NOISE IMPACT ASSESSMENT

PROPOSED MIXED USE DEVELOPMENT

527 GREGORY TERRACE

FORTITUDE VALLEY

Prepared for:
Cromwell Property Group

Prepared by:
MWA Environmental

12 March 2015

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8					

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1.0 INTRODUCTION

MWA Environmental has been engaged by Cromwell Property Group 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 (see **Figure 1**). The development comprises two residential towers (30 and 25 stories high) that includes retail and commercial uses and basement car parking.

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 2014*, *SC6.21 Noise Impact Assessment Planning Scheme Policy*.

2.0 SITE DESCRIPTION

The subject site is located at 527 Gregory Terrace, 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 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.

3.0 PROPOSED DEVELOPMENT

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

Tower 1 is 30 stories and is to be located on the eastern portion of the site. Tower 2 is 25 stories and is to be located on the western portion of the site. Commercial and retail uses are proposed at the lower levels of the development. Car parking is proposed within basement levels with site access from Gregory Terrace.

Indicative 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.

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;
- 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 2014*, *SC6.21 Noise Impact Assessment Planning Scheme Policy*.

4.1 TRAFFIC NOISE

The 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. Brunswick Street and Gregory Terrace). **Figure 3** demonstrates that the site is affected by QDC Noise Categories 2 and 3.

As such, we have undertaken detailed traffic noise modelling for the proposed development and have provided specifications for the most commercially appropriate methods to achieve the Performance Requirement of QDC MP4.4.

The Brisbane CityPlan 2014 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 6.1***.

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 7.0***.

4.2 OTHER NOISE SOURCES

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	**AO41**
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.	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 1.8m^2; (b) Rw 32 for glazing (windows and doors) where total area of glazing is less than or equal to 1.8m^2.

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 1.8m^2;

(b) Rw 32 for glazing (windows and doors) where total area of glazing is less than or equal to 1.8m^2.

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 7.0***.

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.*

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 20 to 23 October 2014. 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 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:

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[1] 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.

[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
L_1	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
L_{10}	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
L_{90}	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 L_{10} (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)

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 and Brunswick Street adjacent the site was provided by the Brisbane City Council on the 22nd October 2014. Gregory Terrace was supplied as an 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 Street was supplied as an 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

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 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***.

6.1.3 Internal Traffic Noise Requirements

In order to determine the relevant QDC MP4.4 noise categories for each proposed residential unit façade, ultimate design horizon traffic noise predictions have been made across the site. 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 traffic flow conditions. 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 as ***Attachment 4***. Also included in ***Attachment 4*** are the model layouts and modelling output results.

The overall acoustic treatment requirements for the development considering the Transport Noise Corridor Overlay Code requirements and other Code requirements are summarised in ***Section 7.0***.

6.1.4 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 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.

Unit balconies on the western 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.

6.2 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 7.0*** 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.

7.0 OVERALL ACOUSTIC SPECIFICATIONS

Based upon the detailed assessment presented in ***Section 6.0***, 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 4***.
- 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 4***, 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:

<u>Residential Tower on Eastern Part of Site:</u>

1. **QDC MP4.4 Noise Category 3 construction standard – Northern building facades, levels 1 to 6**
2. **QDC MP4.4 Noise Category 2 construction standard – All other building facades**

<u>Residential Tower on Western Part of Site:</u>

1. **QDC MP4.4 Noise Category 3 construction standard – Western building facades, levels 5 to 16 and Northern building facades, levels 5 to 8**
2. **QDC MP4.4 Noise Category 2 construction standard – All other building facades**

8.0 NOISE IMPACT OF PROPOSED DEVELOPMENT

8.1 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 each residential level. Air-conditioning and minor refrigeration plant for the proposed commercial and retail tenancies will also be located within plant rooms on each 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 4.0***. 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 if practicable and discharged through appropriate acoustically designed outlets to achieve the 45 dB(A) limit external to on-site and surrounding residential facades. This design standard will ensure that the noise of the car park exhaust fans does not adversely impact on amenity at surrounding and on-site residential premises.

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

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.

8.2 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 for the proposed commercial and 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.

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.

8.3 CAR PARKING NOISE IMPACTS

Car parking for the development will be at four 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.

9.0 CONCLUSIONS

MWA Environmental has been engaged by Cromwell Property Group to prepare a Noise Impact Assessment for a proposed mixed use development at Fortitude Valley.

The report has been prepared to assess noise amenity at the proposed development considering the requirements of the Brisbane CityPlan 2014 Codes.

The assessment has been based upon detailed noise monitoring and assessment of resultant road traffic noise levels external to the proposed residential buildings. The 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 must 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 on Eastern Part of Site:

1. **QDC MP4.4 Noise Category 3 construction standard – Northern building facades, levels 1 to 6**
2. **QDC MP4.4 Noise Category 2 construction standard – All other building facades**

Residential Tower on Western Part of Site:

1. **QDC MP4.4 Noise Category 3 construction standard – Western building facades, levels 5 to 16 and Northern building facades, levels 5 to 8**
2. **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 servicing activities for the proposed retail and commercial uses 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.

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
12 March 2015

FIGURES

DRAWING REFERENCE
UBD : UNIVERSAL PUBLISHERS PTY LTD

CLIENT
CROMWELL PROPERTY GROUP

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.	14-154
DATE	12/03/15
SCALE	NOT TO SCALE
REV.	

FIGURE 1
DRAWING NUMBER
14-154-1

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LEGEND

SITE BOUNDARY

D NOISE DATALOGGER LOCATION

DRAWING REFERENCES

- © THE STATE OF QLD (DNRM) DCDB.
- © THE STATE OF QLD 2013 QLDGLOBE.
- GOOGLE EARTH PRO 2013.

N

0 25 50 75 100m

CLIENT
CROMWELL PROPERTY GROUP

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

TITLE
NOISE MONITORING LOCATION

JOB	FORTITUDE VALLEY
JOB NO.	14-154
DATE	12/03/15
SCALE	1:3000 (A4)
REV.	

