HEGGIES

REPORT 10-4203-R2

Revision 0

Doonside Residential Parcel
Acoustic Design Recommendations

PREPARED FOR

APP Corporation
Suite 2, Level 4,
6 Newcomen St
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29 MAY 2007

Doonside Residential Parcel

Acoustic Design Recommendations

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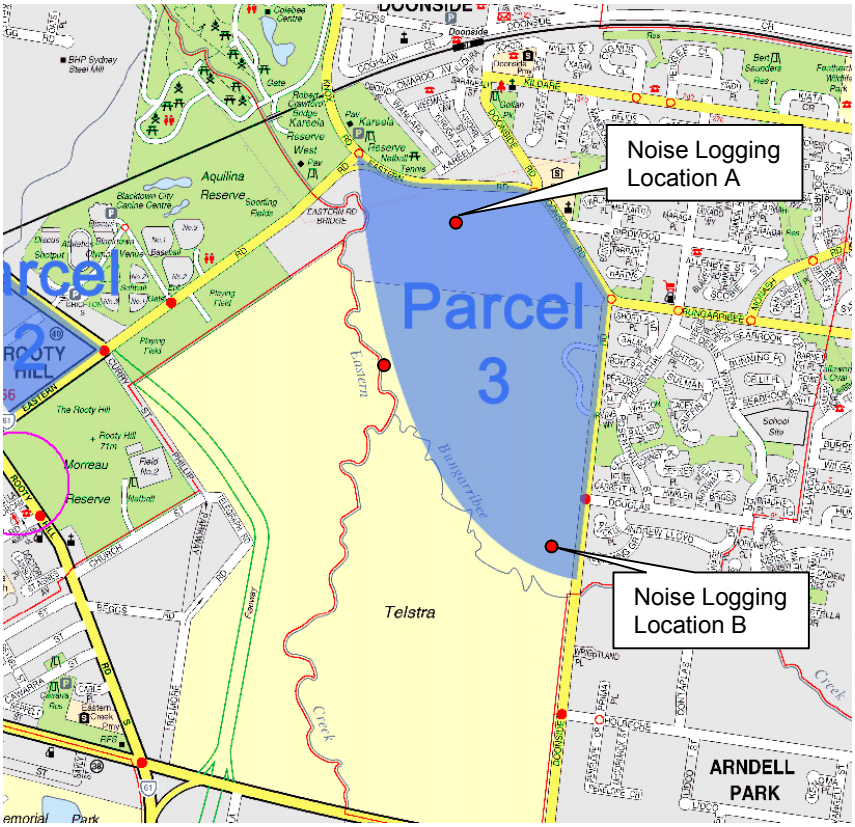
1 INTRODUCTION

Landcom, on behalf of Department of Planning (DoP) (who is the principal landowner) has appointed APP Corporation (APP) as the project manager for the proposal to examine rezoning issues associated with Parcels 2, 3 and 4 of the Western Sydney Parklands Interface Lands into a combination of residential and industrial/commercial (employment) land.

This report provides for design options for the barriers to mitigate noise from the surrounding road network, adjacent to Doonside Residential Parcel and follows on from the Heggies report, 10-4203R1 which undertook a series of noise surveys and included a preliminary assessment of the nature of the noise mitigation required.

The land proposed for redevelopment is shown in Figure 1, also shown is the locations where noise monitoring was undertaken in 2005. The Parcel requires rezoning to permit its use for residential land. It is bounded by Eastern Road to the north and Doonside Road to the east. Bungarribee Creek and Eastern Creek bound the site to the south and to the west respectively. Residential areas border the site to both the north and east, while undeveloped bushland lies to the south and west beyond the creeks. An industrial area is located to the south-east of the site, built around Holbeche Road.

Figure 1 Site Map



2 Existing noise environment

In order to quantify the existing ambient noise environment baseline monitoring were undertaken in September 2005, at representative locations within Doonside Parcel. For the purposes of this report, the previously measured noise levels (as documented in Heggies report 10-4203R1) are considered to be adequately representative for their continued use.

Table 2 presents a summary of the key noise data relevant to the assessment of operational road traffic noise at the site.

Table 2 Summary of Ambient L_{Aeq} Noise Survey Results

Location reference	**Nearest Main Road**	**$L_{Aeq(15hour)}$**	**$L_{Aeq(9hour)}$**
A	Eastern Road	61	58
B	Doonside Road	56	52

3 Noise Criteria

3.1 Road Traffic Noise Criteria

Responsibility for the control of noise emission in New South Wales is vested in Local Government and the Department of Environment and Conservation (DEC), formerly the Environment Protection Authority (EPA). Traffic noise emission impacting on the proposed development should therefore be assessed in accordance with the NSW Government's *Environmental Criteria for Road Traffic Noise* (ECRTN) for vehicle-related noise emissions on public roads.

