

-7 SEP 2015

MEDQ

MULTI-UNIT RESIDENTIAL
153 CAMPBELL STREET, HERSTON



NOISE IMPACT ASSESSMENT

Commissioned by:	Sentinel Property Group
Date:	15 May 2015
Project number:	3818
Version:	V.2
Author:	Roger Hawkins

DOCUMENT INFORMATION				
Author: Roger Hawkins		Reviewed by: Eric Huang		
Date: 15 May 2015		Date: 15 May 2015		
VERSION HISTORY				
Version	Description	Date	Author	Reviewed by
V.0	Draft	16-04-15	Roger Hawkins	EH
V.1	Final	20-04-15	Roger Hawkins	EH
V.2	Final – Minor Edits	15-05-15	Roger Hawkins	EH
DOCUMENT DISTRIBUTION				
Copy	Name/Company	Hard Copy	Electronic Copy	
01	Sentinel Property Group	☐	☒	
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EXECUTIVE SUMMARY

Sentinel Citilink Pty Ltd are proposing a 14 storey short-term residential accommodation building with 3 levels of parking on a site located at 153 Campbell Street, Herston. The development site is formally described as Lot 1 on SP 193899.

Palmer Acoustics (Australia) Pty Ltd has been commissioned by Sentinel Citilink Pty Ltd to complete a noise impact assessment addressing noise associated with the proposed development. The report addresses:

- Ambient noise intrusion into the site;
- Noise emissions from the site to the surrounding environment;
- Recommended noise control measures to ensure compliance with relevant noise criteria.

The overall development site is subject to the Economic Development Act 2012 (administered by Economic Development Queensland (EDQ)) and development applications are to be made under this act. The site lies within the Bowen Hills Urbane Development Area Development scheme and falls within a mixed use zone. The zoning scheme is presented in Figure 2, below.

It is recommended that the acoustic requirements of the Brisbane City Council City Plan 2014 and the Queensland Development Code Mandatory Provisions 4.4 be applied to the development to meet the acoustic requirements of the Bowen Hills UDA Development Scheme.

Based on the results presented, the following conclusions can be drawn:

- The site is located in a Priority Development Area administered by Economic Development Queensland;
- The site is zoned as mixed use;
- The noise impacts onto and from the development can be appropriately considered under the criteria of the Brisbane City council City Plan 2014;
- Road traffic noise intrusion varies from NC1 to NC3 under a QDC MP4.4 evaluation.

To ensure compliance with the criteria of Economic Development Queensland for the control of noise intrusion and emission the following is recommended:

- All façade glazing achieve a minimum attenuation of 30dB;
- Façade elements be chosen to provide the attenuation levels of the Noise Category calculated for each floor/façade or as per an alternative solution;
- Site service access, i.e. refuse vehicles, trucks, etc., should only service the site from 6am to 6 pm.

Subject to the recommendation within the report, it is the opinion of Palmer Acoustics (Australia) Pty Ltd that the proposed development will comply with the requirements of Economic Development Queensland

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1.0 INTRODUCTION

Sentinel Citilink Pty Ltd are proposing a 14 storey short-term residential accommodation building with 3 levels of parking on a site located at 153 Campbell Street, Herston. The development site is formally described as Lot 1 on SP 193899. The site locality is shown on Figure 1, below.

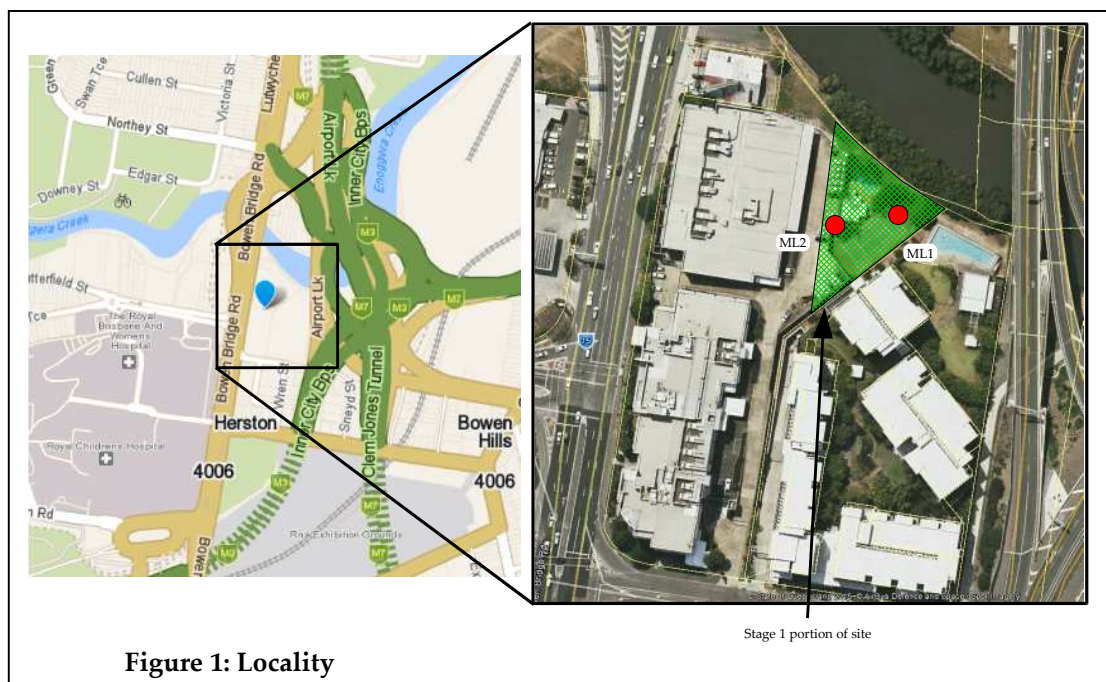
Palmer Acoustics (Australia) Pty Ltd has been commissioned by Sentinel Citilink Pty Ltd to complete a noise impact assessment addressing noise associated with the proposed development. The report aims to address

- Ambient noise intrusion into the site;
- Noise emissions from the site to the surrounding environment;
- Recommended noise control measures to ensure compliance with relevant noise criteria.