FIGURE 2

DRAWING NUMBER
14-154-2

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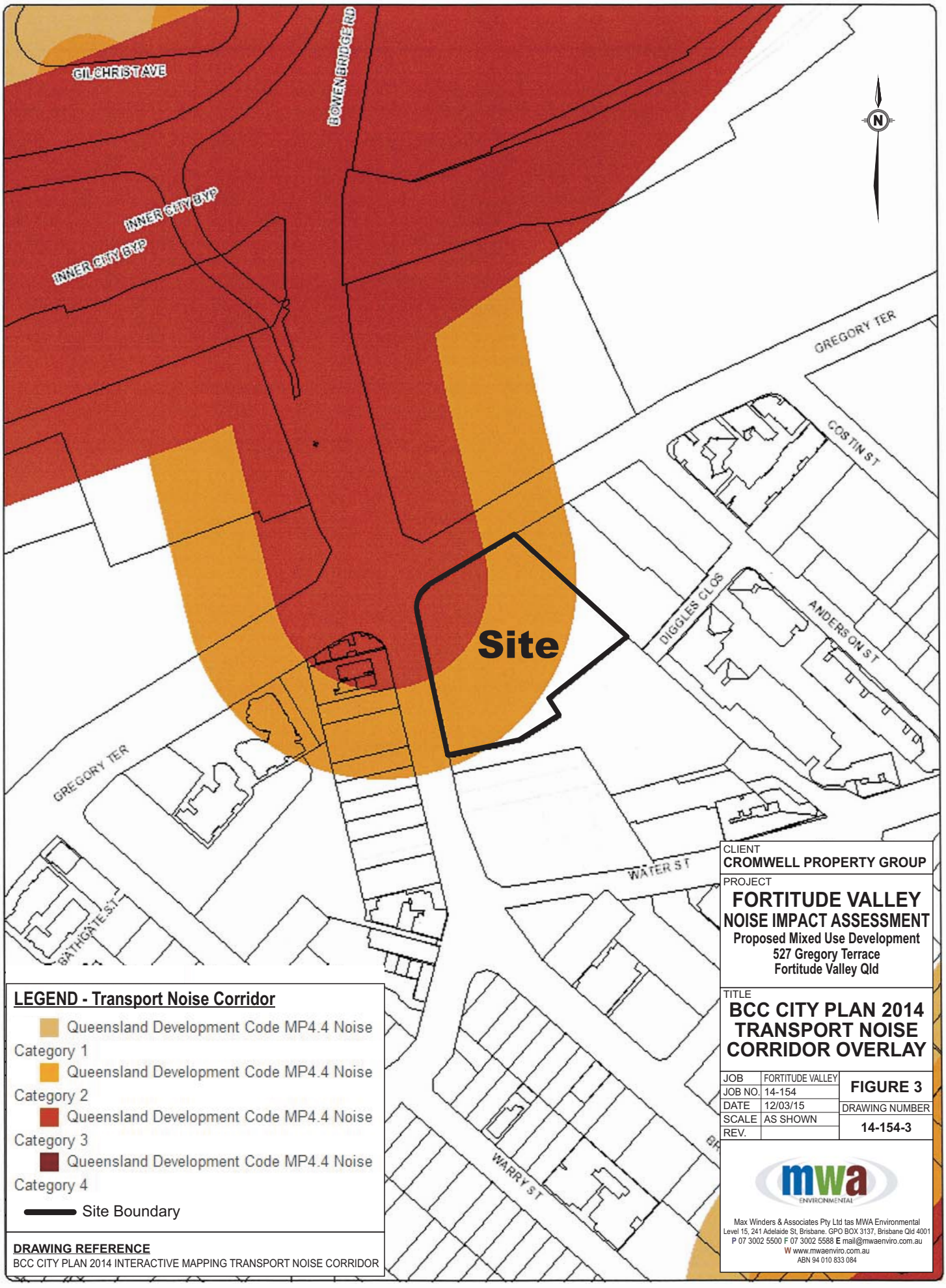

LEGEND - Transport Noise Corridor

- 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
- Site Boundary

DRAWING REFERENCE
BCC CITY PLAN 2014 INTERACTIVE MAPPING TRANSPORT NOISE CORRIDOR

CLIENT
CROMWELL PROPERTY GROUP

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
JOB NO.	14-154
DATE	12/03/15
SCALE	AS SHOWN
REV.	

FIGURE 3
DRAWING NUMBER
14-154-3

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Brisbane City Plan 2014

BRISBANE CITY Planning Scheme

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.