The ECRTN document presents recommended road traffic noise criteria for various types of road and land use developments.

Table 3 DEC's Guidelines for Road Traffic Noise at Residences

	Criteria		
	Day (7am to 10pm)	**Night (10pm to 7am)**	**Where Criteria are Already Exceeded**
New residential land use developments affected by new freeway / arterial traffic noise.	$L_{Aeq(15hr)}$ 55 dBA	$L_{Aeq(9hr)}$ 50 dBA	Where feasible and reasonable, existing noise levels should be reduced to meet the noise criteria via judicious design construction of the development. Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.
New residential developments affected by collector traffic noise	$L_{Aeq(1hr)}$ 60 dBA	$L_{Aeq(1hr)}$ 55 dBA	Where feasible and reasonable, existing noise levels should be reduced to meet noise criteria via judicious design and construction of the development. Locations, internal layouts, building materials and construction should be chosen so as to minimise noise impacts.

Notes: New residential development affected by traffic noise - addresses the acceptable level of road traffic noise impact for new residential developments.

It should be noted that the noise criteria presented within the ECRTN noise policy document are guidelines and non-mandatory. In achieving compliance with the noise criteria, consideration needs to be given to aesthetics, cost implications, equity, community preferences and practicality.

Traffic noise from Eastern Road and Doonside Road would be assessed under the daytime $L_{Aeq(1hour)}$ objective of 60 dBA and night-time $L_{Aeq(1hour)}$ objective of 55dBA.

4 Noise Modelling

4.1 Road Traffic Noise Modelling of the Project Area

Noise modelling of the project area for the present study was carried out using the UK Department of Transport, *"Calculation of Road Traffic Noise"* (CoRTN 1988) algorithms. The modelling allows for traffic volume and mix, type of road surface, vehicle speed, road gradient, ground absorption and shielding from ground topography and physical noise barriers.

The locations of future houses, ground topography, current road alignment and other cadastral data (eg property boundaries) were derived from aerial photographs and electronic information supplied by APP Corporation. All noise model inputs used in this analysis were identical to that used in report 10-4203R1, excepting that the ground contours across the subject site were refined to a resolution of 0.25 m. The traffic volumes used in the model are presented in **Appendix A**.

The CORTN calculation predicts noise levels based on the L_{A10} noise descriptor. Therefore noise measurements conducted on site have been used to adjust the output of CORTN to calculate the relevant L_{Aeq} road traffic noise emission descriptors as required by the DEC, and was used as the basis of calibration of the noise model.

As the site is green-field, the assessment process only requires the evaluation of the operational noise impact for the year 2015. This assessment uses the noise model previously verified (refer 10-4203R1), therefore the need to run additional model verification scenarios is negated.

Noise modelling has been conducted by:

1 Selecting the nominal location of future residential properties having consideration of the proposed lot-layout and internal and link roadway networks. The target barrier required for compliance, was determined based on trying to achieve compliance (or close to compliance) at all properties;

2 Conducting grid noise maps (ie noise contours) across the study area to determine the location of the 60 dBA contour line, having consideration of possible breaks in the perimeter noise wall for link roads from the development to the surrounding road network;

