Acoustics RB Pty Ltd

Report No. 21-1305.R03

Reconfiguring a Lot Application
Orchard Stages 1 and 2 Caboolture West NDP1

Assessment and Control of Road Traffic Noise Intrusion

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SUMMARY

Orchard Property Group has lodged a Reconfiguring a Lot Application with Moreton Bay Regional Council for approval over land located at 34 Craig Road, Upper Caboolture.

The application seeks approval for re-development of the site to generate 101 residential allotments together with one balance lot over two stages of development.

At the SW extent of the land, several of the proposed new allotments adjoin or are located in close proximity to the eastern extent of the arterial road section of the new E-W Road. Because of the proximity of the site to E-W Road, Council will require that the Applicant undertake an assessment of the impact of road traffic noise intrusion onto the site and determine the appropriate measures to achieve adequate control of any excessive road traffic noise intrusion.

Accordingly, Acoustics RB Pty Ltd has been engaged by Orchard Property Group to conduct an assessment of the impact of the road traffic noise intrusion onto the site and to provide recommendations for the control of any excessive levels of road traffic noise intrusion.

This report addresses the expected impact of road traffic noise intrusion against the relevant acceptance criteria set by SC 6.16 *Planning Scheme Policy – Noise*.

The report makes recommendations for appropriate noise control measures to achieve full compliance with the relevant noise level limits and provides guidance for the acoustical design of future residences to be constructed on specific lots.

From the results of the assessment, the following conclusions can be drawn:-

- The acoustical design provisions of Section 8.1 of SC 6.*16 Planning Scheme Policy – Noise* apply to all residences to be constructed on lots located within 100m of the arterial section of E-W Road. In this instance, this requirement will apply to 31 lots. These are Lots 161-163, 201-214 and 221-234.
- In addition, Section 8.1 of SC 6.16 requires that road traffic noise intrusion into the designated private open space of each dwelling located within the 100m setback zone comply with DTMR's 57dBA free field noise level limit for private open spaces.
- In the absence of an acoustic barrier, the 57dBA free field noise level limit set by DTMR for private open spaces would not be met on Lots 204-208.
- To adequately control road traffic noise intrusion in all private open space areas on all lots, it will be sufficient to erect the 1.8m high barrier arrangement shown in Figure 8 of this report.

To adequately control road traffic noise intrusion into the proposed residential allotments, it is recommended that the southern boundaries of Lots 205-207 and western boundary of Lot 207 as well as to part of the eastern boundary of Lot 207 and part of the western boundary of Lot 206. The alignment of this acoustic barrier arrangement is shown in Figure 8.

SC 6.16 *Planning Scheme Policy – Noise* does not provide specifications for the design and/or construction of acoustic fences. Notwithstanding, guidance on the appropriate design specifications and construction requirements can be drawn from (i) Council's Standard Drawing No SF-1520 for typical construction details of post and paling acoustic barriers and (ii) Council's Standard Drawing No SF-1521 for typical construction details of post and board acoustic barriers.

To ensure that adequate control of road traffic noise intrusion into the habitable spaces of any dwellings located on Lots 161-163, 201-214 and 221-234 is achieved, the particular dwellings should be designed and constructed in accordance with AS3671-1989 *Acoustics – Road traffic noise intrusion - Building siting and construction* to achieve compliance with the internal sound levels of AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors*.

It is recommended that a condition of approval be imposed requiring that potential purchasers of Lots 161-163, 201-214 and 221-234 be advised that due consideration needs to be given to the design and construction of any residences on these lots.

Suggested wording of an appropriate condition as commonly adopted by Council is presented below.

Condition *XX* Noise Management

a) The applicant is required to advise prospective buyers of Lots 161-163, 201-214 and 221-234 that the dwelling to be constructed on the particular lot is to be designed and constructed in accordance with the accordance with AS3671-1989 *Acoustics – Road traffic noise intrusion - Building siting and construction* to achieve compliance with the internal sound levels of AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors*.

b) At the completion of construction of any dwellings on Lots 161-163, 201-214 and 221-234, certification shall be undertaken by a qualified Building Certifier. The purpose of this certification is to confirm that, having regard to the Construction Category bands applying to each level of each relevant lot as shown in Table 2 of the approved road traffic noise impact assessment report, the dwelling constructed on the particular lot has been designed and constructed in accordance with AS3671-1989 to achieve compliance with the internal sound levels of AS/NZS 2107:2016.

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1.0 Introduction

Orchard Property Group has lodged a Reconfiguring a Lot Application with Moreton Bay Regional Council for approval over land located at 34 Craig Road, Upper Caboolture.

The application seeks approval for re-development of the site to generate 101 residential allotments together with one balance lot over two stages of development.

At the SW extent of the land, several of the proposed new allotments adjoin or are located in close proximity to the eastern extent of the arterial road section of the new E-W Road. Because of the proximity of the site to E-W Road, Council will require that the Applicant undertake an assessment of the impact of road traffic noise intrusion onto the site and determine the appropriate measures to achieve adequate control of any excessive road traffic noise intrusion.

Accordingly, Acoustics RB Pty Ltd has been engaged by Orchard Property Group to conduct an assessment of the impact of the road traffic noise intrusion onto the site and to provide recommendations for the control of any excessive levels of road traffic noise intrusion.

This report addresses the expected impact of road traffic noise intrusion against the relevant acceptance criteria set by SC 6.16 *Planning Scheme Policy – Noise*.

The report makes recommendations for appropriate noise control measures to achieve full compliance with the relevant noise level limits and provides guidance for the acoustical design of future residences to be constructed on specific lots.

2.0 Existing Situation and Proposed Development

The location of the subject site is shown in Figure 1. The real property description of the site is Lot 1 on SP311833.

The local authority is Moreton Bay Regional Council.

The site is currently occupied by two dwellings and a number of outbuildings.

The proposed lot layout over the site is shown in Figure 2. As can be seen in this figure, and as noted above, it is proposed to re-develop the site to accommodate 101 residential allotments together with one balance lot.

3.0 Proposed New E-W Road

It is also noted that the E-W Road is shown on the MBRC Draft Road Hierarchy Plan as a district collector road for its entire length. Notwithstanding, updated advice has been provided more recently by Council. Specifically, it now intended that the E-W Road will be an arterial road west of the connection with the N-S Arterial Road extension of Tinney Road (ie the extension to be constructed on the land on the northern side of Caboolture River Road). The N-S Arterial Road extension will connect to the E-W Road at or about the northern extent of Craig Road. East of the connection with the N-S Arterial Road extension, the E-W Road will be a district collector road.

On advice from the Project Traffic Engineers, Lambert & Rehbein, it is noted that the western extension of the arterial road section of the E-W Road past the Avid site (ie Lots 1 and 2 Hausman Lane) will be contingent upon the construction of a future bridge crossing of Caboolture River at a point to the NW of the Avid site.

Notwithstanding, it is understood that the construction of the bridge is currently not part of the 10 year plan. That is, it is not expected that the bridge crossing and, hence, the extension of the E-W Road will occur within the 10 year planning horizon applicable to the determination of road traffic noise intrusion onto the subject site.

By reference to Figure 2, Stage 2 of Orchard NDP1 is proposed to be developed on land which adjoins the eastern extent of the arterial road section of the E-W Road. In addition, a number of lots within Stage 1 are located in close proximity to the arterial road section of the road. In total, 31 lots will be located either wholly or partially within 100m of the arterial road section of the E-W Road.

It is noted that a Transport Noise Corridor (TNC) has not been designated along either side of E-W Road. (Refer also Section 3.0 following.)

