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# LANDCORP

# PROPOSED COCKBURN COAST DEVELOPMENT

## ROAD NOISE ASSESSMENT

OCTOBER 2011

OUR REFERENCE: 13754-2-11070

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# NOISE ASSESSMENT
## COCKBURN COAST PROJECT

Job No: 11070

Document Reference: 13754-2-11070

FOR

## LANDCORP

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# APPENDICES

# EXECUTIVE SUMMARY

Landcorp commissioned Herring Storer Acoustics to carry out an acoustic study relating to both road and rail related noise for the proposed Cockburn Coast development.

The purpose of this report was to assess noise received within the development from vehicles travelling along both Cockburn Road and the proposed Cockburn Coast Drive and if exceedance with the stated criteria were determined, establish the required attenuation measures to control noise intrusion to acceptable levels. The traffic noise assessment has been carried out in accordance with the new WAPC State Planning Policy 5.4 *"Road and Rail Transportation Noise and Freight Consideration in Land Use Planning"*.

Under the Western Australian Planning Commission (WAPC) Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations in Land Use Planning"* (SPP5.4), we believe that the appropriate criteria for assessment for this development are as listed below for "Noise Limits".

**EXTERNAL**

$L_{Aeq(Day)}$ of 60 dB(A); and
$L_{Aeq(Night)}$ of 55 dB(A).

**INTERNAL**

$L_{Aeq(Day)}$ of 40 dB(A) in living and work areas; and
$L_{Aeq(Night)}$ of 35 dB(A) in bedrooms.

Noise received at an outdoor area should also comply with the $L_{Aeq}$ of 50 dB(A) during the night period.

From the monitoring undertaken, we also note that as the difference between the $L_{Aeq(day)}$ and the $L_{Aeq(night)}$ is greater than 5 dB (i.e. 5.3 dB) and the day period is the critical period for compliance. Given the difference, if compliance is achieved for the day period, then compliance would also be achieved for the night period.

Even though with the construction of Cockburn Coast Drive, the flow of vehicles along Cockburn Road will significantly reduced, it is proposed that the current noise emissions from vehicles travelling along Cockburn Road be used for the design criteria and bases for any "Quiet House" design. Based on the acoustic assessment and modelling of current noise emissions from Cockburn Road, the following noise level should be used for developments located adjacent to Cockburn Road:

| | | |
|---|---|---|
| Facing Cockburn Road | - | 62 dB(A) |
| Side (perpendicular) to Cockburn Road | - | 59 dB(A) |

Note: For facades on the opposite side to Cockburn Road, except for developments shown on Figure D2 in Appendix D, standard constructions can be used. For those developments indicated on Figure D2, due to the additive effect of noise received from both Cockburn Road and Cockburn Coast Drive, it is recommended that a noise level of 58 dB(A) be used for the facades on the opposite side to Cockburn Road, but not directly exposed to Cockburn Coast Drive.

Initial modelling indicates that noise emissions from the proposed Cockburn Coast Drive would exceed the above acoustic criteria by up to 8 dB(A). Given the given the topography of the land, for this development, a barrier located at the boundary of the lots and the road reserve would be in some locations, fairly ineffectual and in these locations it is recommended that a barrier be incorporated within the road reserve and be included in the design of the road. Additionally, given that the residential developments located adjacent to Cockburn Coast Drive would be multi storey developments, it is recommended that "Quiet House" design be incorporated in the design of all levels (including ground floor). Guidance on the required glazing requirements are outlined in Tables 6.1 and 6.2. The noise that would be received at development located adjacent to the proposed Cockburn Coast Drive varies and the calculated day period noise level that would be received at various locations within the development are shown on Figures D1 and D2 attached in appendix D. It is recommended that these noise levels be used for the determination of "Quiet House" design to achieve compliance with the internal acoustic criteria.

Given the proposed layout, it is noted that the first row of buildings located on the western side of Cockburn Road will act as an acoustic barrier to the developments located behind them. However, to the east of Cockburn Road, with the additive effect of Cockburn Coast Drive, this may not be the case. Therefore, for the locations listed below it is recommended that as part of the design process, an acoustic assessment report be included in the building license submission:

- First row of buildings located adjacent to the western side of Cockburn Road.
- Buildings located between Cockburn Road and Cockburn Coast Drive.

Finally, we note that under the Planning Policy, as noise received within the proposed development would exceed the “Noise Target”, notification on Titles is required for those residence exposed to transportation noise.

# 1. INTRODUCTION

Landcorp commissioned Herring Storer Acoustics to carry out an acoustic study relating to noise emissions from both Cockburn Road and the proposed Cockburn Coast Drive as part of the proposed Cockburn Coast development.