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

Approximate Scale @ A4 1:2,500

0 90
Metres

Date: 12/03/2015

Attachment 1

Indicative Design Drawings

527 GREGORY TERRACE

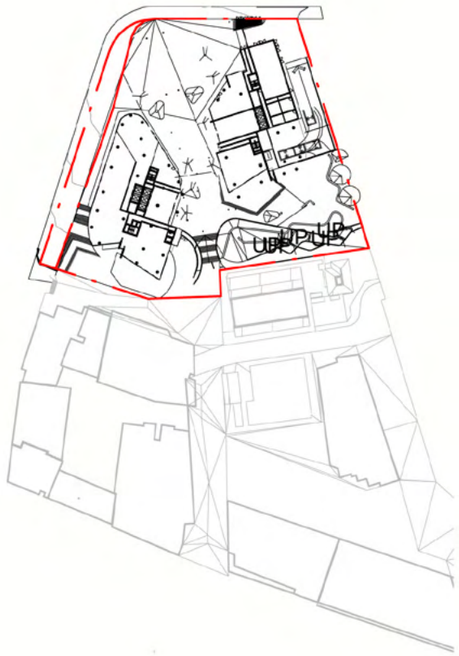
proposed residential development

09 March 2015

Cromwell

plans

ground
1:400



plans

level 1
1:400

plans

level 2
1:400

plans

level 3

1:400

plans

level 4

1:400

plans

typical level
(level 5 to 9 - level 12-21)
1:400

plans

level 10
1:400

plans

level 11
1:400

plans

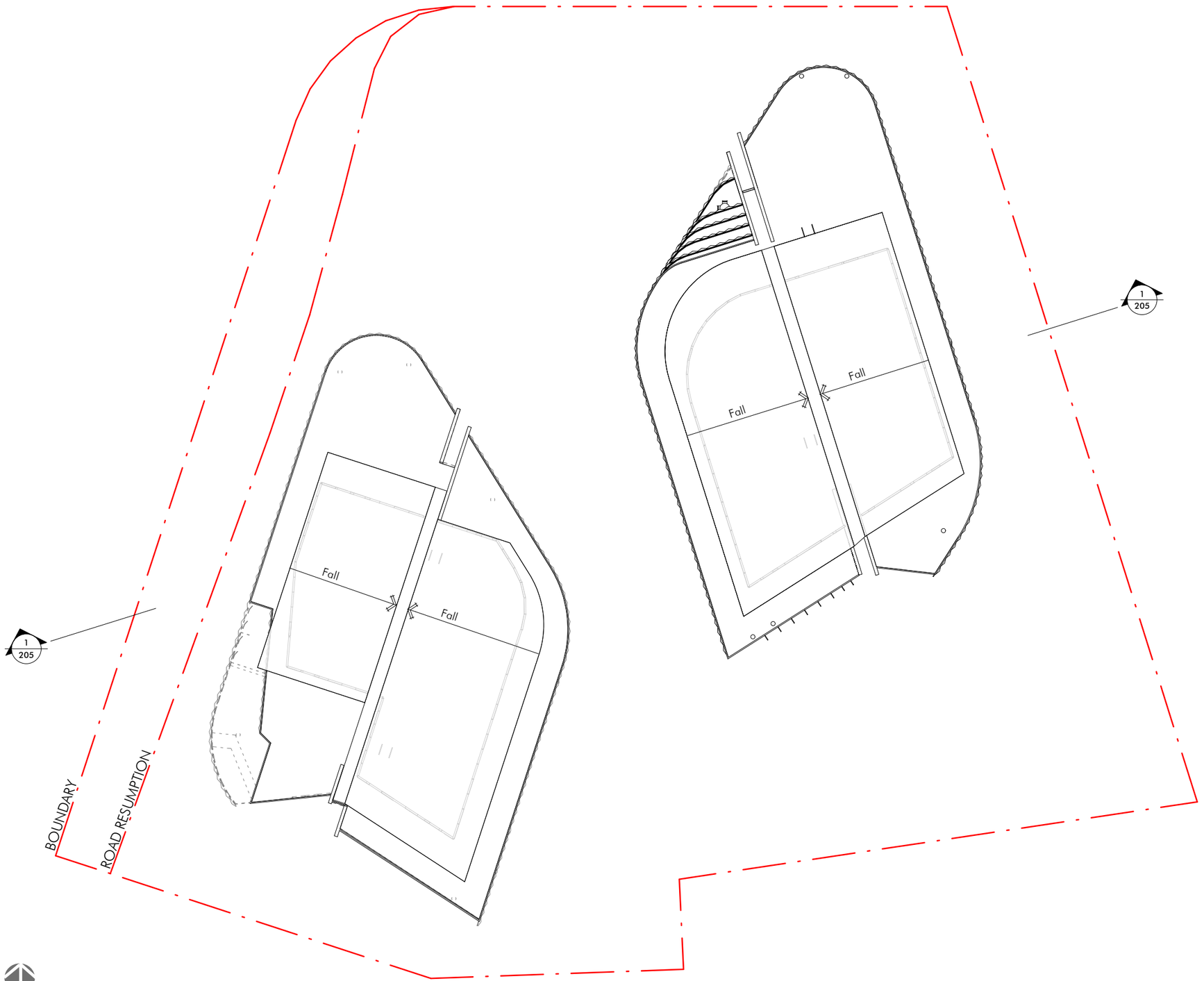
level 21-24
1:400

plans

level 25 - 29
1:400

plans

roof
1:400



plans

basement 1

1:400

CAR PARKING

LEVEL	RESI.	VISITOR	COMM.	RETAIL	TOTAL
B1	19	27	25	13	84

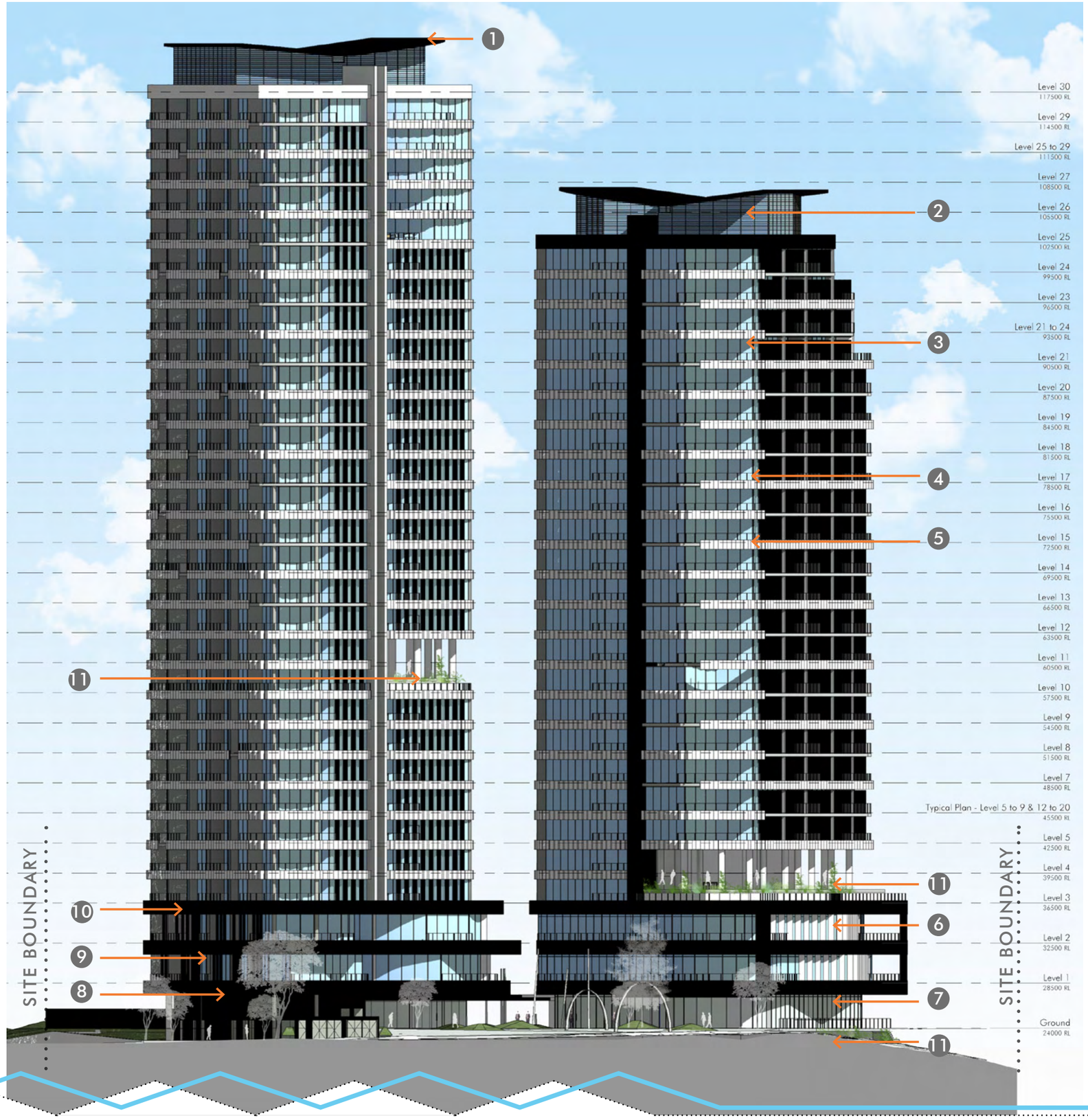
plans

basement 2, 3 and 4

1:400

CAR PARKING

LEVEL	RESI.	VISITOR	COMM.	RETAIL	TOTAL
B2	167	/	/	/	167
B3	167	/	/	/	167
B4	168	/	/	/	168



elevation one

north - gregory terrace 1:400

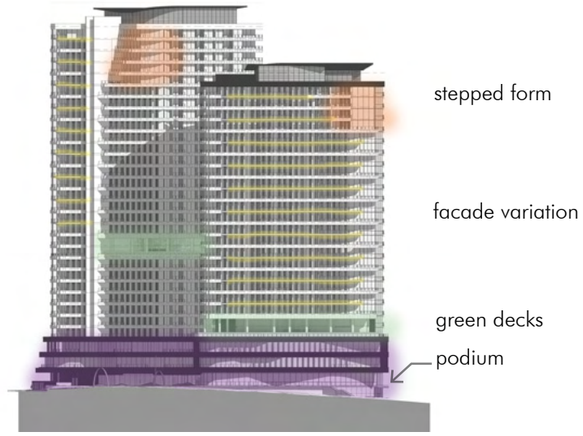
legend

1. metal roof sheeting
2. aluminium louvres
3. glazing with aluminium powdercoat finish
4. glass balustrade with powdercoat finish
5. concrete upstand, rendered and painted finish
6. vertical sunshades
7. shopfront glazing
8. rendered and painted block wall
9. privacy screen
10. prefinished cladding
11. landscaping

elevation two

west - brunswick street 1:400

facade variations



legend

1. curtain wall glazing
2. glazing with aluminium powdercoat finish
3. glass balustrade with powdercoat finish
4. concrete upstand, rendered and painted finish
5. shopfront glazing
6. prefinished cladding
7. landscaping

