APPENDIX F

Acoustic Report prepared by Simpson Engineering Group

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Parkside Annandale – Proposed Retirement Village - Road Traffic Noise Investigation

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Contents

List of Tables

List of Figures

1 Introduction

Parkside Development Pty Ltd (Parkside) retained SEG Consulting Engineers to assess road traffic noise impacts onto a proposed retirement village situated at 33 University Road, Annandale. The site is partially within a noise corridor for a State-controlled road and the focus of this report is to determine the likely future road traffic noise levels and present a suitable noise mitigation strategy to comply with local and state guidelines.

1.1 Site Description

The subject site is part of 1SP343205 bounded by Stuart Drive to the east and University Road to the south, refer to Figure 1. The subject site is located approximately 7km south of Townsville CBD. The area is low lying with grassland and scattered trees.

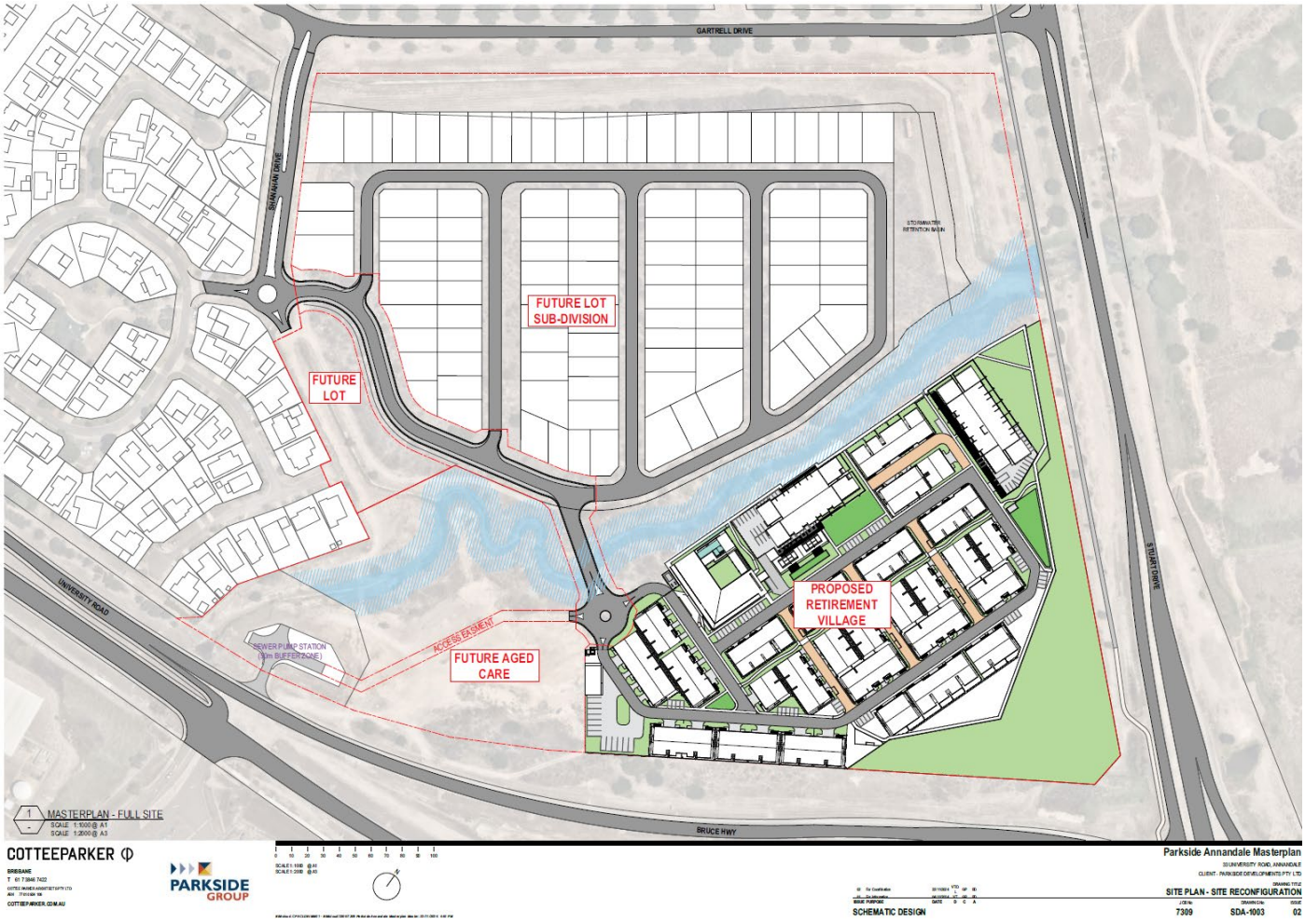

Figure 1: Site and Surroundings (Source: Project Architects – Cottee Parker)

The site partially within a Noise Corridor associated with a State-Controlled Road, refer to Figure 2.

Figure 2: State Controlled Noise Corridor (Source: State Planning Policy IMS)

1.2 Description of the Proposed Development

It is proposed to develop the retirement village precinct of the subject land. The precinct comprises villas, apartments and a community centre. Refer to the conceptual layout in Figure 3. The villas are all single storey structures, while the apartments comprise 3 levels.

Figure 3: Site Layout Schematic Design (Source Cottee Parker)

2 Noise Criteria

2.1 Road Traffic

Townsville City Council

Townsville City Plan (City Plan) 9.3.4 P022 states:

> *Reconfiguration of land potentially affected by the impacts of a transport corridor or other noise generating activities ensures the development is designed to facilitate adequate noise management.*
> ***Editor's note—****Applicants may be required to prepare a Noise impact assessment in accordance with the Development manual planning scheme policy no. SC6.4 - SC6.4.3.15 Noise and vibration assessment guidelines.*
>
> *... No acceptable outcome is nominated.*

Section P022 states:

Where they are used, noise attenuation measures are:

a) *compatible with the local streetscape and do not preclude the creation of active street frontages where desired;*
b) *durable and easily maintained; and*
c) *are designed to discourage crime and antisocial behaviour, having regard to:*
   (i) opportunities for graffiti;
   (ii) provision of casual surveillance of public open space and movement networks; and
   (iii) *opportunities for concealments or vandalism.*

Section SC6.4.4.15 Noise and Vibration assessments provides provide information to developers and other related parties for use during the planning, construction, and operational stages of a development. It contains information to ensure that development is managed in a way which prevents nuisance from the effects of noise and vibration on the health, community well-being and quality of life of an individual or the community, and wildlife.

This section of the City Plan does not specifically refer to road traffic noise impacts onto land to be developed for residential purposes, but refers to Queensland authorities and legislation inter alia :

- Department of Transport and Main Roads (DTMR) – Policy for development on land affected by environmental emissions from transport and transport infrastructure, 10 May 2013
- Department of Transport and Main Roads (DTMR) – Road Traffic Noise Management: Code of Practice
- Department of Transport and Main Roads, Main Roads Technical Standard, MRTS15 Noise Fences Environmental Protection Act 1994
- Queensland Development Code MP Part 4.4 – Buildings in a Transport Noise Corridor.

Other conditions of relevance to this development and contained in SC6.4.3.15.4 Noise and vibration impact assessments.

- (X) Subdivision layouts must be designed to ensure that acoustic mounds and acoustic fences over 1.8m are not included in lots with setbacks adjacent to the acoustic structure of 3m or less.

Queensland Development Code

From 1 September 2010 all new residential buildings and alterations e.g. renovations and additions to existing residential buildings in designated transport noise corridors need to comply with the Queensland Development Code (QDC) Mandatory Part (MP) 4.4 'Buildings in transport noise corridors.' Under the Code, buildings need to achieve certain levels of noise mitigation through the use of appropriate materials for the floor, walls, roof, windows and doors. QDC MP4.4 is a mandatory component of the Queensland Development Code. It applies consistently across the State to all new residential buildings and residential building renovations within designated Transport Noise Corridor (TNC). The designated corridors generally cover land within 100 m of a State-controlled road. This extends to 250 m where there are high noise levels due to significant volumes of traffic or high proportions of heavy vehicles (mainly along motorways and major arterials). Designated corridors can be amended as circumstances change.

TNC for State-controlled roads were designated by gazette on 13 August 2010. TNC for franchised roads were designated by gazette on 29 April 2011. A franchised road means a road to which a road franchise agreement applies. This is usually a toll road.

The Code applies to residential building development applications on properties located in transport noise corridors including houses, townhouses, units, hotels, and motels (Class 1–4 buildings). The requirements apply to new, renovated (where a building development application is required), relocated and pre-fabricated buildings. Work must be carried out in accordance with the requirements of the Code and Building certifiers are responsible for monitoring and certifying that the work complies.

The Code applies to renovations as far as is practical. Building certifiers will have the discretion to determine the type of works that can practically be required to bring the existing house up to the Code's standards. This may include acoustic seals for windows and entry doors, insulation in ceilings, walls (if possible) and under floors and new entry doors and glazing.

