEVEL 2
Scale	1:250
Date	24/03/14
Number	3400_DA19

Architectural Consultant

nettletontribe

netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2444 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au



Client

Propertylink
thinking property

Project

Residential Development
15 Anderson Street, Fortitude Valley

Title	LEVEL 3
Scale	1:250
Date	24/03/14
Number	3400_DA20

Architectural Consultant

nettletontribe

netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2444 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

Ⓐ TYPICAL COURTYARD SECTION

Client: Propertylink thinking property

Project: Residential Development
15 Anderson Street, Fortitude Valley

Title	LEVEL 04 PLAN - PODIUM
Scale	1:250
Date	24/03/14
Number	3400_DA21

Architectural Consultant

nettletontribe
netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3259 2444 f 07 3259 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

Client

Propertylink
thinking property

Project

Residential Development
15 Anderson Street, Fortitude Valley

Title	TYPICAL LEVEL
Scale	1:250
Date	24/03/14
Number	3400_DA22

Architectural Consultant

nettletontribe

nettleton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3259 2444 f 07 3259 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

STAGE 1

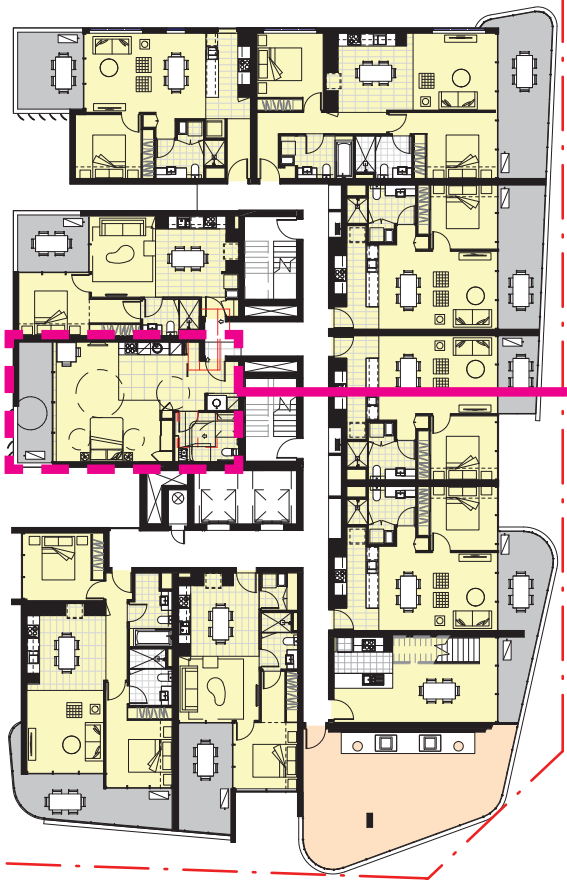
STAGE 2

TOWER 1
LEVEL 10

TOWER 2
LEVEL 11

PWD
UNIT TYPE A
LEVEL 4 - 10

PWD
UNIT TYPE B
LEVEL 4 - 15



Client

Propertylink
thinking property

Project

Residential Development
15 Anderson Street, Fortitude Valley

Title	COMMUNAL LEVEL
Scale	1:250
Date	24/03/14
Number	3400_DA23

Architectural Consultant

nettletontribe

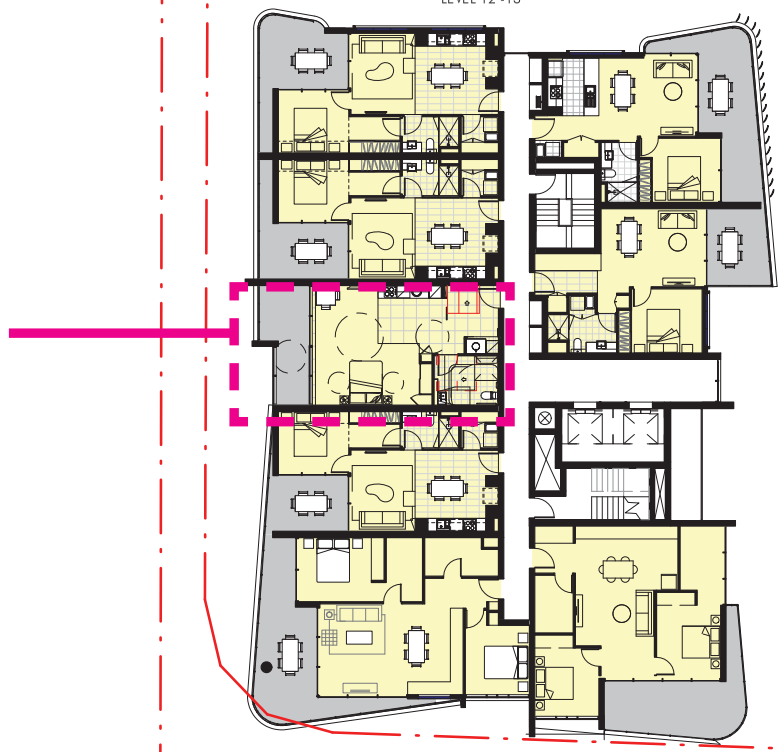
netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2644 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

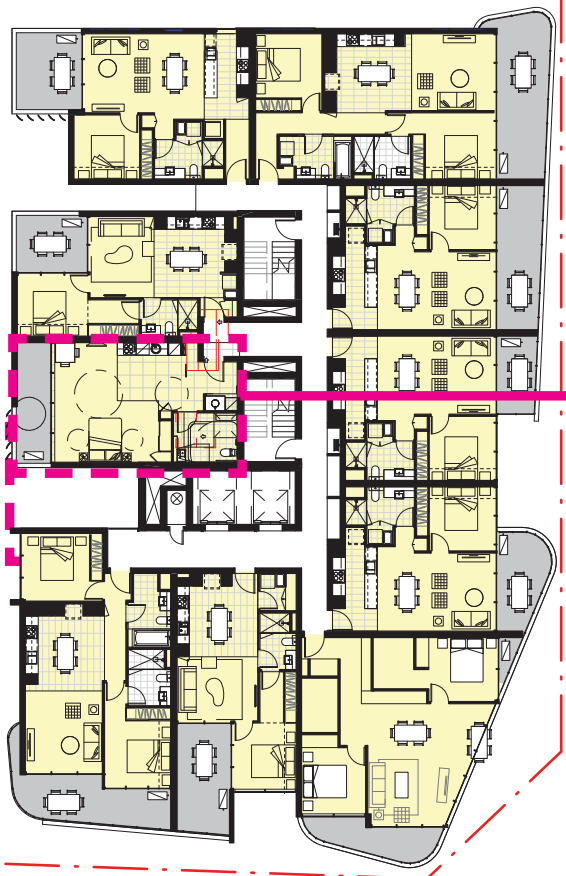
STAGE 1

STAGE 2

TOWER 1
LEVEL 12 -13

TOWER 2
LEVEL 13 - 15





PWD
UNIT TYPE A
LEVEL 4 - 10

PWD
UNIT TYPE B
LEVEL 4 - 15

Client

Propertylink
thinking property

Project

Residential Development
15 Anderson Street, Fortitude Valley

Title	TYPICAL UPPER LEVEL
Scale	1:250
Date	24/03/14
Number	3400_DA24

Architectural Consultant

nettletontribe

netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2644 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