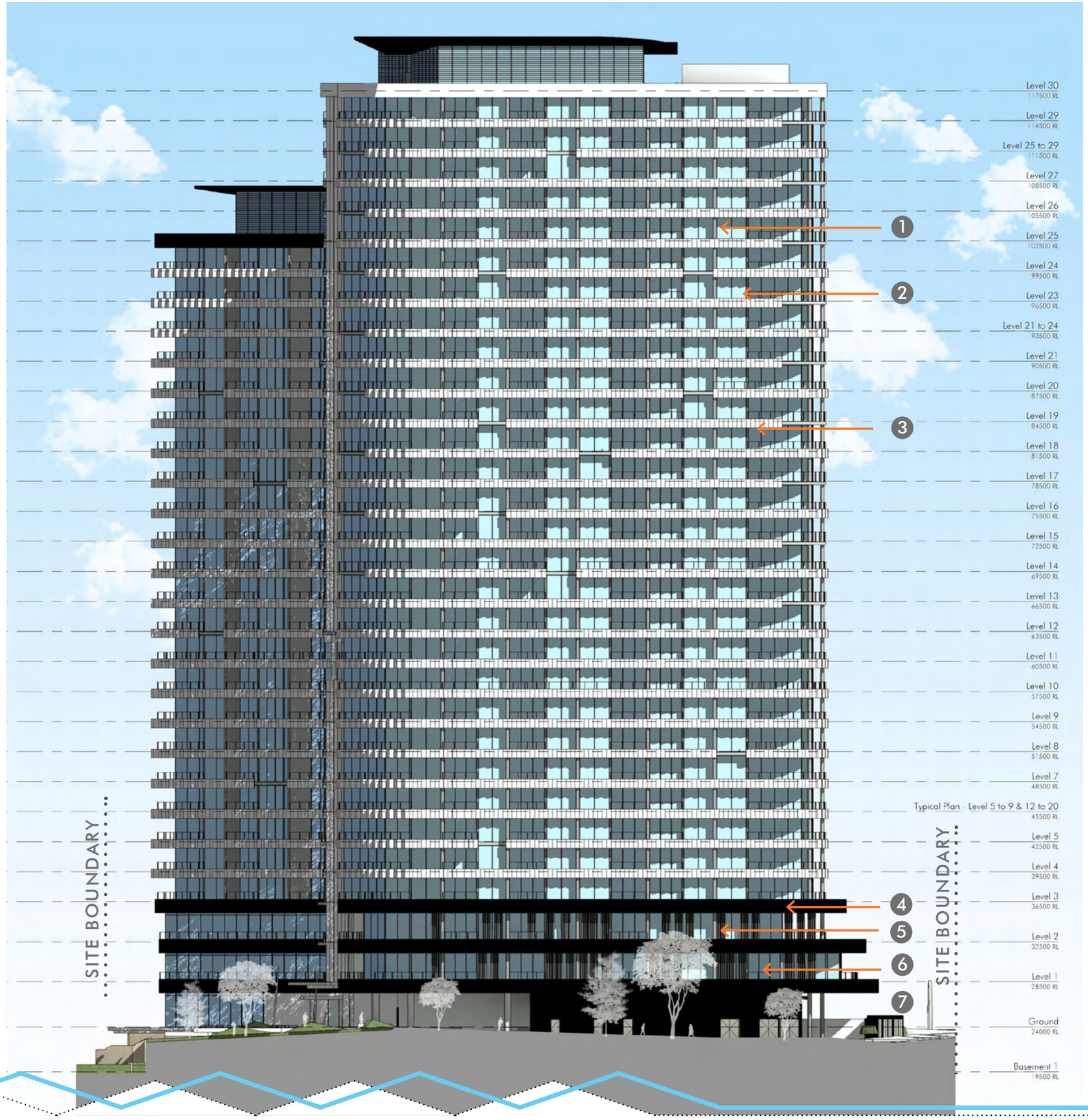
elevation three

south 1:400

legend

1. metal roof sheeting
2. aluminium louvres
3. curtain wall glazing
4. glazing with aluminium powdercoat finish
5. glass balustrade with powdercoat finish
6. concrete upstand, rendered and painted finish
7. landscaping
8. prefinished cladding

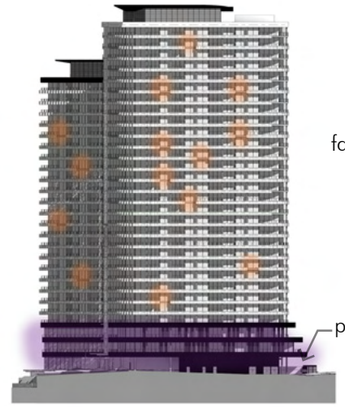
Cromwell



elevation four

east 1:400

facade variations



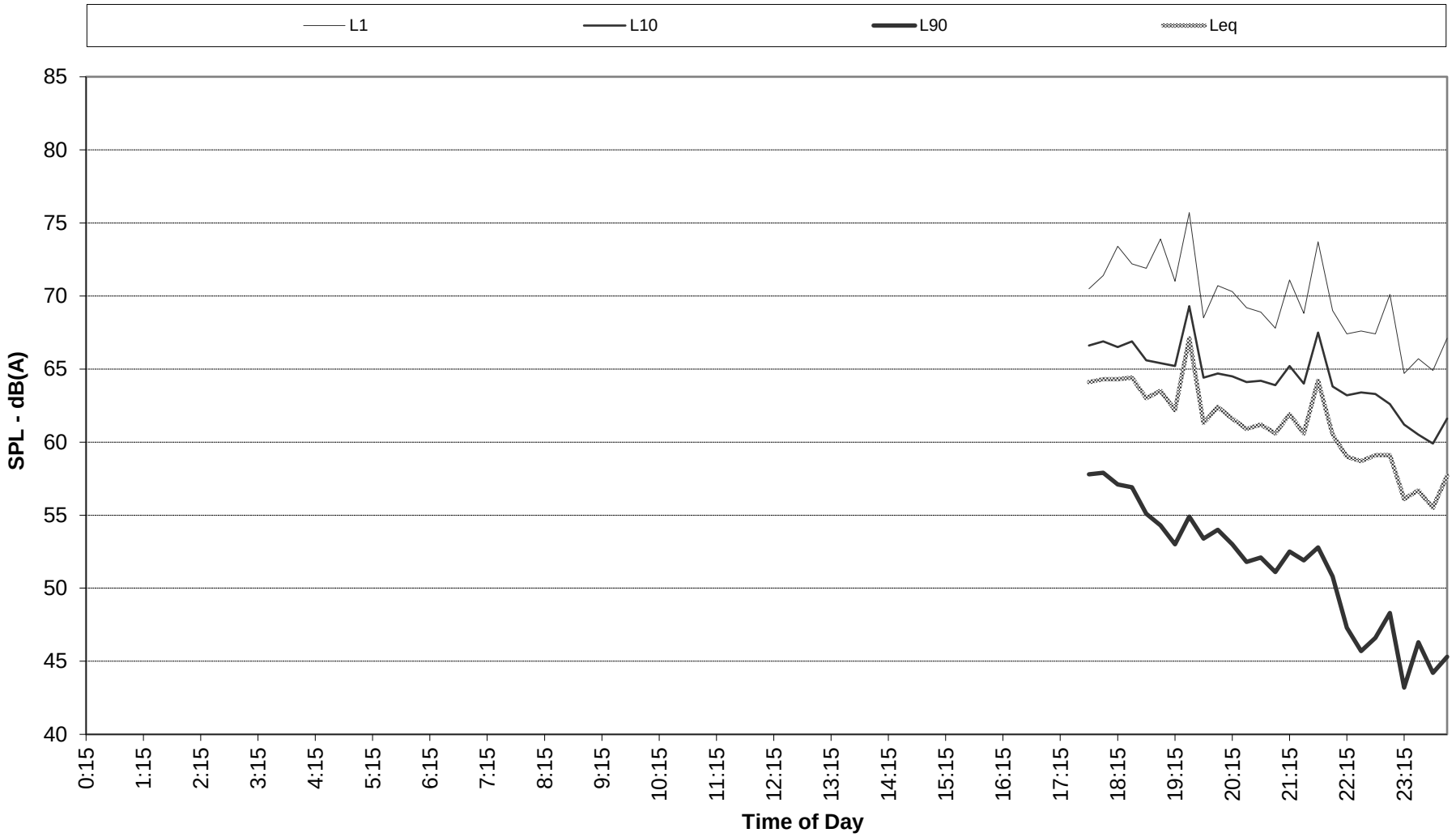
legend

1. glazing with aluminium powdercoat finish
2. glass balustrade with powdercoat finish
3. concrete upstand, rendered and painted finish
4. prefinished cladding
5. privacy screen
6. shopfront glazing
7. rendered and painted block wall