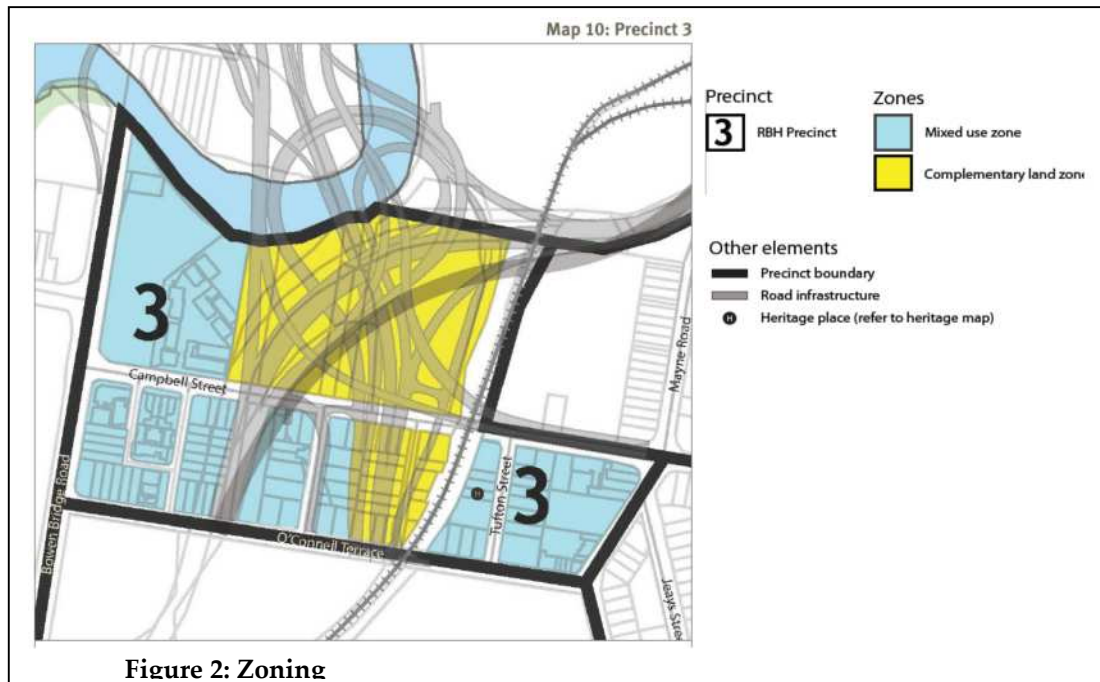
The overall development site is subject to the Economic Development Act 2012 (administered by Economic Development Queensland (EDQ)) and development applications are to be made under this act. The site lies within the Bowen Hills Urbane Development Area Development scheme and falls within a mixed use zone. The zoning scheme is presented in Figure 2, below.

1.1 Existing site and surroundings

The subject site is located to the east of Bowen Bridge Road to the south of Enoggera Creek. To the east is the inner-city bypass interchange with the Clem 7 tunnel and surrounding roadways. Campbell Street forms the southern boundary of the site. The site location is shown on Figure 1. The overall site is currently occupied commercial premises known as Citilink with the Stage 1 development site currently occupied by a tennis court and swimming pool.



The Bowen Hills Development Scheme zonings for the site are presented in Figure 2.



The site is subject to traffic noise intrusion from Bowen Bridge Road and the inner-city bypass interchange with the Clem 7 tunnel and surrounding roadways. The closest interchange roadway is the link from the bypass north to Lutwyche Road. This road way is elevated and provided with roadside acoustic barriers.

1.2 Proposed development

Stage 1 of the overall project is the construction of a 14 storey featuring:

- 10 levels of short-term residential accommodation;
- Roof terrace;
- Reception on Ground level 1;
- Car parking on Lower ground, ground and levels 1 & 2

The development is illustrated on sketches:

- Sketch 1 Site Plan
- Sketch 2 Ground Floor plan
- Sketch 3 Level 01 – Car parking
- Sketch 4 Floor Plans Typical level
- Sketch 5 Roof Plan

2.0 APPLICABLE ACOUSTIC STANDARDS

As noted above the site is identified as being within a Priority Development Area under the Economic Development Act 2012. Under this act the Bowen Hills Urbane Development Area Development scheme is applicable.

2.1 UDA Development Criteria

The land use plan, Section 3.9 Environment establishes general noise requirements:

The design, siting and layout of development must address noise impacts and where necessary incorporate appropriate noise mitigation measures.

Development is to achieve acceptable noise levels for noise sensitive uses in affected areas

The policy references the Environmental Protection (Noise) Policy 2008 for guidance with respect to acceptable noise levels.

In accord with recent approved noise impact assessment reports submitted to EDQ, we propose that the development be assessed for noise intrusion against the criteria of the Brisbane City Council. Specifically assessment will consider the requirements of the Brisbane City Council (BCC) City Plan 2014 overlays and codes:

- Transport noise corridor overlay
- Multiple Dwelling code; and
- Mixed use zone code.

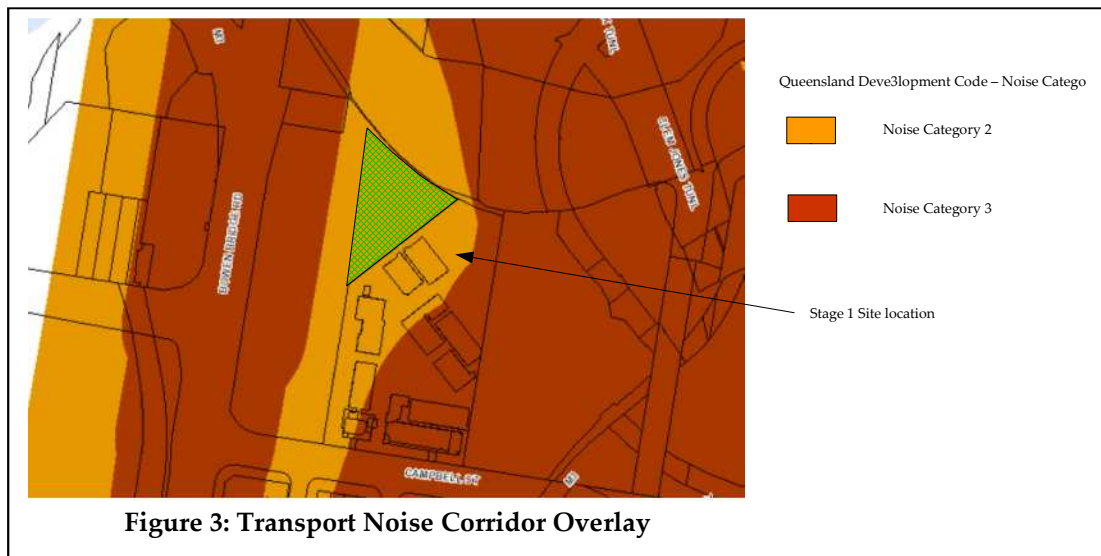
Application of the Transport noise corridor overlay will invoke assessment under the Queensland Development Code (QDC) mandatory provisions MP4.4 Buildings in a Transport Noise corridor.