4.0 SC 6.16 *Planning Scheme Policy – Noise*

4.1 Overview

The requirements for assessing road traffic noise intrusion for Reconfiguring a Lot applications are presented at Section 8.1 of Council's SC 6.16 *Planning Scheme Policy – Noise*.

Section 8.1 of SC 6.16 is reproduced below.

> **8. Assessment of road traffic and railway noise**
> The following outlines the process for establishing acceptable acoustic amenity at sites impacted by noise from roads and railways.
>
> **8.1 Reconfiguring a lot**
> A transport noise impact assessment report is to be provided where development involves reconfiguring a lot in the General Residential, Emerging Community. Rural Residential zones and Township Residential Precinct where:
>
> 1. proposed lots are located within:
>   a. 50 metres of a current or future designated sub arterial; or
>   b. 100 metres of a current or future designated arterial road; or
>   c. 150 metres of a highway or railway; or
>   d. extractive resource transport buffer
> 2. where otherwise requested by Council.
>
> Note - Does not apply if the proposed development site is within a designated transport noise corridor and the Department of Transport and Main Roads is a referral agency.
>
> The assessment is to be in accordance with MP 4.4 of the QDC. The assessment is to identify the noise category applicable to each lot in the proposed development for both lower and upper levels. Noise categories are defined in Schedule 3 of MP4.4.
>
> In addition the assessment is to address the requirement for residential development to have private open space that meets the Environmental Emission Criteria identified in Department of Transport and Main Roads *Policy for Development on land affected by Environmental Emissions from Transport and Transport Infrastructure Version 2 or as amended.*
>
> Note – Noise Categories are derived from the identified noise levels at 1 metre from the facade of the proposed or existing building. For the purposes of this policy the facade is to be determined at the deemed to be building setback or proposed building envelope or the lot boundary.

8.1.1 Property notes

A property note will be applied to all new lots identified as Noise Category 1 or higher. The development approval will advise of the intended property note generally in accordance with the following example.

> *The following notation will be recorded on Council's property system for proposed Lots xxxxxxx*
>
> *This lot is impacted by road traffic noise. A Traffic Noise Impact Report by xxxx, xxxxxx, has been prepared in relation to this lot. The report identifies this lot as being at Noise Level Category X. Mandatory Part 4.4 of the Queensland Development Code identifies the required noise reduction building treatments applicable to each Noise Category.*
>
> *Further assessment by a suitably qualified acoustic expert should be sought in order to determine the appropriate building design and treatment required to effectively mitigate noise impacts for the provision of acceptable acoustic amenity in private open spaces and habitable rooms.*

Note – where lots are impacted by noise sources other than transport alternative property notes will be applied as deemed appropriate.

The key provisions of s.8.1 as they apply to the subject development are summarised below:-

- The provisions of SC 6.16 apply to lots located within 100m of a designated arterial road.
- A Transport Noise Impact Assessment report is to be prepared which identifies the QDC MP 4.4 noise categories applicable to the development.
- The level of road traffic noise intrusion into the designated private open space areas is to comply with the limits set under DTMR *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure* (EEP).
- Property notes are to be applied to all new lots identified as Noise Category 1 or higher.

Each of the requirements with respect to the QDC MP 4.4 noise categories, compliance with the noise levels set by DTMR for acceptable levels of road traffic noise intrusion into private open space areas and the application of property notes is discussed in further detail in the following sub-sections.

4.2 Examination of Applicability of QDC MP 4.4 *Buildings in a Transport Noise Corridor*

Section 8 of SC 6.16 outlines the process for establishing acceptable acoustical amenity at sites impacted by noise from roads and railways.

At stated at s.8.1 *Reconfiguring a Lot* of SC 6.16 of the extract above:-

> "The [transport noise impact] assessment is to be in accordance with MP 4.4 of the QDC. The assessment is to identify the noise category applicable to each lot in the proposed development for both lower and upper levels. Noise categories are defined in Schedule 3 of MP 4.4."

The purpose of QDC MP 4.4 is to ensure control of transport noise intrusion into particular residential buildings, specifically "relevant residential buildings", where a relevant residential building must be located within a Transport Noise Corridor (TNC) as defined at Chapter 8B of *Building Act 1975* and, more particularly, in these circumstances, at s.246X and s.246Y of the Act.

It is noted that the site is not located within a gazetted TNC. As a result, the provisions of QDC MP 4.4 are not triggered. Consequently, it is not appropriate to apply QDC MP 4.4 as a basis for building design. Further discussion re this matter is presented in Attachment A.

Notwithstanding, and as discussed with Council, it is noted that at Section 5 of QDC MP 4.4, AS3671-1989 *Acoustics – Road traffic noise intrusion - Building siting and construction* and AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* are both cited as referenced documents for QDC MP 4.4. In fact, the minimum R_w ratings set at Schedule 1 of the Code have been derived directly by application of the calculation methods of AS3671-1989 to achieve compliance with the recommended internal sound levels of AS/NZS 2107:2016.

Furthermore, when undertaking a site-specific acoustical design review of any relevant residential building located within a TNC, QDC MP 4.4 permits such assessments to be conducted using the more refined and more accurate noise level calculation methods of AS3671-1989 to achieve compliance with the recommended internal sound levels of AS/NZS 2107:2016.

Finally, prior to the introduction of QDC MP 4.4 on 1 September 2010, all assessments to determine the degree of upgrade required to be implemented into any noise-affected residence located on land adjoining a State-controlled road were conducted using the methods of AS3671-1989 to achieve compliance with the recommended internal sound levels of AS/NZS 2107:2016 [1].

Consequently, it can be readily and reasonably concluded that the appropriate means of achieving adequate control of road traffic noise intrusion is to apply the more robust methodology of the calculation methods of AS3671-1989 to the design of noise affected residences, with the goal being to achieve compliance with the recommended internal sound levels of AS/NZS 2107:2016. This method has been adopted successfully for many other recently approved developments within the bounds of MBRC as well as in other local authority jurisdictions where gazettal of TNC's is yet to occur, notably Ipswich City Council.

Finally, it should be noted that, notwithstanding the fact that it is quite reasonable to conclude that QDC MP 4.4 cannot be applied to the current circumstances, the net result of adoption of the more robust methodology of calculation discussed above will be to achieve a more rigorous and more efficient acoustical outcome for the design of the noise-affected dwellings than would have resulted from an application of less refined procedures of QDC MP 4.4.

4.3 Applicability of Construction Categories of AS3671-1989

A discussion of AS3671-1989 together with the appropriate method of applying the calculation procedures of the Standard is presented below. Further information is presented in Attachment B following.

AS3671-1989 sets Construction Categories by reference to $L_{Aeq,T}$ noise levels, notably $L_{Aeq,1hr\ night}$ [2] and $L_{Aeq,1hr\ day}$ [3]. Noise level prediction programs determine road traffic noise levels in terms of the $L_{A10(18hour)}$ [4] noise level parameter. The offsets between $L_{A10(18hour)}$ and the day and night $L_{Aeq,T}$ values are site-specific and depend upon the hourly distribution of traffic.

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1 At that time, ie prior to 1 September 2010, the version of the standard current at that time was AS/NZS 2107:2000.

2 $L_{Aeq,1hr\ night}$ is defined as the maximum rolling average $L_{Aeq,1hr}$ value from 10:00pm to 6:00am, where the integrating time for $L_{Aeq,T}$ (ie equal energy) values used to determine the $L_{Aeq,1hr}$ value is typically 10minutes or 15 minutes.

3 $L_{Aeq,1hr\ day}$ is defined as the maximum rolling average $L_{Aeq,1hr}$ value from 6:00am to 10:00pm, where the integrating time for $L_{Aeq,T}$ (ie equal energy) values used to determine the $L_{Aeq,1hr}$ value is typically 10minutes or 15 minutes.