The purpose of this report was to assess noise received within the development from vehicles travelling along both Cockburn Road and the proposed Cockburn Coast Drive and if exceedance with the stated criteria were determined, establish the required attenuation measures to control noise intrusion to acceptable levels. The traffic noise assessment has been carried out in accordance with the new WAPC State Planning Policy 5.4 *"Road and Rail Transportation Noise and Freight Consideration in Land Use Planning"*.

As part of the study, the following was carried out:

- Undertake noise monitor of noise received from vehicles travelling along Cockburn Road.
- Determine by modelling, the noise that would be received at residences within the development from vehicles travelling on both Cockburn Road and the proposed Cockburn Coast Drive.
- Assess the predicted noise levels for compliance with the appropriate criteria.
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

For information, a locality plan is attached in Appendix A.

# 2. SUMMARY

For this development, noise emissions from vehicle travelling along both Cockburn Road and the proposed Cockburn Coast Drive need to be considered.

Under the Western Australian Planning Commission (WAPC) Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations in Land Use Planning"* (SPP5.4), we believe that the appropriate criteria for assessment for this development are as listed below for "Noise Limits".

**EXTERNAL**

$L_{Aeq(Day)}$ of 60 dB(A); and
$L_{Aeq(Night)}$ of 55 dB(A).

**INTERNAL**

$L_{Aeq(Day)}$ of 40 dB(A) in living and work areas; and
$L_{Aeq(Night)}$ of 35 dB(A) in bedrooms.

Noise received at an outdoor area should also comply with the $L_{Aeq}$ of 50 dB(A) during the night period.

For this development, noise emissions from vehicles travelling along both Cockburn Road and the proposed Cockburn Coast Drive need to be considered.

From the monitoring undertaken, we also note that as the difference between the $L_{Aeq(day)}$ and the $L_{Aeq(night)}$ is greater than 5 dB (i.e. 5.3 dB) and the day period is the critical period for compliance. Given the difference, if compliance is achieved for the day period, then compliance would also be achieved for the night period.

In the future, with development of Cockburn Coast and the construction of Cockburn Coast Drive, the flow of vehicles along Cockburn Road will significantly reduced. However, as it is unclear as to when Cockburn Coast Drive will be constructed, to be conservative and to provide some degree of protection for both residence and future commercial developments it is proposed that the current noise emissions from vehicles travelling along Cockburn Road be used for the design criteria and bases for any "Quiet House" design. Based on the acoustic assessment and modelling of current noise emissions from Cockburn Road, the following noise level should be used for developments located adjacent to Cockburn Road:

| | | |
|---|---|---|
| Facing Cockburn Road | - | 62 dB(A) |
| Side (perpendicular) to Cockburn Road | - | 59 dB(A) |

Note: For facades on the opposite side to Cockburn Road, except for developments located at the southern end of the project area (between Cockburn Road and Cockburn Coast Drive) and as shown on Figure D2 in Appendix D, standard constructions can be used. For those developments indicated on Figure D2, due to the additive effect of noise received from Cockburn Coast Drive, it is recommended that a noise level of 58 dB(A) be used for the facades on the opposite side to Cockburn Road, but not directly exposed to Cockburn Coast Drive.

Initial modelling, indicates that without any noise amelioration, noise emissions from the proposed Cockburn Coast Drive would exceed the above acoustic criteria by up to 8 dB(A). For the proposed Cockburn Coast Drive, it is noted that under the WAPC State Planning Policy 5.4, it is a requirement that the infrastructure provider design mitigation measures to achieve the "Noise Limits" these being $L_{Aeq(Day)}$ of 60 dB(A); and $L_{Aeq(Night)}$ of 55 dB(A). Additionally, under State Planning Policy 5.4, all practicable noise mitigation should be implemented. However, given the topography of the land, barriers located at the boundary of the lots and the road reserve would be in some locations, fairly ineffectual (i.e. in locations where the ground level of the road is above that of the residential development) and in these locations, it is recommended that a barrier be incorporated within the road reserve and be included in the design of the road. However, given that the residential developments located adjacent to Cockburn Coast Drive would be multi storey developments, it is recommended that "Quiet House" design be incorporated in the design of all levels (including ground floor). Guidance on the required glazing requirements are outlined in Tables 6.1 and 6.2. The noise that would be received at development located adjacent to the proposed Cockburn Coast Drive varies and the calculated day period noise level that would be received at various locations within the development are shown on Figures D1 and D2 attached in appendix D. It is recommended that these noise levels be used for the determination of "Quiet House" design to achieve compliance with the internal acoustic criteria.

For those developments located adjacent to Cockburn Road or located between Cockburn Road and the proposed Cockburn Coast Drive that, as part of the design process, an acoustic assessment be undertaken. Additionally, an acoustic assessment report should be included in the building licence submission.

We note that under the Planning Policy, as noise received within the proposed development would exceed the “Noise Target”, notification on Titles is required for those residence exposed to transportation noise.