5 Discussion of Results and Recommendations

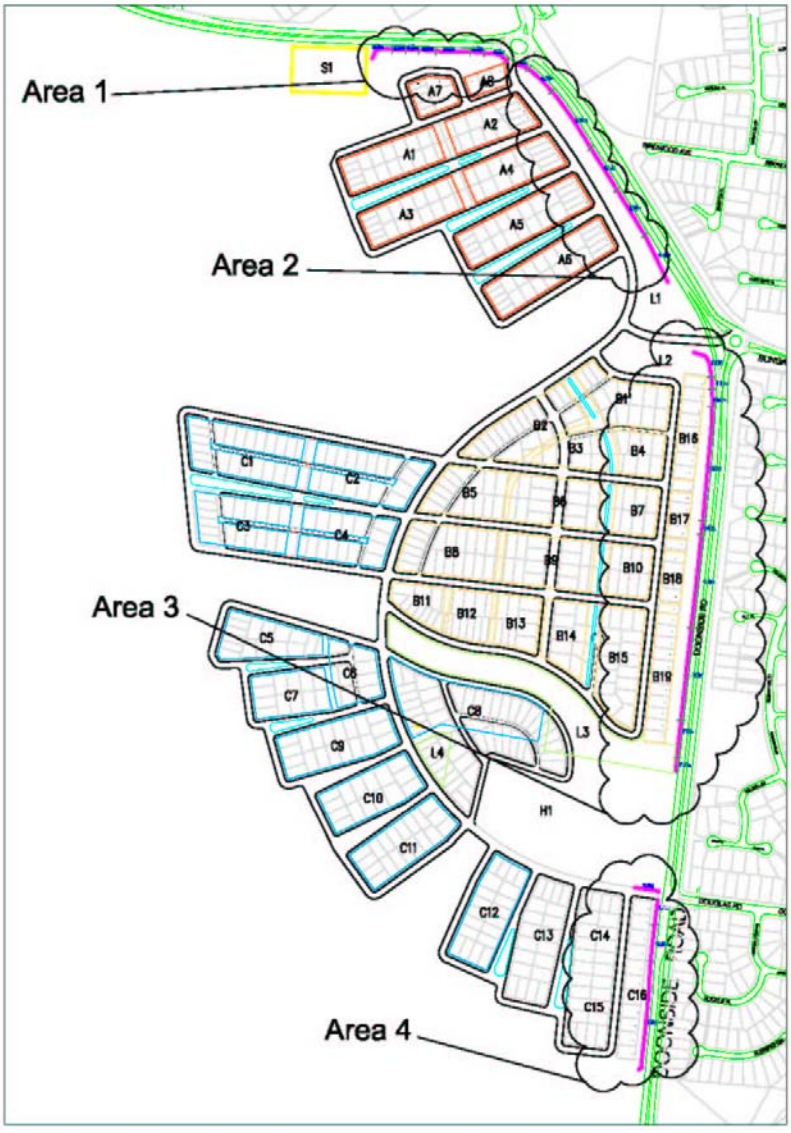
5.1.1 Barrier Design

The road traffic noise model was previously calibrated from a comparison of the supplied traffic flows and the results of the ambient noise monitoring, for 2005.

A comparison of the day-time and night-time night-time noise impacts for 2015 was within 0.2 dBA of each other, and thus any practical interpretation of the impacts would consider them to be identical. For the purpose of this exercise, the daytime noise contours are presented. It should be noted that compliance with the daytime criteria would therefore result in compliance with the night-time criteria, and visa-versa.

In order to best assist in optimising the barrier design, the land parcel was sub-divided in to four discrete areas, as shown in Figure 2.

Figure 2 Parcel 3, - Identification of Areas 1 to 4



The RTA barrier design process provides guidelines for the design of noise barriers. Clearly, the acoustical impacts are of primary consideration; however other factors must also be taken into account in arriving at a final design:

- Urban design considerations and urban design themes of the entire development; and possibly adjoining developments;
- The introduction of themed noise walls (eg undulating top of barrier) etc, or tapered sections at the beginning and/or ends of the walls;
- Overshadowing of residents from high walls;
- Line of sight considerations often dictate the start and end points of barriers;
- Pedestrian safety – in some situations the area behind the ends of barriers may be considered an unsafe area, as pedestrian visibility could be limited;
- Ensuring the wall design is both reasonable and feasible, from an engineering perspective;
- Location of services;
- The partial or full blocking of district views from the proposed dwelling;
- Community input;
- Council requirements;
- Etc.

The barriers presented in this report are based on acoustic considerations only and the final design should take into account the comments from other engineering and urban design disciplines.

The design principles discussed in this report are considered accurate for the first row of dwellings fronting the perimeter road network, but conservative for the second and subsequent rows as there is no account of noise mitigation from the building envelope or boundary property fencing to subsequent properties.

The design is based on single story dwellings, in each of the four zones. Should this not prove not to reflect the final design, at-dwelling noise mitigation may need to be incorporated at selected properties. The noise wall has been located nominally 12 m for the edge of the external roadway (ie Doonside Road and Eastern Road). Whilst a noise wall has been modelled, the design would equally apply should a noise mound be adopted, or combination wall/mound, ensuring there is no change in the height of the top of structure, unless for reasons discussed above.

The optimised walls vary in height along their length, referenced to the height of the surrounding topography. Such a barrier is unlikely to be an aesthetically pleasing design, and some rationalisation of the barrier heights would be expected. The final barrier height(s) chosen by the project team may, in some instances be higher or lower than the ideal acoustic design. Where these differences result in exceedances of the design goal, consideration of at-dwelling noise mitigation may be warranted to ensure compliance with the design objectives.

The results of the calculations showing the location of the daytime 60dBA noise contour across the site is presented graphically in **Appendix B1 to B3**.