Client

Propertylink
thinking property

Project

Residential Development
15 Anderson Street, Fortitude Valley

Title	ELEVATIONS - ANDERSON STREET
Scale	1:300
Date	24/03/14
Number	3400_DA28

Architectural Consultant

nettletontribe

nettleton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3259 2444 f 07 3259 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

Client

Propertylink
thinking property

Project

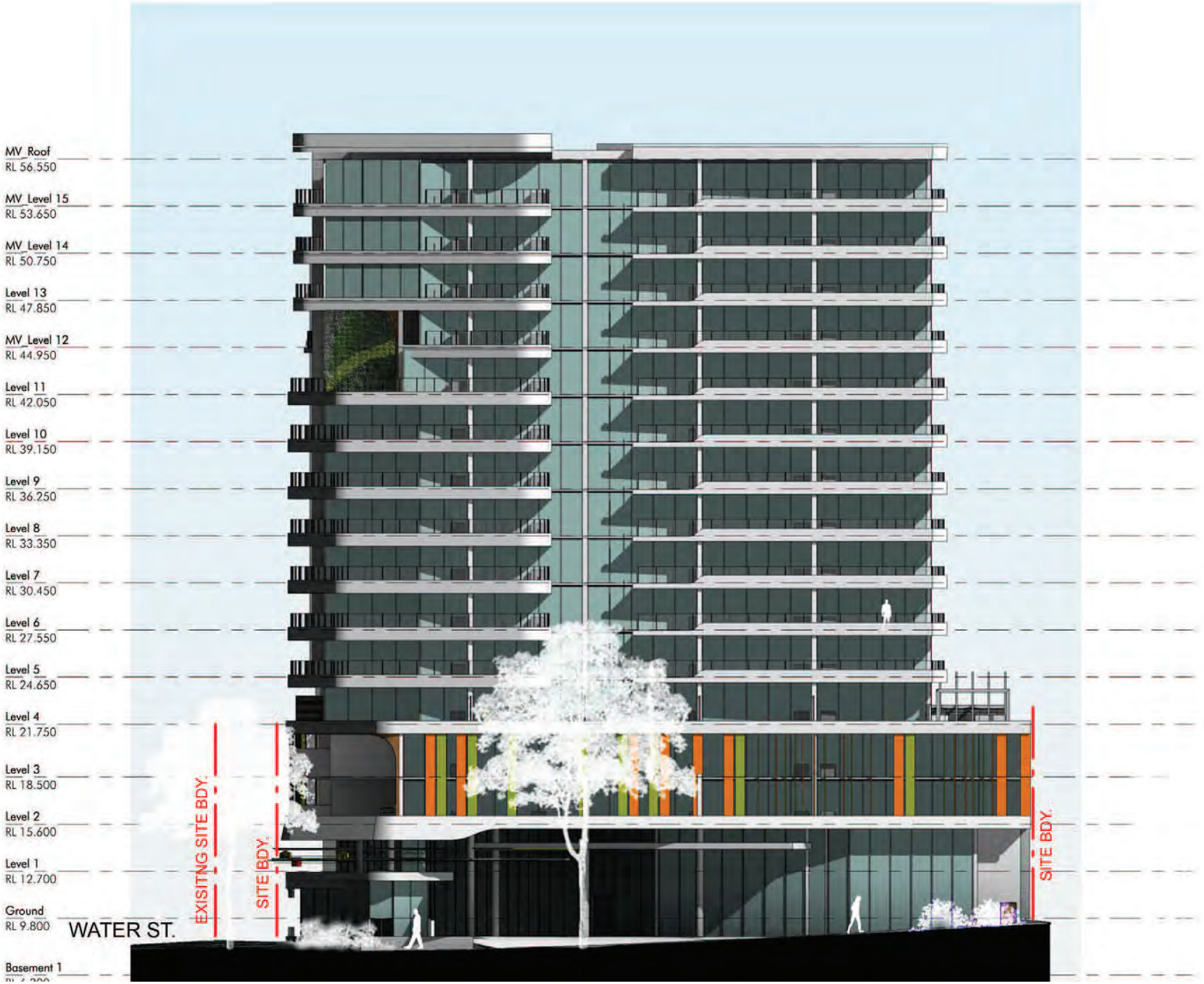
Residential Development
15 Anderson Street, Fortitude Valley

Title	ELEVATIONS - WATER STREET
Scale	1:300
Date	24/03/14
Number	3400_DA29

Architectural Consultant

nettletontribe

netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3239 2644 f 07 3239 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au



Client

Propertylink
thinking property

Project

Residential Development
15 Anderson Street, Fortitude Valley

Title	ELEVATIONS - COSTIN STREET
Scale	1:300
Date	24/03/14
Number	3400_DA30

Architectural Consultant

nettletontribe

netteton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3259 2644 f 07 3259 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