A single property can be partially within a transport noise corridor category or lie across multiple noise categories. In these cases, the requirements will depend on where the actual building is located. If the building sits wholly within a single noise category area on the property, then that noise category's requirements will apply, even though other parts of the property may be in a higher or lower noise category. A building that sits across multiple noise category areas will have to meet the requirements of the higher noise category.

Property owners and building designers have the choice to either adopt the Code's acceptable solution for the relevant noise category (which will be deemed to satisfy the performance requirement), or to have an acoustic assessment completed to identify alternative options for meeting the noise-reduction targets. ***Acoustic assessments can also be used to identify situations where a lower noise category might apply to the property and features such as other buildings, fences or topography may affect the noise levels experienced.***

The MP4.4 Noise category levels for road traffic noise are contained in Table 1.

Table 1: MP4.4. Buildings in A Transport Noise Corridor - Noise Category Levels

Noise Category	Level of transport noise ($L_{A10\ 18\ hour}$) – facade corrected
Category 4	≥ 73 dB(A)
Category 3	68 – 72 dB(A)
Category 2	63 – 67 dB(A)
Category 1	58 – 62 dB(A)
Category 0	≤ 57 dB(A)

A search of the QDC database has revealed that the site is located adjacent to a state-controlled road. Land designated as a Transport Noise Corridor may comprises land up to either 100 metres or 250 metres on both sides of State-controlled roads which are significantly affected by noise. The corridor width near the subject site is 100m. Thus, the QDC MP4.4 applies to a zone up to 100m from both the Bruce Highway (University Road) and Stuart Drive.

Australian Standard AS2107

Australian Standard AS2107 – 2016 "Acoustics—Recommended design sound levels and reverberation times for building interiors" contains design noise levels for various classes of buildings and occupancies. The Standard identifies two noise level design goals namely the *Maximum* and the *Satisfactory* design sound level. The Maximum design sound level is defined as the level of noise above which most people occupying the space start to become dissatisfied with the level of noise. The *Satisfactory* design sound level is defined as the level of noise that has been found to be acceptable and not intrusive by most people for the environment in question. **Table 1** provides an extract from the Standard for Residential buildings adjacent to major roads. The noise level is expressed in terms of the L_{Aeq} which the energy average noise level over the period in question.

Table 1: Recommended design sound levels (ref AS2107 - 2016)

Type of Occupancy	Recommended design sound level L_{Aeq} [dB(A)]	
	Satisfactory	Maximum
Houses and apartments near minor roads – living areas	30	40
Houses and apartments near major roads – sleeping areas	30	35

The appropriate design sound level for this building for quasi-continuous noise (road traffic noise) is the maximum recommended design sound level, namely an L_{Aeq} of 35 dB(A) for sleeping areas and 40 dB(A) for living areas.

State Development Code 1.

The purpose of this code is to protect the safety, function and efficiency of state-controlled roads, future state-controlled roads, road transport infrastructure, active transport infrastructure and public passenger services on state-controlled roads from adverse impacts of development. The code is intended to protect the safety of people using, and living or working near, state-controlled roads. Refer to Table 2 for the Road Noise Performance and Acceptable Outcomes.

Table 2: SDC 1 - Traffic Noise Performance and Acceptable Outcomes

Material change of use (accommodation activity) Involving the creation of 6 or more new residential lots adjacent to a state-controlled road or type 1 multi-modal corridor	
PO38 Reconfiguring a lot minimises free field noise intrusion from a state-controlled road.	AO38.1 Development provides noise barrier or earth mound which is designed, sited and constructed: 1) to achieve the maximum free field acoustic levels in reference table 3 (item 2.1); 2) in accordance with: a) Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; b) Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; c) Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO38.2 Development achieves the maximum free field acoustic levels in reference table 2 (item 2.1) by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
Material change of use (accommodation activity)	

Ground floor level requirements adjacent to a state-controlled road or type 1 multi-modal corridor	
PO39 Development minimises noise intrusion from a state-controlled road in private open space.	AO39.1 Development provides a noise barrier or earth mound which is designed, sited and constructed: 1. to achieve the maximum free field acoustic levels in reference table 3 (item 2.2) for private open space at the ground floor level; 2. in accordance with: a) Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; b) Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019; c) Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO39.2 Development achieves the maximum free field acoustic level in reference table 2 (item 2.2) for private open space by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
PO40 Development (excluding a relevant residential building or relocated building) minimises noise intrusion from a state controlled road in habitable rooms at the facade.	AO40.1 Development (excluding a relevant residential building or relocated building) provides a noise barrier or earth mound which is designed, sited and constructed: 1. to achieve the maximum building façade acoustic level in reference table 1 (item 1.1) for habitable rooms; 2. in accordance with: b) Chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice: Volume 1 (Road Traffic Noise), Department of Transport and Main Roads, 2013; c) Technical Specification-MRTS15 Noise Fences, Transport and Main Roads, 2019;

	d) Technical Specification-MRTS04 General Earthworks, Transport and Main Roads, 2020. OR AO40.2 Development (excluding a relevant residential building or relocated building) achieves the maximum building façade acoustic level in reference table 1 (item 1.1) for habitable rooms by alternative noise attenuation measures where it is not practical to provide a noise barrier or earth mound.
PO41 Habitable rooms (excluding a relevant residential building or relocated building) are designed and constructed using materials to achieve the maximum internal acoustic level in reference table 3 (item 3.1).	No acceptable outcome is provided.
Above ground floor level requirements (accommodation activity) adjacent to a state-controlled road or type 1 multi-modal corridor	
PO42 Balconies, podiums, and roof decks include: 1. a continuous solid gap-free structure or balustrade (excluding gaps required for drainage purposes to comply with the Building Code of Australia); 2. highly acoustically absorbent material treatment for the total area of the soffit above balconies, podiums, and roof decks.	No acceptable outcome is provided.
PO43 Habitable rooms (excluding a relevant residential building or relocated building) are designed and constructed using materials to achieve the maximum internal acoustic level in reference table 3 (item 3.1).	No acceptable outcome is provided.

Table 3: Maximum free field acoustic levels (Source extract of Table 2 of SDC 1)

Applicable Use	Acoustic Levels
2.1: Private open space for residential lots	a. ≤57 dB(A) L10 (18 hour) free field (measured L90 (18 hour) free field between 6am and 12 midnight ≤45 dB(A)) OR b. ≤60 dB(A) L10 (18 hour) free field (measured L90 (18 hour) free field between 6am and 12 midnight >45 dB(A))
2.2: Private open space for an accommodation activity (including lots created for a future accommodation activity)	

Table 4: Maximum building facade acoustic levels (Source extract of Table 1 of SDC 1)

Applicable Use	Acoustic Levels
2.1: Private open space for residential lots	a. ≤60 dB(A) L10 (18 hour) façade corrected (measured L90 (8 hour) free field between 10pm and 6am ≤40 dB(A)) OR b. ≤63 dB(A) L10 (18 hour) façade corrected (measured L90 (8 hour) free field between 10pm and 6am >40 dB(A))

Road Traffic Noise Management (DTMR)

The DTMR Code of Practice (CoP) aims to demonstrate the compliance of the Queensland Department of Transport and Main Roads with its General Environmental Duty as required by the Environmental Protection Act (1994), by assisting understanding of assessment and management of the impact of road traffic noise on the built environment. It is specifically aimed at State-Controlled road network.

Specific mentions of relevance to this report include:

- For residential subdivisions where the finished floor level is not known, the receptor heights shall be assumed at 1.8 m and 4.6 m above an assumed building pad level, for ground and upper floors respectively.
- Pad levels
- Proposed finished floor levels
- Existing dwellings and buildings that will be retained may be included in an acoustical assessment. Future dwellings or buildings shall not be included in an acoustical assessment.

The CoP does not provide specific goals for road traffic noise for the case of a residential development along a state controlled road. Rather it places the onus on the developer to determine an effective mitigation strategy comprising a combination of acoustic walls, building design and layouts to achieve the General Environmental Duty. However, this approach may be guided by earlier versions of the CoP which indicated the noise goal for Precinct 4 to be:

1. An $L_{10\ (18\ hour)}$ of 60 dB(A) façade corrected noise level at the future dwelling façade, or
2. Where the external noise level goal cannot be met, to comply with the internal noise level goals of AS2107 of 1987

Summary Noise Goals

City Plan addresses traffic noise impacts under the reconfiguration of lot code. The code indicates the impacts from a "traffic corridor" are to be assessed. However, SDC 1 and DTMR assessment process also applies to State controlled road corridors. The Queensland Development Code MP4.4 also only applies to state-controlled roads up to a distance of 100m from the road centreline.