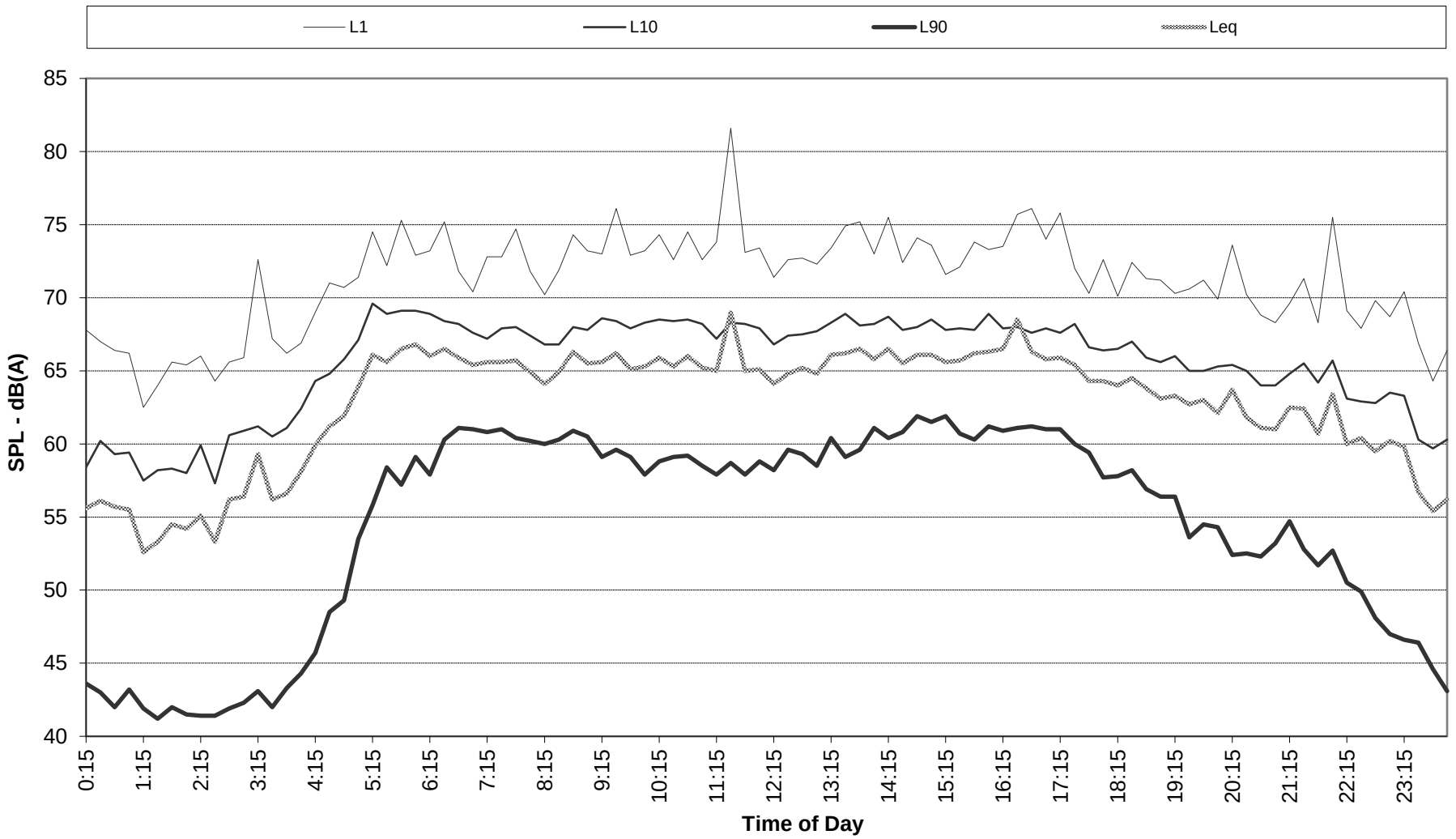
Attachment 2

Noise Datalogger Plots

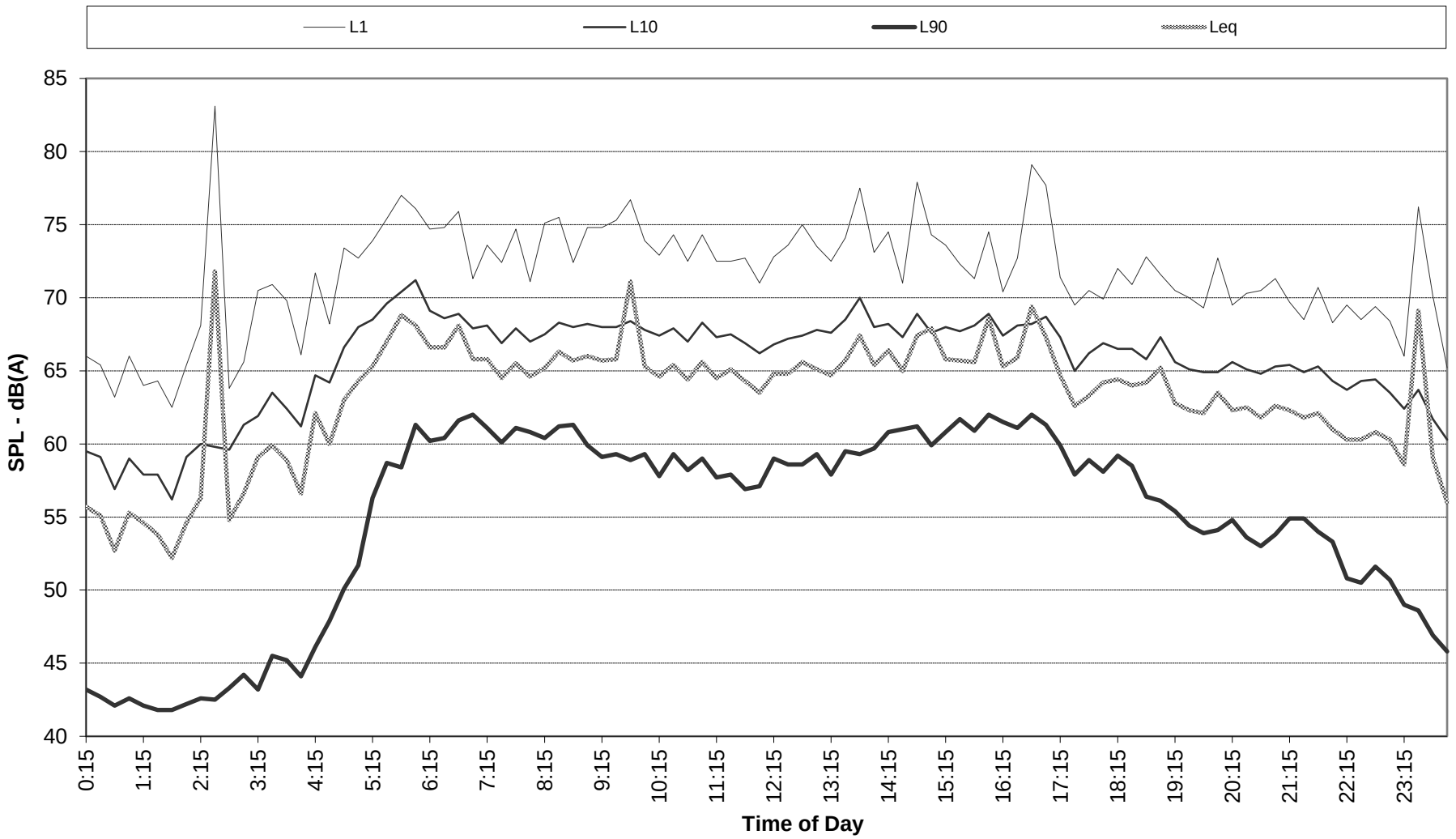
Recorded Statistical Noise Levels for Fortitude Valley 14-154 - - 20-Oct-2014 - Monday