# 3. ACOUSTIC CRITERIA

## 3.1 WAPC PLANNING POLICY

The Western Australian Planning Commission (WAPC) released on 22 September 2009 State Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations In Land Use Planning"*. Section 5.3 – Noise Criteria, which outlines the acoustic criteria, states:

*"5.3 - NOISE CRITERIA*

*Table 1 sets out the outdoor noise criteria that apply to proposals for new noise-sensitive development or new major roads and railways assessed under this policy.*

*These criteria do not apply to –*

- *proposals for redevelopment of existing major roads or railways, which are dealt with by a separate approach as described in section 5.4.1; and*
- *proposals for new freight handling facilities, for which a separate approach is described in section 5.4.2.*

*The outdoor noise criteria set out in Table 1 apply to the emission of road and rail transport noise as received at a noise-sensitive land use. These noise levels apply at the following locations—*

- *for new road or rail infrastructure proposals, at 1 m from the most exposed, habitable façade of the building receiving the noise, at ground floor level only; and*
- *for new noise-sensitive development proposals, at 1 m from the most exposed, habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.*

*Further information is provided in the guidelines.*

***Table 1: Outdoor Noise Criteria***

| ***Time of day*** | ***Noise Target*** | ***Noise Limit*** |
|---|---|---|
| *Day (6 am–10 pm)* | $L_{Aeq(Day)}$ *= 55 dB(A)* | $L_{Aeq(Day)}$ *= 60 dB(A)* |
| *Night (10 pm–6 am)* | $L_{Aeq(Night)}$ *= 50 dB(A)* | $L_{Aeq(Night)}$ *= 55 dB(A)* |

*The 5 dB difference between the outdoor noise target and the outdoor noise limit, as prescribed in Table 1, represents an acceptable margin for compliance. In most situations in which either the noise-sensitive land use or the major road or railway already exists, it should be practicable to achieve outdoor noise levels within this acceptable margin. In relation to greenfield sites, however, there is an expectation that the design of the proposal will be consistent with the target ultimately being achieved.*

*Because the range of noise amelioration measures available for implementation is dependent upon the type of proposal being considered, the application of the noise criteria will vary slightly for each different type. Policy interpretation of the criteria for each type of proposal is outlined in sections 5.3.1 and 5.3.2.*

*The noise criteria were developed after consideration of road and rail transport noise criteria in Australia and overseas, and after a series of case studies to*

*assess whether the levels were practicable. The noise criteria take into account the considerable body of research into the effects of noise on humans, particularly community annoyance, sleep disturbance, long-term effects on cardiovascular health, effects on children's learning performance, and impacts on vulnerable groups such as children and the elderly. Reference is made to the World Health Organization (WHO) recommendations for noise policies in their publications on community noise and the Night Noise Guidelines for Europe. See the policy guidelines for suggested further reading.*

#### *5.3.1 Interpretation and application for noise-sensitive development proposals*

*In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –*

- *acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot[1].*

*If a noise-sensitive development takes place in an area where outdoor noise levels will meet the noise target, no further measures are required under this policy.*

*In areas where the noise target is likely to be exceeded, but noise levels are likely to be within the 5dB margin, mitigation measures should be implemented by the developer with a view to achieving the target levels in a least one outdoor living area on each residential lot[1]. Where indoor spaces are planned to be facing any outdoor area in the margin, noise mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces. In this case, compliance with this policy can be achieved for residential buildings through implementation of the deemed-to-comply measures detailed in the guidelines.*

*In areas where the outdoor noise limit is likely to be exceeded (i.e. above $L_{Aeq(Day)}$ of 60 dB(A) or $L_{Aeq(Night)}$ of 55 dB(A)), a detailed noise assessment in accordance with the guidelines should be undertaken by the developer. Customised noise mitigation measures should be implemented with a view to achieving the noise target in at least one outdoor living or recreation area on each noise-sensitive lot or, if this is not practicable, within the margin. Where indoor spaces will face outdoor areas that are above the noise limit, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces, as specified in the following paragraphs.*

*For residential buildings, acceptable indoor noise levels are $L_{Aeq(Day)}$ of 40 dB(A) in living and work areas and $L_{Aeq(Night)}$ of 35 dB(A) in bedrooms[2]. For all other noise-sensitive buildings, acceptable indoor noise levels under this policy comprise noise levels that meet the recommended design sound levels in Table 1 of Australian Standard AS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors.*

1 For non residential noise-sensitive developments, (e.g. schools and child care centres) consideration should be given to providing a suitable outdoor area that achieves the noise target, where this is appropriate to the type of use.
2 For residential buildings, indoor noise levels are not set for utility spaces such as bathrooms. This policy encourages effective "quiet house" design, which positions these non-sensitive spaces to shield the more sensitive spaces from transport noise (see guidelines for further information).