The existing $L_{90(18\ hour)}$ for the vacant undeveloped site has not been measured since thre is a substantial reconstruction of Stuart Road at present. However, the noise levels are likely to be high given the proximity of the site to the Bruce Highway. It is considered that the desired road traffic noise level goal for outdoor entertaining areas with the provision of a practical noise barrier is 60 dB(A) $L_{10(18\ hour)}$ free field or 63 dB(A) façade corrected. It should be noted that this noise level is mostly comprises QDC Category 1, i.e. there is no additional cost penalties when building dwellings within Category 1 since it only requires standard building treatments readily available in Townsville.

The existing $L_{90(8\ hour)}$ for a vacant undeveloped site is has not been measured but based on experience elsewhere it is expected to exceed 40 dB(A). This would suggest the acceptable outcome with the provision of a practical noise barrier would be a road traffic noise level goal of 60 dB(A) free field or 63 dB(A) façade corrected. It is likely in the future, when this and other nearby sites have been developed the background noise level at night will further increase due to additional noise sources in the area such:

- as human habitation,
- pets,
- air conditioning, and;
- increase in distant road traffic at night.

In this instance a 4m high noise barrier is considered to be a site/region appropriate maximum height for noise barriers on the subject site.

It is understood that the intent of the City Plan is to provide similar levels of protection for residences further from the road than 100m and up to 250m. The main influencing factors being to ensure:

- That the inside of buildings complies with the intent of QDC MP4.4 (QDC MP4.4 equivalent); and,

- That noise barriers are designed to comply with City Plan P022 including "*compatible with the local streetscape and do not preclude the creation of active street frontages where desired*"

Consequently, the noise barriers nominated for this project are designed to mitigate traffic noise from the State Controlled Roads with the intent to mitigate direct external impacts for residential allotments and to design the residence facades to ensure acceptable internal noise levels using standard building controls. A façade corrected road traffic noise level of 63 dB(A) and a maximum noise barrier height of 4m satisfies this balance.

3 Existing Road Traffic Noise Levels

The site was visited on Friday 15 Nov 2024. It was noted there was road reconstruction taking place on Stuart Road. The Townsville Connection Road is being upgraded to dual lanes between University Road and Bowen Road Bridge. The project includes upgrades at 3 intersections: Gartrell Drive, Mervyn Crossman Drive/Fairfield Waters Drive and Kokoda Street. These construction works made it unsuitable to carry out a baseline noise survey due to changes in traffic and road construction noise. Even at the western end of the site, construction noise was clearly audible.

4 Traffic Noise Modelling

4.1 Traffic Noise Parameters

Traffic volume, traffic speed, traffic distribution and road pavement are the key parameters associated with noise from roadways.

AADT Traffic

Traffic volumes are typically described in terms of the Annual Average Daily Traffic (AADT). This is the total traffic over 24 hours and comprises all vehicles. The noise from traffic is typically referred to in terms the $L_{A10(18\ hour)}$, i.e. the average of the hourly L_{10}'s between 6 am and midnight. The 18-hour traffic is taken to be 96% of the AADT. Traffic engineering reports often focus on peak hour congestion issues and consequently provide peak hour traffic. The common rule of thumb to convert peak hour to an AADT is to multiply peak hour by 10.

The traffic volume of relevance to this project are:

1. Year 2034, representing the traffic volume at least 10 years after opening and the design year for noise assessments.

The traffic flow has been based on the TMR traffic census information for Bruce Highway and Stuart Road, refer to Figure 4Figure 5 respectively.

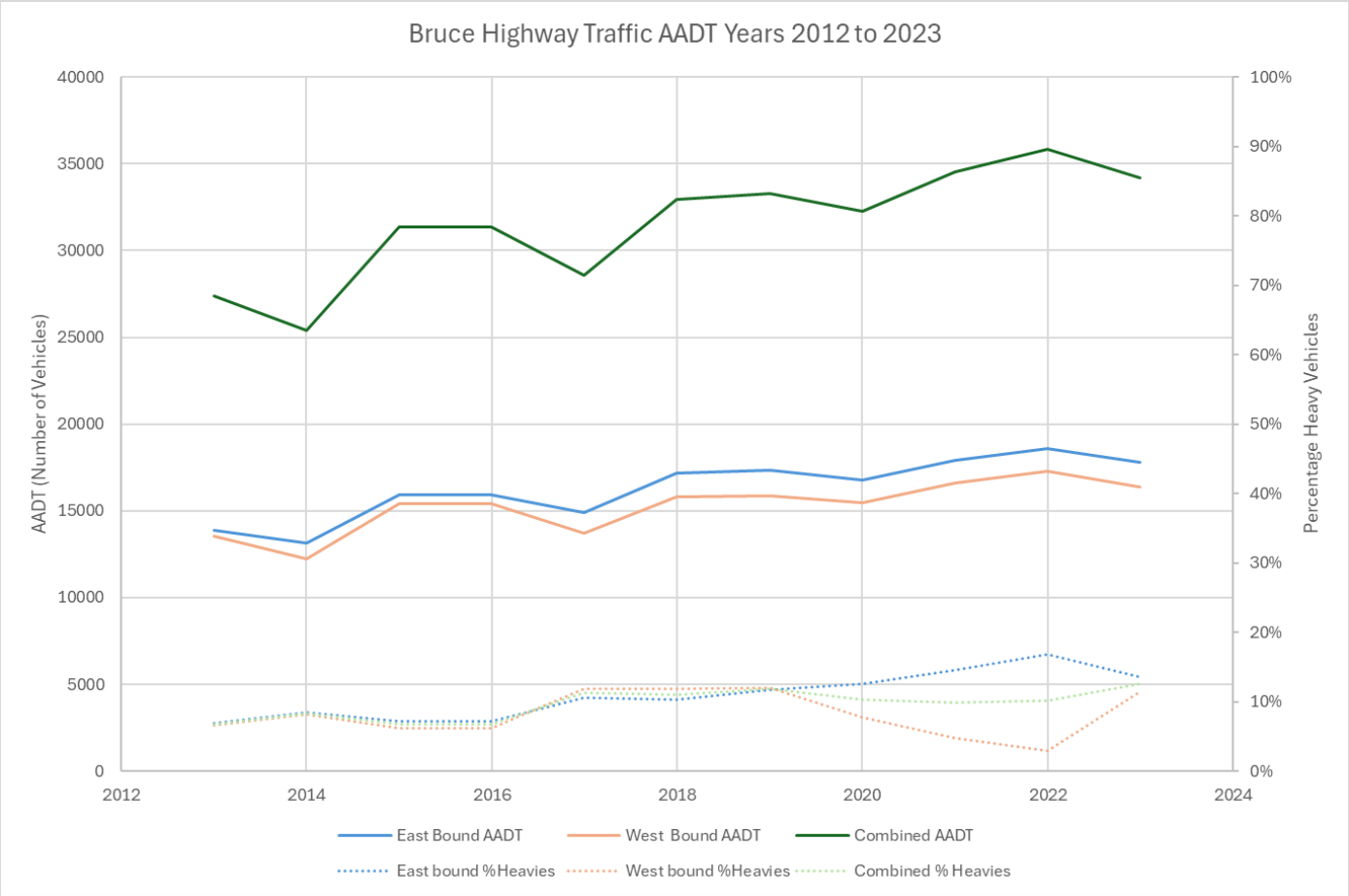

Figure 4: Traffic Census Data For Bruce Highway 2013 to 2023 (Source TMR)