4 $L_{10(18hour)}$ is defined by DTMR in their *Road Traffic Noise Management: Code of Practice* and by UK DoE in their *Calculation of Road Traffic*, as the arithmetic mean of each of the eighteen hourly $L_{10,1hr}$ levels between 6:00am and 12:00 midnight on an average weekday where $L_{10,1hr}$ is the noise level measured in dBA that is exceeded for 10% of the specific one hour period. It is noted that this terminology is not in strict accordance with the recommendations of Standards Australia because it does not identify the A-weighting requirement. Recognising this departure, DTMR has adopted the term $L_{A10(18hour)}$ in their *Code of Practice*. $L_{A10(18hour)}$ has been used throughout this report as a result.

To establish offsets which can be used satisfactorily in most commonly encountered situations, it is appropriate to refer to standard offset values derived from an extensive study of a large number of comparable sites in SE Queensland located adjacent to major roads [5]. When this is done, the relevant Construction Categories can be determined in terms of the predicted $L_{A10(18hour)}$ value directly. The derivation of the bounds of the Construction Categories is presented in Attachment B.

From the results presented in Attachment B, it can be seen that Construction Category 1 means that the relevant floor level of the dwelling (ie ground floor level or first floor level) is subjected to noise levels that do not exceed 48dBA $L_{A10(18hour)}$ facade-corrected. For any dwellings subject to Construction Category 1, there will be no requirement to apply any specific acoustical upgrades to the design of the relevant floor level of the dwelling.

Construction Category 2 means that the relevant floor level of the dwelling (ie ground floor level or first floor level) is subjected to noise levels in the range 48dBA to 63dBA $L_{A10(18hour)}$ facade-corrected. By reference to AS3671-1989 *Acoustics - Road Traffic Noise Intrusion - Building Siting and Construction*, "standard construction (ie brick veneer), except for the lightweight elements such as fibre cement or metal cladding or all-glass facades" is deemed to be adequate to control noise intrusion for dwellings within the Construction Category 2 band, provided all windows and external doors to the dwelling are closed.

Construction Category 3 means that the relevant floor level of the dwelling (ie ground floor level or first floor level) is subjected to noise levels in the range 63dBA [6] to 73dBA $L_{A10(18hour)}$ facade-corrected.

Similarly, Construction Category 4 means that the relevant floor level of the dwelling (ie ground floor level or first floor level) is subjected to noise levels exceeding 73dBA $L_{A10(18hour)}$ facade-corrected.

For both Construction Categories 3 and 4, the design of the dwelling will need to be reviewed acoustically to ensure that the level of road traffic noise intrusion is adequately controlled.

Notes:

For purposes of initial guidance only, standard brick veneer or blockwork wall construction would normally be satisfactory in most instances to deal with external noise levels up to 63dBA $L_{A10(18hour)}$ facade-corrected, ie for Construction Category 2 dwellings. For Construction Category 3 and 4 dwellings, however, it will be necessary to (i) upgrade the acoustical performance of windows and external sliding glass doors beyond standard R_w 23 performance and (ii) close windows and external doors. Further guidance is provided in AS3671-1989 *Acoustics - Road Traffic Noise Intrusion - Building Siting and Construction*.

It is stressed that **Construction** Categories applying under AS3671-1989 are not the same as **Noise** Categories applying under QDC MP 4.4. While the goal of each set of designations is the same, ie to control road traffic noise intrusion, they act in different ways to each other. There is no direct correspondence or consistent correlation between each set of designations. It is regrettable that the term "category" has been adopted by the relevant regulatory bodies for both sets of designations.

[5] Brown, AR & Brown, HD *A Re-Examination of the Relationship Between the $L_{A10(18hour)}$ Noise Level Parameter and Other Road Traffic Noise Level Parameters,* proc. Joint Conference of Australian and New Zealand Acoustical Societies, Brisbane, 2016.

[6] DTMR and several local authorities in SE Queensland apply this limit of 63dBA $L_{A10(18hour)}$ facade-corrected as the basis of setting limits for acceptable levels of road traffic noise intrusion onto residential allotments situated adjacent to major roads.

4.4 DTMR Limits for Road Traffic Noise Intrusion into Private Open Space Areas

SC 6.16 requires that the limits for acceptable levels of road traffic noise intrusion into Private Open Space areas be set by reference to the DTMR's *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure* (EEP). The criteria from the EEP have been adopted in *State Code 1: Development in a State-Controlled Road Environment* of *State Development Assessment Provisions* (SDAP).

Under EEP, a pair of limits has been established, with one limit of the pair applying depending on the prevailing $L_{A90(18hour)}$ noise level. These limits are as follows:-

(a) 57dBA $L_{A10(18hour)}$ free field (ie 60dBA $L_{A10(18hour)}$ facade-corrected) if the measured $L_{A90(18hour)}$ is currently ≤45dBA $L_{A90(18hour)}$ [7]

(b) 60dBA $L_{A10(18hour)}$ free field (ie 63dBA $L_{A10(18hour)}$ facade-corrected) if the measured $L_{A90(18hour)}$ is currently >45dBA $L_{A90(18hour)}$.

5.0 Current Road Traffic Noise Levels and Derived Noise Level Limits

The prediction of road traffic noise intrusion onto any site can be conducted by using the CRTN '88 [8] algorithms. These algorithms have been validated for Australian conditions. Even so, it has been well established that the algorithms generally over-predict the level of road traffic noise intrusion onto adjoining land.

The extent of the over-prediction tends to be site-specific. The degree of over-prediction is generally greater at sites with complex topography and significant distances of separation from the road as well as at sites located adjacent to signalised intersections.

In situations where the road has been formed and is operating with significant volumes of traffic, it is appropriate to conduct noise level measurements under the existing road traffic conditions. The results of these measurements can be used (i) to validate/calibrate the noise prediction model for the site or the development and, (ii) where appropriate, to establish the appropriate parameter offset values so that the equivalent facade-corrected external $L_{A10(18hour)}$ noise limits can be set.

In fact, in situations where the arterial/sub arterial road exists, Council requires that noise logging be undertaken at a representative location on the site to determine the current level of noise intrusion onto that location. For NDP1, neither the E-W Road nor the future N-S Arterial Road extension of Tinney Road exists. Consequently, there would be no utility in carrying out on-site noise logging at this time.

Rather, in the absence of the E-W Road it can be readily determined that the existing $L_{A90(18hour)}$ noise level will be <45dBA. Consequently, the noise level limit applying under EPP for Private Open Space areas will be 57dBA $L_{A10(18hour)}$ free field (ie 60dBA $L_{A10(18hour)}$ facade-corrected).

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[7] $L_{A90(18hour)}$ is defined as the arithmetic mean of each of the eighteen hourly $L_{A90,1hr}$ levels between 6:00am and 10:00pm on an average weekday.

[8] "Calculation of Road Traffic", UK DoE, HMSO, 1988. This is the method endorsed by Queensland Department of Transport and Main Roads and various local authorities.

6.0 Road Traffic Noise Model

6.1 Preparation of Road Traffic Noise Model

The prediction of road traffic noise intrusion onto the site has been conducted using the CRTN '88 algorithms as applied by the SoundPLAN [9] computer program.

The lot layout has been determined from the electronic files provided by the Project Town Planner, PeakUrban. The finished ground levels across the site have been determined from the earthworks design provided by the Project Civil Engineers, PeakUrban. The existing topographical contours surrounding the site have been extracted from the MBRC Open Data Portal *DataHub* website.

At the subject site, the traffic volume, vehicle mix and road speed information for E-W Road under 10 year planning horizon conditions (ie Year 2032) has been set by reference to data provided by the Project Traffic Engineers, Lambert & Rehbein. The relevant information for E-W Road adjacent to the subject site is summarised below in Table 1.