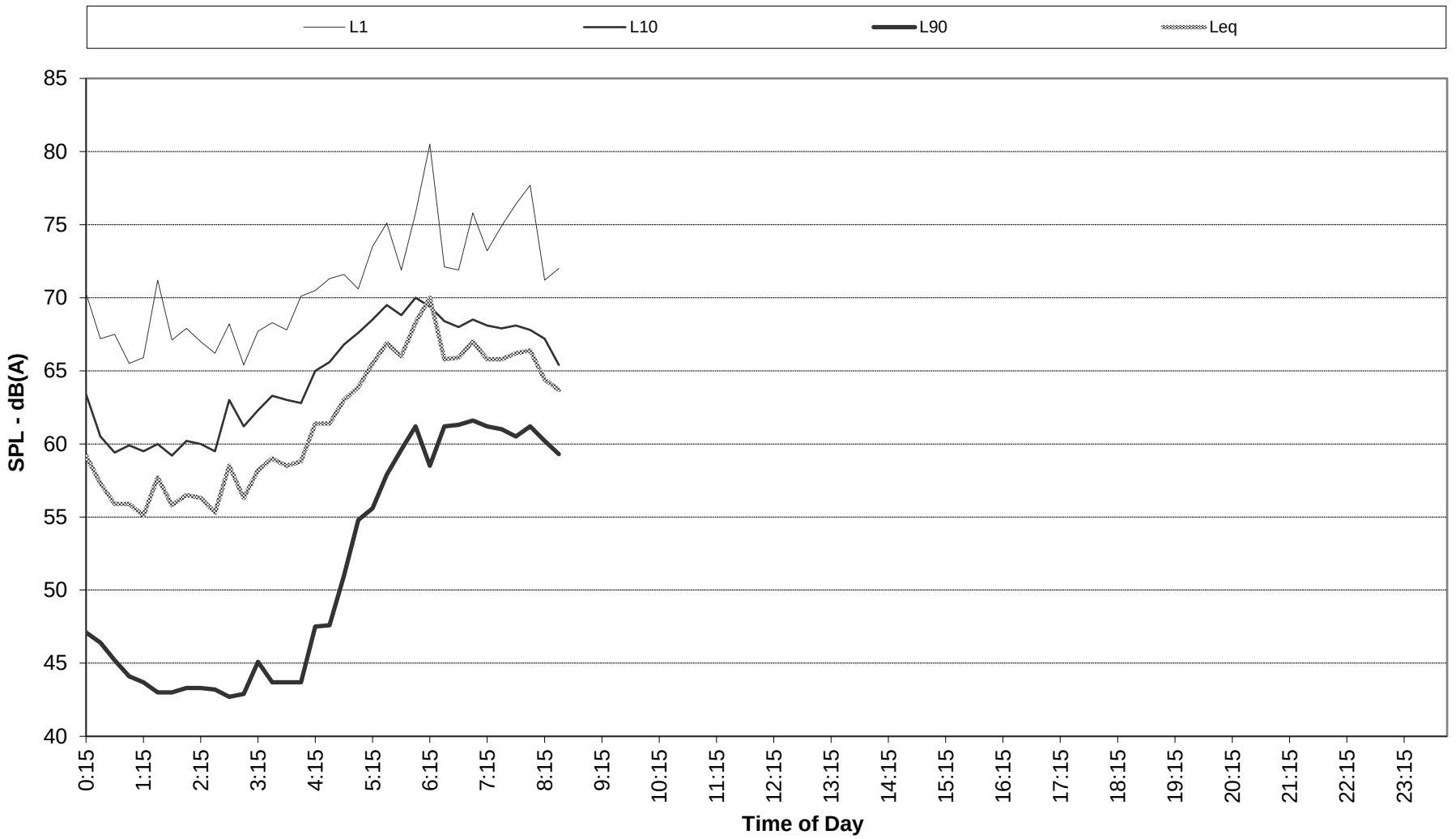
Recorded Statistical Noise Levels for Fortitude Valley 14-154 - - 21-Oct-2014 - Tuesday



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 Modelling Validation

Fortitude Valley 14-154
Proposed Mixed Use Development
527 Gregory Terrace

Existing Model Layout Validation Point Location

December 2014

Fortitude Valley
Run Info
Validation Model

Project description

Project title:	Fortitude Valley
Project No.:	14-154
Engineer:	Travis Carberry
Customer:	Cromwell

Description:

Run description

Calculation:	Single Point Sound
Title:	Validation Model
Group:	
Run file:	RunFile.runx
Result number:	2
Local calculation (ThreadCount=8)	
Calculation start:	27/11/2014 12:09:06 PM
Calculation end:	27/11/2014 12:09:21 PM
Calculation time:	00:00:192 [m:s:ms]
No. of points:	1
No. of calculated points:	1
Kernel version:	29/09/2014 (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	27/11/2014 11:40:58 AM	
- contains:		
Brunswick Street Existing.geo		27/11/2014 11:40:58 AM
Datalogger.geo	27/11/2014 11:10:46 AM	
Existing Site Buildings.geo	27/11/2014 10:52:54 AM	
Gregory Terrace Existing.geo		27/11/2014 11:40:58 AM
Spot Heights.geo	27/11/2014 9:30:10 AM	
Surrounding Buildings.geo	27/11/2014 10:52:54 AM	
RDGM0001.dgm	27/11/2014 9:34:10 AM	

Fortitude Valley
Assessed receiver levels
Validation Model

2

Name	L10(18h) dB(A)	
Datalogger	67.7	

Attachment 4

SoundPLAN 7.3 Modelling
Ultimate Traffic Noise Predictions


Signs and symbols
Road axis
Emission line
Main building
Point receiver
Fortitude Valley 14-154
Proposed Mixed Use
Development
527 Gregory Terrace
Predictions Model Layout
December 2014
Diggles Close
Water Street
Scale 1:1500
0 10 20 40 60

Fortitude Valley
Run Info
Ultimate Predictions

Project description

Project title:	Fortitude Valley
Project No.:	14-154
Engineer:	Travis Carberry
Customer:	Cromwell

Description:

Run description

Calculation:	Single Point Sound
Title:	Ultimate Predictions
Group:	
Run file:	RunFile.runx
Result number:	3

Local calculation (ThreadCount=8)

Calculation start:	27/11/2014 12:53:37 PM
Calculation end:	27/11/2014 12:54:02 PM
Calculation time:	00:09:567 [m:s:ms]
No. of points:	9
No. of calculated points:	9
Kernel version:	29/09/2014 (64 bit)

Run parameters

Reflection order	3	
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 Predictions.sit	27/11/2014 11:59:44 AM	
- contains:		
Spot Heights.geo	27/11/2014 9:30:10 AM	
Surrounding Buildings.geo	27/11/2014 10:52:54 AM	
Brunswick Street Ultimate.geo		27/11/2014 11:42:36 AM
Gregory Terrace Ultimate.geo		27/11/2014 11:42:36 AM
Development.geo	27/11/2014 11:59:44 AM	
RDGM0001.dgm	27/11/2014 9:34:10 AM	

Fortitude Valley
Assessed receiver levels
Ultimate Predictions

2

Name	Usage	Floor	Dir	L10(18h) dB(A)
Eastern Tower	GR	GF	NW	70.5
		F 1		70.4
		F 2		70.3
		F 3		70.2
		F 4		70.2
		F 5		70.0
		F 6		69.7
		F 7		69.5
		F 8		69.2
		F 9		69.0
		F 10		68.7
		F 11		68.5
		F 12		68.3
		F 13		68.0
		F 14		67.8
		F 15		67.6
		F 16		67.4
		F 17		67.2
		F 18		67.0
		F 19		66.8
		F 20		66.6
		F 21		66.4
		F 22		66.2
		F 23		66.1
		F 24		65.9
		F 25		65.7
		F 26		65.5
		F 27		65.4
		F 28		65.2
Eastern Tower	GR	GF	W	68.4
		F 1		69.2
		F 2		69.5
		F 3		69.8
		F 4		69.7
		F 5		69.6
		F 6		69.5
		F 7		69.3
		F 8		69.1
		F 9		68.9
		F 10		68.8
		F 11		68.6
		F 12		68.4
		F 13		68.2