Table 1 Summary of Barrier Heights

Area	Range of Barrier Heights	Noise Contours for 2016	Comments
Area 1	3.0 m to 5.5 m	Appendix B1	Lot A7 is entirely in compliance and no further consideration of at-dwelling treatments is warranted. Lot 8 has some exceedances of up to 3 dBA, primarily due to the break in the wall due to the road entrance. Such exceedances are of a minor level and easily mitigated through simple at-dwelling mitigation incorporated into the façade design of the building.
Area 2	4.0 m to 5.0 m	Appendix B1	Lots 2 to 6 are in compliance, excepting for one property near the road entrance. The exceedance is a very marginal 1 dBA, and easily mitigated through at-dwelling façade mitigation.
Area 3	3.0 m to 5.0 m	Appendix B2	Lots B16-B19 are generally in or near compliance, with some properties experiencing exceedances of up to a marginal 2dBA. Such exceedances are of a minor level and easily mitigated through simple at-dwelling mitigation incorporated into the façade design of the building. It is also possible to increase the height of the barrier outside lots B17 to B19 (inclusive) to 5,0 m, so as to achieve strict compliance.
Area 4	3.0 m to 4.0 m	Appendix B3	Due to diffraction around the ends of the barrier, some minor noise exceedances are expected in lots C16 of up to 2 dBA. Such exceedances are of a minor level and easily mitigated through simple at-dwelling mitigation incorporated into the façade design of the building. Further increasing the height of the barrier by 0.5m moves the contour very close to the rear of the barrier Further increasing the height of al of the barriers in this area by a further 0.5m results in effective compliance across the area.

The residual impacts are relatively minor (generally less than 2 dBA), and consideration of supplementary at-dwelling treatments may be appropriate to ensure compliance with the design goals. For exceedances of the magnitude expected, particularly typically near the ends of barriers (where barrier effects are reduced), the treatments would typically consist of:

- Fresh air ventilation systems that meet Building Code of Australia requirements with the windows and doors shut;
- Upgrading (or supply of) window and door seals; and
- The sealing of wall vents.

5.1.2 Changes to site layout

The acoustic design detailed in Section 5.1.1, is optimised for the current site layout. It is entirely feasible that subsequent reviews will result in at least some minor changes to the layout of where the dwellings are located.

The current design tends to lie close the noise barrier except in the following circumstances:

- Near vehicular entry points. At these locations further reductions of the 60 dBA noise contour is not considered feasible. At-dwelling property treatments are considered the only practical form of noise mitigation to minimise any property that is in excess of the noise criteria.
- North-West of lot A7 (towards S1). To achieve strict compliance this currently undeveloped area, the 3 m noise running along the S1 property could be extended further south. However, as the exceedances are of minor nature, property mitigation may prove the most cost-effective option;

- Within Area 2, there is a small bulge in the contours almost opposite Birwood Ave, which could be significantly reduced by increasing the barrier height from 4.5 m to 5.0 m in the region immediately adjacent to the 'bulge';
- A small 'bulge' in the 60 dBA contour south of lot B17 (to B19) has been previously discussed;
- A small 'bulge' in the 60 dBA contour at lot C16 has been previously discussed.

6 CONCLUSION

The acoustic criteria for new residential dwellings constructed adjacent to collector roads is a one-hour L_{Aeq} index of 60 dBA and 55 dBA during the daytime and night-time periods respectively.

Based on the footprint for the proposed site layout, target barriers have been defined that result in compliance (or near compliance) along the project, excepting for areas that are influenced by discontinuities in the noise wall from entrance/exit roads.

The heights of the barriers vary along their length, but are typically in the range 3 m to 5 m above the existing terrain. In the vicinity of entry/exit roads, the noise contour extends a small way into the development, though localised, small exceedances can be easily mitigated using at-dwelling architectural treatments as a means of noise control.

The barriers detailed in this report only consider the acoustical requirements and have not considered a wider range of design issues such as; urban design or engineering considerations that may feed into the final design heights. When the barrier design heights and the lot layout completed, a final check may show that some properties no-longer comply with the noise target levels, and depending upon the degree of exceedances, the incorporation of at-dwelling noise mitigation may require further consideration.