Road Traffic Parameter	West of Access Road A4/Craig Rd	East of Access Road A4/Craig Rd
Traffic Volume - Eastbound (AADT)	3920	4085
Traffic Volume - Westbound (AADT)	3460	3720
Percentage Heavy Vehicles (%)	3	3
Traffic Speed (km/h)	60	60
Road Surface	Dense Graded Asphalt	Dense Graded Asphalt

Table 1 – Road Traffic Data for E-W Road – Year 2032

Notes:

As advised by the Project Traffic Engineers, the posted road speed for E-W Road has not yet been set by Council. Further, while it is possible to make an informed determination of the total volume of traffic on the road, the actual percentage of heavy vehicles on the road can only be an estimate this point.

Notwithstanding, because the section of the E-W Road designated as an arterial road will not be functioning as such until after the 10 year planning horizon, it is appropriate to expect that it will be functioning as a lower order road during this period. Consequently, it is appropriate to adopt the road speed and percentage heavy vehicles consistent with the lower order function as shown in Table 1.

The noise level prediction calculations also took account of the various site-specific variables and parameter settings which influence the level of road traffic noise emission onto the site. These included:-

- Site topography
- Distance from road
- Road gradients and road surfaces
- Vertical alignment of road
- Angle of view to road
- Receptor height [10]

[9] SoundPLAN is an integrated software package for noise and air pollution evaluation developed in Germany by Braunstein + Berndt GmbH. It has been configured to predict the extent of (i) road traffic noise intrusion by application of the CRTN '88 algorithms and (ii) industrial noise emission using the CONCAWE algorithms. It is in use in more than 48 countries and has had widespread application throughout Australia. It is endorsed by DTMR, MBRC, BCC, RCC, LCC, GCCC, SCRC, DES and most other State environmental authorities.

[10] Noise levels at ground floor level facades are determined at a receptor height of 1.6m above ground level. For first floor level facades, the receptor height is 4.2m.

6.2 Road Traffic Noise Prediction Scenarios

Under s.8.1 of SC 6.16, it is necessary to consider the impact of road traffic noise intrusion onto residential lots located within the 100m of an arterial road. As can be determined from Figure 2 and, more definitively, by reference to Figures 4-7 following, there will be 31 new lots either wholly or partially located within the 100m setback zone. These are Lots 161-163, 201-214 and 221-234 [11].

Four road traffic noise scenarios have been modelled.

The details of each are presented below.

Scenario 1: Receiver height set at 1.3m agl (ie occupant ear level in private open space), E-W Road at 2032 traffic volume, no barriers constructed. Refer Figure 4 for noise level contours. Note: Noise level contours are presented only over those lots lying within the 100m setback zone.

Scenario 2: Receiver height set at 1.3m agl (ie occupant ear level in private open space), E-W Road at 2032 traffic volume, 1.8m high acoustic barrier to the southern boundaries of Lots 205-207 and the western boundary of Lot 207 as well as to part of the eastern boundary of Lot 207 and part of the western boundary of Lot 206. Refer Figure 5 for 57dBA $L_{A10(18hour)}$ free field noise level contour and Figure 8 for alignment of acoustic barriers.

Scenario 3: Receiver height set at 1.6m agl (ie ground floor level facades), E-W Road at 2032 traffic volume, 1.8m high acoustic barrier as shown in Figure 8. Refer Figure 6 for the ground floor level AS3671-1989 Construction Categories.

Scenario 4: Receiver height set at 4.2m agl (ie first floor level facades), E-W Road at 2032 traffic volume, 1.8m high acoustic barrier as shown in Figure 8. Refer Figure 7 for the first floor level AS3671-1989 Construction Categories.

7.0 Discussion

From the results presented in Figure 4, it can be seen that with no acoustic barriers in place, the 57dBA $L_{A10(18hour)}$ free field noise level target adopted by DTMR (and, hence, by Council) for private open spaces areas would not be met on Lots 204-208.

As shown in Figure 5, to adequately control road traffic noise intrusion into the private open space areas across Lots 204-208, it will be sufficient to construct 1.8m high acoustic barriers along the southern boundaries of Lots 205-207 and the western boundary of Lot 207 as well as to part of the eastern boundary of Lot 207 and part of the western boundary of Lot 206.

The alignment of this acoustic barrier arrangement is shown in Figure 8.

With this barrier arrangement in place, the AS3671-1989 Construction Categories applying to the ground floor and first floor facades of the residential allotments located within 100m of arterial road section the E-W Road (ie 161-163, 201-214 and 221-234) will be as shown in Figures 6 and 7, respectively.

[11] It is noted that the incursion of 100m setback line intrudes to a very degree onto both Lot 160 and Lot 164. There are two points to make about this. Firstly, a conservative view has been adopted with respect to the extent of the arterial road segment of the E-W Road. More specifically, the transition between the arterial road segment and in the district collector segment has been set on the eastern side of the intersection rather than the centre. In doing so, the 100m setback line is shown intruding slightly onto Lots 160 and 164. In addition, having regard to standard building setbacks from rear and side boundaries, any residence constructed on either Lot 160 or Lot 164 would lie outside the 100m setback line. Taken together, it can be concluded that the minor incursion of the 100m shown in Figures 4-7 will be of no material significance. Consequently, it is not necessary to include Lots 160 and 164 in the list of affected lots.

By reference to Figure 6 (ground floor facades, 1.8m high acoustic barrier constructed), it can be seen that the construction category applying to the lower level of any residence constructed on Lots 161, 221 and 222 will depend upon the placement of the residence on the lot [12]. Notwithstanding, to ensure that all contingencies are covered, it is appropriate to designate the construction category applying to each of Lots 161, 221 and 222 by reference to the higher of the two categories shown in Figure 6.

By reference to Figure 7 (first floor facades, 1.8m high acoustic barrier constructed), it can be seen that the construction category applying to upper level of any residence constructed on Lot 205 and 206 will depend upon the placement of the residence on the lot [13]. Notwithstanding, to ensure that all contingencies are covered, it is appropriate to designate the construction category applying to the lot by reference to the higher of the two categories shown in Figure 7.

A summary of the Construction Categories applying to Lots 161-163, 201-214 and 221-234 is presented below in Table 2.

Lot	AS3671 Construction Category by Level		Lot	AS3671 Construction Category by Level		Lot	AS3671 Construction Category by Level	
	Ground Floor	First Floor		Ground Floor	First Floor		Ground Floor	First Floor
161	**2**	**2**	209	**2**	**2**	226	**2**	**2**
162	**2**	**2**	210	**2**	**2**	227	**2**	**2**
163	**2**	**2**	211	**2**	**2**	228	**2**	**2**
201	**2**	**2**	212	**2**	**2**	229	**2**	**2**
202	**2**	**2**	213	**2**	**2**	230	**2**	**2**
203	**2**	**2**	214	**2**	**2**	231	**2**	**2**
204	**2**	**2**	221	**2**	**2**	232	**2**	**2**
205	**2**	**3**	222	**2**	**2**	233	**2**	**2**
206	**2**	**3**	223	**2**	**2**	234	**2**	**2**
207	**2**	**3**	224	**2**	**2**			
208	**2**	**2**	225	**2**	**2**			

Table 2 – AS3671-1989 Construction Categories Applying to Lots 161-163, 201-214 and 221-234

(AS3671-1989 Construction Categories are not the same as QDC MP 4.4 Noise Categories)

The alignment of the acoustic fence is shown in Figure 8. It is noted that the acoustic fence will be domestic in scale, ie 1.8m high and extending along the southern boundaries of Lots 205-207 and western boundary of Lot 207 as well as to part of the eastern boundary of Lot 207 and part of the western boundary of Lot 206. To adequately address the Council's normal landscaping requirements, it would be appropriate to consider the planting of low height vegetation in the verge. Details can be prepared by the Project Landscape Architect, as necessary.