*These requirements also apply in the case of new noise-sensitive developments in the vicinity of a major transport corridor where there is no existing railway or major road (bearing in mind the policy's 15-20 year planning horizon). In these instances, the developer should engage in dialogue with the relevant infrastructure provider to develop a noise management plan to ascertain individual responsibilities, cost sharing arrangements and construction time frame.*

*If the policy objectives for noise-sensitive developments are not achievable, best practicable measures should be implemented, having regard to section 5.8 and the guidelines."*

The Policy, under Section 5.7, also provides the following information regarding "Notifications on Titles".

*"5.7 - NOTIFICATION ON TITLE*

*If the measures outlined previously cannot practicably achieve the target noise levels for new noise-sensitive developments, this should be notified on the certificate of title.*

*Notifications on certificates of title and/or advice to prospective purchasers advising of the potential for noise impacts from major road and rail corridors can be effective in warning people who are sensitive to the potential impacts of transport noise. Such advice can also bring to the attention of prospective developers the need to reduce the impact of noise through sensitive design and construction of buildings and the location of outdoor living areas.*

*The notification is to ensure that prospective purchasers are advised of –*

- *the potential for transport noise impacts; and*
- *the potential for quiet house design requirements to minimise noise intrusion through house layout and noise insulation (see the guidelines).*

*Notification should be provided to prospective purchasers and be required as a condition of subdivision (including strata subdivision) for the purposes of noise-sensitive development as well as planning approval involving noise-sensitive development, where noise levels are forecast or estimated to exceed the target outdoor noise criteria, regardless of proposed noise attenuation measures. The requirement for notification as a condition of subdivision and the land area over which the notification requirement applies, should be identified in the noise management plan in accordance with the guidelines.*

*An example of a standard form of wording for notifications is presented in the guidelines."*

### 3.2 APPROPRIATE CRITERIA

Based on the above, the following criteria are proposed for this development:

**External**

| | |
|---|---|
| Day | Maximum of 60 dB(A) $L_{Aeq}$ |
| Night | Maximum of 55 dB(A) $L_{Aeq}$ |
| Outdoor Living Areas | Maximum of 50 dB(A) $L_{Aeq}$ |

**Internal**

| | |
|---|---|
| Sleeping Areas | 35 dB(A) $L_{Aeq(night)}$ |
| Living Areas | 40 dB(A) $L_{Aeq(day)}$ |

## 4. MEASUREMENTS AND OBSERVATIONS

Noise logging was conducted on the site to determine the existing noise received from vehicles travelling along the Cockburn Road. Monitoring was carried out between Thursday 14th April 2011 and Thursday 21st April 2011.

Test instrumentation comprised a calibrated RTA Noise Loggers and Rion Calibrator.

The results for the logger located adjacent to the Cockburn Road are summarised in Table 4.1 and are presented graphically in Figure B1 in Appendix B.

**TABLE 4.1 – SUMMARY OF MEASURED NOISE LEVELS**

| Parameter | Measured Level dB(A)* | Difference between $L_{10(18hour)}$ and $L_{Aeq(parameter)}$ dB(A) |
|---|---|---|
| $L_{A10\ (18\ hour)}$ | 63.7 | N/A |
| $L_{Aeq,\ day\ (6am\ to\ 10pm)}$ | 62.1 | = $L_{A10\ (18\ hour)}$ – 1.6 |
| $L_{Aeq,\ night\ (10pm\ to\ 6am)}$ | 56.8 | = $L_{A10(18\ hour)}$ – 6.9 |

* It is normal practice to quote decibels to the nearest whole number. Fractions are retained here to minimise any cumulative rounding error.

We also note that as the difference between the $L_{Aeq(day)}$ and the $L_{Aeq(night)}$ is 5.3 dB. Given the difference, if compliance is achieved for the day period, then compliance would also be achieved for the night period and the day period is the critical period for compliance.

## 5. METHODOLOGY

To determine the noise received within the development from the Cockburn Road and the proposed Cockburn Coast Drive, noise modelling was carried out using SoundPlan, using the Calculation of Road Traffic Noise (CoRTN) algorithms. Noise modelling was undertaken in accordance with the "Implementation Guidelines" for the State Planning Policy 5.4.

The input data for the model included:

- Topographical data, with the ground level within the subdivision from information supplied by client;
- Existing traffic volumes as obtained from the Main Roads Metropolitan Traffic Digest.
- Future traffic volumes as obtained from the WorleyParsons traffic study, as listed in Table 5.1.
- A +2.5 dB adjustment to allow for façade reflection.