Client
Propertylink
thinking property

Project
Residential Development
15 Anderson Street, Fortitude Valley

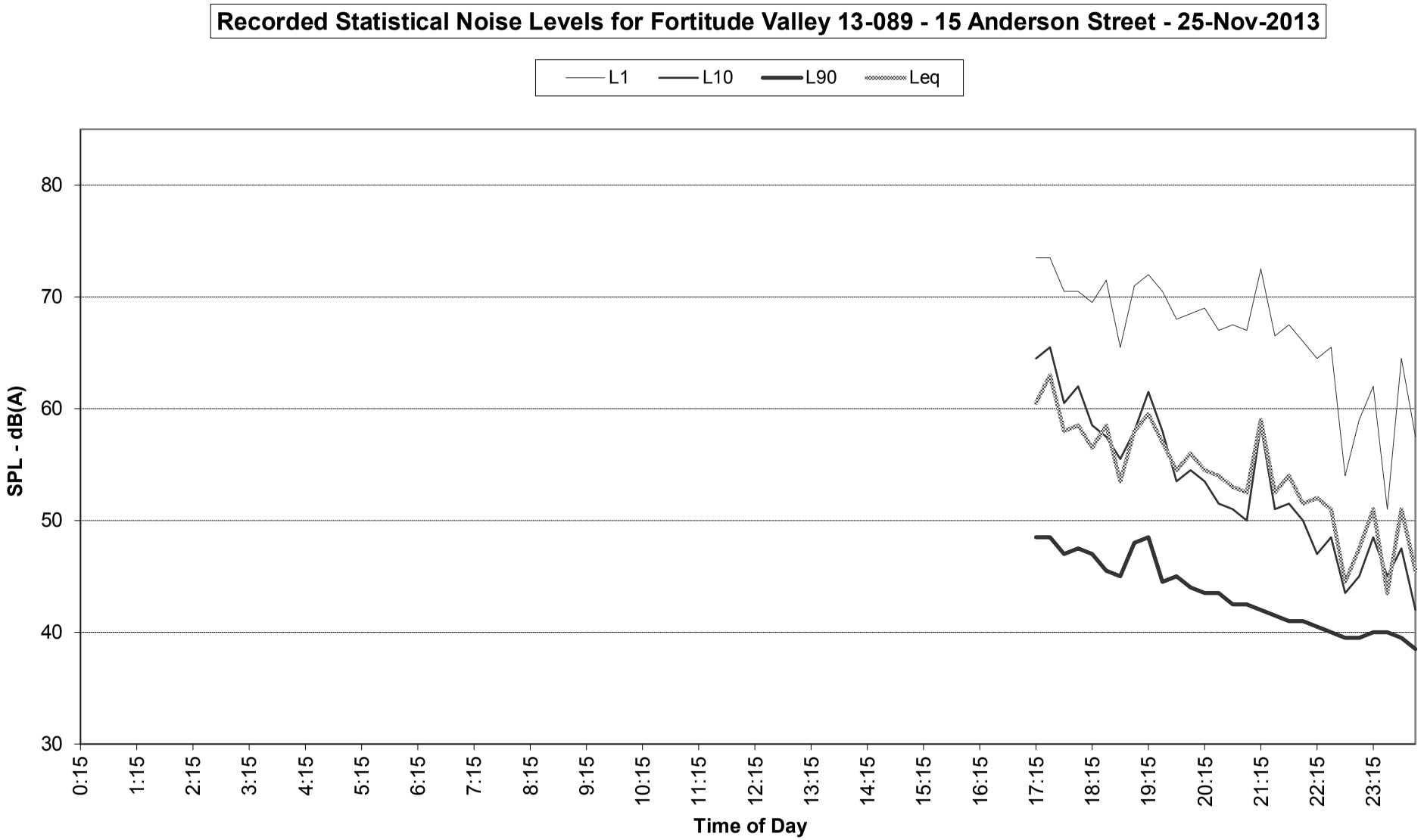
Title	ELEVATIONS - NORTH-WEST
Scale	1:300
Date	24/03/14
Number	3400_DA31

Architectural Consultant
nettletontribe

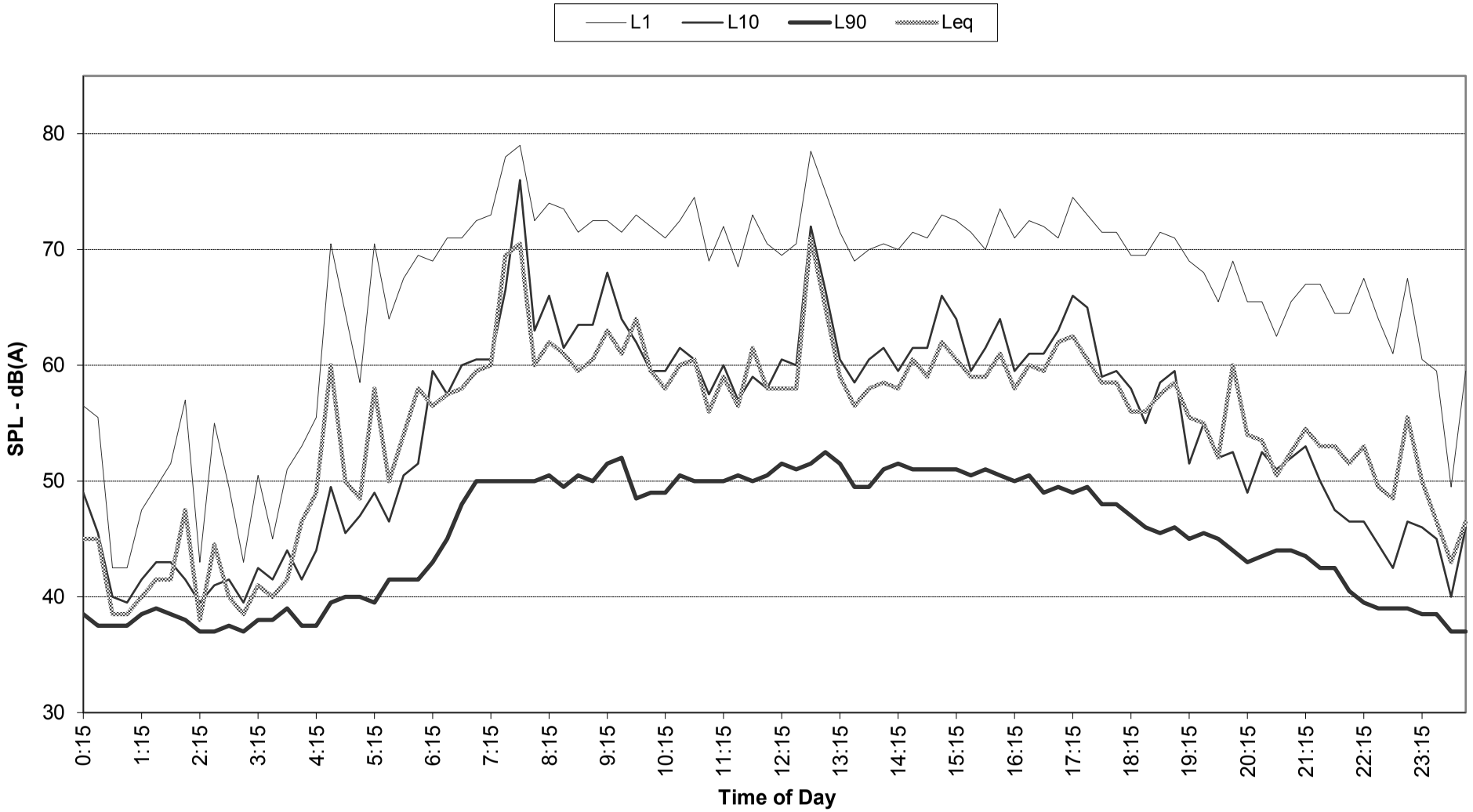
nettleton tribe partnership pty ltd ABN 58 161 683 122
Level 5, 344 queen street brisbane qld 4000
t 07 3259 2444 f 07 3259 2455
e brisbane@nettletontribe.com.au w nettletontribe.com.au