[12] It is noted that Lots 162, 163 and 223 also lie within two noise category bands. Any residence constructed on any of these three lots, however, would lie at least partially within the Construction Category 2 band. For this reason, the appropriate designation for each of these lots is Construction Category 2.

[13] It is noted that there is a minor incursion of the Noise Category 3 and onto the SW corner of Lot 208, but the degree of intrusion does not extend past the standard building setbacks. In these circumstances, the lower of the two categories can be applied to this lot. It is noted that Lot 207 also lies within two noise category bands. Notwithstanding, it is also evident that any highset residence constructed on this lot, however, would lie almost wholly within the Construction Category 3 band. For this reason, the appropriate designation for each of this lot is Construction Category 3.

8.0 Conclusions

From the results of the assessment presented above, the following conclusions can be drawn:-

- The acoustical design provisions of Section 8.1 of SC 6.*16 Planning Scheme Policy – Noise* apply to all residences to be constructed on lots located within 100m of the arterial section of E-W Road. In this instance, this requirement will apply to 31 lots. These are Lots 161-163, 201-214 and 221-234.
- In addition, Section 8.1 of SC 6.16 requires that road traffic noise intrusion into the designated private open space of each dwelling located within the 100m setback zone comply with DTMR's 57dBA free field noise level limit for private open spaces.
- In the absence of an acoustic barrier, the 57dBA free field noise level limit set by DTMR for private open spaces would not be met on Lots 204-208.
- To adequately control road traffic noise intrusion in all private open space areas on all lots, it will be sufficient to erect the 1.8m high barrier arrangement shown in Figure 8 of this report.

9.0 Recommendations

To adequately control road traffic noise intrusion into the proposed residential allotments, it is recommended that a 1.8m high acoustic barrier be constructed along the southern boundaries of Lots 205-207 and western boundary of Lot 207 as well as to part of the eastern boundary of Lot 207 and part of the western boundary of Lot 206. The alignment of this acoustic barrier arrangement is shown in Figure 8.

Note: The extent of barrier shown in Figure 8 is the minimum necessary. If desired, the length of the returns, notably the return along the western boundary of Lot 206, may be extended if deemed appropriate for other reasons.

SC 6.16 *Planning Scheme Policy – Noise* does not provide specifications for the design and/or construction of acoustic fences. Notwithstanding, guidance on the appropriate design specifications and construction requirements can be drawn from (i) Council's Standard Drawing No SF-1520 for typical construction details of post and paling acoustic barriers and (ii) Council's Standard Drawing No SF-1521 for typical construction details of post and board acoustic barriers.

To ensure that adequate control of road traffic noise intrusion into the habitable spaces of any dwellings located on Lots 161-163, 201-214 and 221-234 is achieved, the particular dwellings should be designed and constructed in accordance with AS3671-1989 *Acoustics – Road traffic noise intrusion - Building siting and construction* to achieve compliance with the internal sound levels of AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors*.

It is recommended that a condition of approval be imposed requiring that potential purchasers of Lots 161-163, 201-214 and 221-234 be advised that due consideration needs to be given to the design and construction of any residences on these lots.

Suggested wording of an appropriate condition as commonly adopted by Council is presented overpage.

Condition *XX* Noise Management

a) The applicant is required to advise prospective buyers of Lots 161-163, 201-214 and 221-234 that the dwelling to be constructed on the particular lot is to be designed and constructed in accordance with the accordance with AS3671-1989 *Acoustics – Road traffic noise intrusion - Building siting and construction* to achieve compliance with the internal sound levels of AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors*.

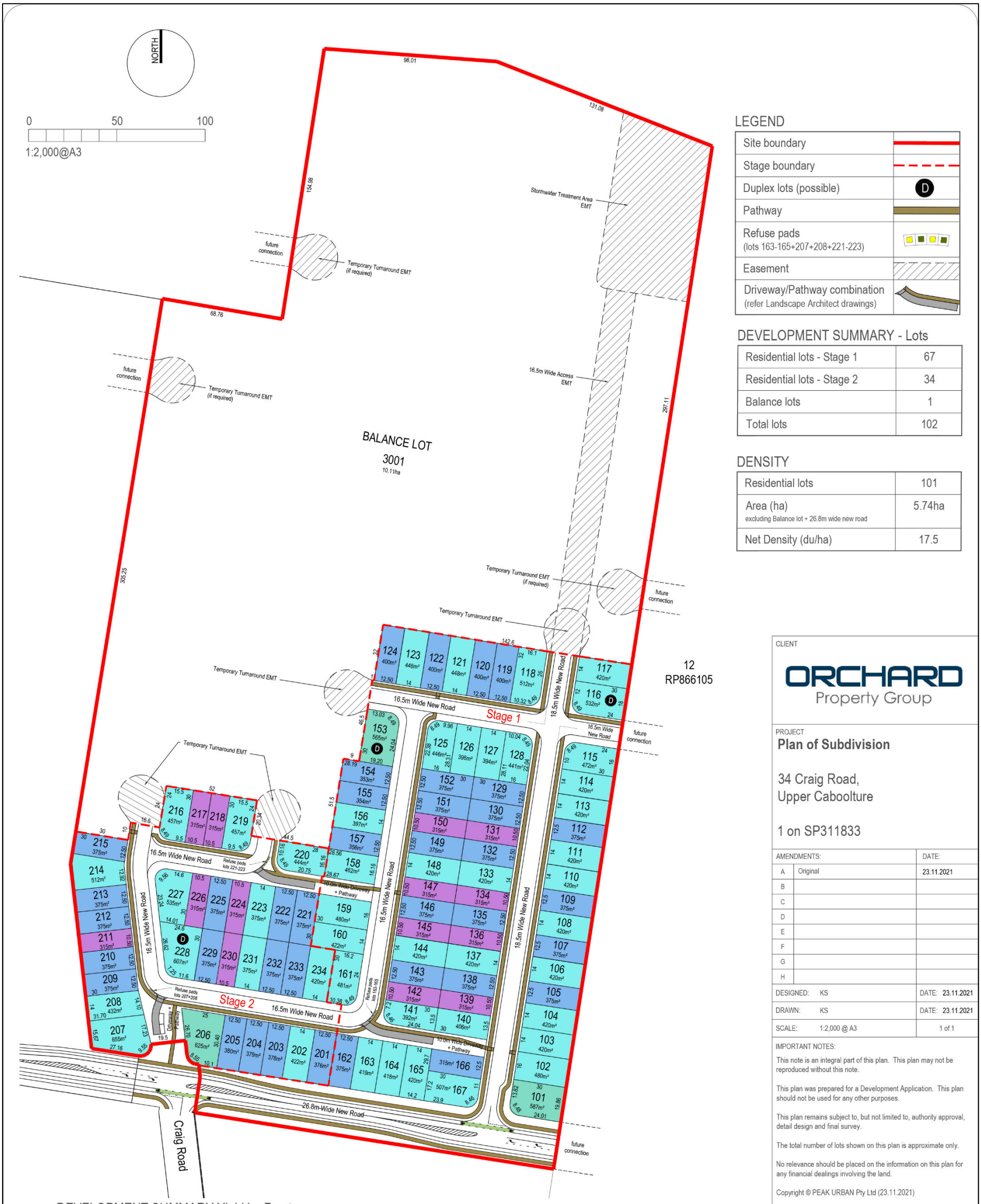
b) At the completion of construction of any dwellings on Lots 161-163, 201-214 and 221-234, certification shall be undertaken by a qualified Building Certifier. The purpose of this certification is to confirm that, having regard to the Construction Category bands applying to each level of each relevant lot as shown in Table 2 of the approved road traffic noise impact assessment report, the dwelling constructed on the particular lot has been designed and constructed in accordance with AS3671-1989 to achieve compliance with the internal sound levels of AS/NZS 2107:2016.