2.2 QDC MP4.4

The road network surrounding the site is not gazetted under the Building Act and therefore MP4.4 provisions are not directly applicable. However the BCC provides a Transport Noise corridor overlay under the City Plan 2014 to guide in achieving similar noise attenuation outcomes. The overlay noise categories are presented in Figure 3, below.

The development site lies within Noise Category 2.

The overlay does not consider intervening buildings or the effect of greater building exposure with height. Accordingly an acoustic model was constructed of the surrounding road network to verify the applicability of the overlay.



3.0 AMBIENT AND ROAD TRAFFIC NOISE LEVEL MEASUREMENTS

3.1 Measurement Procedures

Ambient noise levels were measured over an eight day period commencing Tuesday 17th March 2015. The measurement locations are shown as ML1 & 2 on Figure 1 and are indicated in Figure 4. ML1 was selected as the environmental monitoring location as the most appropriate location considering security, exposure to on-site mechanical plant and general site access noise. ML1 was at ground level close to



Figure 4: ML1 Logger location

the Enoggera Creek boundary of the site separated as far as possible from on-site traffic movements and pedestrian activity. Examination of the logged record indicates that the tennis court was not used over the logging period. ML2 location was chosen as more directly exposed to traffic noise from the elevated interchange roadways. Where the logged record indicated close traffic movement and pedestrian activity data was removed from calculation.

Noise intrusion from Bowen Bridge Road was not monitored as Stage 1 will be shielded from traffic noise intrusion by existing buildings and by successive stages of the overall development.

The logged records are presented as Sketches 6 & 7

3.2 Instrumentation

The following instruments were used to measure the ambient noise levels:

- Convergent Instruments Noise Sentry RT (Palmer Acoustics NS4)
- Convergent Instruments Noise Sentry RT (Palmer Acoustics NS5)
- B & K 4231 Calibrator (serial number 2095146)

The operation of the sound level measuring equipment was field calibrated before and after each measurement session and was found to be within 0.2dB of the reference signal. The calibrator used in this assessment has a current calibration certificate from a certified NATA calibration laboratory. The data loggers used were selected owing to the lack of a secure, accessible logging location and have proven to be accurate and equivalent to traditional environmental loggers and are two of several used by Palmer Acoustics on a wide range of assessments.

4.0 AMBIENT NOISE LEVELS

The typical average ambient noise levels measured at ML1 are presented in Table 1. The noise sources present during the survey included:

- Road traffic noise;
- Noise from surrounding buildings.

Table 1: Measured Ambient Noise Levels ML1

Time	Measured Noise Levels ¹ dB(A) ²					
	L _{Amax} ³	L _{A01} ⁴	L _{A10} ⁵	L _{Aeq} ⁶	RBL ⁷	L _{Aeq adj T} ⁸
Day: 7 am to 6 pm	69	62	59	57	54	59
Evening: 6 pm to 10 pm	67	60	57	55	52	56
Night: 10 pm to 7 am	62	56	53	52	48	53

¹ Average noise levels throughout the period, with the exception of L_{A90} which is the average below the median noise levels for the period.

² dB(A) decibels, A-weighted

³ L_{Amax} refers to the maximum a-weighted sound pressure level occurring during the sampling period

⁴ L_{A01} for a specified time interval, means the A-weighted sound pressure level that is equalled for 1% of the interval

⁵ L_{A10} for a specified time interval, means the A-weighted sound pressure level that is equalled or exceeded for 10% of the interval

⁶ L_{Aeq} for a specified time interval, means the time average A-weighted sound pressure level, within the meaning given by AS1055.1 for the interval

⁷ RBL refers to the rating Background Level as defined in NIAPSP

⁸ L_{Aeq adj T} means the L_{Aeq} for the time period indicated, i.e. 11 hours day, 4 hours evening, 9 hours night.

5.0 ROAD TRAFFIC NOISE INTRUSION – MP4.4

5.1 Modelling Procedure

As noted above, the development is located within Noise Category 2 of the Transport Noise Corridor overlay.

To confirm the applicability of the overlay to the multiple levels of the development an acoustic model was constructed to predict noise level at individual levels utilising the PEN 3D2000 computer model. This program uses the algorithms from the *Calculation of Road Traffic Noise* UK Department of Transport (1992) traffic noise prediction model.

5.2 Existing and Future Traffic Volumes

The existing and future traffic flows for the surrounding roadways was obtained from the Clem 7 website and recent noise assessments in the area. Growth rates are taken to be annual compounding rates. Existing and predicted traffic volumes are set out in Table 2.

Table 2: Existing and future traffic flows

Road	AADT ⁹		Commercial Vehicles %	Speed Zone
	2015	2025		
Bowen Bridge Road	45332	49661	1.9%	60 kph
Campbell Street	7150	7832	3.8%	60 kph
ICB to Lutwyche Rd	17367	22002	21.5%	60 kph
ICB Northbound	28475	29161	12.6%	80 kph
ICB Southbound	27164	30045	14.2%	80 kph
Clem 7	25383	29548	5%	80 kph

5.3 Verification of Traffic Noise Model

To determine the validity of the model, the measured noise levels have been compared to the predicted noise levels for the existing scenario. Significant surrounding buildings were included in the modelling of the site. The road traffic noise prediction model predicted a noise level of 57.6 (free field) at ML2. This compares with a measured level of 57.5, within the 2dB margin of prediction error.

5.4 Predicted Noise impacts

Road traffic noise levels have been predicted for the 2025 scenario based on the traffic volumes presented in Table 2. Microphone heights were taken as 1.5m above finished floor level. The Noise impact predictions for the North East façade are presented in Table 3.

