



NOISE IMPACT ASSESSMENT

PROPOSED MIXED USE DEVELOPMENT

527 GREGORY TERRACE

FORTITUDE VALLEY

PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2016/759
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Prepared for:
Kingsford Development Australia

Prepared by:
MWA Environmental

20 September 2016

DOCUMENT CONTROL SHEET

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1.0 INTRODUCTION

1.1 STUDY BRIEF

MWA Environmental have been engaged by Kingsford Development Australia to prepare a Noise Impact Assessment for a proposed mixed use development at Fortitude Valley.

The proposed development is located at 527 Gregory Terrace, Fortitude Valley. The development comprises two residential towers (Tower 1, 30 storeys and Tower 2, 25 storeys) which includes retail and commercial uses, roof top recreational areas and basement car parking.

Upon submission of the Development Application to *Economic Development Queensland*, further detail was requested in terms of development design layout and reconfiguration of the development.

This report considers the updated architectural drawings and the 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.

This report has been prepared for submission to *Economic Development Queensland* and has been prepared in accordance with the requirements of applicable Australian Standards and the requirements of Brisbane City Councils (BCC) *CityPlan 2014*, SC6.21 *Noise Impact Assessment Planning Scheme Policy*.

1.2 SITE DESCRIPTION

The subject site is located at 527 Gregory Terrace, Fortitude Valley. The site location is shown on **Figure 1**.

The subject site has a real property description of Lot 22 on RP202547.

The site is zoned EC Emerging Community under CityPlan 2014 however the property is identified as being a priority development area under the *Economic Development Act 2012*.

The surrounding land includes a mix of residential, commercial and office uses. Surrounding car parking areas are located at adjacent land uses and along Gregory Terrace. 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 120 metres to the east of the site, beyond existing development. The RNA Showgrounds are located to the north and northeast of the site.

Gregory Terrace adjoins the site to the north and Brunswick Street adjoins the site to the west. 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.

1.3 PROPOSED DEVELOPMENT

The proposed development is for two mixed use towers to be located at the site.

Tower 1 is 30 storeys and is to be located on the western portion of the site and comprising of retail uses and recreational zone at ground level and typically sixteen units per floor (Level 2 to 29). Tower 2 is 25 storeys and is to be located on the eastern portion of the site with typically 8 units per floor (Level 2 to 24) and retail at ground level.

Car parking is proposed within five basement levels with site access from Gregory Terrace. Roof top recreational area with allocated plant room are proposed for both towers.

Architectural design drawings for the project are included as **Attachment 1**.

The proposed residential units will incorporate acoustic treatments to account for potential noise impacts from surrounding land uses and transportation noise sources.

2.0 RELEVANT NOISE PROVISIONS

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;
- 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 Councils (BCC) *CityPlan 2014*, SC6.21 *Noise Impact Assessment Planning Scheme Policy*.

2.1 TRANSPORT NOISE OVERLAY CODE

Brisbane CityPlan 2014 allows for Queensland Development Code MP4.4 (“**QDC MP4.4**”) noise categories to be applied for the design and construction of residential buildings considering noise emissions from major roadways (i.e. Bowen Bridge Road, Brunswick Street and Gregory Terrace). **Figure 3** demonstrates that the noise category for the majority of the site is ‘Noise Category 2’, with a small portion of the site mapped as ‘Noise Category 3’.

As such, the requirements of QDC MP4.4 apply for the design and construction of residential buildings considering noise emissions from the mapped roadway and other major transportation routes.

The Performance Requirement and Acceptable Solutions of QDC MP4.4 are as follows:

PERFORMANCE REQUIREMENTS	ACCEPTABLE SOLUTIONS
<i>Residential buildings</i> P1 <i>Habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupants' health and amenity.</i>	A1 <i>The external envelope of habitable rooms in a residential building located in a transport noise corridor complies with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum transport noise reduction level for the relevant noise category by:</i> <i>(a) using materials specified in Schedule 2;</i> <i>OR</i> <i>(b) using materials with manufacturer's specifications that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category.</i>

As such, the Performance Requirement of QDC MP4.4 may be achieved by:

- A. Applying the Acceptable Solutions specified in A1 by adopting the default CityPlan 2014 mapping Noise Category for all building facades;
- B. Applying the Acceptable Solutions specified in A1 based upon a site-specific assessment of the appropriate Noise Category for each building façade i.e. based upon detailed noise modelling; or
- C. Undertaking detailed assessment using AS3671 to specify acoustic ratings for individual building elements to achieve the design indoor noise levels of AS2107:2000.

It is considered that EDQ approval conditions are likely to include an advice note that QDC MP4.4 is applicable to the development, EDQ does not regulate the QDC requirements and the ultimate means of achieving the QDC MP4.4 Performance Requirement is a matter to be resolved to the satisfaction of the building certifier.

The applicant may commission an appropriately qualified acoustic consultant to the detailed design stage of the project to provide specifications for the most commercially appropriate methods to achieve the Performance Requirement of QDC MP4.4.

The Transport Noise Corridor Overlay Code also includes the following requirements for outdoor recreation space:

Performance outcomes	Acceptable outcomes
PO1 Development provides outdoor space for passive recreation in a manner where transport noise has been minimised.	AO1 Development ensures that each dwelling : (a) has a balcony or outdoor recreation area shielded by the building from direct road traffic noise; or (b) with a balcony exposed to road traffic noise has a solid gap-free balustrade.

Further detail regarding road traffic noise mitigation requirements for the development is provided in **Section 4.1**.

The overall acoustic treatment requirements for the development considering the Brisbane CityPlan 2014 Transport Noise Corridor Overlay Code requirements and other Brisbane CityPlan 2014 Code requirements are summarised in **Section 5.0**.

2.2 MULTIPLE DWELLING CODE

The Brisbane CityPlan 2014 Multiple Dwelling Code provides the following PO41 relevant to acoustic treatment of residential multiple dwelling facades (to bedrooms and indoor primary living areas):

PO41 Development in a zone in the centre zones category or the Mixed use zone must: (a) be located, designed and constructed to protect bedrooms and other habitable rooms from exposure to noise arising from non-residential activities outside the building; (b) be designed and constructed to achieve a minimum reduction in sound pressure level between the exterior of the building and the bedrooms or indoor primary living areas of 30dBA. Note—A noise impact assessment report prepared in accordance with the Noise impact assessment planning scheme policy can assist in demonstrating achievement of this performance outcome. Note—Site-specific criteria will be identified in a neighbourhood plan for sites within a Special Entertainment Precinct Area or within the Transport noise corridor overlay.	AO41 Development in a zone in the centre zones category or the Mixed use zone has a minimum acoustic performance of: (a) Rw 35 for glazing (windows and doors) where total area of glazing is greater than 1.8m²; (b) Rw 32 for glazing (windows and doors) where total area of glazing is less than or equal to 1.8m².
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Effectively, PO41 requires that all facades of the building to living areas and bedrooms achieve a minimum sound transmission loss of 30 dB(A). This may be achieved in accordance with AO41 by the provision of glazing elements in accordance with Noise Category 2 of QDC MP4.4, as follows:

- (a) Rw 35 for glazing (windows and doors) where total area of glazing is greater than 1.8m²;
- (b) Rw 32 for glazing (windows and doors) where total area of glazing is less than or equal to 1.8m².

Under PO41, this requirement applies to all building facades and it is considered that the Multiple Dwelling Code requirements overrides any Noise Category 1 or Noise Category 0 requirements for traffic noise attenuation at the subject site in relation to glazing acoustic requirements.

The overall acoustic treatment requirements for the building considering the Brisbane CityPlan 2014 Multiple Dwelling Code requirements and other Brisbane CityPlan 2014 Code requirements are summarised in **Section 5.0**.

In addition to the above, for the assessment of plant and equipment noise, the following is taken from the Multiple Dwelling Code:

$L_{Aeq,adj,T}$ emitted from mechanical plant is not greater than the rating background level plus 3 dB(A) at a sensitive use not associated with the development.

3.0 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 20 to 23 October 2014. The noise datalogger was located on the north western part of the site as shown on **Figure 4**. 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 a Rion NL-22 Sound Level Meter, 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:

- 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. AS1055.1–1997¹ 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.

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

¹ 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
20 to 23 October, 2014**

PARAMETER	PERIOD	RECORDED NOISE LEVELS - dB(A)		
		MINIMUM	MAXIMUM	AVERAGE
L₁	Daytime (7am-6pm)	69.5	81.6	73.5
	Evening (6pm-10pm)	67.8	75.7	70.8
	Nighttime (10pm-7am)	62.5	83.1	69.3
L₁₀	Daytime (7am-6pm)	65.0	70.0	67.7
	Evening (6pm-10pm)	63.8	69.3	65.4
	Nighttime (10pm-7am)	56.2	71.2	63.2
L₉₀	Daytime (7am-6pm)	56.9	62.0	59.8
	Evening (6pm-10pm)	50.8	59.2	54.3
	Nighttime (10pm-7am)	41.2	62.0	48.4
L_{eq}	Daytime (7am-6pm)	62.6	71.1	65.6
	Evening (6pm-10pm)	60.5	67.1	62.7
	Nighttime (10pm-7am)	52.2	71.8	59.9

Other recorded statistical noise level parameters included:

- Recorded L₁₀ (18 hour) = 66.7 dB(A)
- Rating Background Level (RBL) Day = 59 dB(A)
- Rating Background Level (RBL) Evening = 53 dB(A)
- Rating Background Level (RBL) Night = 42 dB(A)

4.0 ASSESSMENT OF NOISE IMPACT ON DEVELOPMENT

4.1 TRAFFIC NOISE ASSESSMENT

4.1.1 Traffic Volume Data

Existing and ultimate projection traffic count data for Gregory Terrace and Brunswick Street adjacent the site was provided by Brisbane City Council on the 22nd October 2014. Gregory Terraces existing and ultimate (10 year design horizon) traffic volume of 15,000 vehicles per day (vpd) and 18,000 vpd respectively, and a commercial vehicle content of 4%. Brunswick Streets existing and ultimate (10 year design horizon) traffic volume of 42,000 vpd and 50,000 vpd respectively, and a commercial vehicle content of 5%.

The 18 hour (6am to Midnight) traffic volume is generally approximated as 94% of the daily volume. The existing and ultimate (10-year design horizon) traffic volumes for Gregory Terrace and Brunswick Street, as determined from the data provided by Brisbane City Council, are listed in **Table 2** below.