Fortitude Valley
Assessed receiver levels
Ultimate Predictions

2

Name	Usage	Floor	Dir	L10(18h) dB(A)	
		F 14		68.0	
		F 15		67.8	
		F 16		67.6	
		F 17		67.4	
		F 18		67.2	
		F 19		67.0	
		F 20		66.8	
		F 21		66.7	
		F 22		66.5	
		F 23		66.3	
		F 24		66.1	
		F 25		65.9	
		F 26		65.8	
		F 27		65.6	
		F 28		65.4	
Eastern Tower	GR	GF	SE	46.3	
		F 1		46.7	
		F 2		47.3	
		F 3		47.8	
		F 4		48.3	
		F 5		48.9	
		F 6		49.6	
		F 7		50.3	
		F 8		51.2	
		F 9		52.1	
		F 10		53.0	
		F 11		53.9	
		F 12		54.7	
		F 13		55.3	
		F 14		55.8	
		F 15		56.2	
		F 16		56.5	
		F 17		56.8	
		F 18		57.0	
		F 19		57.2	
		F 20		57.4	
		F 21		57.5	
		F 22		57.6	
		F 23		57.8	
		F 24		57.9	
		F 25		57.9	
		F 26		58.0	
		F 27		58.1	

Fortitude Valley
Assessed receiver levels
Ultimate Predictions

Name	Usage	Floor	Dir	L10(18h) dB(A)	
		F 28		58.1	
Eastern Tower	GR	GF	NE	57.3	
		F 1		57.8	
		F 2		57.9	
		F 3		58.3	
		F 4		59.2	
		F 5		60.5	
		F 6		61.5	
		F 7		62.1	
		F 8		62.6	
		F 9		63.0	
		F 10		63.0	
		F 11		63.0	
		F 12		62.9	
		F 13		62.7	
		F 14		62.5	
		F 15		62.4	
		F 16		62.2	
		F 17		62.1	
		F 18		61.9	
		F 19		61.7	
		F 20		61.6	
		F 21		61.4	
		F 22		61.3	
		F 23		61.2	
		F 24		61.0	
		F 25		60.9	
		F 26		60.7	
		F 27		60.6	
		F 28		60.5	
Eastern Tower	GR	GF	SW	63.9	
		F 1		64.7	
		F 2		65.2	
		F 3		65.6	
		F 4		65.8	
		F 5		65.7	
		F 6		65.6	
		F 7		65.5	
		F 8		65.4	
		F 9		65.2	
		F 10		65.1	
		F 11		65.0	
		F 12		64.9	

Name	Usage	Floor	Dir	L10(18h) dB(A)	
		F 13		64.7	
		F 14		64.6	
		F 15		64.4	
		F 16		64.3	
		F 17		64.2	
		F 18		64.0	
		F 19		63.9	
		F 20		63.8	
		F 21		63.6	
		F 22		63.5	
		F 23		63.4	
		F 24		63.2	
		F 25		63.1	
		F 26		63.0	
		F 27		62.9	
		F 28		62.8	
Western Tower	GR	GF	S	67.4	
		F 1		67.6	
		F 2		67.7	
		F 3		67.8	
		F 4		67.9	
		F 5		67.9	
		F 6		67.8	
		F 7		67.7	
		F 8		67.5	
		F 9		67.4	
		F 10		67.2	
		F 11		67.0	
		F 12		66.9	
		F 13		66.7	
		F 14		66.5	
		F 15		66.4	
		F 16		66.2	
		F 17		66.0	
		F 18		65.8	
		F 19		65.6	
		F 20		65.5	
		F 21		65.3	
		F 22		65.1	
		F 23		64.9	
Western Tower	GR	GF	W	74.6	
		F 1		74.4	
		F 2		74.1	

Fortitude Valley
Assessed receiver levels
Ultimate Predictions

2

Name	Usage	Floor	Dir	L10(18h) dB(A)	
		F 3		73.8	
		F 4		73.5	
		F 5		73.1	
		F 6		72.8	
		F 7		72.5	
		F 8		72.2	
		F 9		71.8	
		F 10		71.5	
		F 11		71.2	
		F 12		70.9	
		F 13		70.7	
		F 14		70.4	
		F 15		70.1	
		F 16		69.9	
		F 17		69.6	
		F 18		69.4	
		F 19		69.2	
		F 20		68.9	
		F 21		68.7	
		F 22		68.5	
		F 23		68.3	
Western Tower	GR	GF	N	71.4	
		F 1		71.5	
		F 2		71.4	
		F 3		71.2	
		F 4		71.0	
		F 5		70.7	
		F 6		70.4	
		F 7		70.2	
		F 8		69.9	
		F 9		69.6	
		F 10		69.4	
		F 11		69.1	
		F 12		68.8	
		F 13		68.6	
		F 14		68.3	
		F 15		68.1	
		F 16		67.9	
		F 17		67.6	
		F 18		67.4	
		F 19		67.2	
		F 20		67.0	
		F 21		66.7	

Fortitude Valley
Assessed receiver levels
Ultimate Predictions

2

Name	Usage	Floor	Dir	L10(18h) dB(A)	
Western Tower	GR	F 22	E	66.5	
		F 23		66.4	
		GF		44.5	
		F 1		44.9	
		F 2		45.2	
		F 3		45.5	
		F 4		45.8	
		F 5		46.1	
		F 6		46.4	
		F 7		46.8	
		F 8		47.2	
		F 9		47.6	
		F 10		48.0	
		F 11		48.6	
		F 12		49.3	
		F 13		49.9	
		F 14		50.4	
		F 15		50.7	
		F 16		51.2	
		F 17		51.7	
		F 18		52.2	
		F 19		52.5	
		F 20		52.7	
		F 21		52.9	
		F 22		53.1	
		F 23		53.4	

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

Job: Fortitude Valley
Job #: 14-154
Date: 27/11/2014

Tower	Façade	Level	L10 18hr dB(A)	QDC MP4.4 Noise Category
Eastern Tower	Northwest	Level 1	68.0	Category 3
		Level 2	67.9	Category 3
		Level 3	67.8	Category 3
		Level 4	67.7	Category 3
		Level 5	67.7	Category 3
		Level 6	67.5	Category 3
		Level 7	67.2	Category 2
		Level 8	67.0	Category 2
		Level 9	66.7	Category 2
		Level 10	66.5	Category 2
		Level 11	66.2	Category 2
		Level 12	66.0	Category 2
		Level 13	65.8	Category 2
		Level 14	65.5	Category 2
		Level 15	65.3	Category 2
		Level 16	65.1	Category 2
		Level 17	64.9	Category 2
		Level 18	64.7	Category 2
		Level 19	64.5	Category 2
		Level 20	64.3	Category 2
		Level 21	64.1	Category 2
		Level 22	63.9	Category 2
		Level 23	63.7	Category 2
		Level 24	63.6	Category 2
		Level 25	63.4	Category 2
		Level 26	63.2	Category 2
		Level 27	63.0	Category 2
		Level 28	62.9	Category 2
		Level 29	62.7	Category 2
	West	Level 1	65.9	Category 2
		Level 2	66.7	Category 2
		Level 3	67.0	Category 2
		Level 4	67.3	Category 2
		Level 5	67.2	Category 2
		Level 6	67.1	Category 2
		Level 7	67.0	Category 2
		Level 8	66.8	Category 2
		Level 9	66.6	Category 2
		Level 10	66.4	Category 2
		Level 11	66.3	Category 2
		Level 12	66.1	Category 2
		Level 13	65.9	Category 2
		Level 14	65.7	Category 2
		Level 15	65.5	Category 2
		Level 16	65.3	Category 2
		Level 17	65.1	Category 2
		Level 18	64.9	Category 2
		Level 19	64.7	Category 2
		Level 20	64.5	Category 2
		Level 21	64.3	Category 2
		Level 22	64.2	Category 2
		Level 23	64.0	Category 2
		Level 24	63.8	Category 2
		Level 25	63.6	Category 2
		Level 26	63.4	Category 2
		Level 27	63.3	Category 2
		Level 28	63.1	Category 2
		Level 29	62.9	Category 2