Doonside Road and Eastern Road Traffic Volumes for 2005

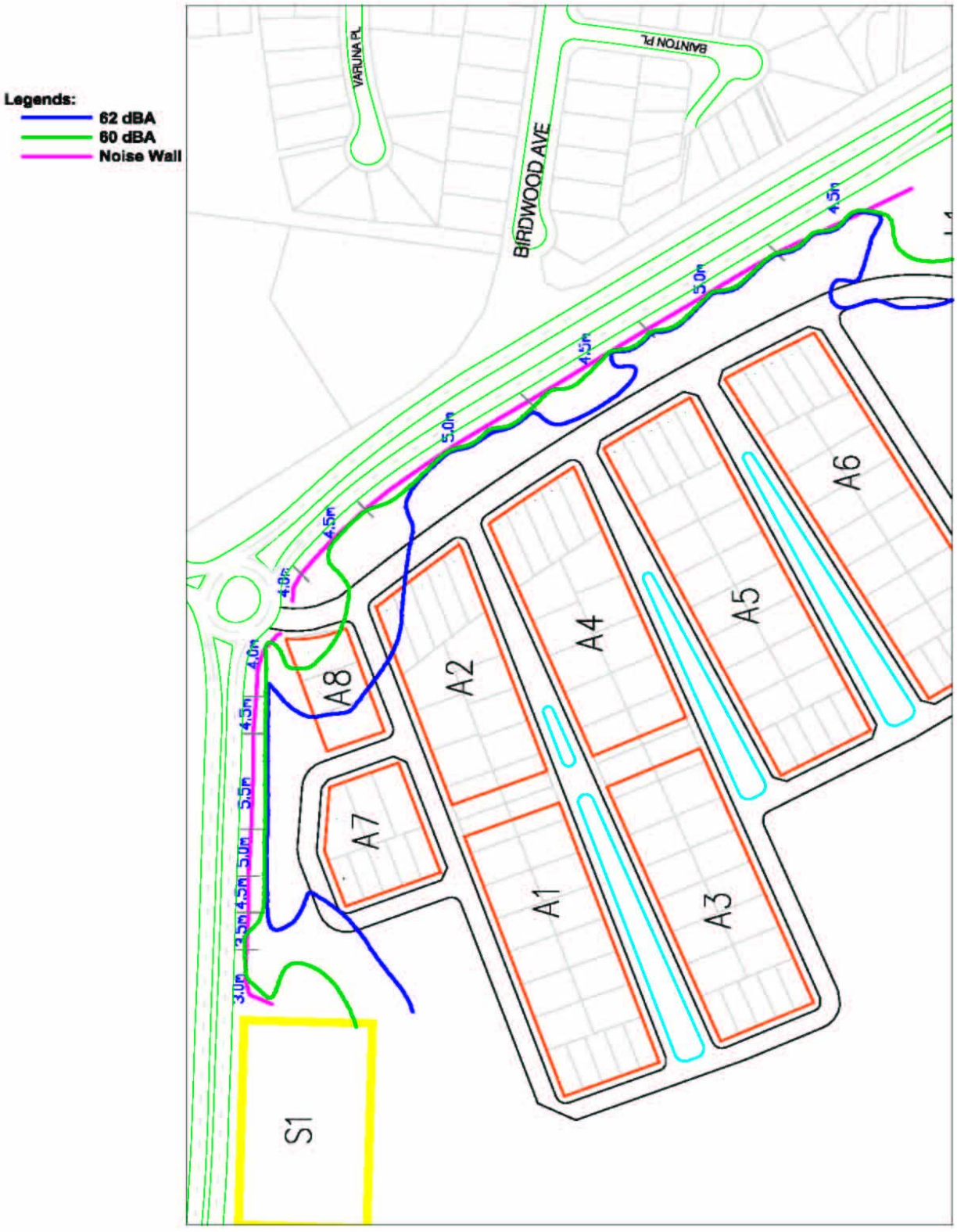
Location	Direction	Day traffic 7am – 10pm	Night traffic 10pm – 7am	Speed (km/hr)	% Heavy Vehicles	
					Daytime	Night-time
Doonside Road –Sth of Bungarribee Rd	Northbound	10170	2265	70	7 %	7 %
Doonside Road –Sth of Bungarribee Rd	Southbound	10170	2265	70	7 %	7 %
Eastern Road – West of Knox Road	Westbound	8528	2476	60	4 %	4 %
Eastern Road – West of Knox Road	Eastbound	8528	2476	60	4 %	4 %
Eastern Road – East of Knox Road	Westbound	16039[1]	2887[1]	60	6 %	6 %
Eastern Road – East of Knox Road	Eastbound	16039[1]	2887[1]	60	6 %	6 %