Table 2: Existing and Ultimate Traffic Volume Data

Road	VPD		VP18hr		%CV
	Existing	Ultimate	Existing	Ultimate	
Gregory Terrace	15,000	18,000	14,100	16,920	4
Brunswick Street	42,000	50,000	39,480	47,000	5

4.1.2 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 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 66.7 dB(A) as the free-field L_{10} (18 hour). The model prediction for the monitoring location was an L_{10} (18 hour) of 67.7 dB(A), thus the model is well validated and suitable for future traffic noise projections.

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

4.1.3 Predicted Future Traffic Noise Levels

The SoundPLAN 7.3 model was setup to predict the external L_{10} (18 hour) traffic noise levels under ultimate traffic flow conditions in order to determine the relevant QDC MP4.4 noise categories for each proposed residential unit façade.

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 predicted results for the ultimate planning horizon as noise contour maps with the corresponding QDC MP4.4 Noise Category are presented in **Attachment 4**.

Based upon the development-specific assessment of QDC Noise Categories, a table of the predicted ultimate L_{10} (18 hour) noise levels at each level of the proposed development building and the corresponding QDC MP4.4 Noise Category required is included in **Attachment 5** as well as QDC MP4.4 acceptable solutions for acoustic treatment requirements from Schedule 1 and Schedule 2.

The overall acoustic treatment requirements for the development considering the Transport Noise Corridor Overlay Code requirements and other Code requirements are summarised in **Section 5.0**.

4.1.4 Outdoor Traffic Noise Requirements

The Transport Noise Corridor Overlay Code also includes the following requirements for outdoor recreation space:

Performance outcomes	Acceptable outcomes
PO1 Development provides outdoor space for passive recreation in a manner where transport noise has been minimised.	AO1 Development ensures that each <u>dwelling</u> : (a) has a balcony or outdoor recreation area shielded by the building from direct road traffic noise; or (b) with a balcony exposed to road traffic noise has a solid gap-free balustrade.

Unit balconies on the western, southern and northern building facades of each tower have line-of-sight to Brunswick Street / Gregory Terrace and therefore should incorporate solid balustrades to balconies. Solid balustrades may be constructed of appropriate materials to achieve a minimum surface density of 10 kg/m^2 and be gap-free (minimum leakage of 1% total balustrade area) using materials such as glass and/or masonry.

It is considered that unit balconies on the eastern building facades of each tower are suitably shielded by the proposed development building structures from Brunswick Street / Gregory Terrace and therefore do not require solid balustrades.

The development provides a rooftop outdoor recreation area which given its layout and elevation is significantly screened from surrounding road traffic noise sources and supplements the provision of private balconies with solid balustrades as per Acceptable Outcome A01.

4.2 SURROUNDING LAND USES NOISE ASSESSMENT

Surrounding land uses include a mix of residential, commercial and office uses. The Tivoli Theatre is located approximately 120 metres to the east of the site, beyond existing development. The RNA Showgrounds are located to the north and northeast of the site

From site inspections, the noise from surrounding land uses are considered to be low noise impact and have little potential to adversely impact upon residential amenity at the proposed development. It is considered that the Tivoli Theatre and RNA Showgrounds are suitably separated from the development site such that adverse noise impacts shall not occur from these surrounding uses.

Noise impacts from the car parking areas surrounding the site were noted to be within the level of more frequent traffic noise peaks. 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 air-conditioning plant and equipment surrounding the site, associated with the adjacent residential, commercial and office uses. It is considered that relevant plant noise criteria would be readily achieved at the development with standard residential building façade construction.

The design of the development will be to provide suitable construction considering the relevant QDC MP4.4 noise categories and as per PO41 of the Multiple Dwelling Code. It is considered that the required acoustic treatment for the development as per **Section 5.0** will adequately ensure that noise from surrounding land uses (including the Tivoli Theatre and RNA Showgrounds) does not impact upon future residential amenity at the development.

5.0 OVERALL ACOUSTIC SPECIFICATIONS

Based upon the detailed assessment presented in **Section 4.0**, overall acoustic specifications for the development must take account of the minimum required noise reduction considering road traffic noise and Multiple Dwelling Code requirements. The following summarises the relevant noise reduction requirements for the development:

- Road traffic noise – relevant QDC MP4.4 Noise Categories as included as **Attachment 5**.
- Multiple Dwelling Code - minimum 30 dB(A) sound transmission loss specified in PO41 of the Multiple Dwelling Code.

It is considered that the Multiple Dwelling Code minimum 30 dB(A) sound transmission loss requirements relates to QDC MP4.4 Noise Category 2 construction standard. As such, it is recommended that all proposed development facades are constructed to a minimum QDC MP4.4 Noise Category 2 construction standard. As per **Attachment 5**, some development façades (facing Brunswick Street and Gregory Terrace) were deemed to require QDC MP4.4 Noise Category 3 construction standard.

As such the overall acoustic specifications required for the proposed development are as summarised as follows for each residential tower:

Residential Tower 1 of Site:

1. QDC MP4.4 Noise Category 3 construction standard – Western building facades, ground level to level 16
2. QDC MP4.4 Noise Category 2 construction standard – All other building facades

Residential Tower 2 of Site:

3. QDC MP4.4 Noise Category 3 construction standard – North-western building facades, levels 1 to 5
4. QDC MP4.4 Noise Category 2 construction standard – All other building facades

6.0 NOISE IMPACT OF PROPOSED DEVELOPMENT

6.1 PLANT AND EQUIPMENT NOISE

External plant and equipment associated with the proposed development is likely to include air-conditioning plant for residential units located within condenser plant rooms on roof top level. Air-conditioning and minor refrigeration plant for the proposed commercial and retail tenancies will also be located within plant rooms on that level, whilst car park exhaust fans and lift plant will be located within basement levels and roof level plant spaces respectively.

For plant and equipment noise, relevant noise criteria are as per the Brisbane City Council Brisbane City Plan 2014 and are summarised in **Section 2.2**. The following **Table 3** lists the adopted noise criteria for plant and equipment installed at the development:

Table 3: Plant and Equipment Noise Criteria – dB(A)

Time Period	Measured RBL at Development Site – dB(A)	Criterion Noise Level – dB(A)
Daytime (7am to 6pm)	59	62
Evening (6pm to 10pm)	53	56
Night-time (10pm to 7am)	42	45

As such, the appropriate noise criteria for the assessment of plant noise impacts from the proposed development is 45 dB(A) external to on-site and surrounding residential facades.

Any mechanical plant and equipment associated with the development should thus 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 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 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 from 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 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.

6.2 SERVICE VEHICLE ACTIVITIES AND LOADING NOISE

Considering the nature of the proposed commercial and retail uses 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 and refuse collection areas are located in the basement and are appropriately enclosed to on-site and surrounding residential uses. Servicing for the proposed commercial and retail tenancies would also be anticipated to be infrequent due to the small nature of the tenancies, and would generally include relatively quiet small trucks or vans.

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.

6.3 CAR PARKING NOISE IMPACTS

Car parking for the development will be located on five basement levels. 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.

7.0 CONCLUSIONS

MWA Environmental have been engaged by Kingsford Development Australia to prepare a Noise Impact Assessment for a proposed mixed use development located at 527 Gregory Terrace, Fortitude Valley.

This report has been prepared to assess noise amenity at the proposed development considering the updated architectural drawings and the requirements of the Brisbane CityPlan 2014 Codes.

This assessment has been based upon detailed noise monitoring and assessment of resultant road traffic noise levels external to the proposed residential buildings.

This report also considered noise amenity impacts with respect to noise impact on future residential from surrounding land uses and the impact upon surrounding residential land uses as a result of the development.

Based upon the detailed assessment conducted, overall acoustic specifications for the development should take account the minimum required noise reduction considering road traffic noise and Multiple Dwelling Code requirements. The overall acoustic specifications required for the proposed development are as follows:

Residential Tower 1 of Site:

1. QDC MP4.4 Noise Category 3 construction standard – Western building facades, ground level to level 16
2. QDC MP4.4 Noise Category 2 construction standard – All other building facades

Residential Tower 2 of Site:

3. QDC MP4.4 Noise Category 3 construction standard – North-western building facades, levels 1 to 5
4. QDC MP4.4 Noise Category 2 construction standard – All other building facades

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.

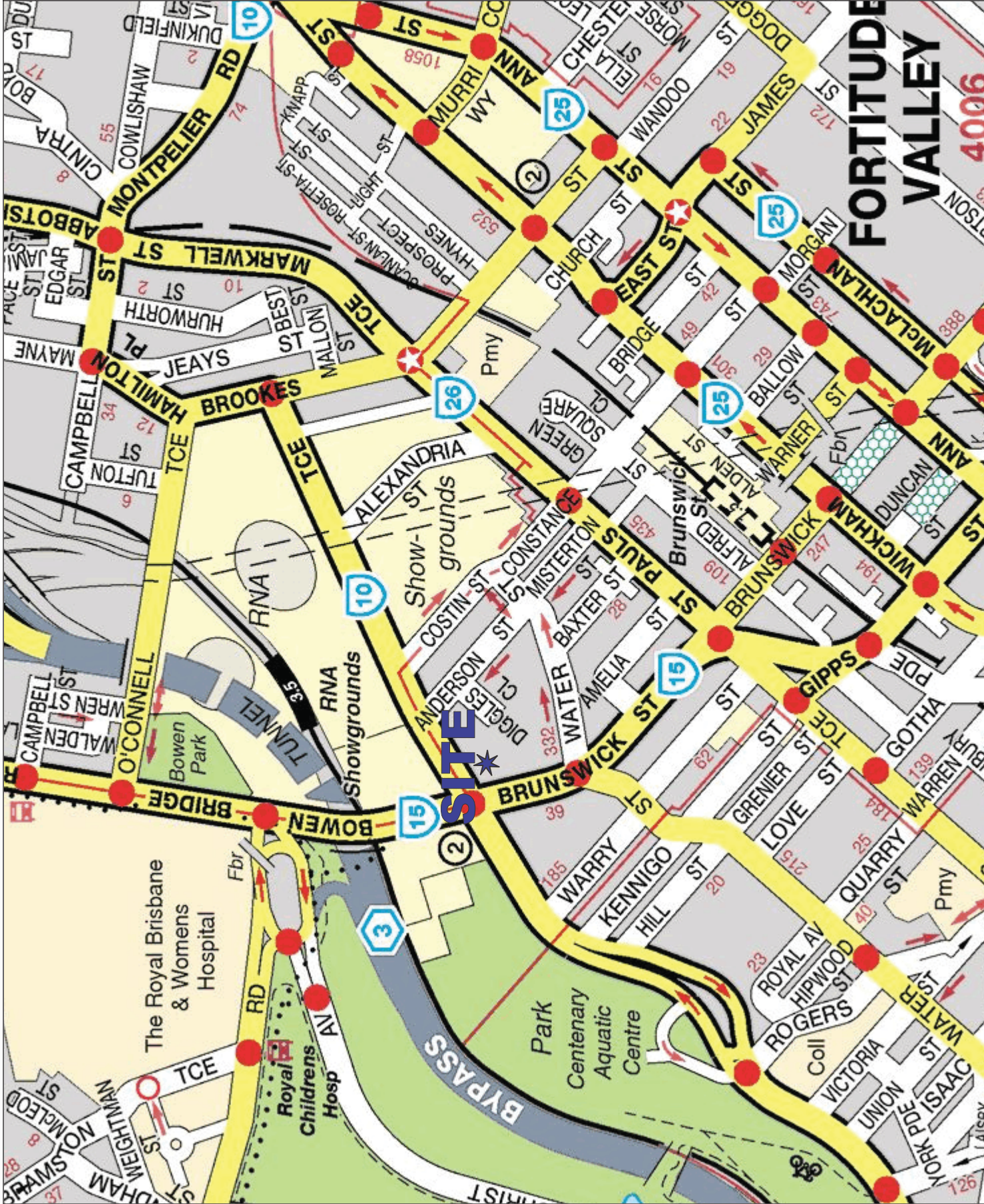
The noise of proposed car parking has been assessed with the conclusion that noise impacts at on-site and surrounding residences will be largely contained by the basement car park structures and will be minimal at surrounding residential land uses.