We trust that this information is adequate for your purposes at this stage, but should you require any further information, please do not hesitate to contact us.

Report prepared by:

Russell Brown,
Director, Acoustics RB Pty Ltd
RPEQ 2799

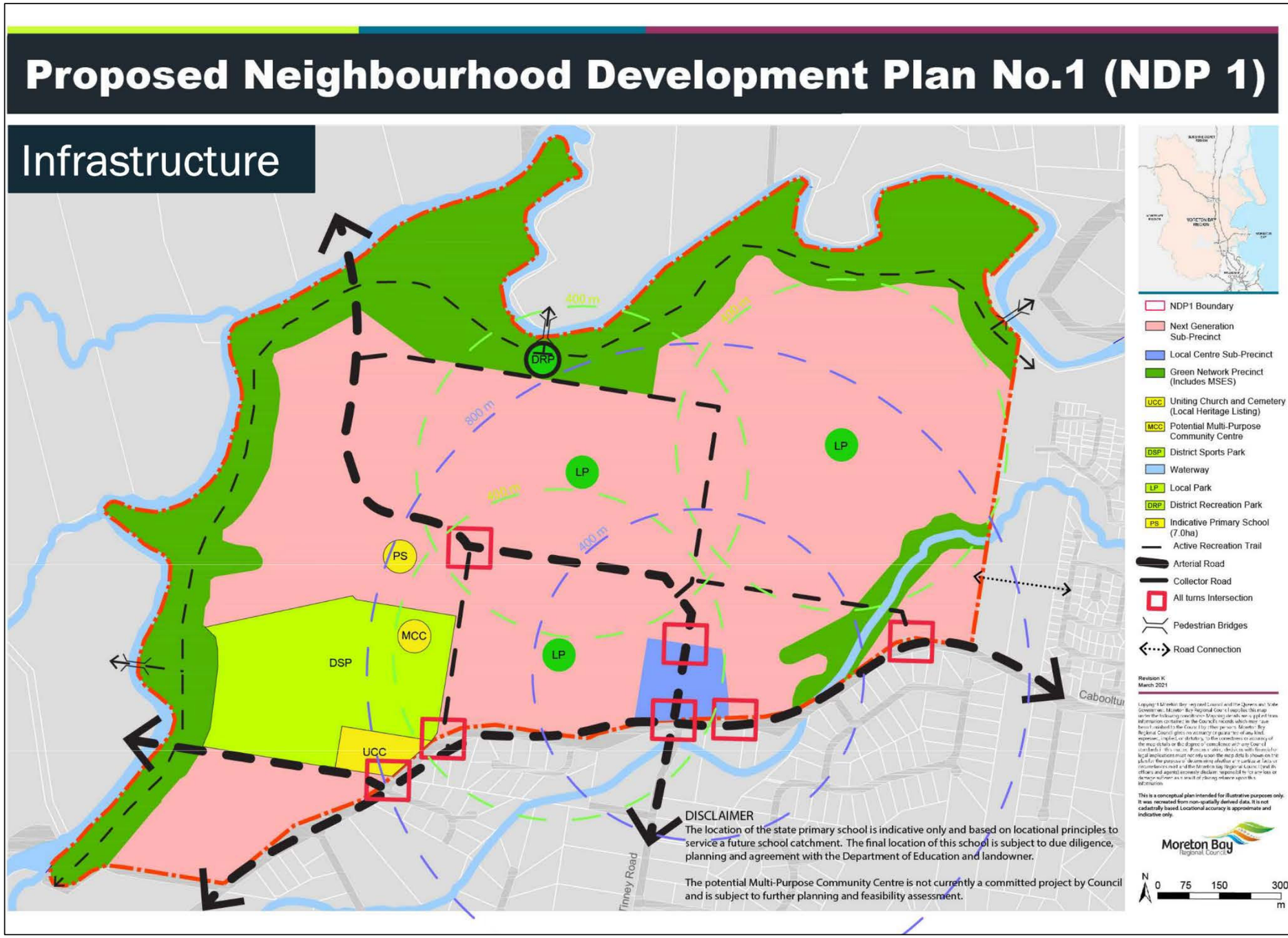
Figure 1 – Site Location (Shown with Green Overlay)



DEVELOPMENT SUMMARY Yield by Frontage

MBRC Lot Type	Lot Frontage	Stage 1		Stage 2		Total	
		Number of Lots	%	Number of Lots	%	Number of Lots	%
Type A	7.5m	0	0.0%	0	0.0%	0	0.0%
Type B	>7.5m-10.5m (10.0m)	0	0.0%	0	0.0%	0	0.0%
	>7.5m-10.5m (10.5m)	8	11.9%	6	17.6%	14	13.9%
Type C	>10.5m-12.5m (12.5m)	23	34.3%	15	44.1%	38	37.6%
Type D	>12.5m-18m (12.5m+)	2	3.0%	1	2.9%	3	3.0%
	>12.5m-18m (14.0m)	22	32.8%	6	17.6%	28	27.7%
	>12.5m-18m (15.0m)	0	0.0%	2	5.9%	2	2.0%
	>12.5m-18m (16.0m)	9	13.4%	3	8.8%	12	11.9%
	>12.5m-18m (18.0m)	1	1.5%	0	0.0%	1	1.0%
Type E	>18.0m-32.0m	2	3.0%	1	2.9%	3	3.0%
Type F	32.0m+	0	0.0%	0	0.0%	0	0.0%
Total		67	100%	34	100%	101	100%

Figure 2 – Site Plan for Orchard (Stages 1 and 2 Shown Outlined)



- Maintains arterial/ sub-arterial north-south and east-west routes
- Re-establishes Tinney Road connection
- Establishes active transport network utilising GNP road network
- No change to stormwater network
- Northern intersection (Local Centre) assists with stormwater solution
- Revised location of DSP
- DRP identified to indicate level of embellishments
- Maintains 2017 GNP