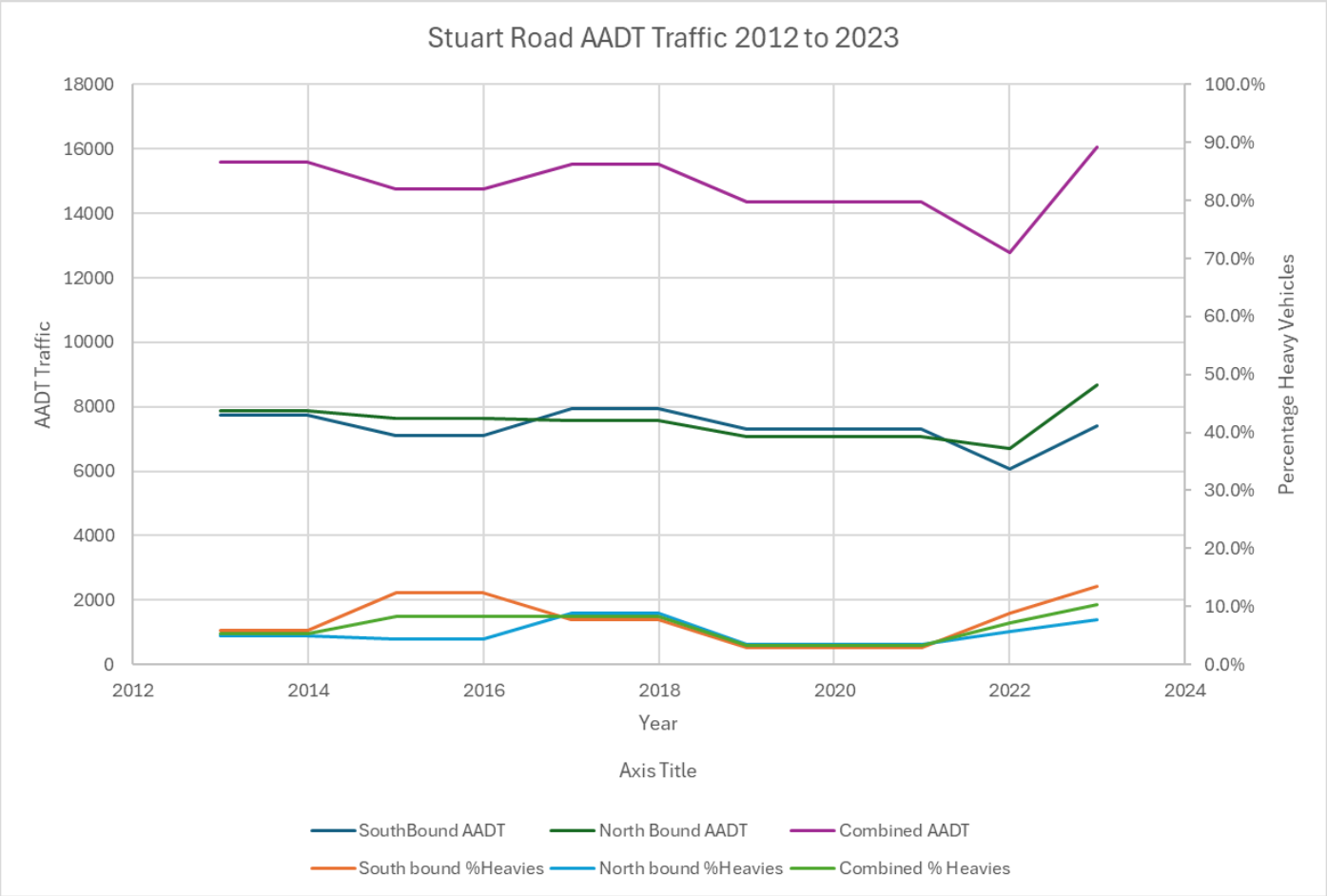

Figure 5: Traffic Census Data For Stuart Road 2013 to 2023 (Source TMR)

The projected traffic flow for 2024 has been based on a linear fit of the 10 years of historic traffic flow data. Both roads have been subject to construction works which has likely disrupted to normal traffic flow. However, the projection of traffic flow from 2024 to 2034 has been based on an annual growth of 3%. This is the growth observed on the Bruce Highway (University Road) over the past 10 years. The percentage heavy vehicles applied to the future traffic model is based the average of the two direction flows.

Road Surface

All roads have been modelled as dense graded asphalt (DGA). The traffic noise generation corrections for various road pavement types recommended by TMR for various road surfaces are contained in Table 5

Table 5:Queensland pavement surface correction factors for application in predicting the levels of road traffic noise in Queensland in an initial year and up to five years beyond. (Source TMR 2013)

Pavement Surface Type	Pavement Surface Correction Factor (dB(A)) (Pavement Surface Age (Years)				
	Base Year	Base +1 year	Base +3 year	Base +4 year	Base +5 year
OGA	-1.7	-2.2	-0.5	0	1.5
SMA	-1.4	-1.0	-0.3	-0.2	0.5
DGA	0	0	0	0	**0**
CS	4.2	2.8	2.3	2.6	**2.8**
PCC	3.0	3.9	4.6	4.9	4.4

Road Alignment

The road traffic noise model has included the future duplication for Shaw Road, Refer to Figure 6. The model has assumed that the future duplication of all lanes is similar to that for the existing through road. The noise model also includes the realigned University Road.

Figure 6: Future Alignment of Stuart Road (Source TMR flythrough video)

Traffic Speed

The traffic speed has been based on the existing sign posted speed limits.

Noise Contouring Height

The Civil engineer provided the earthworks platforms. In accordance with TMR requirements the contouring height is set to 1.8m above the designed platform. All road traffic noise contours are expressed as a façade corrected $L_{10(18\ hour)}$.

Buildings

The proponent is intending to construct all the buildings and is in fact represents the project. Consequent it is appropriate to include the screening effect of the buildings for villas beyond the first residential row.

Summary of Traffic Parameters

The traffic modelling parameters adopted in this report are contained in Table 6.

Table 6: Road Traffic Modelling Parameters

Road segment	Year	AADT	heavy vehicles	Road Surface	Speed (km/h)	Source
Future Design Case (2034)						
University Road East Bound	2034	25,679	12.5%	DGA	80	TMR / SEG
University Road West Bound	2034	23,462	12.5%	DGA	80	TMR / SEG
Stuart Road, North bound	2034	9309	6.6%	DGA	60	TMR / SEG
Stuart Road, South bound	2034	9798	6.6%	DGA	60	TMR / SEG

4.2 Road Traffic Noise Model

The road traffic noise models were developed using PEN3D. PEN3D is a road traffic noise level developed by Noise Mapping Australia (owned by SEG). The software package is an advanced 3D model that has been used in Australia by consultants and road authorities to model road traffic noise. PEN3D incorporates the CoRTN calculation procedure and is compliant with TMR noise modelling requirements. It is a TMR recognised traffic noise modelling software package.

The digital terrain model for the nearby roads was obtained from TCC 2016 Lidar Survey. The alignment of the roads was obtained from the Open Street Maps web page. These highly accurate road alignments were overlaid onto the DTM and the noise model auto calculates road gradients for the road segments. The terrain model for the site was obtained from the Civil consultant for the project.

It should be noted that CoRTN noise model is valid for distances up to 300m from the road. The entire site has been modelled and the site is well within the valid distance.

4.3 Future Road Traffic Noise Levels

These future conditions are described in Section 4.1. The future noise levels are shown for the no barrier design case in Figure 8. This may be compared with the SPP road traffic contours, Figure 2 and the modelled noise contours on the subject site are noisier than the noise levels. In the northern corner of the site the modelled noise levels are 70 dB(A) and the SPP contours for the same area are 68 dB(A). However, the SPP contours do not contain the duplication of either University Road, nor Stuart Drive.

The road traffic noise levels are expressed in terms of the $L_{10(18\ hour)}$ facade corrected. Facade corrected includes a plus 2.5 dB(A) correction compared with free-field measurements. The future QDC zones for the entire site without noise barriers are contained in Figure 9. The site encompasses the Cat 2 to Cat 3 MP4.4 building design categories.

The future road traffic noise and QDC zones are shown in Figure 10 and Figure 11. The maximum noise level at any future façade with the proposed fences is 63 dB(A) (i.e. between 62.5 dB(A) and 63.4 dB(A)), refer to Figure 12 showing the 63 dB(A) zone. Strictly this places these 12 villas marginally within in MP4.4 Category 2. However, the SDC 1 maximum building facade acoustic levels is an $L_{10(18\ hour)}$ of <= 63 dB(A). Hence all of the ground level villas comply with the road traffic goals contained in SDC 1.

The North apartment block comprises 3 levels. The ground floor comprises a mix of apartments and undercover carparking, while the next 2 levels are entirely apartments, refer to Figure 7.

Figure 7: Northern Apartments (Source Cottee Parker)

The maximum calculated future road traffic noise levels for the 1m from the balcony balustrade façade facing Stuart Road are contained in Table 7. The balustrade is to be constructed from a solid material and the overhead surfaces are to be acoustically absorptive. It is anticipated that the noise

reduction at the apartment façade would be approximately 2 to 3 dB(A) lower than the noise levels in Table 7, i.e. at most a noise level of $L_{10(18\ hour)}$ of 66 dB(A).

Table 7: Calculated Road Traffic Noise Levels, Northern Apartments, 1 m From Balustrade

Level	$L_{10(18\ hour)}$ façade corrected in dB(A)		
	Southern end	Middle	Northern end
Ground floor	-	61	61
Middle Floor	68	67	65
Top floor	68	68	67

4.3.1 Proposed Noise Barriers

The proposed noise barriers are contained in Figure 13. The noise barrier heights are reported relative to the civil engineering design levels.

There are a number of alternative building materials for noise barriers. These include lapped and capped timber, brick, concrete masonry, fibrous cement, toughened glass, transparent materials or earth mounds. The minimum acoustic requirement of any noise barrier is that it be solid and continuous without any gaps between palings, panels, or between the ground and barrier itself.

Finally, the specific acoustical requirements for the acoustic fence are:

- It should have a surface density of at least 15 kg/m^2.
- There should be a horizontal rail every 500mm in elevation (pickets should be fixed to each rail);
- There should not be any gaps between the elements of the fence and the ground; and,
- The fence should be robustly supported and constructed to ensure that the fence does not warp or bend when exposed to weathering.
- It may be desirable to incorporate transparent elements in parts of the acoustic fence. For instance, the sections of the acoustic fence may to be lapped and capped timber or similar fibrous cement sheeting with a density of at least 15kg/m^2 and remaining section may be tempered glass, acrylic or similar transparent material with a minimum density of 15kg/m^2. To ensure longevity and aesthetics of acrylic or similar polymer materials it is important it be provided with a robust UV protection

It should be noted that TMR is less willing to accept timber fences due to concerns relating to longevity. However, this is of greater concern for fences along highways, rather than adjacent to commercial premises where aesthetic concerns regarding a warping and gaps forming in the fence would render the fence unacceptable.