**TABLE 5.1 – NOISE MODELLING INPUT DATA**

| Parameter | Value | |
|---|---|---|
| | Cockburn Road | Cockburn Coast Drive |
| Existing Traffic for 2006 | 15540 vpd | NA |
| Traffic flows for 2031 | 7000 vpd | 21000 vpd |
| Heavy Vehicles (%) | 7.6% | 7.6% |
| Current Speed (km/hr) | 60/70 | NA |
| Future Speed (km/hr) | 50 | 70 |
| Receiver Level (m) | +1.5 above ground | +1.5 above ground |
| Current Road Surface | Chip Seal | NA |
| Future Road Surface | Dense Graded Asphalt | Dense Graded Asphalt |

The traffic volume for the year 2031 was based on the data as provided and as contained within the Transport Study.

The noise model was calibrated, based on the existing traffic volumes detailed in Table 5.1, the current road alignment and the existing topography, the existing traffic noise levels have been calculated to verify the prediction model and calibrated to correlate with the monitored noise levels. Calculations are free field as the noise logger was located away from any building façades. The SoundPlan computer model was calibrated with the monitored data as listed in Table 3.1.

Noise modelling for the future road network, with Cockburn Coast Drive, was undertaken and the noise contour plot is attached in Appendix C as Figure C1.

## 6. DESIGN CONSIDERATIONS

The policy states that the outdoor criteria apply to the ground floor level only. The policy also states that noise mitigation measures should be implemented with a view to achieving the target levels in least one outdoor living area. Although, we believe that the policy only applies to ground floor of residences, comments and recommendations with regards to first storeys have also been included.

The results of the acoustic assessment indicate that noise received at the residences located adjacent to the proposed Cockburn Coast Drive in the year 2031 would exceed the “Noise Limits” as outlined in the Western Australian Planning Commission (WAPC) Planning Policy 5.4 “Road and Rail Transport Noise and Freight Considerations in Land Use Planning” by up to 8 dB(A).

For the proposed Cockburn Coast Drive, it is noted that under the WAPC State Planning Policy 5.4, it is a requirement that the infrastructure provider design mitigation measures to achieve the "Noise Limits" these being $L_{Aeq(Day)}$ of 60 dB(A); and $L_{Aeq(Night)}$ of 55 dB(A). Additionally, under State Planning Policy 5.4, all practicable noise mitigation should be implemented. However, given the given the topography of the land, a barrier located at the boundary of the lots and the road reserve would be in some locations, fairly ineffectual (i.e. in locations where the ground level of the road is above that of the residential development) and in these locations, it is recommended that a barrier be incorporated within the road reserve and be included in the design of the road. Additionally, given that the residential developments located adjacent to Cockburn Coast Drive would be multi storey developments, it is recommended that "Quiet House" design be incorporated in the design of all levels (including ground floor).

Generally, for these types of developments, the first row of buildings along the road(s) of concern normally act as acoustic barriers to those developments located behind. Hence, improved construction is usually only required for the first row of buildings. Given the proposed layout, we believe that this would apply to the western side of Cockburn Road. However, for developments located between Cockburn Road and the Cockburn Coast Drive, due to the additive effect of noise received from both these roads (especially where these two roads converge at the southern end of the development) this may not be the case. Additionally, for this area, noise received at facades on the opposite sides to Cockburn Road and Cockburn Coast Drive also need to be considered.

In the future, with development of Cockburn Coast and the construction of Cockburn Coast Drive, the flow of vehicles along Cockburn Road will be significantly reduced. However, as it is unclear as to when Cockburn Coast Drive will be constructed, to be conservative and to provide some degree of protection for both residence and future commercial developments it is proposed that the current noise emissions from vehicles travelling along Cockburn Road be used for the design criteria and bases for any "Quiet House" design. Based on the acoustic assessment and modelling of current noise emissions from Cockburn Road, the following noise level should be used for developments located adjacent to Cockburn Road:

| | | |
|---|---|---|
| Facing Cockburn Road | - | 62 dB(A) |
| Side (perpendicular) to Cockburn Road | - | 59 dB(A) |

Note: For facades on the opposite side to Cockburn Road, standard constructions can be used on developments located on the western side of Cockburn Road and the northern section of developments located on the eastern side of Cockburn Road. However, for developments located at the southern end of the project area (between Cockburn Road and Cockburn Coast Drive) and as shown on Figure D2 in Appendix D, improved construction is also required. For these developments as shown on Figure D2, it is recommended that a noise level of 58 dB(A) be used for the facades on the opposite side to Cockburn Road, but not directly exposed to Cockburn Coast Drive.

With regards to developments located adjacent to Cockburn Coast Drive, the recommended external noise levels to be used as the design bases for "Quiet House" design are shown on the plan attached as Figures D1 and D2 in Appendix D.

Calculations were carried out to determine the noise that would be received within the proposed apartments due to passing vehicles. Guidance on the calculations was taken from *AS 3671-1989 "Acoustics – Road traffic noise intrusion-Building siting and construction"*.