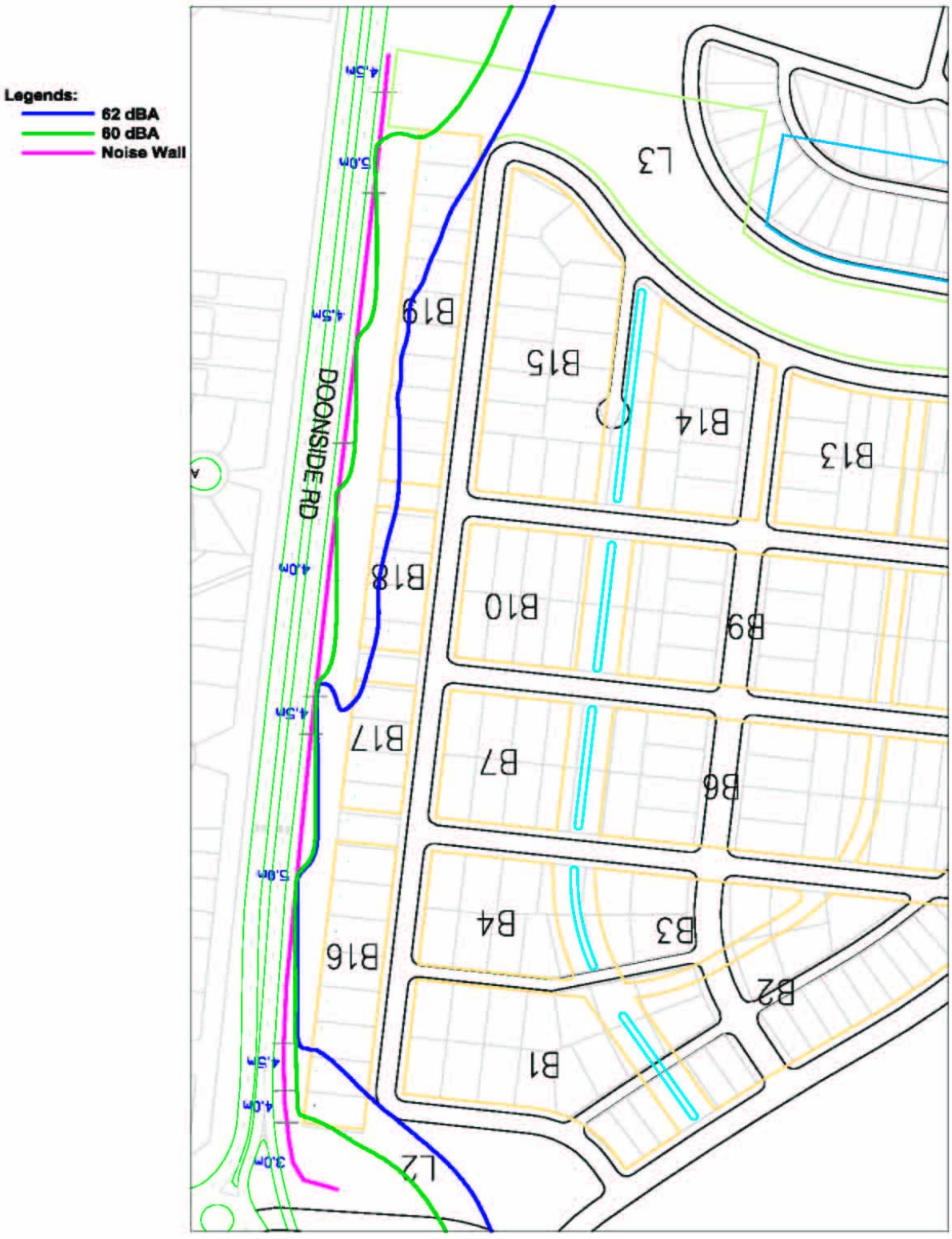
1 Expansion factor for this section of road not available, it is estimated as the average of expansion factors for Eastern Road – West of Knox Road, and Doonside Road - South of Bungarribee Road. See **Appendix F** for details