The noise of minor infrequent servicing activities and refuse collection for the proposed development will be contained in the basement car parking areas and is generally conducted in daytime and evening periods (7am to 10pm) with little potential to impact on on-site or surrounding residential amenity.

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
20 September 2016

FIGURES



CLIENT
VICTOR YAO JIA

PROJECT
**FORTITUDE VALLEY
NOISE IMPACT ASSESSMENT**
Proposed Mixed Use Development
527 Gregory Terrace
Fortitude Valley Qld

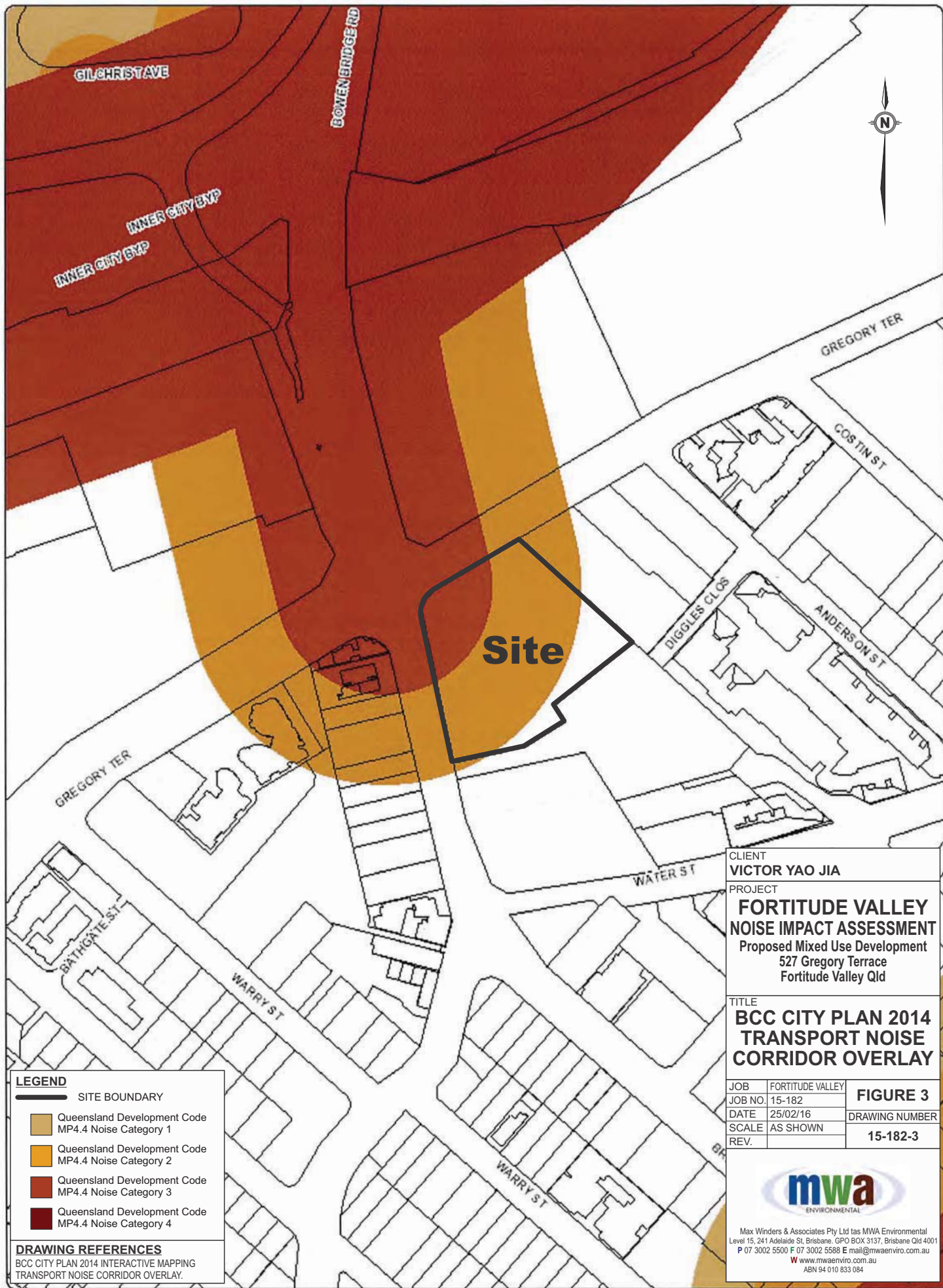
TITLE
**GENERAL
SITE LOCATION**

JOB	FORTITUDE VALLEY
JOB NO	15-182
DATE	25/02/16
SCALE	NOT TO SCALE
REV.	15-182-1



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Site

LEGEND

- SITE BOUNDARY
- Queensland Development Code MP4.4 Noise Category 1
- Queensland Development Code MP4.4 Noise Category 2
- Queensland Development Code MP4.4 Noise Category 3
- Queensland Development Code MP4.4 Noise Category 4

DRAWING REFERENCES

BCC CITY PLAN 2014 INTERACTIVE MAPPING
TRANSPORT NOISE CORRIDOR OVERLAY

CLIENT VICTOR YAO JIA		
PROJECT FORTITUDE VALLEY NOISE IMPACT ASSESSMENT Proposed Mixed Use Development 527 Gregory Terrace Fortitude Valley Qld		
TITLE BCC CITY PLAN 2014 TRANSPORT NOISE CORRIDOR OVERLAY		
JOB	FORTITUDE VALLEY	FIGURE 3
JOB NO.	15-182	
DATE	25/02/16	DRAWING NUMBER
SCALE	AS SHOWN	
REV.		15-182-3



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NOTES

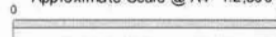
This map is notional only and should not be used for interpreting City Plan provisions relating to specific sites. To properly interpret the maps, the planning scheme must be referred to. The Digital Cadastre Database (supplied by State of Queensland - Department of Natural Resources and Mines) will be updated from time to time.

Mapping adopted by Council, effective 12 September 2014

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Projection: Map Grid of Australia, Zone 56
Horizontal Datum: Geocentric Datum of Australia 1994

Approximate Scale @ A4 1:2,500



Metres



BRISBANE CITY
Planning Scheme

LEGEND
SITE BOUNDARY
NOISE DATALOGGER LOCATION
D
DRAWING REFERENCES
- © THE STATE OF QUEENSLAND 2015 QLD GLOBE
- GOOGLE EARTH PRO 30-05-15.



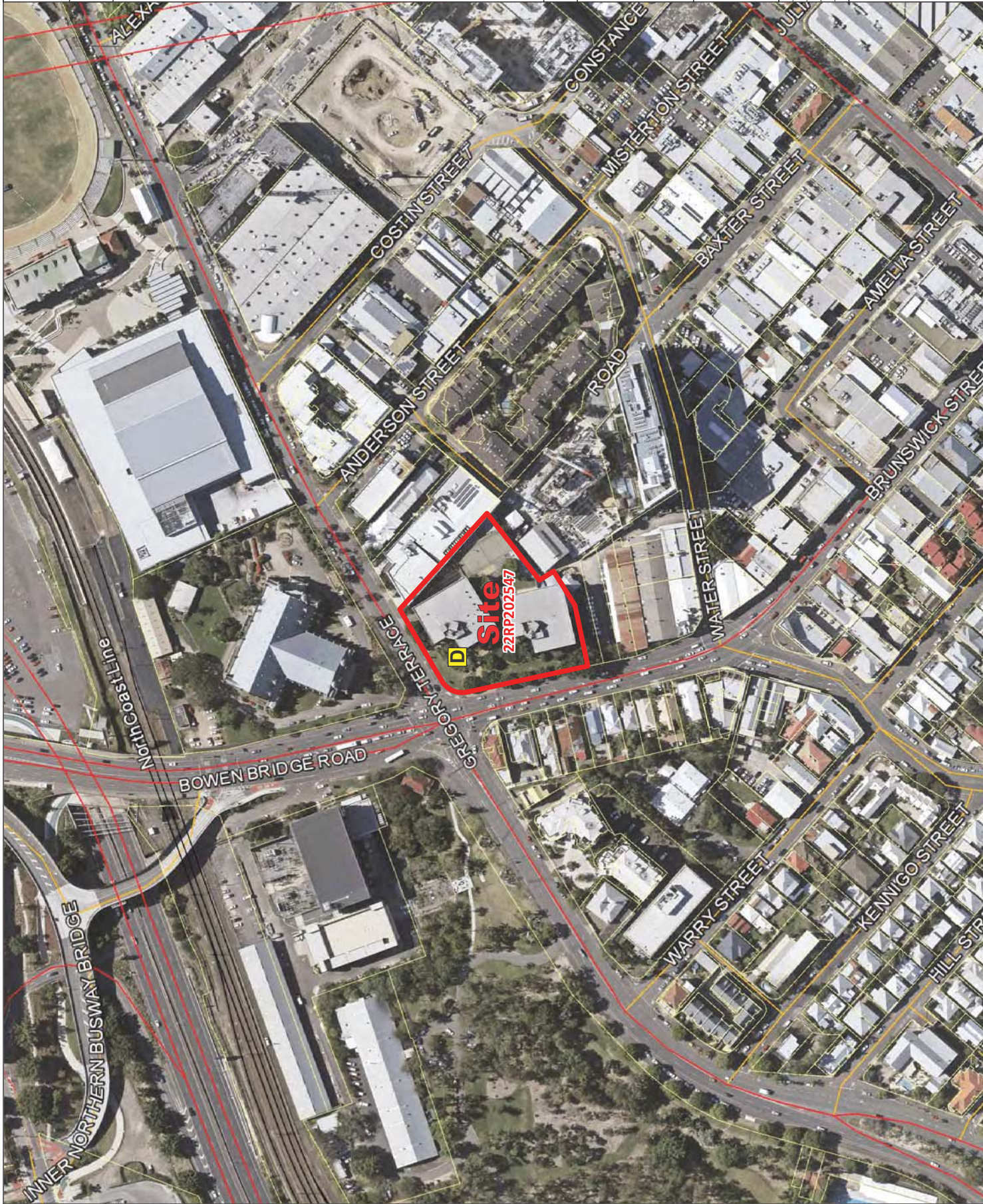
CLIENT
VICTOR YAO JIA
PROJECT
**FORTITUDE VALLEY
NOISE IMPACT ASSESSMENT**
Proposed Mixed Use Development
527 Gregory Terrace
Fortitude Valley Qld