Based on the calculated noise levels, preliminary calculations were carried out to determine various acoustic ratings required to achieve acceptable internal noise levels. The required $R_W$ ratings were calculated and the preliminary determination of glazing for bedrooms and living spaces are listed in Tables 6.1 and 6.2.

**Table 6.1 – Bedroom Glazing Requirements**

| Noise level (dB(A)) | $R_w$ Value | Description of Construction |
|---|---|---|
| 55 to 57 | 20 to 24 | Openable - 6mm horizontal sliding window<br>Fixed – 4mm glass |
| 58 to 59 | 25 to 27 | Openable – 6mm glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 6mm glass |
| 60 to 61 | 28 to 30 | Openable – 6.38mm laminated glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 6.38mm laminated glass<br>Fixed – 10mm glass |
| 62 to 64 | 31 to 34 | Openable – 10.38mm laminated glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 10.38mm laminated glass |
| 65 to 67 | 35 to 37 | Openable – 10.5mm laminated glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 10.5mm laminated glass |

**Table 6.2 – living Spaces Glazing Requirements**

| Noise level (dB(A)) | $R_w$ Value | Description of Construction |
|---|---|---|
| 59 to 61 | 20 to 24 | Openable - 6mm horizontal sliding window<br>Fixed – 4mm glass |
| 62 to 63 | 25 to 27 | Openable – 6mm glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 6mm glass |
| 64 to 65 | 28 to 30 | Openable – 6.38mm laminated glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 6.38mm laminated glass<br>Fixed – 10mm glass |
| 66 to 69 | 31 to 34 | Openable – 10.38mm laminated glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 10.38mm laminated glass |
| 69 to 71 | 35 to 37 | Openable – 10.5mm laminated glass in awning type windows with mechanical winders closing on compressible seals.<br>Fixed – 10.5mm laminated glass |

Notes:

1. The increased construction requirements detailed above are only effective when doors and windows are closed.
2. For glazing requiring an $R_W$ rating in the order of 38 dB and higher is likely to require a double glazed system with a reasonable air gap (in the order of 125mm and higher).

## 7. CONCLUSION

In accordance with the WAPC Planning Policy 5.4, an assessment of the noise that would be received within the Cockburn Coast Development, from vehicles travelling on both Cockburn Road and the proposed Cockburn Coast Drive has been undertaken.

In accordance with the Policy, the following would be the acoustic criteria applicable to this project:

**External**

| | |
|---|---|
| Day | Maximum of 60 dB(A) $L_{Aeq}$ |
| Night | Maximum of 55 dB(A) $L_{Aeq}$ |
| Outdoor Living Areas | Maximum of 50 dB(A) $L_{Aeq\ (Night\ Period)}$ |

**Internal**

| | |
|---|---|
| Sleeping Areas | 35 dB(A) $L_{Aeq(night)}$ |
| Living Areas | 40 dB(A) $L_{Aeq(day)}$ |

For this development, noise emissions from vehicle travelling along both Cockburn Road and the proposed Cockburn Coast Drive need to be considered.

From the previous monitoring undertaken, we also note that as the difference between the $L_{Aeq(day)}$ and the $L_{Aeq(night)}$ is greater than 5 dB (i.e. 5.3 dB) and the day period is the critical period for compliance. Given the difference, if compliance is achieved for the day period, then compliance would also be achieved for the night period.

In the future, with development of Cockburn Coast and the construction of Cockburn Coast Drive, the flow of vehicles along Cockburn Road will be significantly reduced. However, as it is unclear as to when Cockburn Coast Drive will be constructed, to be conservative and to provide some degree of protection for both residence and future commercial developments it is proposed that the current noise emissions from vehicles travelling along Cockburn Road be used for the design criteria and bases for any "Quiet House" design. Based on the acoustic assessment and modelling of current noise emissions from Cockburn Road, the following noise level should be used for developments located adjacent to Cockburn Road:

| | | |
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| Facing Cockburn Road | - | 62 dB(A) |
| Side (perpendicular) to Cockburn Road | - | 59 dB(A) |

Note: For facades on the opposite side to Cockburn Road, standard constructions can be used, except for developments located at the southern end between Cockburn Road and Cockburn Coast Drive, as shown on Figure D2 in Appendix D. For these developments, due to the additive effect of noise received from Cockburn Coast Drive, it is recommended that a noise level of 58 dB(A) be used for the facades on the opposite side to Cockburn Road, but not directly exposed to Cockburn Coast Drive.