Figure 3A – Proposed Alignment of Arterial Road Section of E-W Road

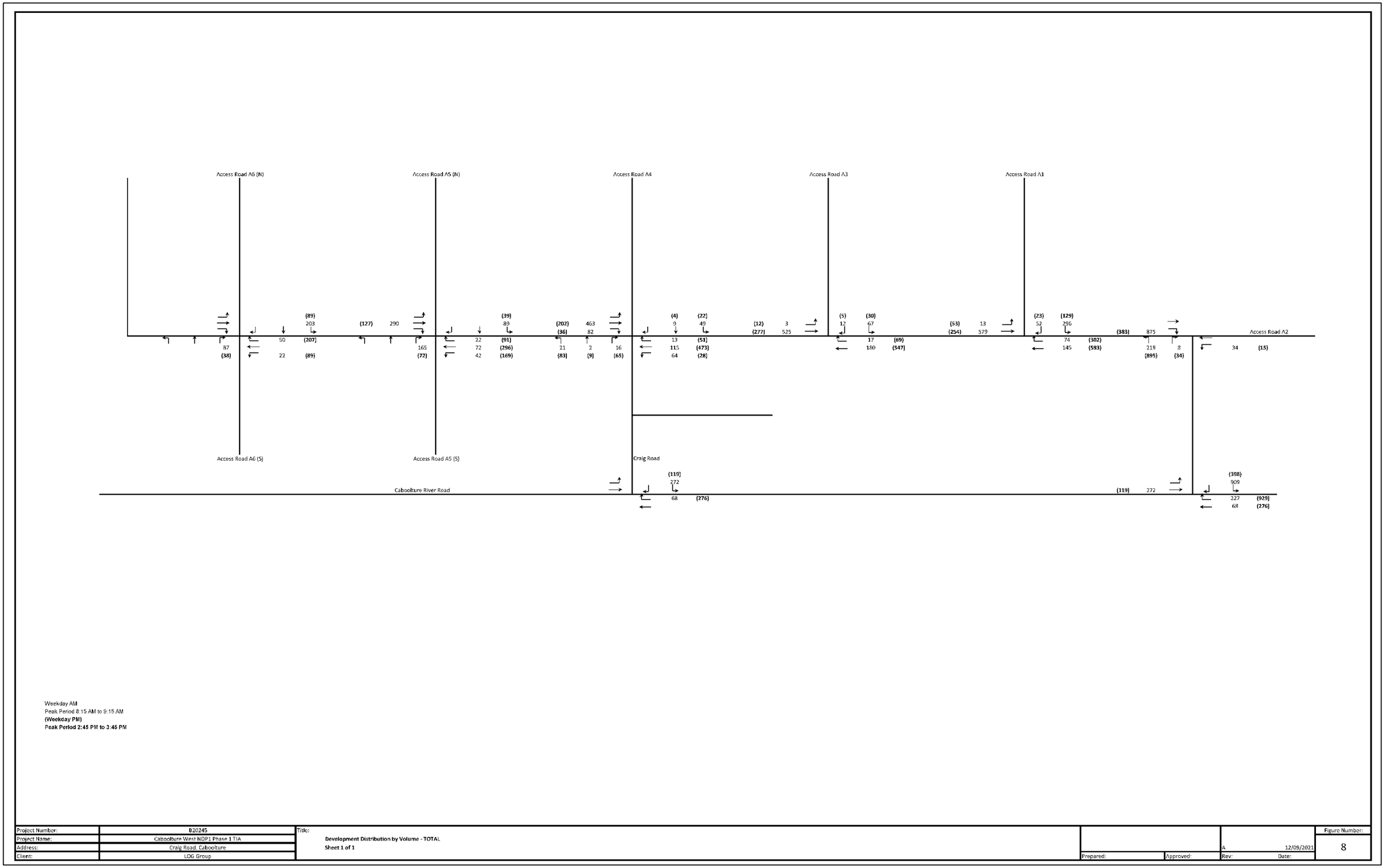


Figure 3B – Forecast Peak Hour Road Traffic Volumes for E-W Road

Figures 4-7 (Noise Contour Plots) and Figure 8 (Barrier Alignment)

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Report No. 21-1305.R03 Figure 4

Free Field $L_{A10(18hour)}$ Noise Levels

Internal E-W Arterial Road (2032)
No Acoustic Barriers to Subject Site

Private Open Spaces (Stages 1 and 2)

N

BALANCE LOT 3001

Stage 2

Stage 1

Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

A3 Scale 1:1250

0 5 10 20 30 40 50 60 70 80 90 100 m

Free Field $L_{A10(18hour)}$ Noise Level (dBA)

	<= 39
39 <	<= 41
41 <	<= 43
43 <	<= 45
45 <	<= 47
47 <	<= 49
49 <	<= 51
51 <	<= 53
53 <	<= 55
55 <	<= 57
57 <	<= 59
59 <	<= 61
61 <	<= 63
63 <	<= 65
65 <	<= 67
67 <	

Acoustics RB Pty Ltd

Report No. 21-1305.R03 Figure 5

Free Field 57dBA $L_{A10(18hour)}$ Noise Level

Internal E-W Arterial Road (2032)
1.8m High Acoustic Barriers to Lots 205-207

Private Open Spaces (Stages 1 and 2)

N

BALANCE LOT 3001

Stage 2

Stage 1

Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

future connection

future connection

A3 Scale 1:1250

0 5 10 20 30 40 50 60 70 80 90 100 m

Free Field $L_{A10(18hour)}$ Noise Level (dBA)

<= 57 Compliant

57 < Non-compliant

Acoustics RB Pty Ltd

Report No. 21-1305.R03 Figure 6

Facade-Corrected $L_{A10(18hour)}$ Noise Levels
and AS3671-1989 Construction Categories

Internal E-W Arterial Road (2032)
1.8m High Acoustic Barriers to Lots 205-207

Ground Floor Receptors

N

BALANCE LOT
3001

Stage 2

Stage 1

Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

future connection

future connection

AS3671-1989 Construction Categories
are not the same as
QDC MP 4.4 Noise Categories

Facade-Corrected $L_{A10(18hour)}$ Noise Level (dBA)
and AS3671-1989 Construction Categories

	<=	48	Construction Category 1
48 <	<=	63	Construction Category 2
63 <	<=	73	Construction Category 3
73 <			Construction Category 4

A3 Scale 1:1250

0 5 10 20 30 40 50 60 70 80 90 100 m

Acoustics RB Pty Ltd

Report No. 21-1305.R03 Figure 7

Facade-Corrected $L_{A10(18hour)}$ Noise Levels
and AS3671-1989 Construction Categories

Internal E-W Arterial Road (2032)
1.8m High Acoustic Barriers to Lots 205-207

First Floor Receptors

N

BALANCE LOT
3001

Stage 1

Stage 2

Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

100m Setback from E-W Arterial Road

future connection

future connection

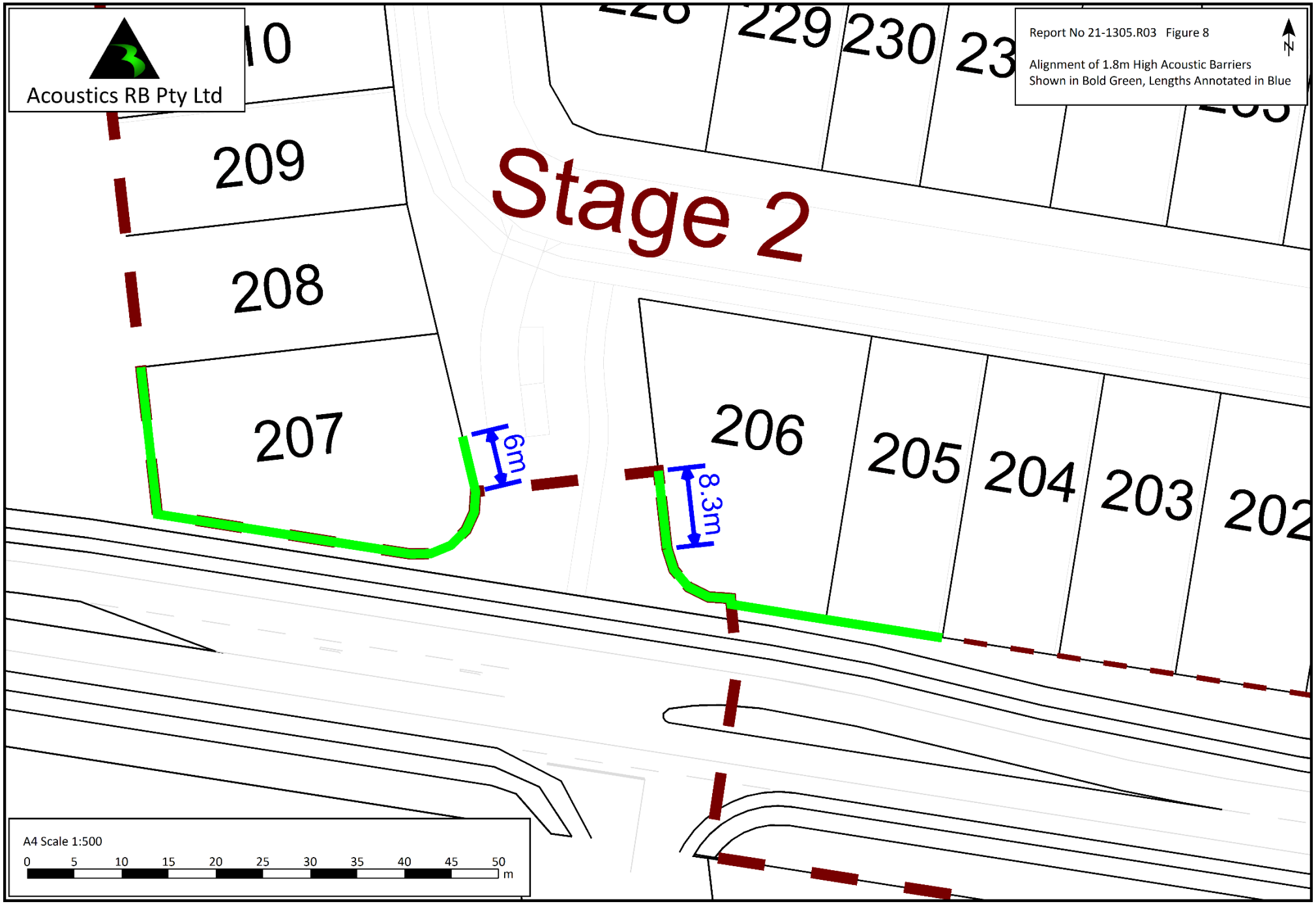
AS3671-1989 Construction Categories
are not the same as
QDC MP 4.4 Noise Categories