⁹ Annual average daily traffic volume

Table 3: Road Traffic Noise Impact Level Predictions

Level	RL	Predicted Noise Level dB(A) LA10 18 hour and Noise Category	
		North East Façade	West facade
Level 2	15.0	66 – NC2	61 – NC1
Level 3	18.0	67 - NC2	62 - NC1
Level 4	21.0	67 - NC2	62 - NC1
Level 5	24.0	68 - NC3	63 - NC2
Level 6	27.0	68 - NC3	63 - NC2
Level 7	30.0	71 - NC3	64 - NC2
Level 8	33.0	71 - NC3	64 - NC2
Level 9	36.0	71 - NC3	64 - NC2
Level 10	39.0	71 - NC3	66 - NC2
Level 11	42.0	71 - NC3	66 - NC2
Roof Terrace	45.0	59 - NC1	

5.5 Comment

As indicated in Table 3 the acoustic model confirms the BCC noise category assignment for most levels of the west façade and up to Level 4 on the more exposed NE façade. Noise impacts of up to NC3 are indicated for the upper levels of the NE façade.

Under the QDC MP4.4, the required attenuation specification of façade elements, e.g. glazing, may be taken from Schedule 1 of MP4.4, extracted as Table 4, below.

The Building act provides for alternate solutions to be presented. We propose that during detailed design the required façade element acoustic performance i.e. Rw value, be calculated in accordance with Australian Standard AS3671 1989 *Road Traffic Noise Intrusion – Building Siting and Construction*. This approach will allow specific performance levels to be calculated for individual elements, e.g. sliding exterior doors, and allow optimisation of façade elements. Objective internal levels, not given in MP4.4, will be as per the “recommended” levels from Table 1 of Australian Standard AS 2107 – 2000 Acoustics – Recommended design sound levels and reverberation times for building interiors. We propose design levels of:

- Living areas 40 dB(A) LAeq
- Sleeping areas 35 dB(A) LAeq
- Work areas, i.e. remaining habitable spaces 40 dB(A) LAeq

Table 4: Schedule 1: Extract from Queensland Development Code MP 4.4 page 8

Noise Category	Minimum transport noise reductions (dB(A)) required for habitable rooms	Component of building's external envelope	Minimum Rw required for each component
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

Noise Category	Minimum transport noise reductions (dB(A)) required for habitable rooms	Component of building's external envelope	Minimum Rw required for each component
			habitable room is less than or equal to 1.8m ²)
		External walls	47
		Roof	41
		Floors	45
		Entry door	33
Category 2	30	Glazing	35 (where total area of glazing for a habitable room is greater than 1.8m ²)
			32 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)
		External walls	41
		Roof	38
		Floors	45
		Entry door	33
Category 1	25	Glazing	27 (where total area of glazing for a habitable room is greater than 1.8m ²)
			24 (where total area of glazing for a habitable room is less than or equal to 1.8m ²)
		External walls	35
		Roof	35
		Entry door	28

6.0 NOISE INTRUSION BCC CODES

The property is considered to be located in a MU1 Mixed use zone (inner city) and consequently subject to the following overlays, and codes that are significant acoustically for a multiple dwelling:

- Multiple Dwelling code;
- Mixed use zone code.

6.1 Multiple Dwelling Code – Intrusion Criteria

As noted above we propose to apply the BCC Multiple Dwelling Code. The development will be appropriately considered as being in a mixed use zone. The acoustic performance requirement for the façades of multiple dwelling constructions in a mixed use zone is presented in code Performance Outcome PO41, extracted in Table 5, below.

Table 5: Extract from Table 9.3.14.3.A—Criteria for assessable development

Performance outcomes	Acceptable outcomes
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.	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.

The outcomes as above will be considered at detailed design alongside the outcomes of the optimised façade design. The performance requirements of the acceptable outcome are equal to the *Acceptable forms of construction* for MP4.4 Noise Category 2.

6.2 Noise from adjacent commercial uses

The stated intention of the performance outcome above is to protect the internal habitable spaces of a residential development within a mixed use zone from noise intrusion from external non-residential activities.

6.3 Noise Emission criteria – Centre or Mixed Use Code

Under the Centre or Mixed Use Code the noise emissions are to be controlled as described in Table 9.3.3.3.A, partially extracted as Table 6, below.

Table 6: Extract from Table 9.3.3.3.A—Criteria for self-assessable & assessable development

Performance outcomes	Acceptable outcomes
Section A—If for self-assessable or assessable development	
PO1 Development: (a) has hours of operation which are controlled so that the use does not detrimentally impact on the amenity of adjoining residents; (b) where not located in a Special entertainment precinct identified in a neighbourhood plan, does not result in noise emissions that exceed the noise (planning) criteria in Table 9.3.3.3.F low frequency noise criteria in Table 9.3.3.3.G and night-time noise criteria in Table	AO1.1 Development: (a) for accommodation activities, dwelling unit or emergency services has unlimited hours of operation; (b) for a club, if licensed, function facility, hotel or nightclub entertainment facility does not generate noise which is clearly audible and detectable, or impacts on the amenity of a resident, in a dwelling or other sensitive use; Note—Development for a club, if licensed,

Performance outcomes	Acceptable outcomes
Section A – If for self-assessable or assessable development	
9.3.3.3.H in a sensitive zone or a nearby sensitive use.	function facility, hotel or nightclub entertainment facility is not expected to achieve this outcome. (c) for any other use: (ii) where in the District centre zone, Neighbourhood centre zone or Mixed use zone: (A) has hours of operation, including for deliveries, which are limited to 6am to 10pm; or (B) does not generate noise which is clearly audible and disturbing in a dwelling or other sensitive use; (iii) where in any other zone: (A) has hours of operation, including for deliveries, which are limited to 6am to 8pm; or (B) does not generate noise which is clearly audible and disturbing in a dwelling or other sensitive use. AO1.2 Development ensures mechanical plant or equipment is acoustically screened from an adjoining sensitive use.

6.4 Mechanical Plant Emission Noise

Designs for mechanical services have not yet been completed and plant selections and locations are unknown. Therefore, we are only able to recommend design limits for the control of mechanical plant noise emissions at the nearest noise sensitive receptor.

From Table 6 we note that the noise emission criteria are met by acoustically screening mechanical plant. If detailed design is required the design criteria are extracted as Tables 7 - 9. Where values are derived from measured levels these have been added to the tables.