During the detail design phase, it is expected the design will be modified to account for acoustically treated drainage openings. Additionally, there is likely to be a pedestrian access provided to Stuart Road. Additional design of the pedestrian access will be undertaken to maintain the acoustic properties of the acoustic fence.

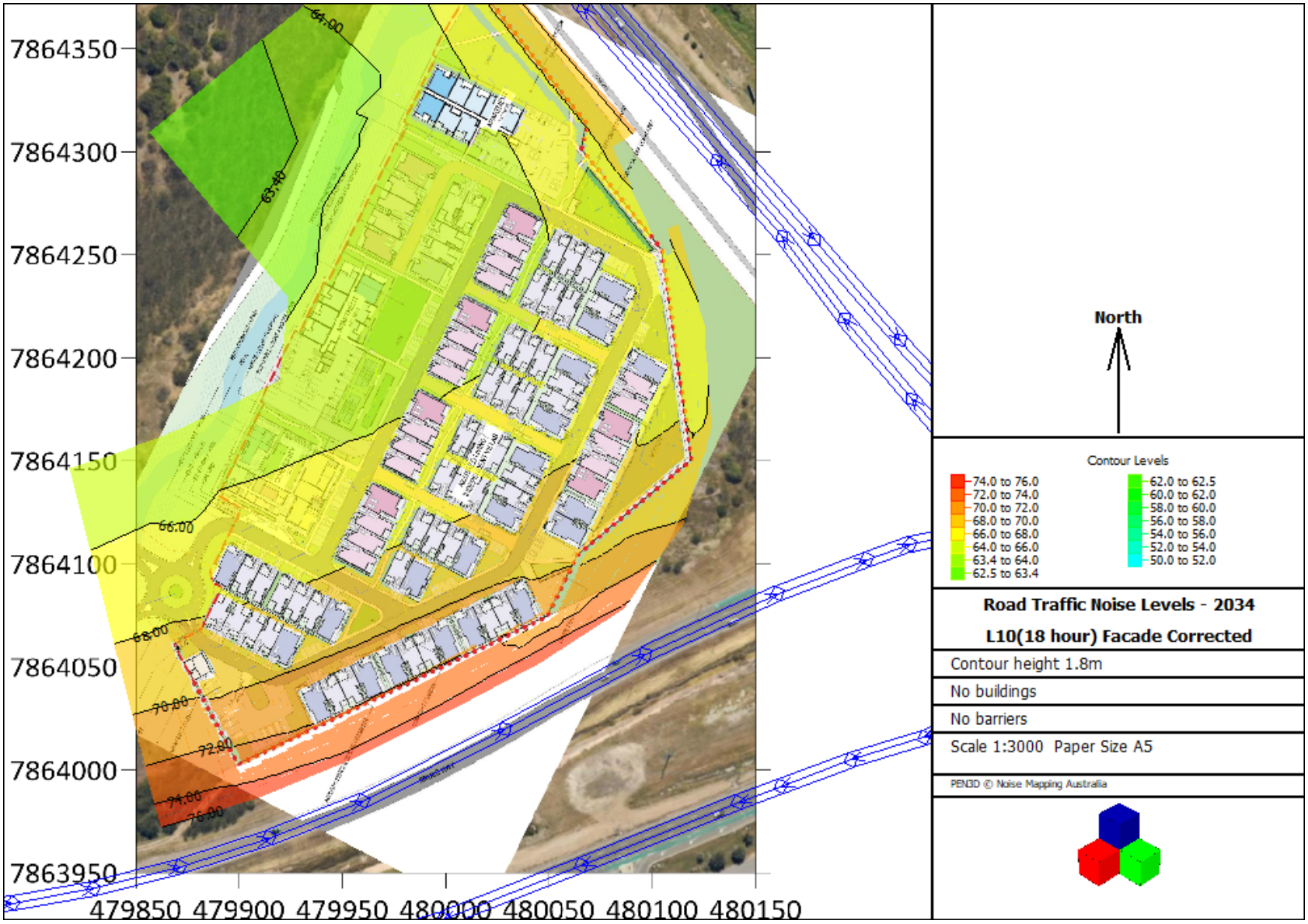

Figure 8: Precinct Year 2034 Road Traffic Noise Model - Facade Corrected - No Barriers - No Buildings

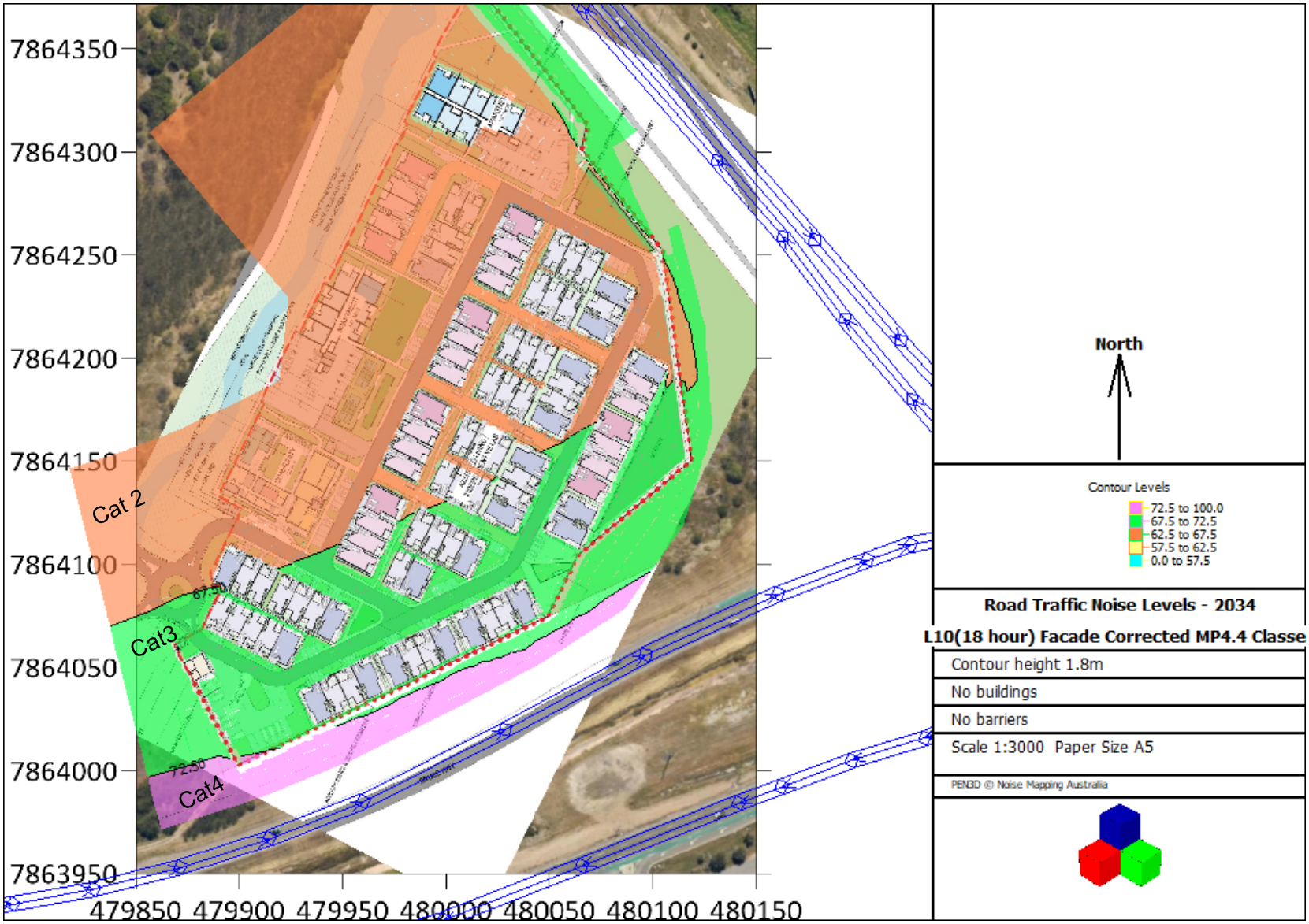

Figure 9: Year 2034 Road Traffic Noise Model - Facade Corrected – No Barriers No Buildings QDC Code Categories