Attachment 2

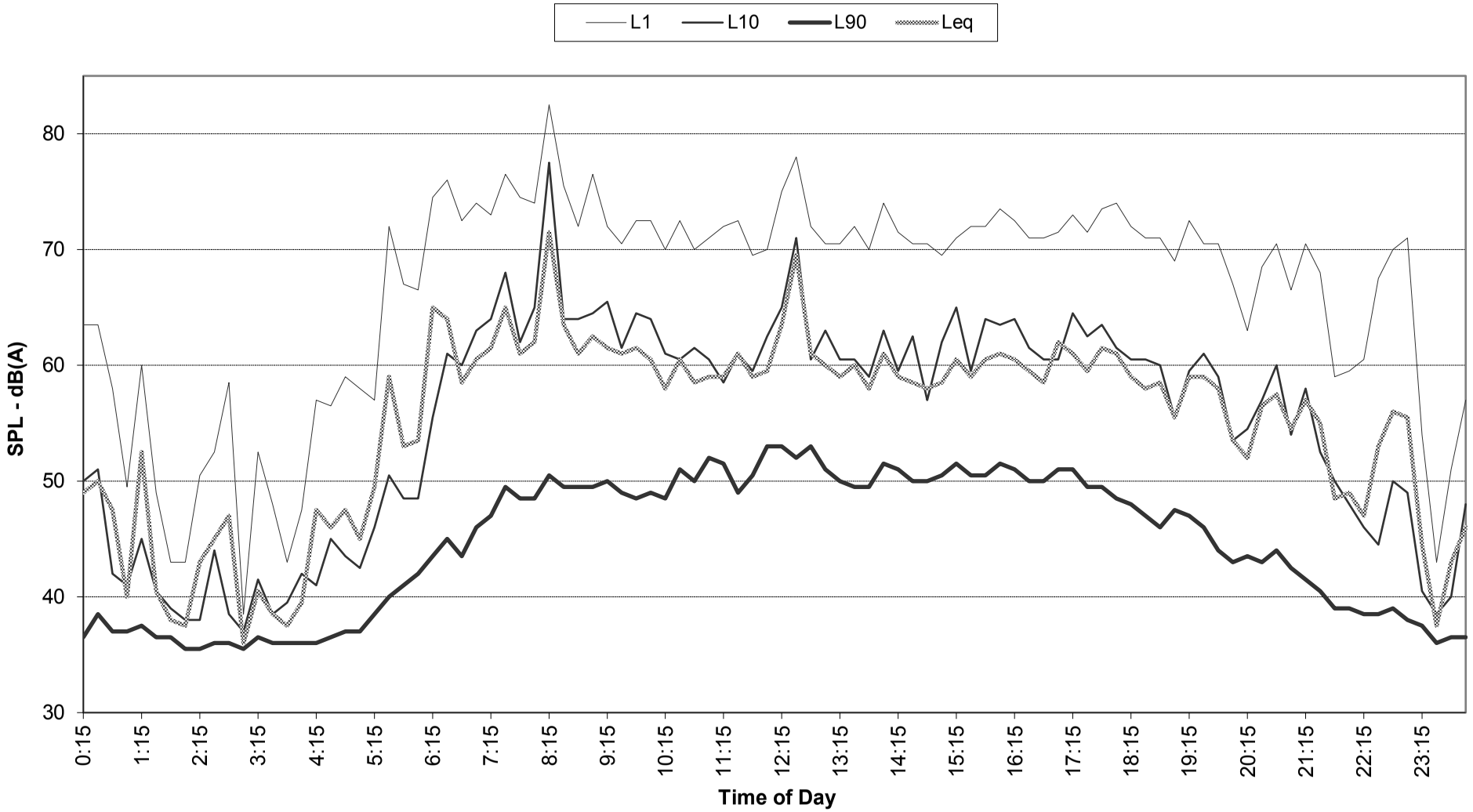
Noise Datalogger Plots


Recorded Statistical Noise Levels for Fortitude Valley 13-089 - 15 Anderson Street - 25-Nov-2013
L1
L10
L90
Leq
SPL - dB(A)
80
70
60
50
40
30
0:15
1:15
2:15
3:15
4:15
5:15
6:15
7:15
8:15
9:15
10:15
11:15
12:15
13:15
14:15
15:15
16:15
17:15
18:15
19:15
20:15
21:15
22:15
23:15
Time of Day

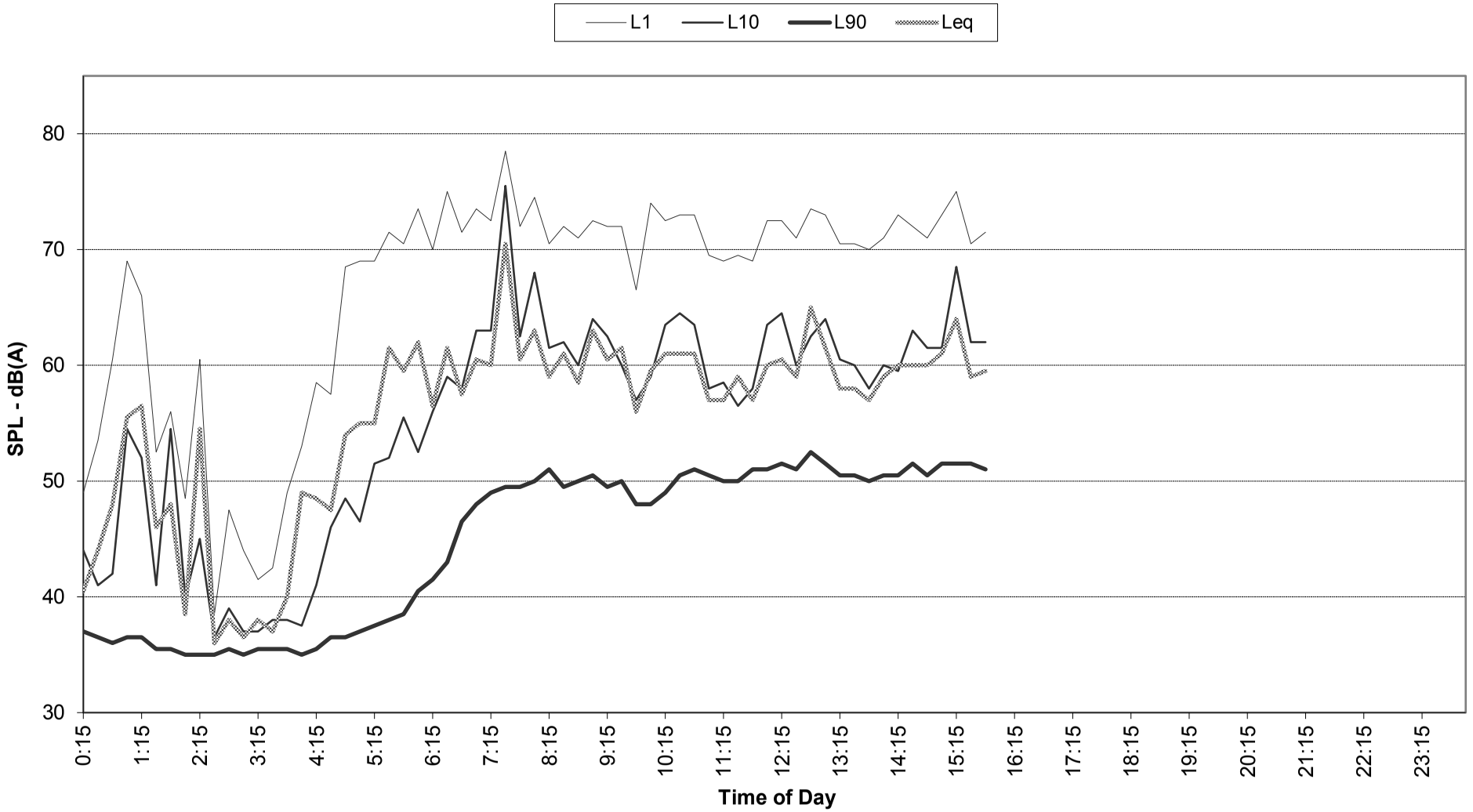
Recorded Statistical Noise Levels for Fortitude Valley 13-089 - 15 Anderson Street - 26-Nov-2013