TITLE
**NOISE MONITORING
LOCATION**

JOB	Fortitude Valley	FIGURE 4
JOB NO.	15-182	
DATE	25/02/16	DRAWING NUMBER
SCALE	1:3000 (A4)	
REV.		15-182-4



Max Winders & Associates Pty Ltd has MWA Environmental
Level 15, 24 Adelaide St, Brisbane, QPO 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



Attachment 1

Design Drawings

AREA DISCLAIMER
Subject to change during contract document development, and to Variations in accordance with the Contract Terms. See Identification Plan contained in the Disclosure Statement associated document for Area(s) that are indicative only.



Ground Floor

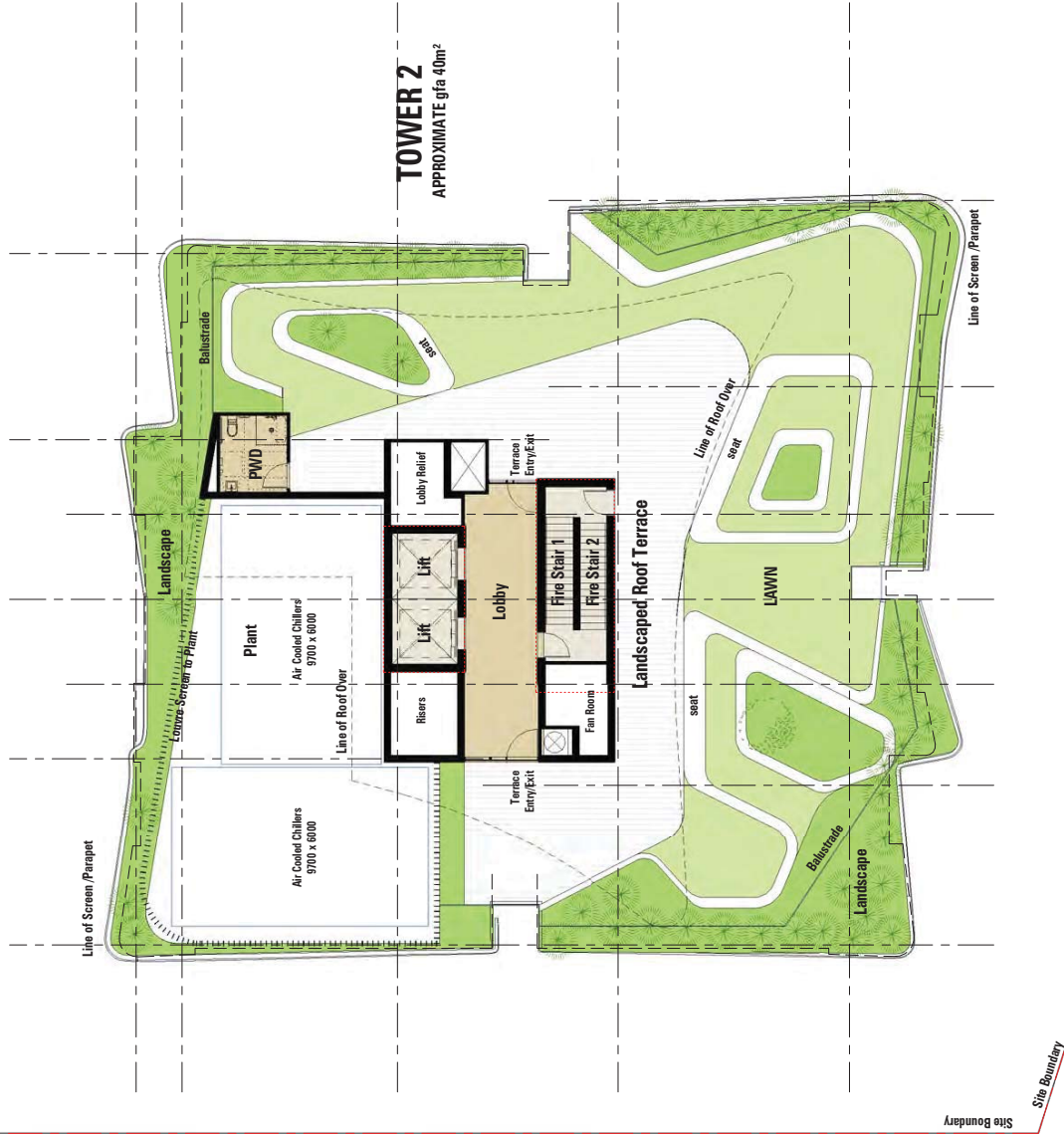




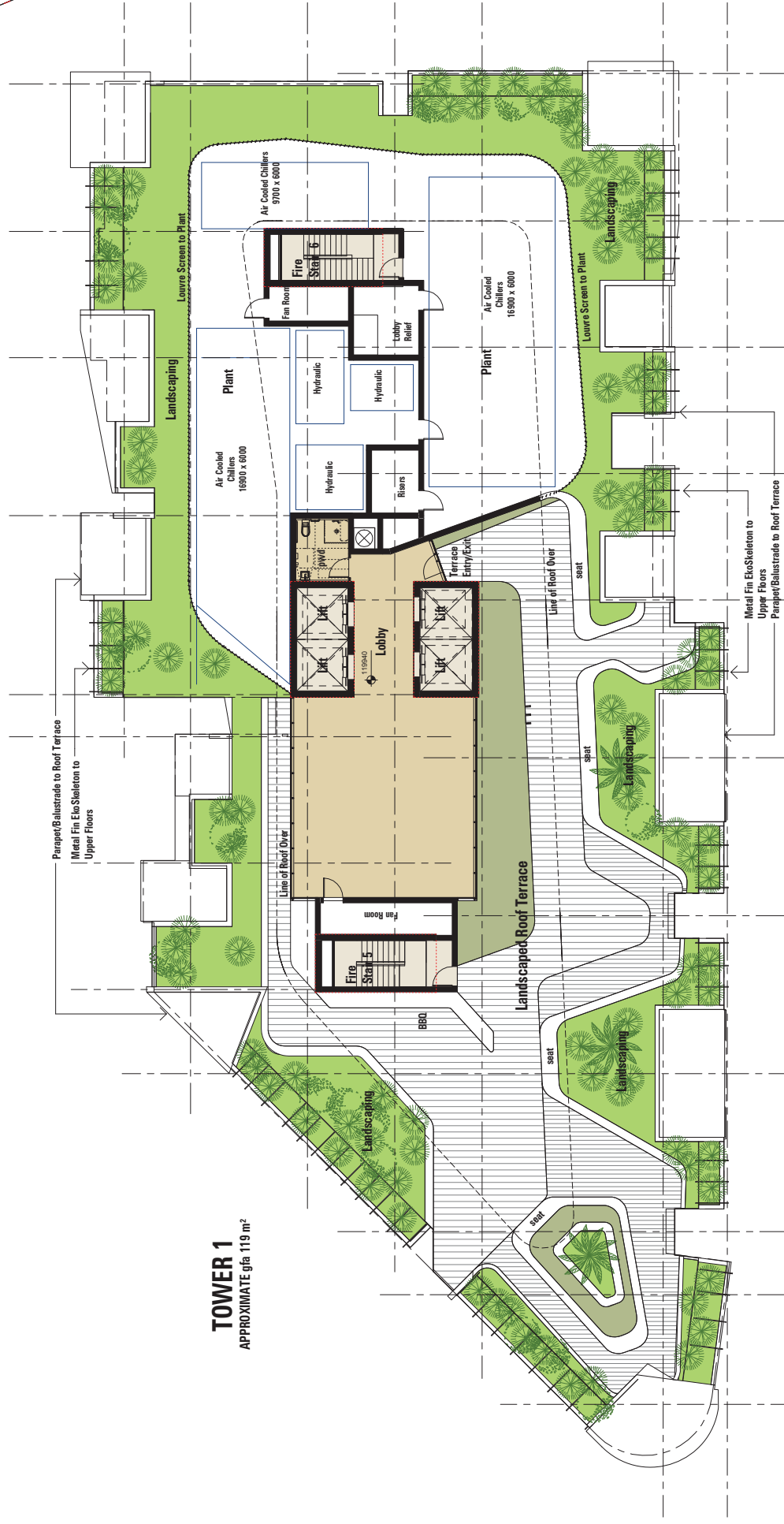








TOWER 1
APPROXIMATE gfa 119 m²



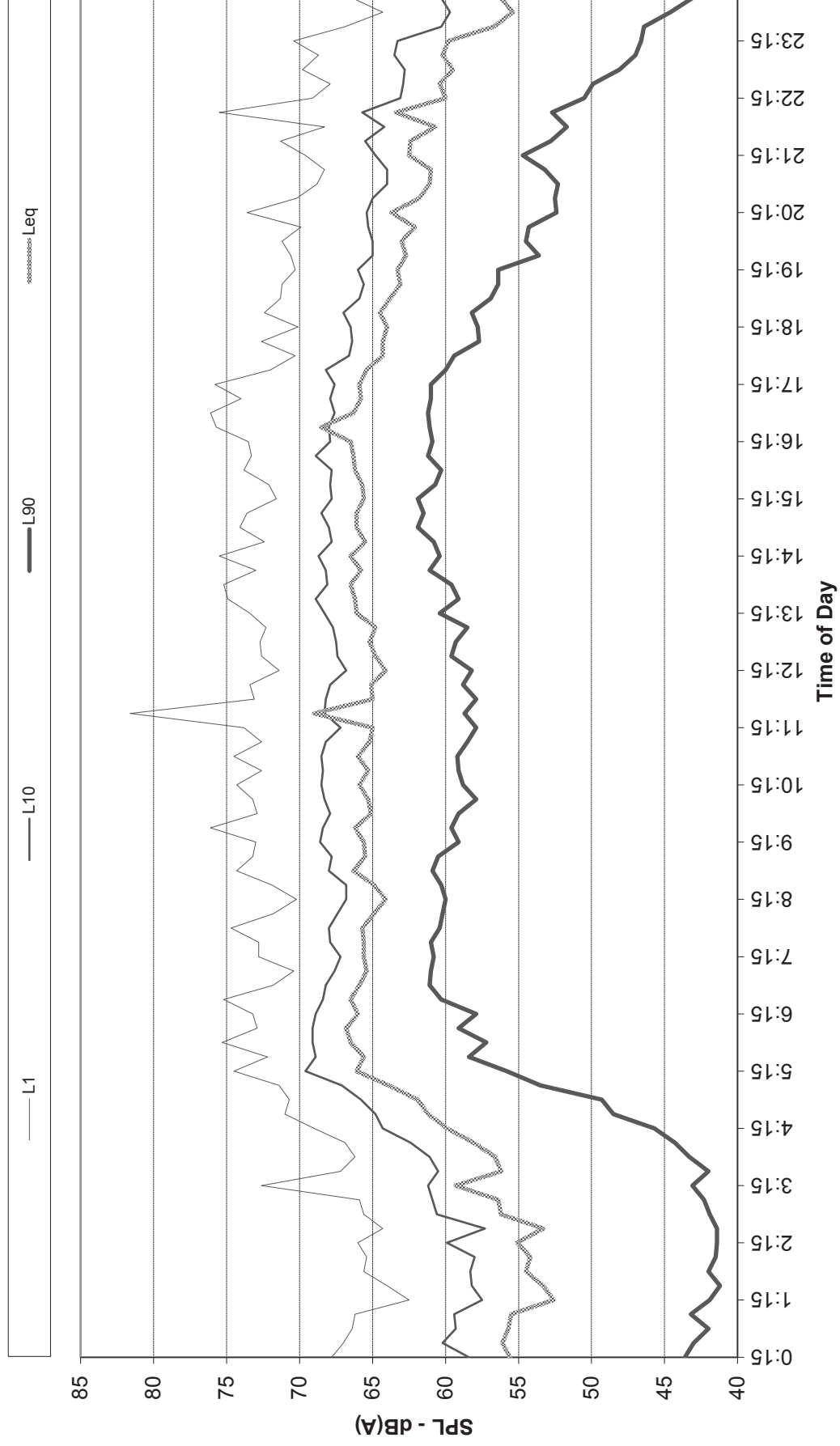
Attachment 2

Noise Datalogger Plots

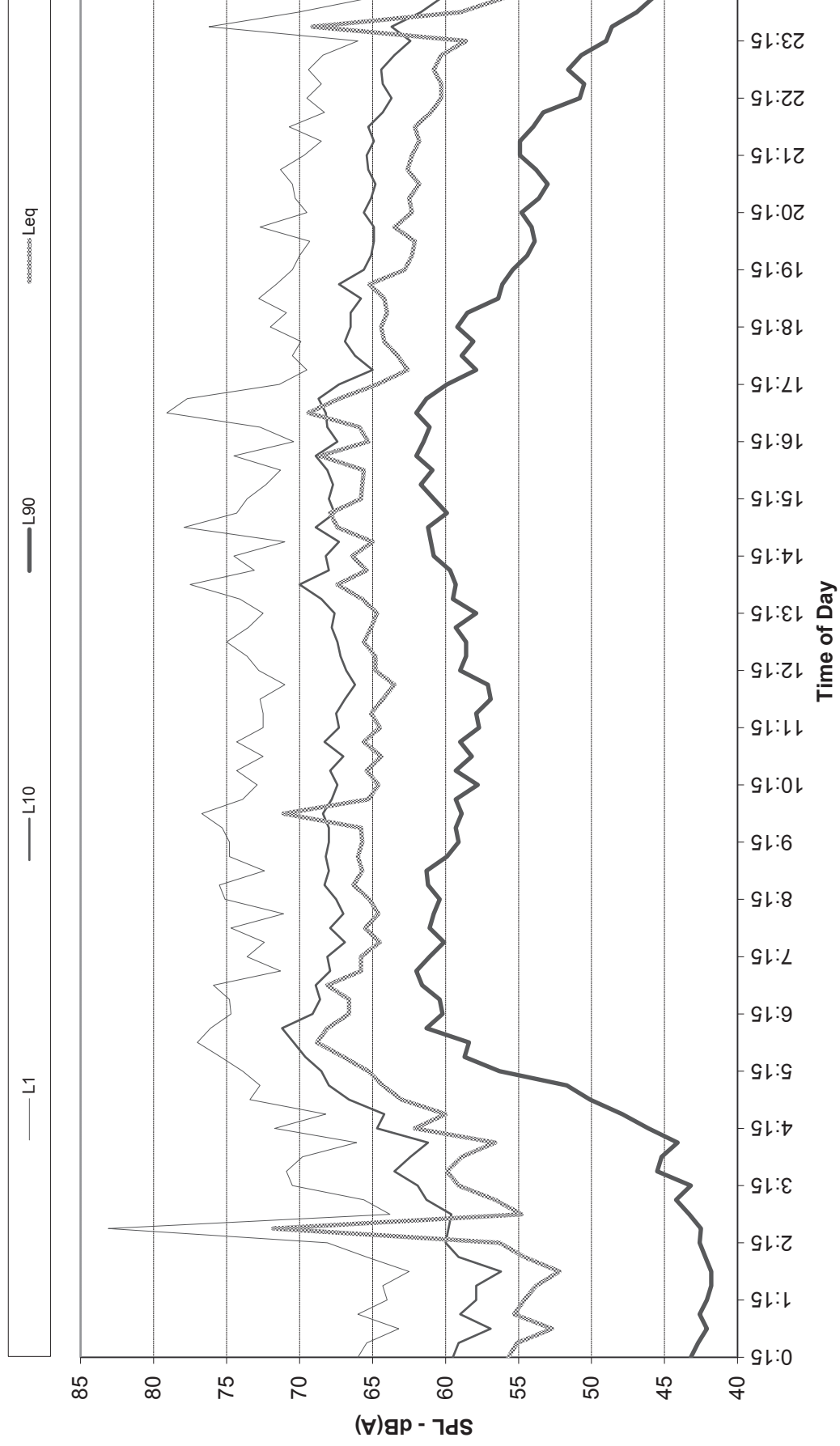
Recorded Statistical Noise Levels for Fortitude Valley 14-154 - - 20-Oct-2014 - Monday



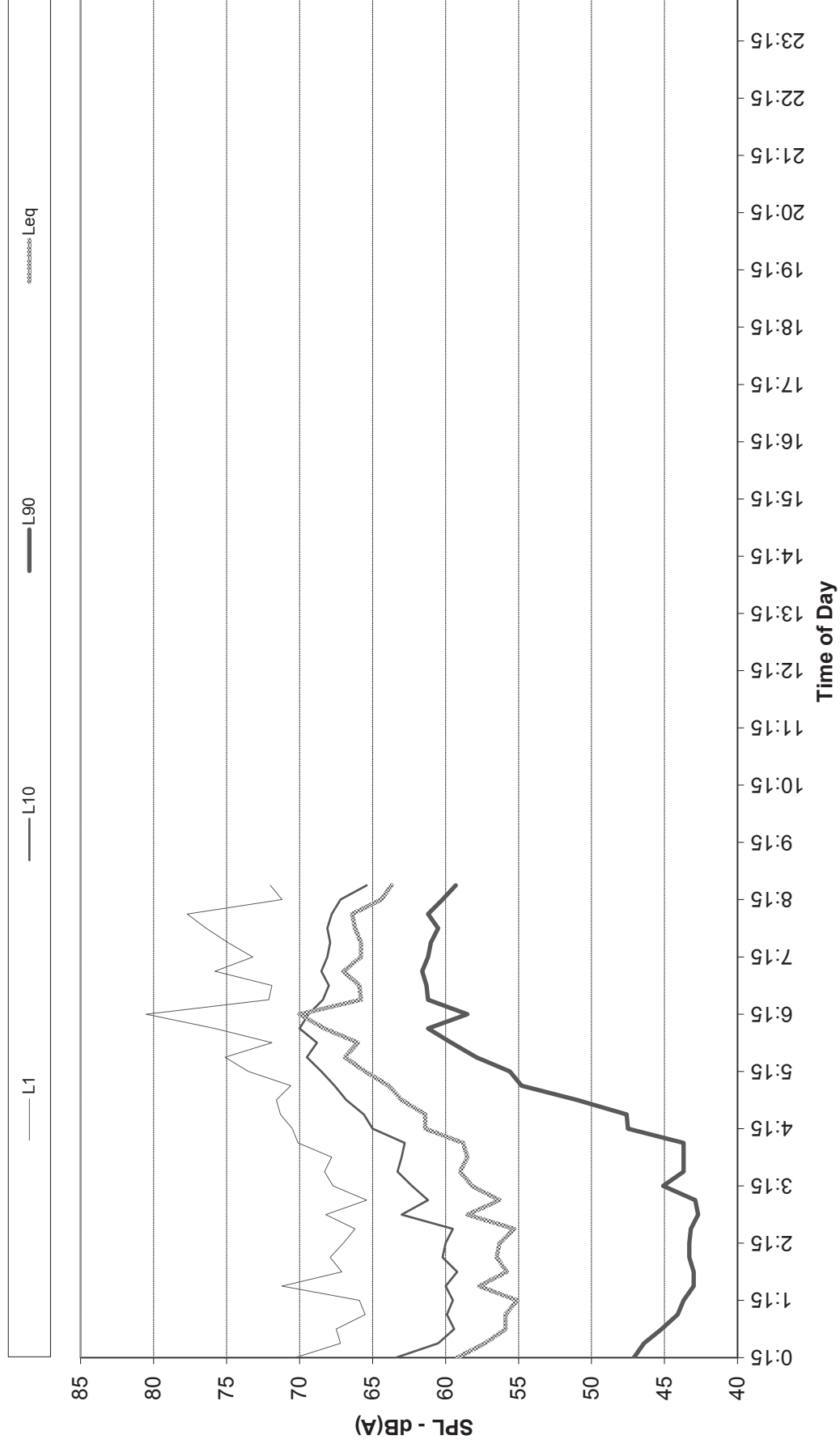
Recorded Statistical Noise Levels for Fortitude Valley 14-154 - - 21-Oct-2014 - Tuesday