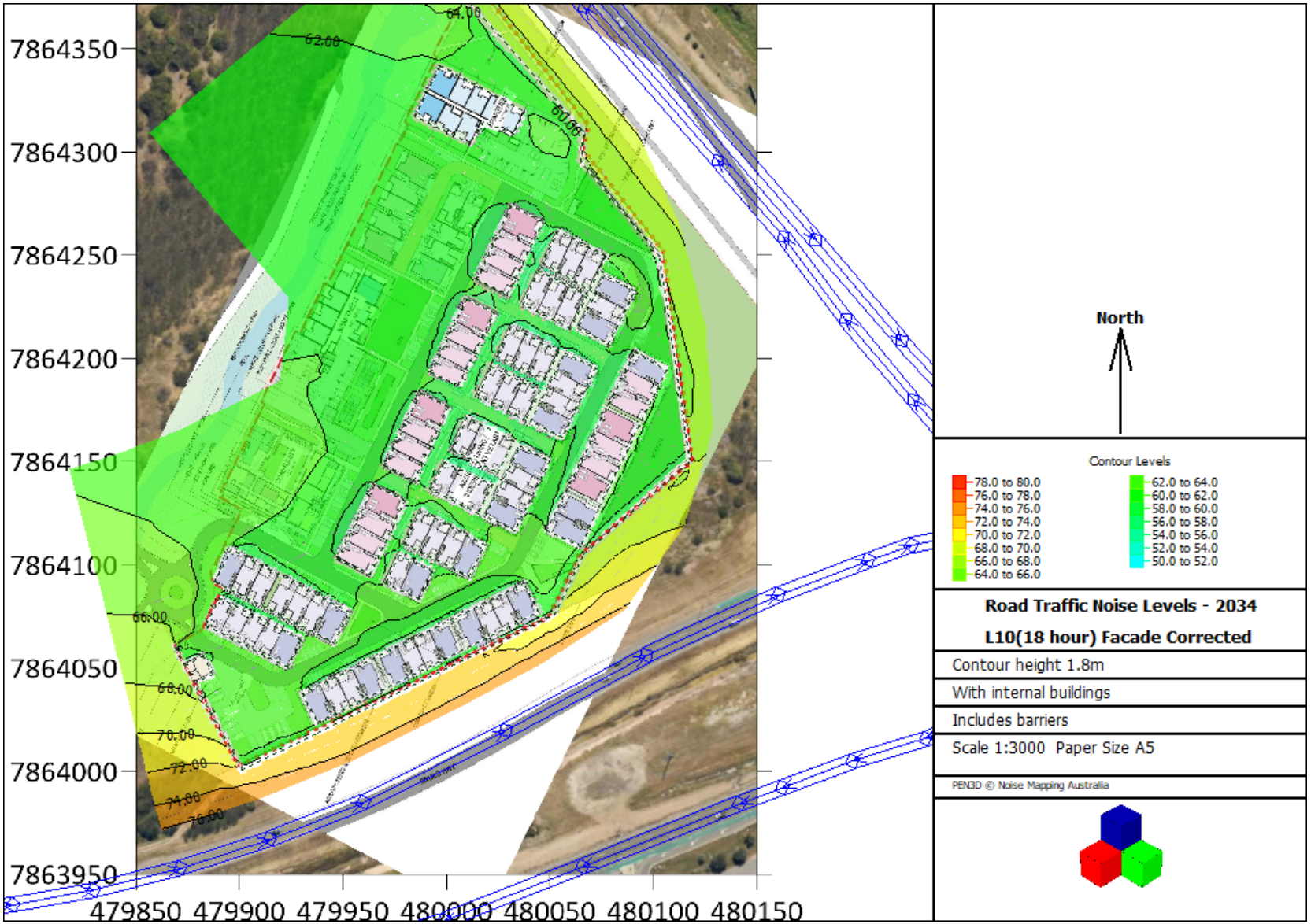

Figure 10: Year 2034 Road Traffic Noise Model – Facade Corrected – Includes Acoustic Fences and Buildings

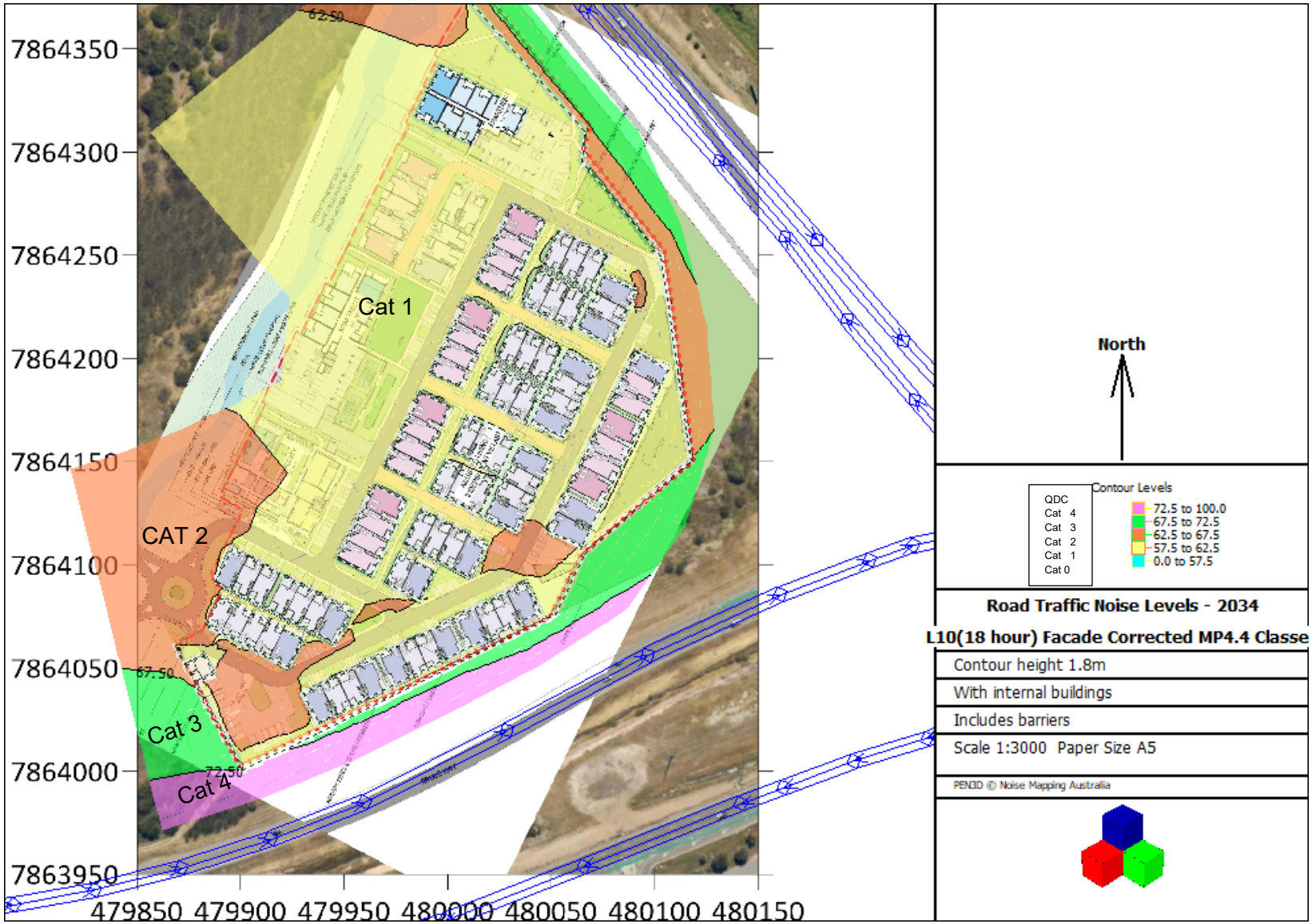

Figure 11: Year 2036 Road Traffic Noise Model – For Precinct 4 - Facade Corrected – MP4.4 Categories – Includes Acoustic Fences