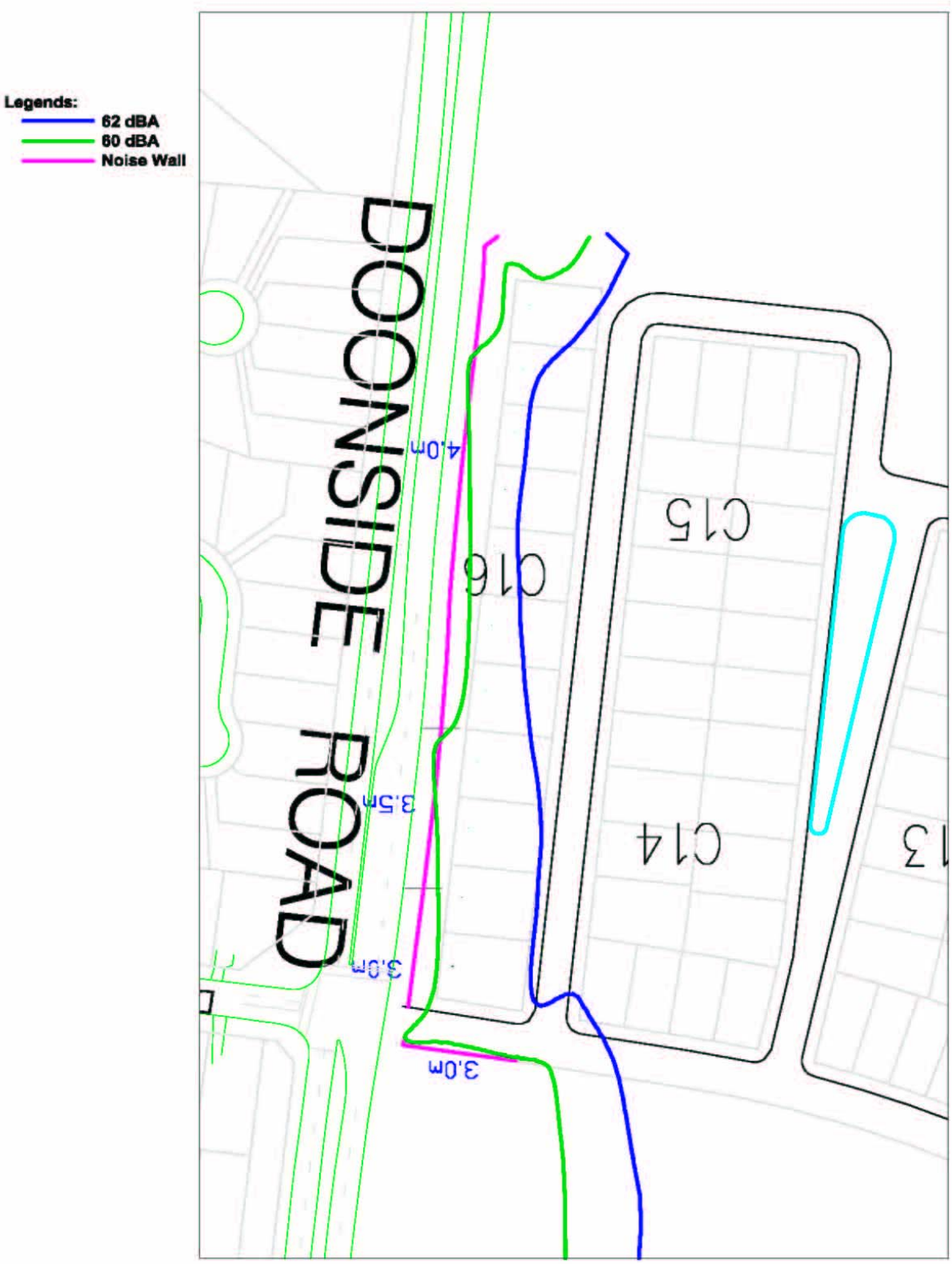
Doonside Road and Eastern Road Traffic Volumes for 2015