Table 7: Extract from Table 9.3.3.3.F – Noise (planning) criteria

Criteria location	Intrusive noise criteria	Acoustic amenity criteria		
	Day, evening and night $L_{Aeq,adj,T}$ are not greater than the RBL plus the value in this column for the relevant criteria location, where T equals: day – 11hr, evening – 4hr night – 9hr	Day	Evening	Night
At a sensitive use in the Mixed use zone	5dB(A) - 64dB(A) Day - 61 dB(A) Evening - 58 dB(A) Night	60dB(A)	55dB(A)	50dB(A)

Table 8: Extract from Table 9.3.3.3.G – Low frequency noise criteria

Criteria location	Day $L_{Ceq,adj,11hr}$ is not greater than the following values at the relevant criteria location	Evening $L_{Ceq,adj,4hr}$ is not greater than the following values at the relevant criteria location	Night $L_{Ceq,adj,9hr}$ is not greater than the following values at the relevant criteria location
At a sensitive use in the Mixed use zone	75dB(C)	75dB(C)	70dB(C)

Table 9: Extract from Table 9.3.3.3.H – Night-time noise criteria

Criteria location	Where the existing $L_{Aeq,9hr}$ night at the criteria location is:	Average of the highest 15 single L_{Amax} events over a given night (10pm–7am) period is not greater than the following values at the relevant criteria location	The absolute highest single L_{Amax} event over a given night (10pm–7am) period is not greater than the following values at the relevant criteria location
External to a sensitive use located in a: • High density residential zone;	45 to 60 dB(A)	L_{Aeq} 9 hour night +5dB(A) 58 dba	L_{Aeq} 9 hour night +10dB(A) 63 dba

To comply with these limits, there are a number of engineering solutions available. Low noise levels are achieved by the engineered selection and application of:

- Low sound power level equipment;
- Silencers;
- Acoustic enclosures;
- Noise barriers;
- Vibration isolation systems.

The application of such principles and treatments, along with providing maximum separation distances between noise sources and sensitive areas will ensure that noise from plant and equipment complies with limits.

6.5 Site vehicle access and parking

The proposed development includes four levels of car parking from basement to Level 1. Access to the parking is via an existing driveway from Campbell Street. Noise from the expected use is not expected to be greater than the existing use as a commercial driveway.

The required measures to control noise emissions from this source are expressed in Performance Outcome PO60 of the Centre or Mixed Use Code, extracted as Table 10, below.

Table 10: Extract from Table 9.3.3.3.A – Criteria for self-assessable & assessable development

Performance outcomes	Acceptable outcomes
Section A – If for self-assessable or assessable development	
PO60 Development of garages, driveways and parking structures minimise impacts on the amenity of neighbouring dwellings.	AO60.1 Development for a car park: (a) provides a 2m-high acoustic fence and a landscaped area 1.5m wide where located adjacent to a neighbouring dwelling; (b) is acoustically screened where the car park is used at night and where located adjacent to a neighbouring dwelling.
	AO60.2 Development for a driveway or vehicle movement area is screened by a 2m-high acoustic fence along the side or rear boundary if located adjacent to a residential dwelling.

The adjacent property on the eastern boundary of the driveway has its own vehicle access path along the boundary. Accordingly, from Table 10 AO60.2, there is no requirement for acoustic treatment of the driveway.

Site service access, i.e. refuse vehicles, trucks, etc., should only service the site 6am to 6 pm.

Noise emissions from the driveway onto the internal dwellings will be controlled by the required façade treatments for multiple dwellings in a mixed use zone.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results presented, the following conclusions can be drawn:

- The site is located in a Priority Development Area administered by Economic Development Queensland;
- The site is zoned as mixed use;
- The noise impacts onto and from the development can be appropriately considered under the criteria of the Brisbane City council City Plan 2014;
- Road traffic noise intrusion varies from NC1 to NC3 under a QDC MP4.4 evaluation.

To ensure compliance with the criteria of Economic Development Queensland for the control of noise intrusion and emission the following is recommended:

- All façade glazing achieve a minimum attenuation of 30dB;
- Façade elements be chosen to provide the attenuation levels of the Noise Category calculated for each floor/façade or as per an alternative solution;
- Site service access, i.e. refuse vehicles, trucks, etc., should only service the site from 6am to 6 pm.

Subject to the recommendation within the report, it is the opinion of Palmer Acoustics (Australia) Pty Ltd that the proposed development will comply with the requirements of Economic Development Queensland

Author:

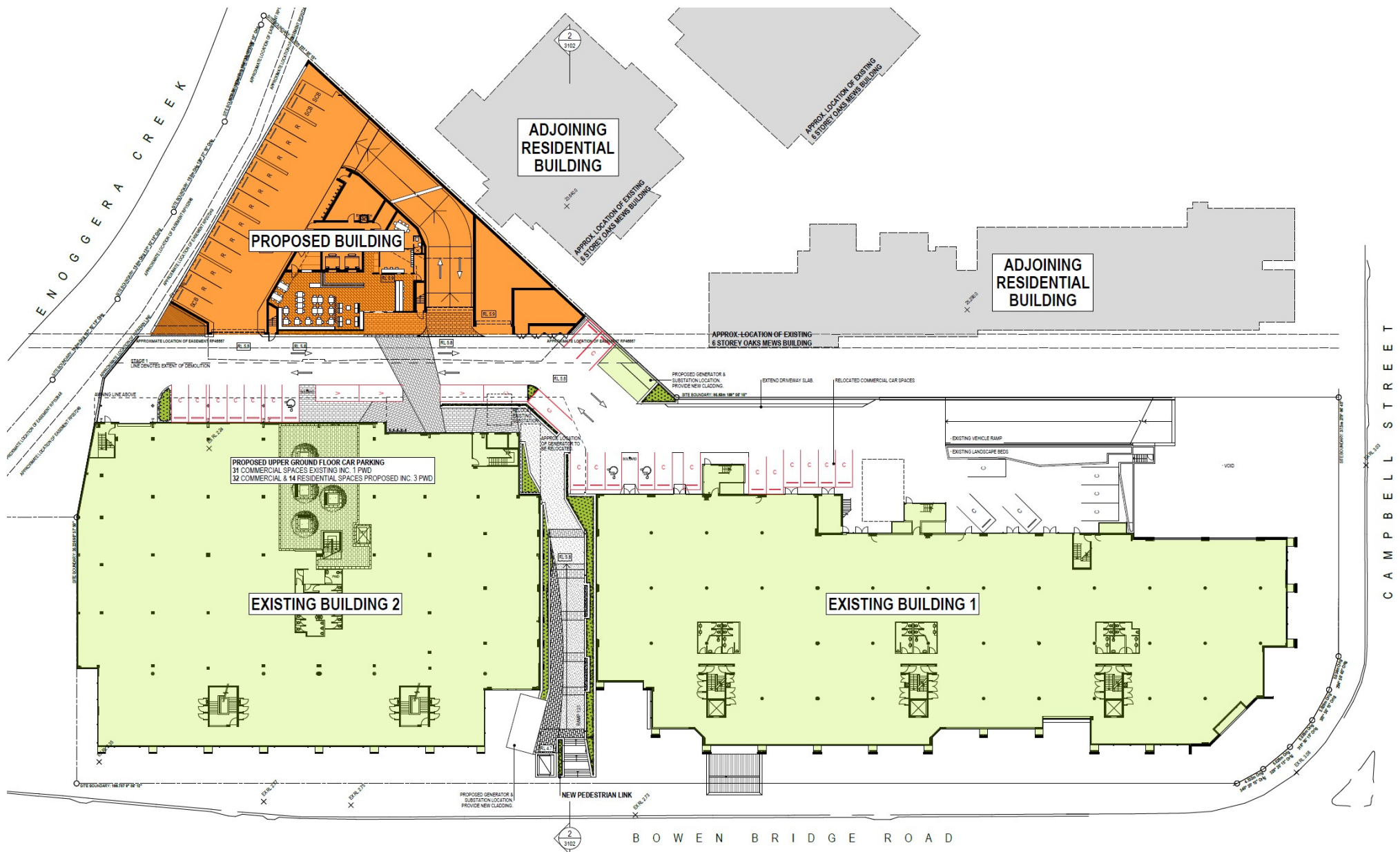


ROGER HAWKINS RPEQ 6022
Senior Engineer

Reviewed by:

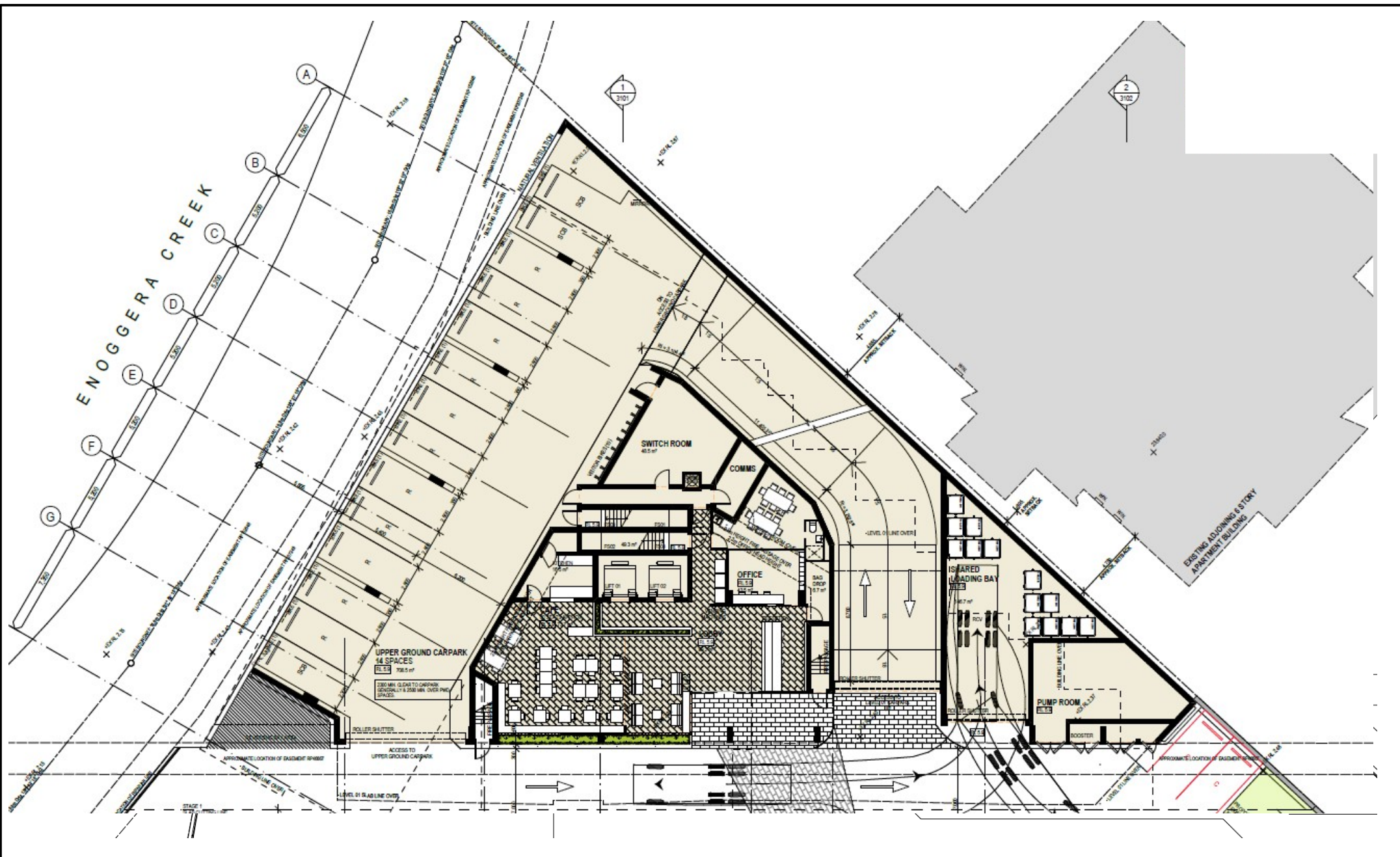


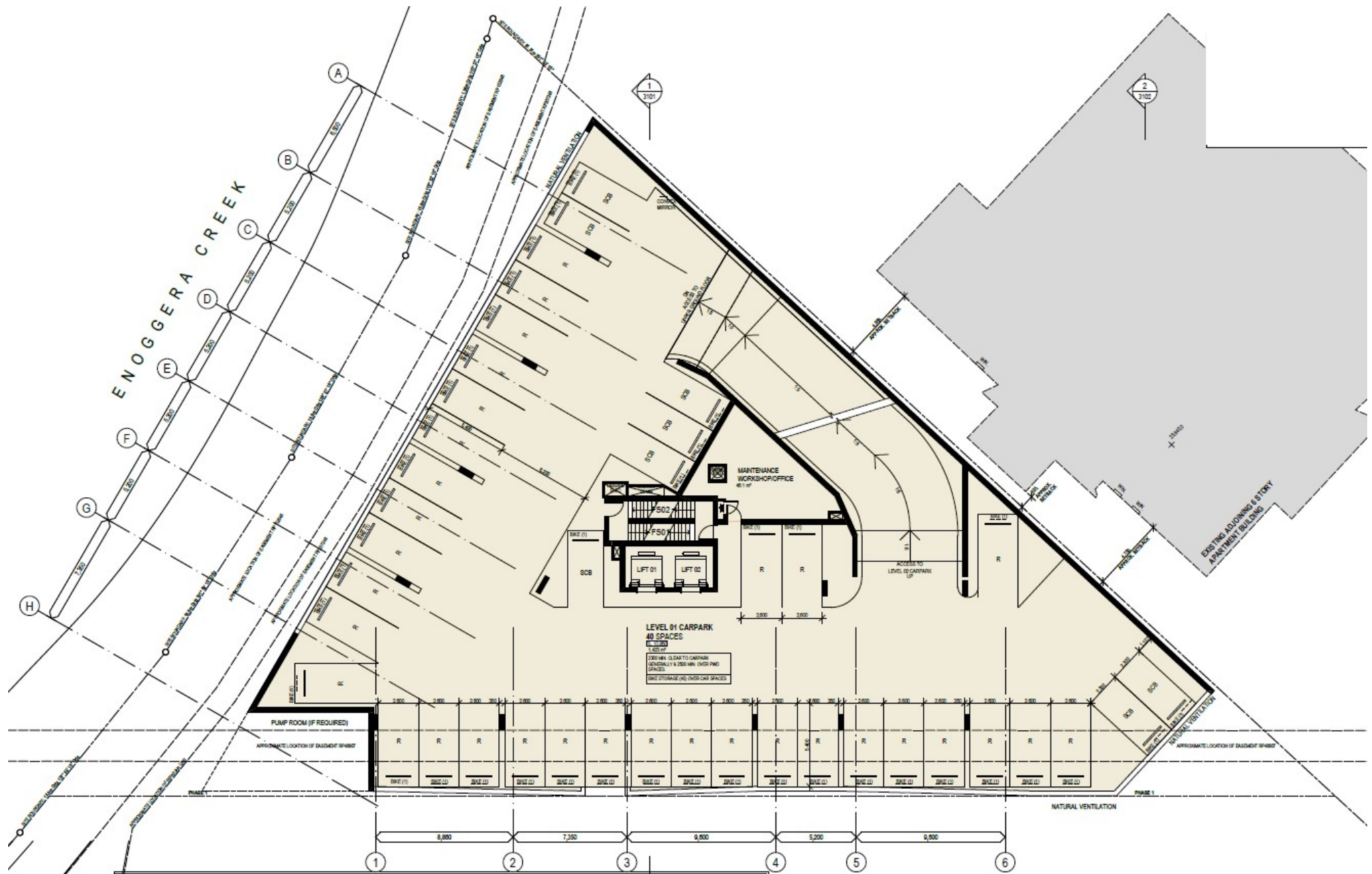
ERIC HUANG BEng
Engineer



SITE PLAN - UPPER GROUND FLOOR
SCALE 1:250 @ A1
SCALE 1:500 @ A3

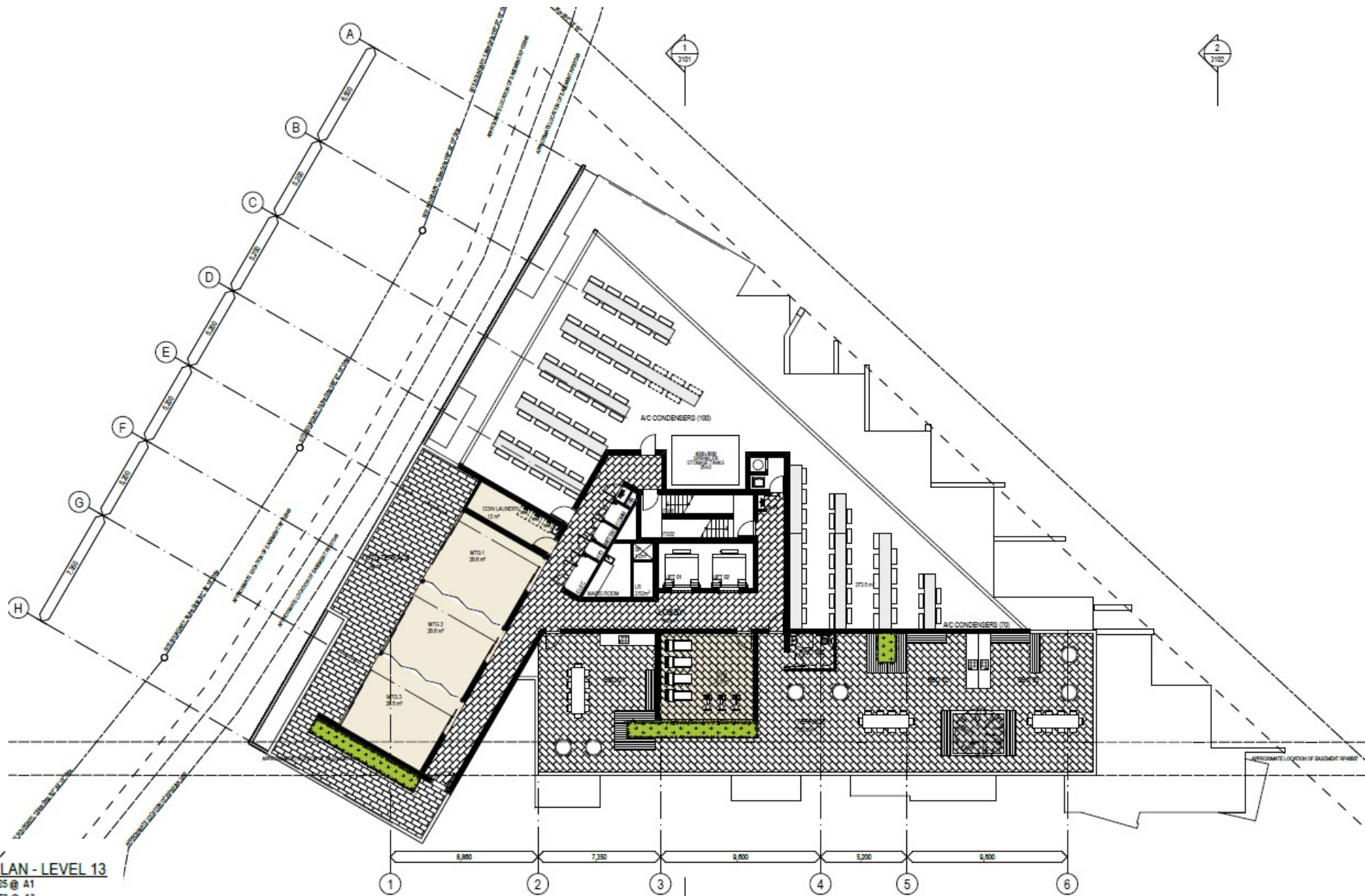
Title	Site plan	Sketch No.	1	Project No.	3818
Project	153 Campbell Road, Herston - Sentinel Citilink Development, Stage 1	Date	May 2015	Scale	NTS
www.palmeracoustics.com 24 Mexicanus Drive Park Ridge, QLD 4125 Australia p. (07) 3802 2155 enquiry@palmeracoustics.com					