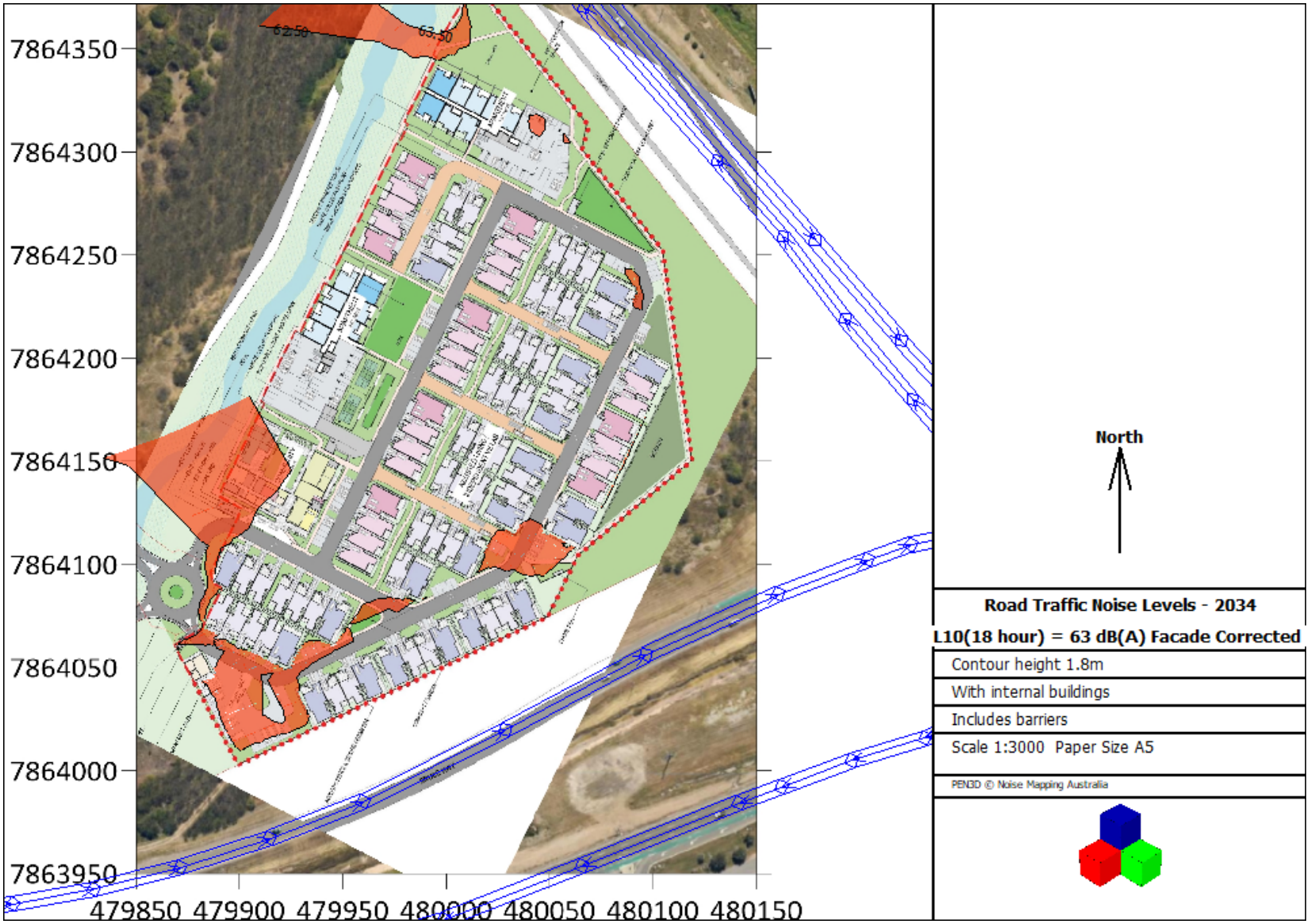

Figure 12: Year 2034 Road Traffic Noise Model – L10(18 hour) = 63 dB(A) Facade Corrected – Includes Acoustic Fences and Buildings

Figure 13: Barrier Design (Retirement Village)

5 Building Noise Control

The deemed to comply QDC MP4.4 acoustical requirements for all the building elements (walls, glazing, doors, ceiling) are contained in Table 8. A rooms windows needs to be kept closed if either the external noise level exceeds the outdoor noise level criterion or the required noise level reduction through the window is more Rw 10. For QDC Categories 1 to 4 air conditioning is required for all habitable rooms.

Table 8: Deemed to Comply Building Construction – (Source QDC MP4.4. Schedule 1)

Noise Category	Component of Building's external envelope	Minimum Rw required
3	Glazing	38 (Total area of glazing is >1.8m^2) 35 (Total area of glazing is <=1.8m^2)
	External Walls	47
	Roof	41
	Floors	45
	Entry Doors	33
2	Glazing	35 (Total area of glazing is >1.8m^2) 32 (Total area of glazing is <=1.8m^2)
	External Walls	41
	Roof	38
	Floors	45
	Entry Doors	33
1	Glazing	27 (Total area of glazing is >1.8m^2) 24 (Total area of glazing is <=1.8m^2)
	External Walls	35
	Roof	35
	Entry Doors	28
0	No additional facade treatments required	

It is proposed to determine the optimum acoustical treatments for each villa and apartment in MP4.4 Category 2 during the detail design phase. This entails an acoustical analysis of each room and the actual traffic noise exposure on each facade. The redesign incorporates building construction methods that are proposed for the development and not necessarily reflected in the QDC MP4.4 deemed to comply building designs

The calculated Rw's for glazing is contained in Figure 14 for a bedroom (4m by 4m) exposed to an external facade corrected noise level of $L_{Aeq(1\ hour)}$ 63 dB(A) ($L_{10(18\ hour)}$ of 66 dB(A)) and meeting an internal noise level of 35 dB(A). This represents a bedroom exposed to the highest likely road traffic noise levels on the site.

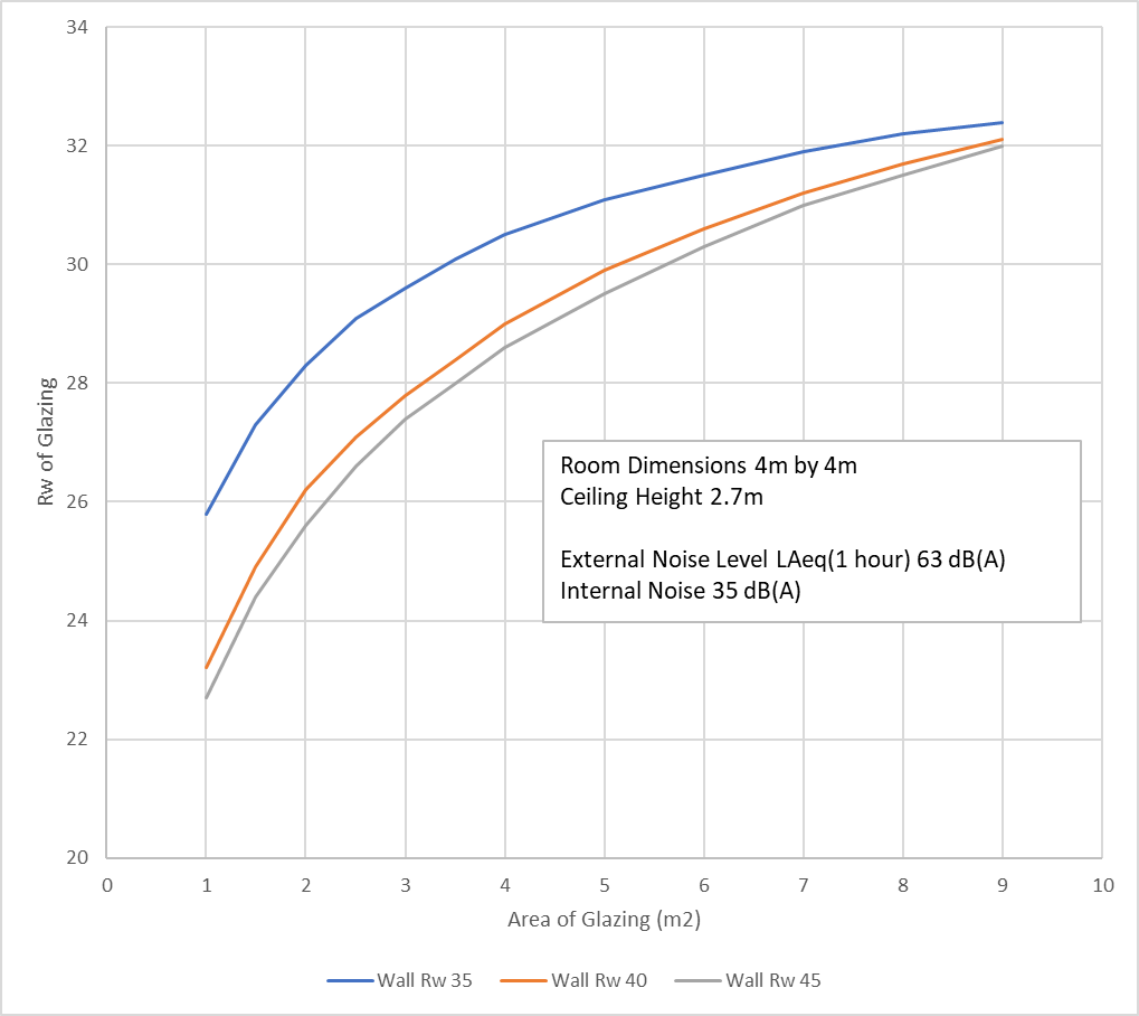

Figure 14: Rw for Glazing as a function of Glass Area and Wall Rw for Bedrooms.

For a building having a lightweight wall (Rw 35) and a nominal window size of 2m by 2m the glazing for the bedroom would be Rw 31. This is achievable with single glazing; however Townsville requires a heavier construction method (for cyclone resistance) and would normally require a slightly heavier construction wall (Rw 40) and glazing of Rw29. All noise affected bedrooms require the windows to be closed to achieve the internal noise level goal and consequently require either air-conditioning or mechanical ventilation.