Recorded Statistical Noise Levels for Fortitude Valley 13-089 - 15 Anderson Street - 27-Nov-2013



Recorded Statistical Noise Levels for Fortitude Valley 13-089 - 15 Anderson Street - 28-Nov-2013



Attachment 3

SoundPLAN 7.3 Modelling Validation


Signs and symbols
Road axis
Emission line
Surface
Buildings
Datalogger
Fortitude Valley 13-089
Proposed Residential
Development
15 Anderson Street
Existing Model Layout
Validation
March 2014
Scale 1:2500
0 12.5 25 50 75
Diddles Close
Symes Street
Baxter Street
Amelia Street
Julia Street
Alfred Street
Warry Street

Fortitude Valley
Run Info
Validation Model

Project description

Project title:	Fortitude Valley
Project No.:	13-089
Engineer:	Travis Carberry
Customer:	Property Link

Description:

Run description

Calculation:	Single Point Sound
Title:	Validation Model
Group:	
Run file:	RunFile.runx
Result number:	5
Local calculation (ThreadCount=8)	
Calculation start:	19/03/2014 3:34:26 PM
Calculation end:	19/03/2014 3:34:36 PM
Calculation time:	00:00:532 [m:s:ms]
No. of points:	1
No. of calculated points:	1
Kernel version:	10/03/2014 (64 bit)

Run parameters

Reflection order	1	
Maximal reflection distance to receiver		200 m
Maximal reflection distance to source		50 m
Search radius	5000 m	
Weighting:	dB(A)	
Tolerance:	0.010 dB	

Standards:

Roads:	Calculation of Road Traffic Noise (UK)

Driving on left side

Emission according to: CoRTN

Disable low flow correction: No

Method for L10 to Leq conversion: TRL formula

Calculation with side screening: No

Attenuation

Foliage:	No attenuation
Built up area:	No attenuation

Industrial site:	No attenuation
Assessment:	Day Night Level

Reflection of "own" facade is suppressed

Geometry data

Validation Model.sit	19/03/2014 3:34:18 PM	
- contains:		
Anderson Street Existing.geo		19/03/2014 3:24:16 PM
Brunswick Street Existing.geo		11/03/2014 3:51:06 PM
Costin Street Existing.geo	19/03/2014 3:24:16 PM	
DXF_0.geo	19/03/2014 3:24:16 PM	
Geo-File1.geo	9/01/2014 2:18:18 PM	
Gregory Terrace Existing.geo		11/03/2014 3:51:06 PM
Misterton Street Existing.geo		19/03/2014 3:24:16 PM
Spot Heights.geo	9/01/2014 2:18:24 PM	
St Pauls Terrace Existing.geo		11/03/2014 3:51:06 PM
Water Street Existing.geo	19/03/2014 3:24:16 PM	
Datalogger.geo	19/03/2014 3:34:18 PM	
Existing Site Buildings.geo	19/03/2014 3:24:16 PM	
Surrounding Buildings.geo	19/03/2014 3:29:10 PM	
RDGM0001.dgm	9/01/2014 2:18:56 PM	

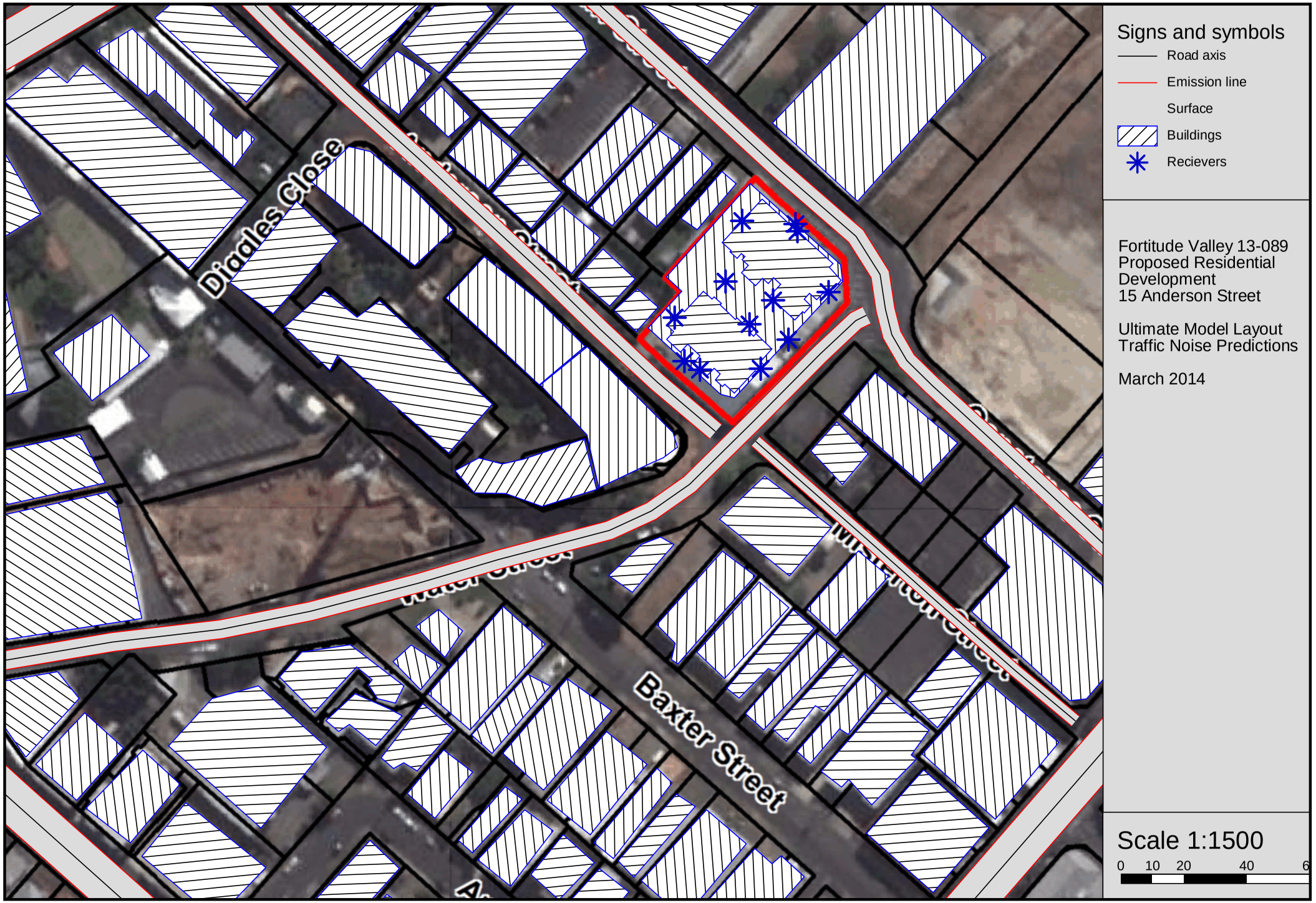
Fortitude Valley
Assessed receiver levels
Validation Model