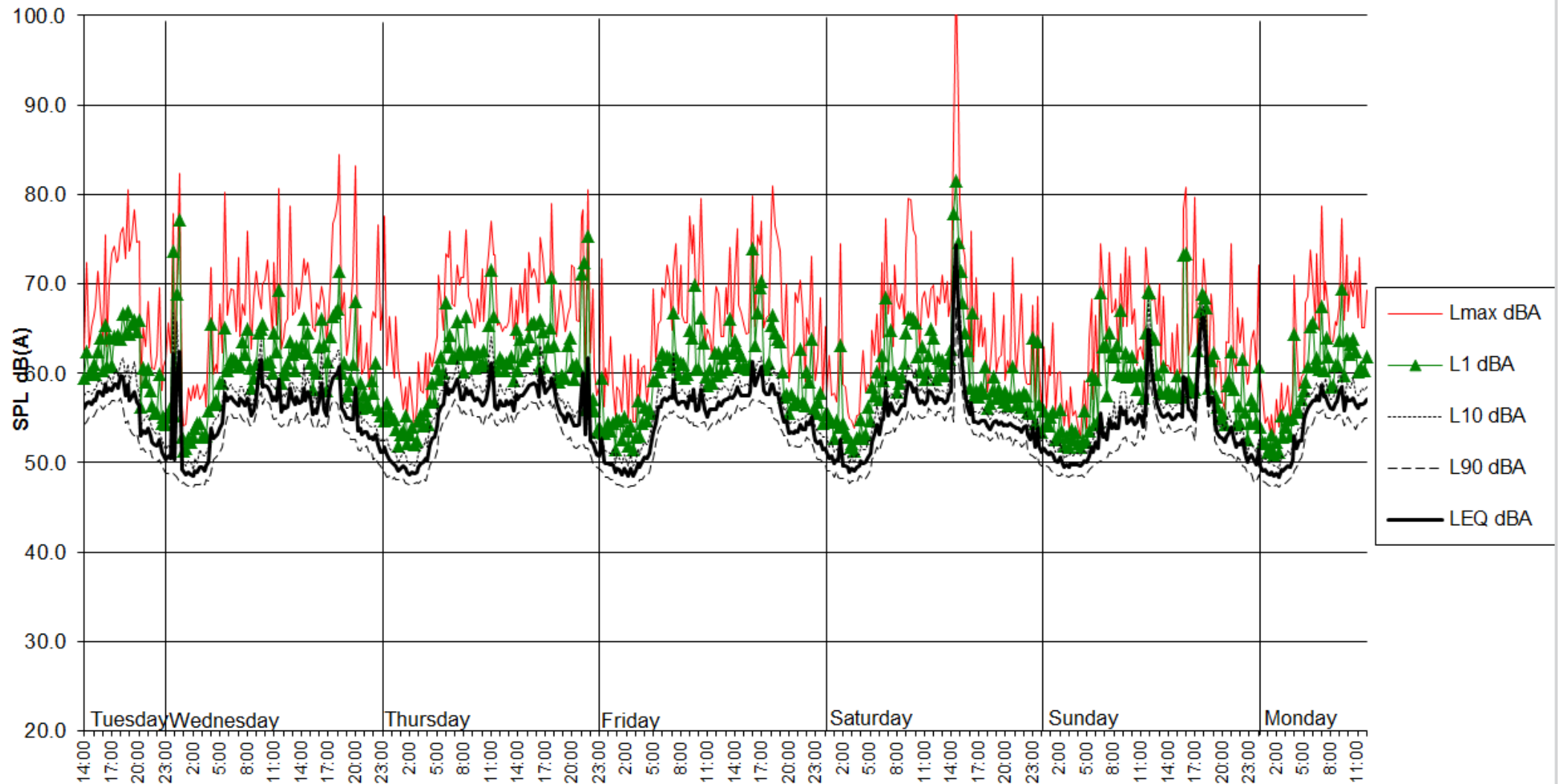


Title	Floor Plan – Typical level	Sketch No.	4	Project No.	3818
Project	153 Campbell Road, Herston - Sentinel Citilink Development, Stage 1	Date	May 2015	Scale	NTS
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Title	Roof level	Sketch No.	5	Project No.	3818
Project	153 Campbell Road, Herston - Sentinel Citilink Development, Stage 1	Date	May 2015	Scale	NTS
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3818 Citilink Tennis Court Ambient Logging, ML1, 17 to 23 March 2015



3818 Citilink Elevated Carpark **Ambient Logging, ML2, 17 to 23 March 2015**