Tower	Façade	Level	L10 18hr dB(A)	QDC MP4.4 Noise Category
Eastern Tower	Southeast	Level 1	43.8	Category 0
		Level 2	44.2	Category 0
		Level 3	44.8	Category 0
		Level 4	45.3	Category 0
		Level 5	45.8	Category 0
		Level 6	46.4	Category 0
		Level 7	47.1	Category 0
		Level 8	47.8	Category 0
		Level 9	48.7	Category 0
		Level 10	49.6	Category 0
		Level 11	50.5	Category 0
		Level 12	51.4	Category 0
		Level 13	52.2	Category 0
		Level 14	52.8	Category 0
		Level 15	53.3	Category 0
		Level 16	53.7	Category 0
		Level 17	54.0	Category 0
		Level 18	54.3	Category 0
		Level 19	54.5	Category 0
		Level 20	54.7	Category 0
		Level 21	54.9	Category 0
		Level 22	55.0	Category 0
		Level 23	55.1	Category 0
		Level 24	55.3	Category 0
		Level 25	55.4	Category 0
		Level 26	55.4	Category 0
		Level 27	55.5	Category 0
		Level 28	55.6	Category 0
		Level 29	55.6	Category 0
	Northeast	Level 1	54.8	Category 0
		Level 2	55.3	Category 0
		Level 3	55.4	Category 0
		Level 4	55.8	Category 0
		Level 5	56.7	Category 0
		Level 6	58.0	Category 1
		Level 7	59.0	Category 1
		Level 8	59.6	Category 1
		Level 9	60.1	Category 1
		Level 10	60.5	Category 1
		Level 11	60.5	Category 1
		Level 12	60.5	Category 1
		Level 13	60.4	Category 1
		Level 14	60.2	Category 1
		Level 15	60.0	Category 1
		Level 16	59.9	Category 1
		Level 17	59.7	Category 1
		Level 18	59.6	Category 1
		Level 19	59.4	Category 1
		Level 20	59.2	Category 1
		Level 21	59.1	Category 1
		Level 22	58.9	Category 1
		Level 23	58.8	Category 1
		Level 24	58.7	Category 1
		Level 25	58.5	Category 1
		Level 26	58.4	Category 1
		Level 27	58.2	Category 1
		Level 28	58.1	Category 1
		Level 29	58.0	Category 1

Tower	Façade	Level	L10 18hr	QDC MP4.4 Noise Category
			dB(A)	
Eastern Tower	Southwest	Level 1	61.4	Category 1
		Level 2	62.2	Category 1
		Level 3	62.7	Category 2
		Level 4	63.1	Category 2
		Level 5	63.3	Category 2
		Level 6	63.2	Category 2
		Level 7	63.1	Category 2
		Level 8	63.0	Category 2
		Level 9	62.9	Category 2
		Level 10	62.7	Category 2
		Level 11	62.6	Category 2
		Level 12	62.5	Category 2
		Level 13	62.4	Category 1
		Level 14	62.2	Category 1
		Level 15	62.1	Category 1
		Level 16	61.9	Category 1
		Level 17	61.8	Category 1
		Level 18	61.7	Category 1
		Level 19	61.5	Category 1
		Level 20	61.4	Category 1
		Level 21	61.3	Category 1
		Level 22	61.1	Category 1
		Level 23	61.0	Category 1
		Level 24	60.9	Category 1
		Level 25	60.7	Category 1
		Level 26	60.6	Category 1
		Level 27	60.5	Category 1
		Level 28	60.4	Category 1
		Level 29	60.3	Category 1

Tower	Façade	Level	L10 18hr dB(A)	QDC MP4.4 Noise Category
Western Tower	South	Level 1	64.9	Category 2
		Level 2	65.1	Category 2
		Level 3	65.2	Category 2
		Level 4	65.3	Category 2
		Level 5	65.4	Category 2
		Level 6	65.4	Category 2
		Level 7	65.3	Category 2
		Level 8	65.2	Category 2
		Level 9	65.0	Category 2
		Level 10	64.9	Category 2
		Level 11	64.7	Category 2
		Level 12	64.5	Category 2
		Level 13	64.4	Category 2
		Level 14	64.2	Category 2
		Level 15	64.0	Category 2
		Level 16	63.9	Category 2
		Level 17	63.7	Category 2
		Level 18	63.5	Category 2
		Level 19	63.3	Category 2
		Level 20	63.1	Category 2
		Level 21	63.0	Category 2
		Level 22	62.8	Category 2
		Level 23	62.6	Category 2
		Level 24	62.4	Category 1
	West	Level 1	72.1	Category 3
		Level 2	71.9	Category 3
		Level 3	71.6	Category 3
		Level 4	71.3	Category 3
		Level 5	71.0	Category 3
		Level 6	70.6	Category 3
		Level 7	70.3	Category 3
		Level 8	70.0	Category 3
		Level 9	69.7	Category 3
		Level 10	69.3	Category 3
		Level 11	69.0	Category 3
		Level 12	68.7	Category 3
		Level 13	68.4	Category 3
		Level 14	68.2	Category 3
		Level 15	67.9	Category 3
		Level 16	67.6	Category 3
		Level 17	67.4	Category 2
		Level 18	67.1	Category 2
		Level 19	66.9	Category 2
		Level 20	66.7	Category 2
		Level 21	66.4	Category 2
		Level 22	66.2	Category 2
		Level 23	66.0	Category 2
		Level 24	65.8	Category 2

Tower	Façade	Level	L10 18hr dB(A)	QDC MP4.4 Noise Category
Western Tower	North	Level 1	68.9	Category 3
		Level 2	69.0	Category 3
		Level 3	68.9	Category 3
		Level 4	68.7	Category 3
		Level 5	68.5	Category 3
		Level 6	68.2	Category 3
		Level 7	67.9	Category 3
		Level 8	67.7	Category 3
		Level 9	67.4	Category 2
		Level 10	67.1	Category 2
		Level 11	66.9	Category 2
		Level 12	66.6	Category 2
		Level 13	66.3	Category 2
		Level 14	66.1	Category 2
		Level 15	65.8	Category 2
		Level 16	65.6	Category 2
		Level 17	65.4	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	64.2	Category 2
		Level 23	64.0	Category 2
		Level 24	63.9	Category 2
	East	Level 1	42.0	Category 0
		Level 2	42.4	Category 0
		Level 3	42.7	Category 0
		Level 4	43.0	Category 0
		Level 5	43.3	Category 0
		Level 6	43.6	Category 0
		Level 7	43.9	Category 0
		Level 8	44.3	Category 0
		Level 9	44.7	Category 0
		Level 10	45.1	Category 0
		Level 11	45.5	Category 0
		Level 12	46.1	Category 0
		Level 13	46.8	Category 0
		Level 14	47.4	Category 0
		Level 15	47.9	Category 0
		Level 16	48.2	Category 0
		Level 17	48.7	Category 0
		Level 18	49.2	Category 0
		Level 19	49.7	Category 0
		Level 20	50.0	Category 0
		Level 21	50.2	Category 0
		Level 22	50.4	Category 0
		Level 23	50.6	Category 0
		Level 24	50.9	Category 0