2

Name	L10(18h) dB(A)	
Datalogger	59.0	

Attachment 4

SoundPLAN 7.3 Modelling
Ultimate Traffic Noise Predictions


Diggles Close
Baxter Street
Signs and symbols
Road axis
Emission line
Surface
Buildings
Recievers
Fortitude Valley 13-089
Proposed Residential
Development
15 Anderson Street
Ultimate Model Layout
Traffic Noise Predictions
March 2014
Scale 1:1500
0 10 20 40

Fortitude Valley
Run Info
Ultimate Traffic Noise Predictions

Project description

Project title:	Fortitude Valley
Project No.:	13-089
Engineer:	Travis Carberry
Customer:	Property Link

Description:

Run description

Calculation:	Single Point Sound
Title:	Ultimate Traffic Noise Predictions
Group:	
Run file:	RunFile.runx
Result number:	10
Local calculation (ThreadCount=8)	
Calculation start:	19/03/2014 4:44:16 PM
Calculation end:	19/03/2014 4:44:36 PM
Calculation time:	00:10:352 [m:s:ms]
No. of points:	12
No. of calculated points:	12
Kernel version:	10/03/2014 (64 bit)

Run parameters

Reflection order	1	
Maximal reflection distance to receiver		200 m
Maximal reflection distance to source		50 m
Search radius	5000 m	
Weighting:	dB(A)	
Tolerance:	0.010 dB	

Standards:

Roads:	Calculation of Road Traffic Noise (UK)

Driving on left side
Emission according to: CoRTN
Disable low flow correction: No
Method for L10 to Leq conversion: TRL formula
Calculation with side screening: No
Attenuation

Foliage:	No attenuation
Built up area:	No attenuation

Industrial site:	No attenuation
Assessment:	Day Night Level

Reflection of "own" facade is suppressed

Geometry data

Ultimate Traffic Noise Predictions.sit		19/03/2014 4:44:12 PM
- contains:		
DXF_0.geo	19/03/2014 3:24:16 PM	
Development.geo	19/03/2014 4:43:52 PM	
Spot Heights.geo	9/01/2014 2:18:24 PM	
Surrounding Buildings.geo	19/03/2014 3:29:10 PM	
Anderson Street Ultimate.geo		19/03/2014 3:59:10 PM
Brunswick Street Ultimate.geo		19/03/2014 3:59:10 PM
Costin Street Ultimate.geo	19/03/2014 3:59:10 PM	
Gregory Terrace Ultimate.geo		19/03/2014 3:59:10 PM
Misterton Street Ulltimate.geo		19/03/2014 3:59:10 PM
St Pauls Terrace Ultimate.geo		19/03/2014 3:59:10 PM
Water Street Ultimate.geo	19/03/2014 3:59:10 PM	
RDGM0001.dgm	9/01/2014 2:18:56 PM	

Fortitude Valley
Assessed receiver levels
Ultimate Traffic Noise Predictions

2

Name	Floor	Dir	L10(18h) dB(A)	
Outdoor Recreation Area	GF		48.1	
Podium East Facade	GF	NE	67.1	
	F 1		66.8	
	F 2		66.1	
	F 3		65.4	
Podium South Facade	GF	SE	60.4	
	F 1		61.1	
	F 2		61.6	
	F 3		61.9	
Podium West Facade	GF	SW	62.4	
	F 1		62.7	
	F 2		62.5	
	F 3		62.4	
Tower 1 East Facade	GF	NE	53.8	
	F 1		56.4	
	F 2		57.7	
	F 3		58.4	
	F 4		58.7	
	F 5		58.9	
	F 6		59.0	
	F 7		59.1	
	F 8		59.1	
	F 9		59.3	
Tower 1 North Facade	GF	NW	53.0	
	F 1		56.3	
	F 2		57.9	
	F 3		58.8	
	F 4		59.2	
	F 5		59.3	
	F 6		59.4	
	F 7		59.4	
	F 8		59.4	
	F 9		59.6	
Tower 1 South Facade	GF	SE	60.9	
	F 1		61.3	
	F 2		61.4	
	F 3		61.6	
	F 4		61.6	
	F 5		61.7	
	F 6		61.6	
	F 7		61.6	
	F 8		61.6	

Fortitude Valley
Assessed receiver levels
Ultimate Traffic Noise Predictions

2

Name	Floor	Dir	L10(18h) dB(A)	
	F 9		61.7	
Tower 1 West Facade	GF	SW	58.4	
	F 1		61.4	
	F 2		61.5	
	F 3		61.4	
	F 4		61.3	
	F 5		61.2	
	F 6		61.0	
	F 7		60.9	
	F 8		60.8	
	F 9		60.8	
Tower 2 East Facade	GF	NE	60.3	
	F 1		63.5	
	F 2		63.3	
	F 3		63.0	
	F 4		62.6	
	F 5		62.3	
	F 6		62.0	
	F 7		61.7	
	F 8		61.5	
	F 9		61.4	
	F 10		61.2	
	F 11		61.2	
Tower 2 North Facade	GF	NW	55.2	
	F 1		57.8	
	F 2		58.6	
	F 3		58.9	
	F 4		59.1	
	F 5		59.3	
	F 6		59.4	
	F 7		59.5	
	F 8		59.5	
	F 9		59.6	
	F 10		59.7	
	F 11		59.8	
Tower 2 South Facade	GF	SE	61.5	
	F 1		62.6	
	F 2		62.5	
	F 3		62.3	
	F 4		62.1	
	F 5		62.0	
	F 6		61.9	

Fortitude Valley
Assessed receiver levels
Ultimate Traffic Noise Predictions

Name	Floor	Dir	L10(18h) dB(A)	
	F 7		61.8	
	F 8		61.7	
	F 9		61.6	
	F 10		61.6	
	F 11		61.6	
Tower 2 West Facade	GF	SW	48.3	
	F 1		50.3	
	F 2		51.7	
	F 3		52.6	
	F 4		53.3	
	F 5		53.9	
	F 6		54.6	
	F 7		55.1	
	F 8		55.6	
	F 9		56.1	
	F 10		56.7	
	F 11		57.6	