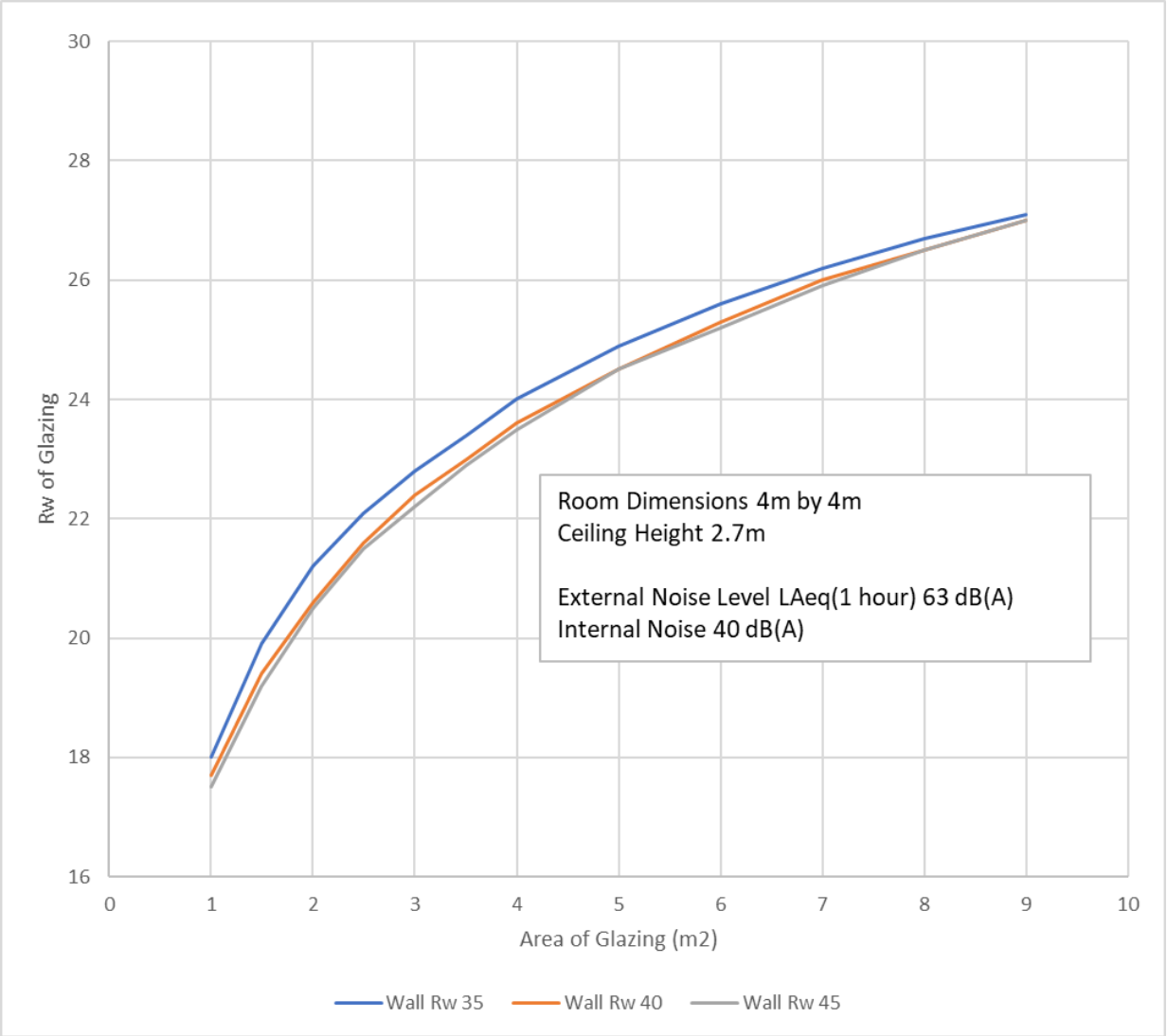

Figure 15: Rw for Glazing as a function of Glass Area and Wall Rw for Living and Work Areas.

The nominal window acoustic requirements for living rooms and work rooms for the most noise affected allotment is expected to be below Rw 28 for spaces with very large windows. For instance, a Living space with a very large glass sliding door (3.8m by 2.2m = 8.8m^2), would require windows having Rw 27. All noise affected living rooms will require the windows to be closed to achieve the internal noise level goal and consequently require either air-conditioning or mechanical ventilation.

For guidance the required facade requirements for each lot (based on noise exposure of is contained in Table 9 assuming the walls are constructed having an Rw40 specification and the room is 4m by 4m. It is assumed the bedroom windows have a surface area of 4m^2 and the living room has windows/sliding doors with a surface area of 8.8m^2.

Table 9: Calculated Rw for Windows (4m by 4m rooms)

$L_{Aeq(1\ hour)}$ (Facade corrected) [dB(A)]	**Bedroom**	**Living Room**
Window Surface Area	*$4m^2$*	*$8.8m^2$*
Rw For Wall	*Rw40*	*Rw40*
63	29	27
62	28	26
61	27	25
60	26	24
58	22	18

Thus, the strategy for building noise control for this development is as follows:

1. For buildings within the MP4.4 Category 1 zone, adopt MP4.4 deemed to comply constructions
2. For buildings exposed to MP 4.4 Category 2, walls to be at least Rw45, ceiling Rw42 with the detail design to maintain Rw for glazing to be less than Rw32
3. The northern apartments to have a continuous solid gap-free structure or balustrade and highly acoustically absorbent material treatment for the total area of the soffit above balconies.

6 Conclusions

This road traffic noise report has assessed the likely noise impact onto the retirement village.

The Townsville City Council requirements for this development have been determined. It is understood that the intent of the City Plan is to provide similar levels of protection for villas throughout the site, rather than limiting the assessment of 100m from the road. The main influencing factors being to ensure:

- That the inside of buildings complies with the intent of QDC MP4.4 (MP4.4 equivalent); and,
- That noise barriers are designed to comply with City Plan P022 including "*compatible with the local streetscape and do not preclude the creation of active street frontages where desired*"

Consequently, the noise barriers nominated are designed with the intent to mitigate direct impacts for residential allotments and to design the residence facades to ensure acceptable internal noise levels and comply with outdoor entertainment area goals.

City Plan addresses traffic noise impacts under the reconfiguration of lot code. The code indicates the impacts from a "traffic corridor" are to be assessed. The State Code 1 and DTMR assessment process only applies to state-controlled roads, and the Queensland Development Code MP4.4 also only applies to state-controlled roads up to 100m from the alignment of University and Stuart Roads.

The relevant future noise model was determined to be in the year 2034, 10 years after the application. The traffic parameters incorporated in the future noise model are for the year 2034 and incorporate future projections as well as relevant changes to traffic speed, percentage heavy vehicles, road surface and 4-laning.

Without noise barriers it was determined the noise levels were elevated and potentially necessitated substantial noise control to be incorporated into the building facade. Consequently, the barrier designs have been nominated for the development so that all ground floor villas comply with SDC 1.

Most of the villas are in the MP4.4 Category 1 zone. There are 12 villas marginally within MP4.4 Category 2.

The middle and top floor of the northern apartment block is within Mp4.4 Category 2. This building is to be designed to comply with the SDC 1 recommendations namely, to have a continuous solid gap-free structure or balustrade and highly acoustically absorbent material treatment for the total area of the soffit above balconies. The façade of the building to be designed to meet suitable internal noise levels from road traffic.

Finally, the report presents methods to acoustically design buildings addressing two important issues:

1. typical wall and roof construction methods in Townsville.
2. glazing supply chain limitations for windows in Townsville.

Specifically, externally walls for residential buildings in the Townsville area are much more substantial than allowed for in the QDC MP4.4 document and the full range of heavy-duty glazing with high Rw ratings is not readily available in Townsville at a reasonable cost. The report presents methods and a more economical alternative Rw ratings based on the same modelling methodology as used when developing the deemed to comply QDC MP4.4

References

Department of Transport & Main Roads (TMR) 2013 - Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise – Appendices

State Development Assessment Provisions Version 3.1 – 30 Sept 2024

APPENDIX G

Matters of Interest Report

Matters of Interest for all selected Lot Plans

Coastal area - erosion prone area
Coastal area - medium storm tide inundation area
Coastal area - high storm tide inundation area
Queensland waterways for waterway barrier works
State-controlled road
Area within 25m of a State-controlled road
Future State-controlled road

Matters of Interest by Lot Plan

Lot Plan: 1SP343205 (Area: 195800 m²)

Coastal area - erosion prone area
Coastal area - medium storm tide inundation area
Coastal area - high storm tide inundation area
Queensland waterways for waterway barrier works
State-controlled road
Area within 25m of a State-controlled road
Future State-controlled road

Coastal area - erosion prone area

Date: 28/11/2024

N

Scale: 1:4,100

0 40 80 120 160

Metres

Queensland Government

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