Recorded Statistical Noise Levels for Fortitude Valley 14-154 - - 22-Oct-2014 - Wednesday



Recorded Statistical Noise Levels for Fortitude Valley 14-154 - - 23-Oct-2014 - Thursday



Attachment 3

*SoundPLAN 7.3 Model Extract and
Validation Result*

Signs and symbols

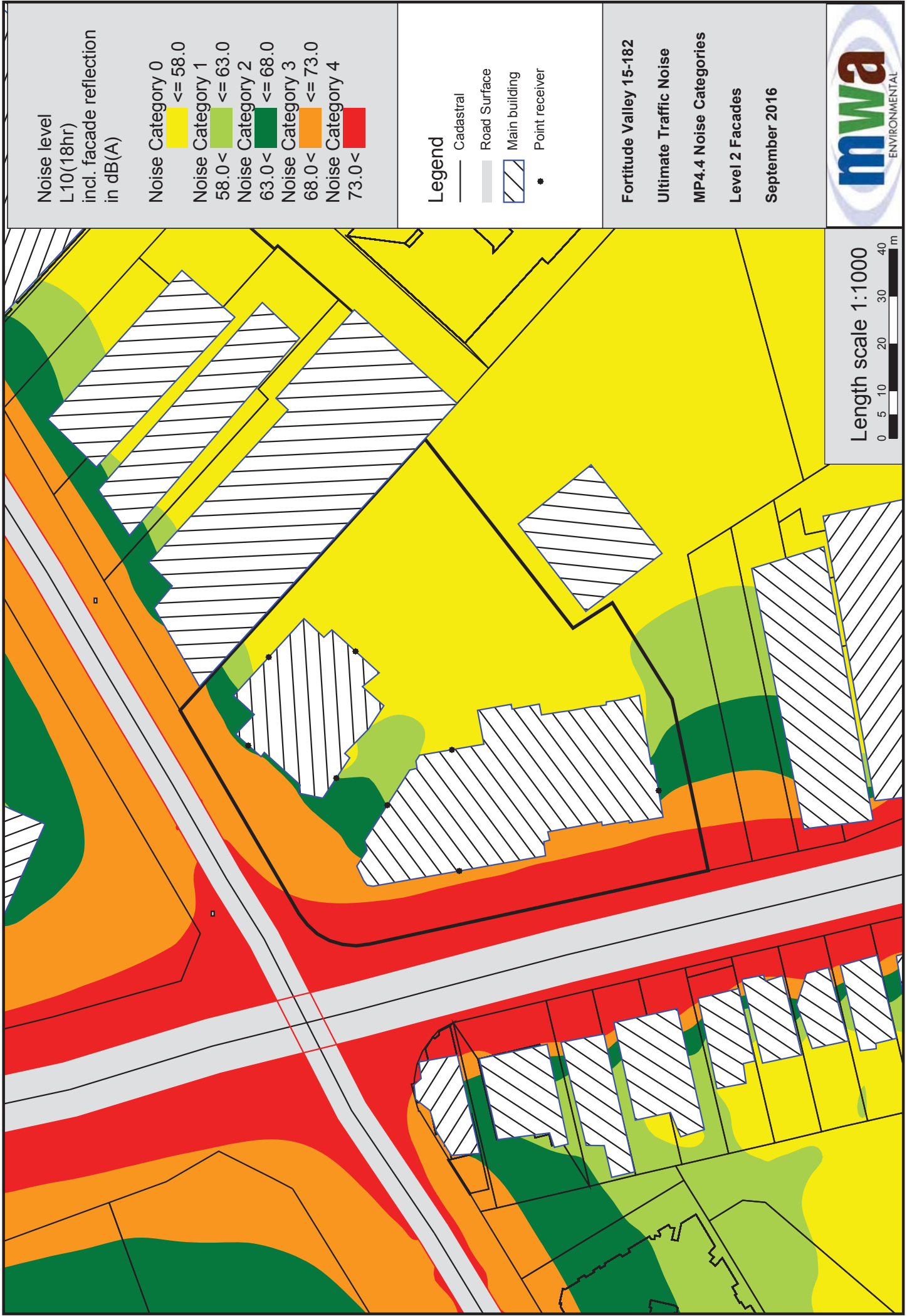
- Road axis
- Emission line
- Main building
- Point receiver

Fortitude Valley 15-182
Proposed Mixed Use
Development
527 Gregory Terrace
Existing Model Layout
Validation Point
Location
September 2016



Attachment 4

*SoundPLAN 7.3 Modelling
Ultimate QDC Noise Category Contour Maps*







Attachment 5

*Predicted QDC MP4.4 Noise Categories
And QDC MP4.4 Acceptable Solutions*

**MWA Environmental - Ultimate Traffic Noise Predictions
and Corresponding QDC MP4.4. Noise Categories**

Job: Fortitude Valley

Job #: 15-182

Date: 20/09/2016

Tower	Façade	Level	L10 18hr	QDC MP4.4 Noise Category
			dB(A)	
Tower 1	East	Level 1	38.6	Category 0
		Level 2	38.5	Category 0
		Level 3	38.5	Category 0
		Level 4	38.4	Category 0
		Level 5	38.3	Category 0
		Level 6	38.2	Category 0
		Level 7	38	Category 0
		Level 8	37.9	Category 0
		Level 9	37.8	Category 0
		Level 10	37.6	Category 0
		Level 11	37.5	Category 0
		Level 12	37.3	Category 0
		Level 13	37.2	Category 0
		Level 14	37	Category 0
		Level 15	36.8	Category 0
		Level 16	36.7	Category 0
		Level 17	36.5	Category 0
		Level 18	36.3	Category 0
		Level 19	36.2	Category 0
		Level 20	36	Category 0
		Level 21	35.9	Category 0
		Level 22	35.7	Category 0
		Level 23	35.6	Category 0
		Level 24	35.5	Category 0
		Level 25	35.5	Category 0
		Level 26	35.7	Category 0
		Level 27	36.1	Category 0
		Level 28	37	Category 0
		Level 29	38.9	Category 0
		Level 30	41.7	Category 0
	South	Level 1	67.2	Category 2
		Level 2	67.2	Category 2
		Level 3	67.2	Category 2
		Level 4	67.2	Category 2
		Level 5	67	Category 2
		Level 6	66.8	Category 2
		Level 7	66.5	Category 2
		Level 8	66.2	Category 2
		Level 9	66	Category 2
		Level 10	65.7	Category 2
		Level 11	65.5	Category 2
		Level 12	65.2	Category 2
		Level 13	65	Category 2
		Level 14	64.7	Category 2
		Level 15	64.5	Category 2
		Level 16	64.3	Category 2
		Level 17	64	Category 2
		Level 18	63.8	Category 2
		Level 19	63.6	Category 2
		Level 20	63.4	Category 2
		Level 21	63.2	Category 2
		Level 22	63	Category 2
		Level 23	62.8	Category 1
		Level 24	62.6	Category 1
		Level 25	62.4	Category 1
		Level 26	62.2	Category 1
		Level 27	62	Category 1
		Level 28	61.8	Category 1
		Level 29	61.6	Category 1
		Level 30	61.4	Category 1

Tower	Façade	Level	L10 18hr	QDC MP4.4 Noise Category
			dB(A)	
Tower 1	North-East	Level 1	62.2	Category 1
		Level 2	63.2	Category 2
		Level 3	63.9	Category 2
		Level 4	64	Category 2
		Level 5	64	Category 2
		Level 6	63.9	Category 2
		Level 7	63.7	Category 2
		Level 8	63.6	Category 2
		Level 9	63.5	Category 2
		Level 10	63.3	Category 2
		Level 11	63.1	Category 2
		Level 12	63	Category 2
		Level 13	62.8	Category 1
		Level 14	62.7	Category 1
		Level 15	62.5	Category 1
		Level 16	62.3	Category 1
		Level 17	62.2	Category 1
		Level 18	62	Category 1
		Level 19	61.8	Category 1
		Level 20	61.7	Category 1
		Level 21	61.5	Category 1
		Level 22	61.4	Category 1
		Level 23	61.2	Category 1
		Level 24	61.1	Category 1
		Level 25	60.9	Category 1
		Level 26	60.8	Category 1
		Level 27	60.6	Category 1
		Level 28	60.5	Category 1
		Level 29	60.3	Category 1
		Level 30	60.2	Category 1
	West	Level 1	72.1	Category 3
		Level 2	72.1	Category 3
		Level 3	71.9	Category 3
		Level 4	71.7	Category 3
		Level 5	71.4	Category 3
		Level 6	71.1	Category 3
		Level 7	70.7	Category 3
		Level 8	70.4	Category 3
		Level 9	70.1	Category 3
		Level 10	69.7	Category 3
		Level 11	69.4	Category 3
		Level 12	69.1	Category 3
		Level 13	68.8	Category 3
		Level 14	68.5	Category 3
		Level 15	68.2	Category 3
		Level 16	68	Category 3
		Level 17	67.7	Category 2
		Level 18	67.4	Category 2
		Level 19	67.2	Category 2
		Level 20	67	Category 2
		Level 21	66.7	Category 2
		Level 22	66.5	Category 2
		Level 23	66.3	Category 2
		Level 24	66	Category 2
		Level 25	65.8	Category 2
		Level 26	65.6	Category 2
		Level 27	65.4	Category 2
		Level 28	65.2	Category 2
		Level 29	65	Category 2
		Level 30	64.8	Category 2