Attachment 5

Required Rw Values for Development
Traffic Noise

MWA ENVIRONMENTAL - BUILDING COMPONENTRY RW VALUES

JOB NAME: Fortitude Valley
JOB #: 13-089
DATE: 24/03/2014

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Podium	Ground Floor	Unit 1	Living	South	Wall	**21**
					Glazing	**22**
				West	Wall	**20**
					Glazing	**22**
			Bed 1	West	Wall	**22**
					Glazing	**27**
		Unit 2	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**28**
				South	Wall	**23**
					Glazing	**27**
		Unit 3	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**22**
					Glazing	**27**
				North	Wall	**23**
					Glazing	**26**
	Level 1	Unit 1	Living	South	Wall	**22**
					Glazing	**22**
				West	Wall	**20**
					Glazing	**23**
			Bed 1	West	Wall	**22**
					Glazing	**27**
			Bed 2	South	Wall	**21**
					Glazing	**26**
		Unit 2	Living	West	Wall	**20**
					Glazing	**22**
			Bed 1	West	Wall	**28**
				South	Wall	**23**
					Glazing	**28**
		Unit 3	Living	West	Wall	**20**
					Glazing	**22**
			Bed 1	West	Wall	**22**
					Glazing	**27**
				North	Wall	**23**
					Glazing	**28**
	Level 2	Unit 1	Living	South	Wall	**26**
				West	Wall	**20**
					Glazing	**21**
		Unit 2	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**28**
				South	Wall	**23**
					Glazing	**27**
		Unit 3	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**22**
					Glazing	**27**
				North	Wall	**23**
					Glazing	**27**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Podium	Level 2	Unit 4	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**28**
				South	Wall	**23**
					Glazing	**27**
		Unit 5	Living	West	Wall	**20**
					Glazing	**23**
			Bed 1	West	Wall	**21**
					Glazing	**26**
			Bed 2	West	Wall	**21**
					Glazing	**26**
				North	Wall	**28**
		Unit 6	Living	East	Wall	**23**
					Glazing	**29**
			Bed 1	East	Wall	**26**
					Glazing	**31**
			Bed 2	East	Wall	**26**
					Glazing	**31**
				North	Wall	**31**
		Unit 7	Living	East	Wall	**21**
					Glazing	**27**
			Bed 1	East	Wall	**26**
					Glazing	**31**
		Unit 8	Living	East	Wall	**21**
					Glazing	**27**
			Bed 1	East	Wall	**26**
					Glazing	**31**
		Unit 9	Living	East	Wall	**21**
					Glazing	**27**
			Bed 1	East	Wall	**26**
					Glazing	**31**
		Unit 10	Living	South	Wall	**26**
				East	Wall	**20**
					Glazing	**25**
		Unit 11	Living	South	Wall	**20**
					Glazing	**20**
			Bed 1	South	Wall	**21**
					Glazing	**26**
				West	Wall	**21**
					Glazing	**27**
		Unit 12	Living	South	Wall	**20**
					Glazing	**23**
			Bed 1	South	Wall	**21**
					Glazing	**26**
		Unit 13	Living	South	Wall	**20**
					Glazing	**22**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	South	Wall	**22**
					Glazing	**27**
		Unit 14	Living	South	Wall	**20**
					Glazing	**20**
			Bed 1	South	Wall	**21**
					Glazing	**26**
			Bed 2	South	Wall	**21**
					Glazing	**26**
				East	Wall	**24**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Podium	Level 3	Unit 1	Bed 1	South	Wall	**27**
				West	Wall	**21**
					Glazing	**27**
			Bed 2	West	Wall	**27**
				South	Wall	**25**
					Glazing	**26**
		Unit 2	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**28**
				South	Wall	**23**
					Glazing	**27**
		Unit 3	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**22**
					Glazing	**27**
				North	Wall	**23**
					Glazing	**27**
		Unit 4	Living	West	Wall	**20**
					Glazing	**21**
			Bed 1	West	Wall	**28**
				South	Wall	**23**
					Glazing	**27**
		Unit 5	Living	West	Wall	**20**
					Glazing	**23**
			Bed 1	West	Wall	**21**
					Glazing	**26**
			Bed 2	West	Wall	**21**
					Glazing	**26**
				North	Wall	**28**
		Unit 6	Living	East	Wall	**22**
					Glazing	**28**
			Bed 1	East	Wall	**25**
					Glazing	**30**
			Bed 2	East	Wall	**25**
					Glazing	**31**
				North	Wall	**31**
		Unit 7	Living	East	Wall	**21**
					Glazing	**26**
			Bed 1	East	Wall	**25**
					Glazing	**31**
		Unit 8	Living	East	Wall	**21**
					Glazing	**26**
			Bed 1	East	Wall	**25**
					Glazing	**31**
		Unit 9	Living	East	Wall	**21**
					Glazing	**26**
			Bed 1	East	Wall	**25**
					Glazing	**31**
		Unit 10	Bed 1	South	Wall	**27**
				East	Wall	**25**
					Glazing	**31**
			Bed 2	East	Wall	**26**
				South	Wall	**24**
					Glazing	**25**
		Unit 11	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**21**
					Glazing	**27**
				West	Wall	**22**
					Glazing	**27**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Podium	Level 3	Unit 12	Living	South	Wall	**20**
					Glazing	**23**
			Bed 1	South	Wall	**21**
					Glazing	**26**
		Unit 13	Living	South	Wall	**20**
					Glazing	**22**
			Bed 1	South	Wall	**23**
					Glazing	**27**
			Bed 2	South	Wall	**22**
					Glazing	**27**
		Unit 14	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**21**
					Glazing	**26**
			Bed 2	South	Wall	**21**
					Glazing	**27**
				East	Wall	**25**
Tower 1	Level 4	Unit 1	Living	West	Wall	**20**
					Glazing	**23**
				South	Wall	**20**
					Glazing	**22**
			Bed 1	West	Wall	**21**
					Glazing	**26**
			Bed 2	South	Wall	**22**
					Glazing	**27**
		Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**21**
					Glazing	**26**
				North	Wall	**22**
					Glazing	**26**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 5	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**21**
			Bed 1	West	Wall	**27**
				North	Wall	**22**
					Glazing	**26**
		Unit 7	Living	East	Wall	**20**
					Glazing	**20**
			Bed 1	East	Wall	**20**
					Glazing	**24**
		Unit 8	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**20**
					Glazing	**24**
				East	Wall	**24**
					Glazing	**24**
			Bed 2	South	Wall	**21**
					Glazing	**27**
				East	Wall	**24**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Tower 1	Levels 5-9	Unit 1	Living	West	Wall	**20**
					Glazing	**23**
				South	Wall	**20**
					Glazing	**22**
			Bed 1	West	Wall	**21**
					Glazing	**26**
			Bed 2	South	Wall	**22**
					Glazing	**27**
		Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**21**
					Glazing	**26**
				North	Wall	**22**
					Glazing	**26**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 5	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**21**
			Bed 1	West	Wall	**27**
				North	Wall	**22**
					Glazing	**26**
		Level 6	Living	East	Wall	**20**
					Glazing	**20**
				North	Wall	**20**
					Glazing	**21**
			Bed 1	East	Wall	**20**
					Glazing	**24**
		Unit 7	Living	East	Wall	**20**
					Glazing	**20**
			Bed 1	East	Wall	**20**
					Glazing	**24**
		Unit 8	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**20**
					Glazing	**24**
				East	Wall	**24**
					Glazing	**24**
			Bed 2	South	Wall	**21**
					Glazing	**27**
				East	Wall	**25**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Tower 1	Level 10	Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**21**
					Glazing	**26**
				North	Wall	**22**
					Glazing	**26**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 5	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**21**
			Bed 1	West	Wall	**27**
				North	Wall	**22**
					Glazing	**26**
		Level 6	Living	East	Wall	**20**
					Glazing	**20**
				North	Wall	**20**
					Glazing	**21**
			Bed 1	East	Wall	**20**
					Glazing	**24**
		Unit 7	Living	East	Wall	**20**
					Glazing	**20**
			Bed 1	East	Wall	**20**
					Glazing	**24**
		Unit 8	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**20**
					Glazing	**24**
				East	Wall	**24**
					Glazing	**24**
			Bed 2	South	Wall	**21**
					Glazing	**27**
				East	Wall	**25**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Tower 1	Levels 11-13	Unit 1	Living	West	Wall	**20**
					Glazing	**23**
				South	Wall	**20**
					Glazing	**22**
			Bed 1	West	Wall	**21**
					Glazing	**26**
			Bed 2	South	Wall	**22**
					Glazing	**27**
		Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**21**
					Glazing	**26**
				North	Wall	**22**
					Glazing	**26**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**27**
				South	Wall	**22**
					Glazing	**26**
		Unit 5	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**21**
			Bed 1	West	Wall	**27**
				North	Wall	**22**
					Glazing	**26**
		Level 6	Living	East	Wall	**20**
					Glazing	**20**
				North	Wall	**20**
					Glazing	**21**
			Bed 1	East	Wall	**20**
					Glazing	**24**
		Unit 7	Living	East	Wall	**20**
					Glazing	**20**
			Bed 1	East	Wall	**20**
					Glazing	**24**
		Unit 8	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**20**
					Glazing	**24**
				East	Wall	**24**
					Glazing	**24**
			Bed 2	South	Wall	**21**
					Glazing	**27**
				East	Wall	**25**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Tower 2	Level 4	Unit 1	Living	South	Wall	**20**
					Glazing	**23**
				West	Wall	**22**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	West	Wall	**20**
					Glazing	**23**
				East	Wall	**25**
		Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**20**
					Glazing	**22**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				North	Wall	**20**
					Glazing	**22**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**24**
		Level 5	Living	East	Wall	**20**
					Glazing	**24**
				North	Wall	**22**
					Glazing	**20**
			Bed 1	East	Wall	**23**
					Glazing	**28**
			Bed 1	North	Wall	**20**
					Glazing	**25**
		Unit 6	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 7	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 8	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 9	Living	South	Wall	**20**
					Glazing	**23**
				East	Wall	**20**
					Glazing	**26**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	East	Wall	**23**
					Glazing	**28**
				South	Wall	**28**
		Unit 10	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**22**
					Glazing	**27**
				West	Wall	**23**
					Glazing	**27**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Tower 2	Levels 5-10	Unit 1	Living	South	Wall	**20**
					Glazing	**23**
				West	Wall	**22**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	West	Wall	**20**
					Glazing	**23**
				East	Wall	**25**
		Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**20**
					Glazing	**22**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				North	Wall	**20**
					Glazing	**22**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**24**
		Level 5	Living	East	Wall	**20**
					Glazing	**24**
				North	Wall	**22**
					Glazing	**20**
			Bed 1	East	Wall	**23**
					Glazing	**28**
			Bed 1	North	Wall	**20**
					Glazing	**25**
		Unit 6	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 7	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 8	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 9	Living	South	Wall	**20**
					Glazing	**23**
				East	Wall	**20**
					Glazing	**26**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	East	Wall	**23**
					Glazing	**28**
				South	Wall	**28**
		Unit 10	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**22**
					Glazing	**27**
				West	Wall	**23**
					Glazing	**27**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Tower 2	Level 11	Unit 1	Living	South	Wall	**20**
					Glazing	**23**
				West	Wall	**22**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	West	Wall	**20**
					Glazing	**23**
				East	Wall	**25**
		Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**20**
					Glazing	**22**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				North	Wall	**20**
					Glazing	**22**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**24**
		Level 5	Living	East	Wall	**20**
					Glazing	**24**
				North	Wall	**22**
					Glazing	**20**
			Bed 1	East	Wall	**23**
					Glazing	**28**
			Bed 1	North	Wall	**20**
					Glazing	**25**
		Unit 6	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 7	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 8	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 10	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**22**
					Glazing	**27**
				West	Wall	**23**
					Glazing	**27**