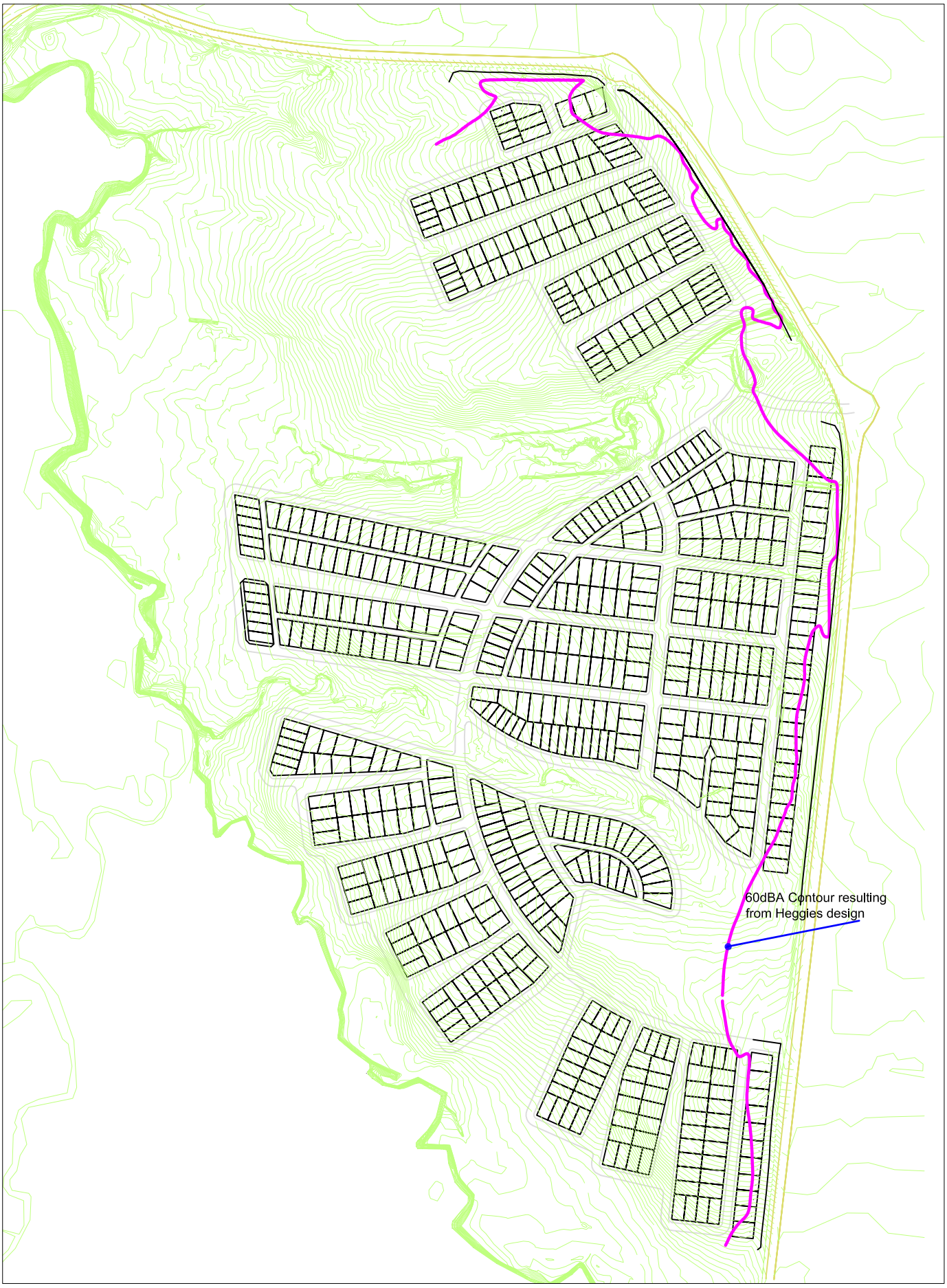
Location	Direction	Day traffic 7am – 10pm	Night traffic 10pm – 7am	Speed (km/hr)	% Heavy Vehicles	
					Daytime	Night-time
Doonside Road –Sth of Bungarribee Rd	Northbound	10265	2287	70	7 %	7 %
Doonside Road –Sth of Bungarribee Rd	Southbound	16796	3741	70	7 %	7 %
Eastern Road – West of Knox Road	Westbound	10490	1523	60	4 %	4 %
Eastern Road – West of Knox Road	Eastbound	14802	2149	60	4 %	4 %
Eastern Road – East of Knox Road	Westbound	12573[2]	2263[2]	60	6 %	6 %
Eastern Road – East of Knox Road	Eastbound	20974[2]	3775[2]	60	6 %	6 %

2 Expansion factor for this section of road not available, it is estimated as the average of expansion factors for Eastern Road – West of Knox Road, and Doonside Road - South of Bungarribee Road. See **Appendix F** for details


Legends:
62 dBA
60 dBA
Noise Wall
VARUNA PL
BAINTON PL
BIRDWOOD AVE
A1
A2
A3
A4
A5
A6
A7
A8
S1
4.0m
4.5m
5.0m
5.5m
3.0m
2.5m


Legends:
62 dBA
60 dBA
Noise Wall
DOONSIDE RD
L3
L2
B19
B15
B14
B13
B18
B10
B9
B17
B7
B6
B16
B4
B3
B2
B1
4.5m
5.0m
4.0m
3.0m


Legends:
62 dBA
60 dBA
Noise Wall
DOONSIDE ROAD
4.0m
3.5m
3.0m
3.0m
C16
C15
C14
13



50 mm ON ORIGINAL

REV	DATE	AMENDMENT / ISSUE DESCRIPTION	PREPARED	CHECKED

Heggies Pty Ltd
9 Penang Road
#08-14 Park Mall
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Year 2016 60dBA Noise Contours for the Heggies and Edaw Noise Wall Designs

FILE NAME: Noise Contours 20070529

DRAWING No. 2016 Contours

REVISION A