Initial modelling, indicates that noise emissions from the proposed Cockburn coast Drive would exceed the above acoustic criteria by up to 8 dB(A). For the proposed Cockburn Coast Drive, it is noted that under the WAPC State Planning Policy 5.4, it is a requirement that the infrastructure provider design mitigation measures to achieve the "Noise Limits" these being $L_{Aeq(Day)}$ of 60 dB(A); and $L_{Aeq(Night)}$ of 55 dB(A). However, given the topography of the land, barriers located at the boundary of the lots and the road reserve would be in some locations, fairly ineffectual and in these locations it is recommended that a barrier be incorporated within the road reserve and be included in the design of the road. Additionally, given that the residential developments located adjacent to Cockburn Coast Drive would be multi-storey developments, it is recommended that "Quiet House" design be incorporated in the design of all levels (including ground floor). Guidance on the required glazing requirements are outlined in Tables 6.1 and 6.2. The noise that would be received at development located adjacent to the proposed Cockburn Coast Drive varies and the calculated day period noise level that would be received at various locations within the development are shown on Figures D1 and D2 attached in Appendix D. It is recommended that these noise levels be used for the determination of "Quiet House" design to achieve compliance with the internal acoustic criteria.

Given the proposed layout, it is noted that the first row of buildings located on the western side of Cockburn Road will act as an acoustic barrier to the developments located behind them. However, to the east of Cockburn Road, with the additive effect of Cockburn Coast Drive, this may not be the case. Therefore, for the locations listed below it is recommended that as part of the design process, an acoustic assessment report be included in the building license submission:

- First row of buildings located adjacent to the western side of Cockburn Road.
- Buildings located between Cockburn Road and Cockburn Coast Drive.

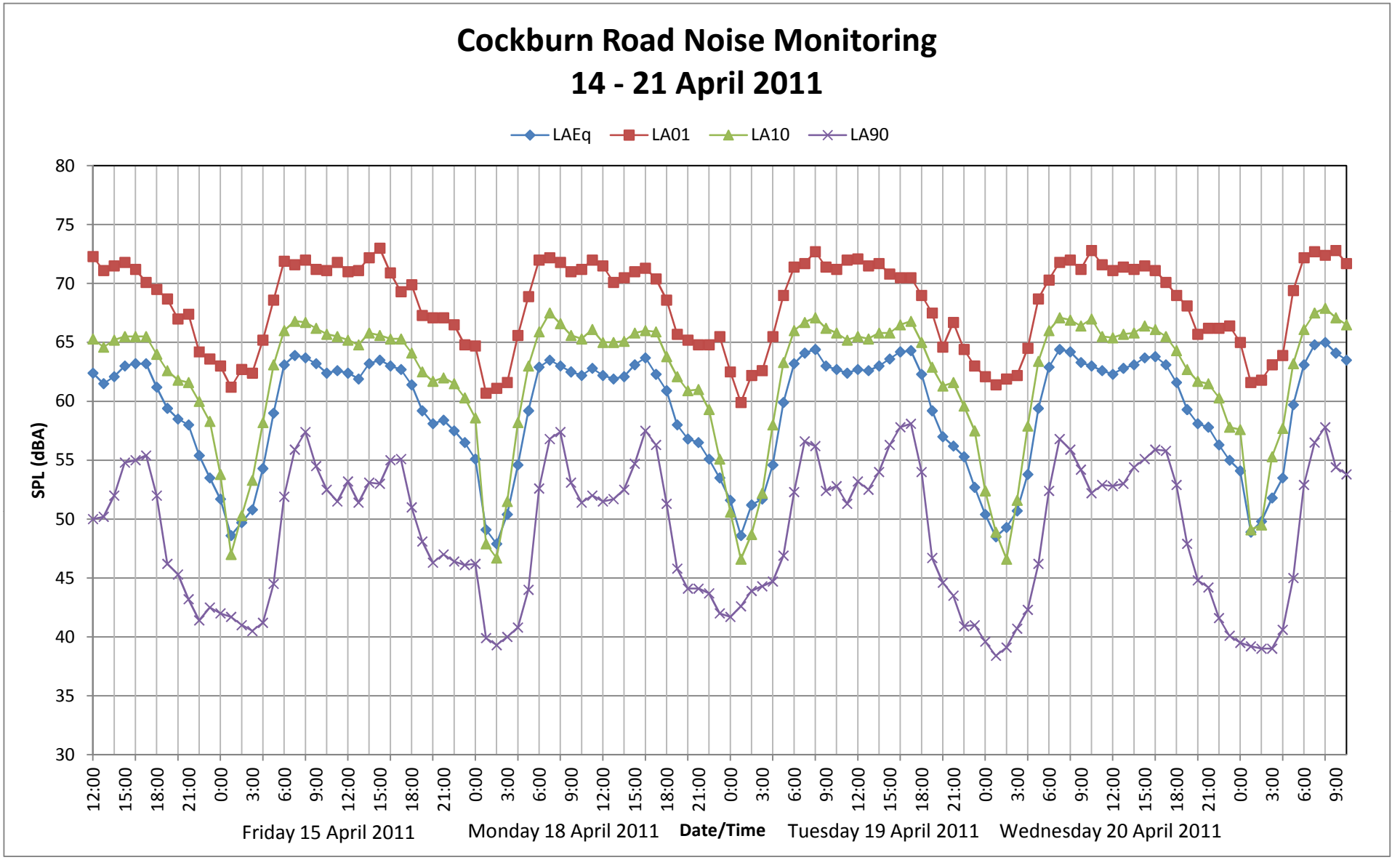
Finally, we note that under the Planning Policy, as noise received within the proposed development would exceed the “Noise Target”, notification on Titles is required for those residence exposed to transportation noise.