Facade-Corrected $L_{A10(18hour)}$ Noise Level (dBA)
and AS3671-1989 Construction Categories

	<=	48	Construction Category 1
48 <	<=	63	Construction Category 2
63 <	<=	73	Construction Category 3
73 <			Construction Category 4

A3 Scale 1:1250

0 5 10 20 30 40 50 60 70 80 90 100 m


Acoustics RB Pty Ltd
Report No 21-1305.R03 Figure 8
Alignment of 1.8m High Acoustic Barriers
Shown in Bold Green, Lengths Annotated in Blue
N
Stage 2
209
208
207
206
205
204
203
9m
8.3m
A4 Scale 1:500
0 5 10 15 20 25 30 35 40 45 50 m

Attachment A

Constraint on Adoption of QDC MP 4.4

Section 8 *Assessment of Road Traffic and Railway Noise* of SC 6.16 *Planning Scheme Policy – Noise* outlines the process of establishing acceptable acoustical amenity at sites impacted by noise from roads and railways. At Section 8.1 *Reconfiguring a Lot* of SC 6.16, it is stated:-

> "The [transport noise impact] assessment is to be in accordance with MP4 .4 of the QDC. The assessment is to identify the noise category applicable to each lot in the proposed development for both lower and upper levels. Noise categories are defined in Schedule 3 of MP4.4."

With respect to s.8.1, it is relevant to have regard to *Queensland Development Code MP4.4 Buildings in a Transport Noise Corridor* (QDC MP4.4) and Chapter 8B (especially s.246X) of *Building Act 1975.*

The relevant extracts from QDC MP4.4 follow below.

1 Purpose

To ensure *habitable rooms* of particular residential buildings located in *transport noise corridors* are designed and constructed to reduce the extent to which *transport noise* intrudes into those rooms.

3 Application

This QDC part applies to building work for a *relevant residential building* if the work is the subject of a building development application made on or after 17 August 2015.

6 What is a *relevant residential building*

A building is a *relevant residential building* if:

(a) a building development application for the construction of the building is made after 31 August 2010; and

(b) the building:

  (i) is a class 1, 2, 3 or 4 building; and

  (ii) is located in a *transport noise corridor*; and

  (iii) is not a *relocated building*; and

(c) the building development approval for the construction of the building was not given under the building assessment provisions in force immediately before 1 September 2010, under section 37 of the *Building Act 1975*.

At Section 8 *Definitions* of QDC MP4.4, "transport noise corridor is defined as follows:-

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

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

As noted above, the purpose of QDC MP4.4 is to ensure control of transport noise intrusion into particular residential buildings, specifically "relevant residential buildings", where as noted in the definition above, a relevant residential building must be located within a Transport Noise Corridor (TNC) as defined at Chapter 8B of *Building Act 1975* and, more particularly, at s.246X and s.246Y of the Act.

The subject site is not located in a TNC. Therefore, the provisions of QDC MP4.4 are not triggered.

Whether it is possible to extend the application of QDC MP 4.4 beyond its purpose is a town planning/legal question.

In the absence of an answer to that question and to avoid any inadvertent conflict by attempting to invoke QDC MP 4.4 where it cannot be properly applied, the appropriate means of controlling of road traffic noise intrusion is to apply the more robust methodology of the calculation methods of AS3671-1989 *Acoustics – Road traffic noise intrusion - Building siting and construction* to the design of noise affected residences, with the goal being to achieve compliance with the recommended internal sound levels of AS/NZS 2107:2016 A*coustics – Recommended design sound levels and reverberation times for building interiors*.

Attachment B

Derivation of Upper and Lower Bounds of Construction Categories

The upper and lower bounds of the Construction Categories can be derived in the following manner.

Internal noise level limits set by AS/NZS 2107:2016:-

* Bedrooms and sleeping areas: 35dBA ($L_{Aeq,1hr\ night}$)
* Living and work areas: 40dBA ($L_{Aeq,1hr\ day}$)

Reduction external to internal, glazing open (includes conversion from free field to facade-corrected): 10dBA

External noise limits (facade-corrected):-

* Night: 45dBA ($L_{Aeq,1hr\ night}$)
* Day: 50dBA ($L_{Aeq,1\ hr\ day}$)

Offsets: +3.3dBA (night)
-0.6dBA (day)

Resultant Facade-Corrected External $L_{A10(18hour)}$ Limit:

* Based on internal limits during night: 48.3dBA (48dBA rounded)
* Based on internal limits during day: 49.4dBA (49dBA rounded)

On the basis of these results, the noise level external to the most exposed facade of any residence should not exceed a facade-corrected noise level of **48dBA** $L_{A10(18hour)}$ if the internal noise level limits of AS/NZS 2107:2000 are to be met when windows and external doors are **open**. This is the upper bound Construction Category 1 and the lower bound of Construction Category 2.

Internal noise level limits set by AS/NZS 2107:2016:-

* Bedrooms and sleeping areas: 35dBA ($L_{Aeq,1hr\ night}$)
* Living and work areas: 40dBA ($L_{Aeq,1hr\ day}$)

Reduction external to internal, glazing open (includes conversion from free field to facade-corrected): 25dBA

External noise limits (facade-corrected):-

* Night: 60dBA ($L_{Aeq,1hr\ night}$)
* Day: 65dBA ($L_{Aeq,1\ hr\ day}$)

Offsets: +3.3dBA (night)
-0.6dBA (day)

Resultant Facade-Corrected External $L_{A10(18hour)}$ Limit:

* Based on internal limits during night: 63.3dBA (63dBA rounded)
* Based on internal limits during day: 64.4dBA (64dBA rounded)

On the basis of these results, the noise level external to the most exposed facade of any residence should not exceed a facade-corrected noise level of **63dBA** $L_{A10(18hour)}$ if the internal noise level limits of AS/NZS 2107:2016 are to be met when standard construction windows and external doors are **closed**. This is the upper bound Construction Category 2 and the lower bound of Construction Category 3.