BUILDING	FLOOR	UNIT	ROOM	FAÇADE	COMPONENT	Rw
Tower 2	Levels 12-15	Unit 1	Living	South	Wall	**20**
					Glazing	**23**
				West	Wall	**22**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	West	Wall	**20**
					Glazing	**23**
				East	Wall	**25**
		Unit 2	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**20**
					Glazing	**22**
		Unit 3	Living	West	Wall	**20**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				North	Wall	**20**
					Glazing	**22**
		Unit 4	Living	West	Wall	**20**
					Glazing	**20**
				North	Wall	**21**
					Glazing	**20**
			Bed 1	West	Wall	**23**
				South	Wall	**24**
		Level 5	Living	East	Wall	**20**
					Glazing	**24**
				North	Wall	**22**
					Glazing	**20**
			Bed 1	East	Wall	**23**
					Glazing	**28**
			Bed 1	North	Wall	**20**
					Glazing	**25**
		Unit 6	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 7	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 8	Living	East	Wall	**20**
					Glazing	**24**
			Bed 1	East	Wall	**23**
					Glazing	**29**
		Unit 9	Living	South	Wall	**20**
					Glazing	**22**
				East	Wall	**20**
					Glazing	**26**
			Bed 1	South	Wall	**22**
					Glazing	**27**
			Bed 2	East	Wall	**23**
					Glazing	**28**
		Unit 10	Living	South	Wall	**20**
					Glazing	**21**
			Bed 1	South	Wall	**22**
					Glazing	**27**
				West	Wall	**23**
					Glazing	**27**