Tower	Façade	Level	L10 18hr	QDC MP4.4 Noise Category
			dB(A)	
Tower 2	Northwest	Level 1	68	Category 3
		Level 2	68	Category 3
		Level 3	68	Category 3
		Level 4	68	Category 3
		Level 5	68	Category 3
		Level 6	67.8	Category 2
		Level 7	67.6	Category 2
		Level 8	67.4	Category 2
		Level 9	67.1	Category 2
		Level 10	66.9	Category 2
		Level 11	66.6	Category 2
		Level 12	66.4	Category 2
		Level 13	66.2	Category 2
		Level 14	65.9	Category 2
		Level 15	65.7	Category 2
		Level 16	65.5	Category 2
		Level 17	65.3	Category 2
		Level 18	65.1	Category 2
		Level 19	64.9	Category 2
		Level 20	64.7	Category 2
		Level 21	64.5	Category 2
		Level 22	64.3	Category 2
		Level 23	64.1	Category 2
		Level 24	63.9	Category 2
		Level 25	63.7	Category 2
	North-East	Level 1	55.6	Category 0
		Level 2	56.4	Category 0
		Level 3	56.4	Category 0
		Level 4	56.6	Category 0
		Level 5	57.2	Category 0
		Level 6	58.6	Category 1
		Level 7	59.8	Category 1
		Level 8	60.7	Category 1
		Level 9	61.2	Category 1
		Level 10	61.3	Category 1
		Level 11	61.2	Category 1
		Level 12	61	Category 1
		Level 13	60.9	Category 1
		Level 14	60.7	Category 1
		Level 15	60.5	Category 1
		Level 16	60.3	Category 1
		Level 17	60.1	Category 1
		Level 18	59.9	Category 1
		Level 19	59.8	Category 1
		Level 20	59.6	Category 1
		Level 21	59.4	Category 1
		Level 22	59.3	Category 1
		Level 23	59.1	Category 1
		Level 24	59	Category 1
		Level 25	58.9	Category 1

Tower	Façade	Level	L10 18hr	QDC MP4.4 Noise Category
			dB(A)	
Tower 2	Southeast	Level 1	41.9	Category 0
		Level 2	42.3	Category 0
		Level 3	42.6	Category 0
		Level 4	43	Category 0
		Level 5	43.5	Category 0
		Level 6	43.9	Category 0
		Level 7	44.4	Category 0
		Level 8	44.9	Category 0
		Level 9	45.5	Category 0
		Level 10	46.3	Category 0
		Level 11	47.1	Category 0
		Level 12	47.8	Category 0
		Level 13	48.7	Category 0
		Level 14	49.5	Category 0
		Level 15	50.2	Category 0
		Level 16	50.6	Category 0
		Level 17	51	Category 0
		Level 18	51.4	Category 0
		Level 19	51.7	Category 0
		Level 20	52	Category 0
		Level 21	52.3	Category 0
		Level 22	52.6	Category 0
		Level 23	52.8	Category 0
		Level 24	53	Category 0
		Level 25	53.2	Category 0
	South-west	Level 1	62.7	Category 1
		Level 2	63.6	Category 2
		Level 3	64	Category 2
		Level 4	64.2	Category 2
		Level 5	64.1	Category 2
		Level 6	64	Category 2
		Level 7	63.8	Category 2
		Level 8	63.6	Category 2
		Level 9	63.4	Category 2
		Level 10	63.1	Category 2
		Level 11	62.9	Category 1
		Level 12	62.7	Category 1
		Level 13	62.4	Category 1
		Level 14	62.2	Category 1
		Level 15	61.9	Category 1
		Level 16	61.7	Category 1
		Level 17	61.4	Category 1
		Level 18	61.2	Category 1
		Level 19	60.9	Category 1
		Level 20	60.7	Category 1
		Level 21	60.4	Category 1
		Level 22	60.2	Category 1
		Level 23	60	Category 1
		Level 24	59.7	Category 1
		Level 25	59.5	Category 1

MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

Table of Contents

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Purpose

To ensure *habitable rooms* of Class 1, 2, 3 and 4 buildings located in a *transport noise corridor* are designed and constructed to reduce *transport noise*.

Commencement

This version of Mandatory Part (MP) 4.4 of the Queensland Development Code (QDC) commences on 1 September 2010.

Application

The part applies to building work for the construction or renovation of a *residential building* in a designated *transport noise corridor*.

Referral Agency

There is no referral agency for this part.

Associated Requirements

- (a) *Building Act 1975*
- (b) *Building Regulation 2006*
- (c) Building Code of Australia

Referenced Documents

Number	Date	Title
AS/NZS 2107	2000	Acoustics – Recommended design sound levels and reverberation times for building interiors.
AS 3671	1989	Acoustics – Road traffic noise intrusion – Building siting and construction.
AS/NZS ISO 717.1	2004	Acoustics – Rating of sound insulation in buildings and building elements – Airborne sound insulation.
ISO 140.3 (incorporating Amendment No. 1)	1995	Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Laboratory measurements of airborne sound insulation of building elements.
	2008	Road Traffic Noise Management: Code of Practice (Department of Transport and Main Roads).
Version 2	2007	Code of Practice: Railway Noise Management (Queensland Rail).

Definitions

Note: *Italicised* words within the body of the text, other than legislation titles, are defined below.

Acceptable solution means a relevant building solution which is deemed to satisfy the relevant performance requirement for the purposes of section 14 (4) (a) (ii) of the *Building Act 1975*.

Acoustically rated plasterboard means plasterboard that has been measured to achieve an R_w in accordance with AS/NZS ISO 717.1

Acoustically rated seals means seals that have been measured with a door to achieve an R_w in accordance with AS/NZS ISO 717.1

Annual Average Daily Traffic (AADT) has the meaning given in section 246X(7) of the *Building Act 1975*.

A-weighted sound pressure level is the level of the frequency weighted sound pressure determined in accordance with AS/NSZ 2107:2000.

BCA means the Building Code of Australia.

dB(A) means decibels measured on the 'A' weighting frequency.

External envelope means the structural elements and components of a building, including the roof, ceiling, walls and floors, which separate a *habitable room* from the exterior of the building.

Floor means a slab on ground or part of the *external envelope* which is elevated and exposed to the source of the *transport noise*, but does not include internal floors providing separation between individual sole-occupancy units or storeys.

Habitable Room has the meaning given in the BCA.

L_A is the shortened form of *A weighted sound pressure level* as defined in AS/NZS 2107:2000.

$L_{A10, 18hr}$ means the arithmetic average of the *A-weighted sound pressure level* that is exceeded for 10% of every hour over 18 consecutive hours between 6 am and 12 midnight.

$L_{A90,T}$ means the *A-weighted sound pressure level* that is exceeded for 90 per cent of the measuring period (T).

L_{Aeq} means an *A-weighted sound pressure level* of a continuous steady sound that within a measuring period has the same mean square sound pressure as a sound level that varies with time as defined in AS/NZS 2107:2000.

L_{Amax} means the maximum *A-weighted sound pressure level* during the nominated assessment period.

Manufacturers' specifications means specifications that have been measured in accordance with AS/NZS ISO 717.1 for a material or system and have been approved by a *registered testing authority*.

Noise assessment means an acoustic report, prepared in accordance with Schedule 3, which identifies the *noise category* applicable to a building or site based on site testing of acoustic properties.

Noise category means the category of *transport noise* that is applicable to a building or site within a designated *transport noise corridor*, based on the amount of noise monitored or modeled for the location as indicated in:

- (a) State or Local Government records, as identified in a gazettal notice following designation of a *transport noise corridor*; or

Note: In cases where there is any inconsistency between current designations of transport noise corridors by different State and Local Government authorities, the higher of the noise categories applies.

Note: As soon as practicable after designating land as a transport noise corridor, a Local Government must include a record of the transport noise corridor in its planning scheme. Information is also held and is available for public enquiry in a State Government website.

- (b) a *noise assessment* prepared by a *suitably qualified person*.

Planning scheme has the meaning given in the *Sustainable Planning Act 2009*.

Railway land has the meaning given in the *Building Act 1975*.

Registered testing authority has the meaning given in the BCA.

Residential building means a class 1, class 2, class 3 or class 4 building as defined in the BCA.

R_w means the “weighted sound reduction index” as specified in ISO 140-3.

Single Event Maximum Level has the meaning given in Queensland Rail Limited’s *Code of Practice: Railway Noise Management* (2007) Version 2.

State-controlled road has the meaning given in the *Transport Infrastructure Act 1994*.

Suitably qualified person means a person who is assessed by a building assessment manager to be a competent person in accordance with Part 5 of the *Building Regulation 2006*.

Transport noise means airborne noise originating from a *transport noise corridor*.

Transport noise reduction means the level of reduction of *transport noise* required from the façade of the building to the internal environment, as identified in Schedule 1.

Note: The predicted levels of transport noise reduction will be achieved only when doors, windows and other openings in the relevant parts of the building’s external envelope are closed.

Transport noise corridor means land designated under Chapter 8B of the *Building Act 1975* as a *transport noise corridor*.

MP 4.4 – BUILDINGS IN A TRANSPORT NOISE CORRIDOR

Note: This is identified in State and Local Government records as described in a gazettal notice following designation of the transport noise corridor.

**PERFORMANCE
REQUIREMENTS****ACCEPTABLE SOLUTIONS*****Residential buildings***

P1	<i>Habitable rooms in residential buildings located in a transport noise corridor are adequately protected from transport noise to safeguard occupants' health and amenity.</i>	A1	The external envelope of <i>habitable rooms</i> in a <i>residential building</i> located in a <i>transport noise corridor</i> complies with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum <i>transport noise reduction</i> level for the relevant <i>noise category</i> by: (a) using materials specified in Schedule 2; OR (b) using materials with <i>manufacturer's specifications</i> that, in combination, achieve the minimum R_w value for the relevant building component and applicable <i>noise category</i>.
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Schedule 1

Noise category	Minimum transport noise reduction (dB (A)) required for habitable rooms	Component of building's external envelope	Minimum R_w required for each component
Category 4	40	Glazing	43
		External walls	52
		Roof	45
		Floors	51
		Entry doors	35
Category 3	35	Glazing	38 (where total area of glazing for a habitable room is greater than 1.8m ²)
			35 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)
		External walls	47
		Roof	41
		Floors	45
		Entry doors	33

Noise category	Minimum transport noise reduction (dB (A)) required for <i>habitable rooms</i>	Component of building's <i>external envelope</i>	Minimum R_w required for each component
Category 2	30	Glazing	35 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			32 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	41
		Roof	38
		Floors	45
Category 1	25	Entry doors	33
		Glazing	27 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²)
			24 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²)
		External walls	35
		Roof	35
Category 0	No additional acoustic treatment required – standard building assessment provisions apply.	Entry Doors	28

Schedule 2

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
Glazing	43	Double glazing consisting of two panes of minimum 5mm thick glass with at least 100mm air gap and full perimeter <i>acoustically rated seals</i> .
	38	Minimum 14.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> ; OR Double glazing consisting of one pane of minimum 5mm thick glass and one pane of minimum 6mm thick glass with at least 44mm air gap, and full perimeter <i>acoustically rated seals</i>
		Minimum 10.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> .
	35	Minimum 10.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> .
	32	Minimum 6.38mm thick laminated glass with full perimeter <i>acoustically rated seals</i> .
	27	Minimum 4mm thick glass with full perimeter <i>acoustically rated seals</i>
	24	Minimum 4mm thick glass with standard weather seals

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
External walls	52	Two leaves of clay brick masonry, at least 270mm in total, with subfloor vents fitted with noise attenuators.
		Two leaves of clay brick masonry at least 110mm thick with: (i) cavity not less than 50mm between leaves; and (ii) 50mm thick mineral insulation or 50mm thick glass wool insulation with a density of 11kg/m³ or 50mm thick polyester insulation with a density of 20kg/m³ in the cavity. OR
		Two leaves of clay brick masonry at least 110mm thick with: (i) cavity not less than 50mm between leaves; and (ii) at least 13mm thick cement render on each face OR
	47	Single leaf of clay brick masonry at least 110mm thick with: (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³ positioned between studs; and (iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs. OR
		Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
		Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves
		OR
		Single leaf of clay brick masonry at least 110mm thick with: (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and
		(ii) mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m ³ positioned between studs; and
		(iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs
	41	OR
		Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face
		OR
		Concrete brickwork at least 110mm thick
		OR
		In-situ concrete at least 100mm thick
		OR
		Precast concrete at least 100mm thick and without joints.

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
Roof	35	Single leaf of clay brick masonry at least 110mm thick with: (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs OR Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.
		Concrete or terracotta tile or sheet metal roof with sarking, <i>acoustically rated plasterboard</i> ceiling at least 13mm thick fixed to ceiling joists, cellulose fibre insulation at least 100mm thick with a density of at least 45kg/m ³ in the cavity.
	45	OR Concrete or terracotta tile or sheet metal roof with sarking, 2 layers of <i>acoustically rated plasterboard</i> at least 16mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m ³ or polyester insulation at least 50mm thick with a density of at least 20kg/m ³ in the cavity.
		Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m ³ or polyester insulation at least 50mm thick with a density of at least 20kg/m ³ in the cavity. OR Concrete suspended slab at least 100mm thick.
	38	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m ³ .

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	35	Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity.
Floors	51	Concrete slab at least 150mm thick.
		Concrete slab at least 100mm thick
	45	OR Tongued and grooved boards at least 19mm thick with: (i) timber joists not less than 175mm x 50mm; and (ii) mineral insulation or glass wool insulation at least 75mm thick with a density of at least 11kg/m ³ positioned between joists and laid on plasterboard at least 10mm thick fixed to underside of joists; and (iii) mineral insulation or glass wool insulation at least 25mm thick with a density of at least 11kg/m ³ laid over entire floor, including tops of joists before flooring is laid; and (iv) secured to battens at least 75mm x 50mm; and (v) the assembled flooring laid over the joists, but not fixed to them, with battens lying between the joists.
Entry Doors	35	Solid core timber not less than 45mm thick, fixed so as to overlap the frame or rebate of the frame by not less than 10mm, with full perimeter <i>acoustically rated seals</i> .
	33	Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter <i>acoustically rated seals</i> and constructed of - (i) solid core, wood, particleboard or blockboard not less than 45mm thick; and/or (ii) acoustically laminated glass not less than 10.38mm thick.

Component of building's external envelope	Minimum R_w	Acceptable forms of construction
	28	Fixed so as to overlap the frame or rebate of the frame, constructed of - (i) Wood, particleboard or blockboard not less than 33mm thick; or (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or (iii) Other suitable material with a mass per unit area not less than 24.4kg/m ² ; or (iv) Solid core timber door not less than 35mm thick fitted with full perimeter <i>acoustically rated seals</i> .

Schedule 3

The objective of the *noise assessment* is to clearly demonstrate that the *noise category* that is applicable to a particular part of or entire building, or site. The criteria for determining the relevant *noise category* are given below in Table 1:

Table 1 – *Noise category levels*

Noise Category	Level of <i>transport noise</i> * ($L_{A10, 18hr}$) for <i>State-controlled roads</i> and designated local government roads	Single event maximum noise* (L_{Amax}) for <i>railway land</i>
Category 4	≥ 73 dB(A)	≥ 85 dB(A)
Category 3	68 - 72 dB(A)	80 – 84 dB(A)
Category 2	63 – 67 dB(A)	75 – 79 dB(A)
Category 1	58 - 62 dB(A)	70 - 74 dB(A)
Category 0	≤ 57 dB(A)	≤ 69 dB(A)

* measured at 1 m from the façade of the proposed or existing building.

Noise assessment requirements – State-controlled Roads and Local Government roads:

A *noise assessment* for *State-controlled roads* and *Local Government roads* must be undertaken in accordance with the *Road Traffic Noise Management: Code of Practice* (Department of Transport and Main Roads, 2008).

In addition, the *noise assessment* must contain the following information as a minimum:

1) Background Information and Existing Acoustic Environment

- A brief description of the project.
- A brief description of the current noise environment.
- Documentation of noise monitoring equipment and procedures.
- A site plan showing:
 - o Location of *transport noise corridor*;
 - o Location of proposed *residential buildings*;
 - o Location of noise monitoring equipment including distance to *transport noise corridor*;
 - o Any other existing or proposed structures, including but not limited to buildings, barriers, walls and fences;
 - o Any earth mounding, cuttings or other significant topographical features.
- Site photograph indicating the position of the noise monitor.
- Type of instrument used and field calibration checks.
- Noise monitoring results including:
 - o Sample times and measurement intervals (both attended and unattended);
 - o Weather conditions during measurement including wind speed, wind direction and rainfall;
 - o Adjustments for reflecting surfaces;
 - o Description of sources other than from the *transport noise corridor* (e.g. aircraft, industry, mechanical plant, dog barking) and discussion of any affect on the results;
 - o Table summarising measured noise levels;
 - o Graphical presentation of monitored noise levels using 15 minute intervals and including the $L_{Aeq, adj, 15min}$ and $L_{A90, 15min}$ parameters for a minimum continuous duration of 48 hours.
- Methodology for determining noise levels at locations other than those monitored.

2) Transport Noise Corridor Noise Predictions

- Description of the noise model used and algorithms used in prediction modelling.
- All parameters used in the model including:
 - o Traffic volumes, existing and future (future volumes a minimum of 10 years from the date of the assessment must be used for design purposes);
 - o Road gradient;
 - o Percentage component of heavy vehicles;
 - o Vehicle speed;
 - o Pavement surface and any surface correction;
 - o Ground cover;
 - o Reflections from buildings and barriers.
- Statement of the source, accuracy and resolution of data used for:
 - o Topography;
 - o Road gradient;
 - o Receiver heights;
 - o Any noise barriers, walls or earth mounds.
- Verification of the noise model using the measured levels to demonstrate that the model is capable of generating accurate outputs.
- Noise prediction results including:
 - o A table summarising existing noise levels and predicted future levels;
 - o Statements quantifying any adjustments made to the predicted noise levels for the purpose of assessment;
 - o A table presenting the calculated *noise category* for all *habitable rooms**.

*Note: For multiple storey buildings each building storey must be considered individually. The calculated *noise category* may vary from level to level, particularly where barrier effects are present due to factors such as walls, fences, buildings, and topography.

Noise assessment requirements – *Railway land*:

A *noise assessment* for *railway land* shall be undertaken in accordance with the Code of Practice: Railway Noise Management (2007) Version 2.

In addition, the *noise assessment* must contain the following information as a minimum:

1) Background Information and Existing Acoustic Environment

- A brief description of the project.
- A brief description of the current noise environment.
- Documentation of noise monitoring equipment and procedures.
- A site plan showing:
 - Location of *transport noise corridor*;
 - Location of proposed *residential buildings*;
 - Location of noise monitoring equipment including distance to *transport noise corridor*;
 - Any other existing or proposed structures, including but not limited to buildings, barriers, walls and fences;
 - Any earth mounding, cuttings or other significant topographical features.
- Site photograph indicating the position of the noise monitoring equipment.
- Type of instrument used and field calibration checks.
- Noise monitoring results including:
 - Sample times and measurement intervals (both attended and unattended);
 - Weather conditions during measurement including wind speed, wind direction and rainfall;
 - Adjustments for reflecting surfaces;
 - Description of sources other than from the *transport noise corridor* (e.g. aircraft, industry, mechanical plant, dog barking) and discussion of any affect on the results;
 - Table summarising measured noise levels;
 - Graphical presentation of monitored noise levels (L_{Amax} , *Single Event Maximum Levels*) determined over a minimum continuous duration of 48 hours within 100m of a *railway land*.
- Methodology for determining noise levels at locations other than those monitored.

2) Transport Noise Corridor Noise Predictions

- Description of the noise model used and algorithms used in prediction modelling.
- All parameters used in the model including:
 - Percentage component of freight trains;
 - Total number of train services;
 - Vehicle speed;
 - Ground cover;
 - Reflections from buildings and barriers.

- Statement of the source, accuracy and resolution of data used for:
 - o Topography;
 - o Gradient;
 - o Receiver heights;
 - o Any noise barriers, walls or mound bases.
- Verification of the noise model using the measured levels to demonstrate that the model is capable of generating accurate outputs.
- Noise prediction results including:
 - o A table summarising existing noise levels and predicted future levels;
 - o Statements quantifying any adjustments made to the predicted noise levels for the purpose of assessment;
 - o A table presenting the calculated *noise category* for all *habitable rooms**.

*NB: For multiple storey buildings each building storey must be considered individually. The calculated *noise category* may vary from level to level, particularly where barrier effects are present due to factors such as walls/fences, buildings and topography.