# APPENDIX A

## MASTER PLAN

# APPENDIX B

## GRAPH OF LOGGED NOISE LEVELS

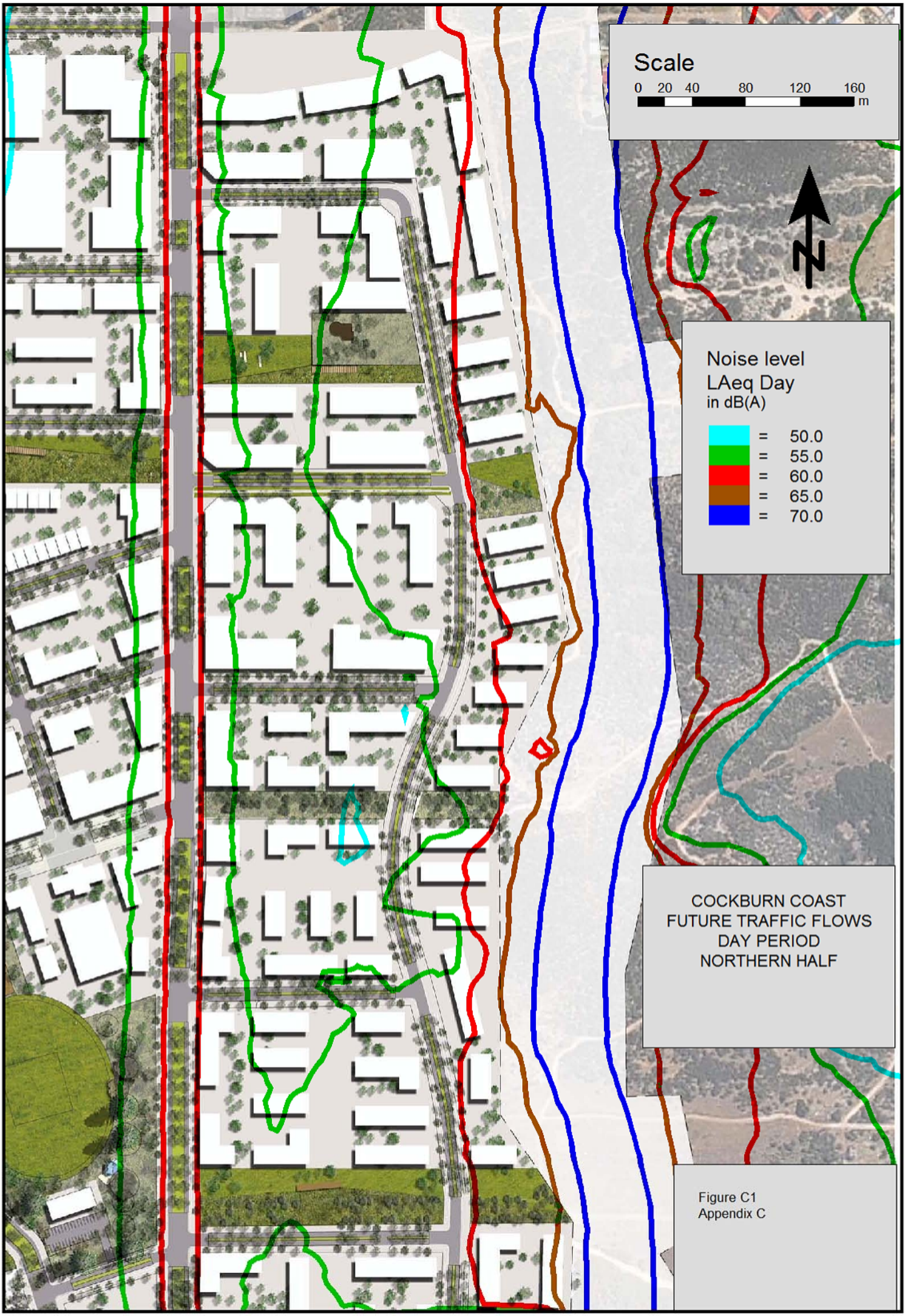


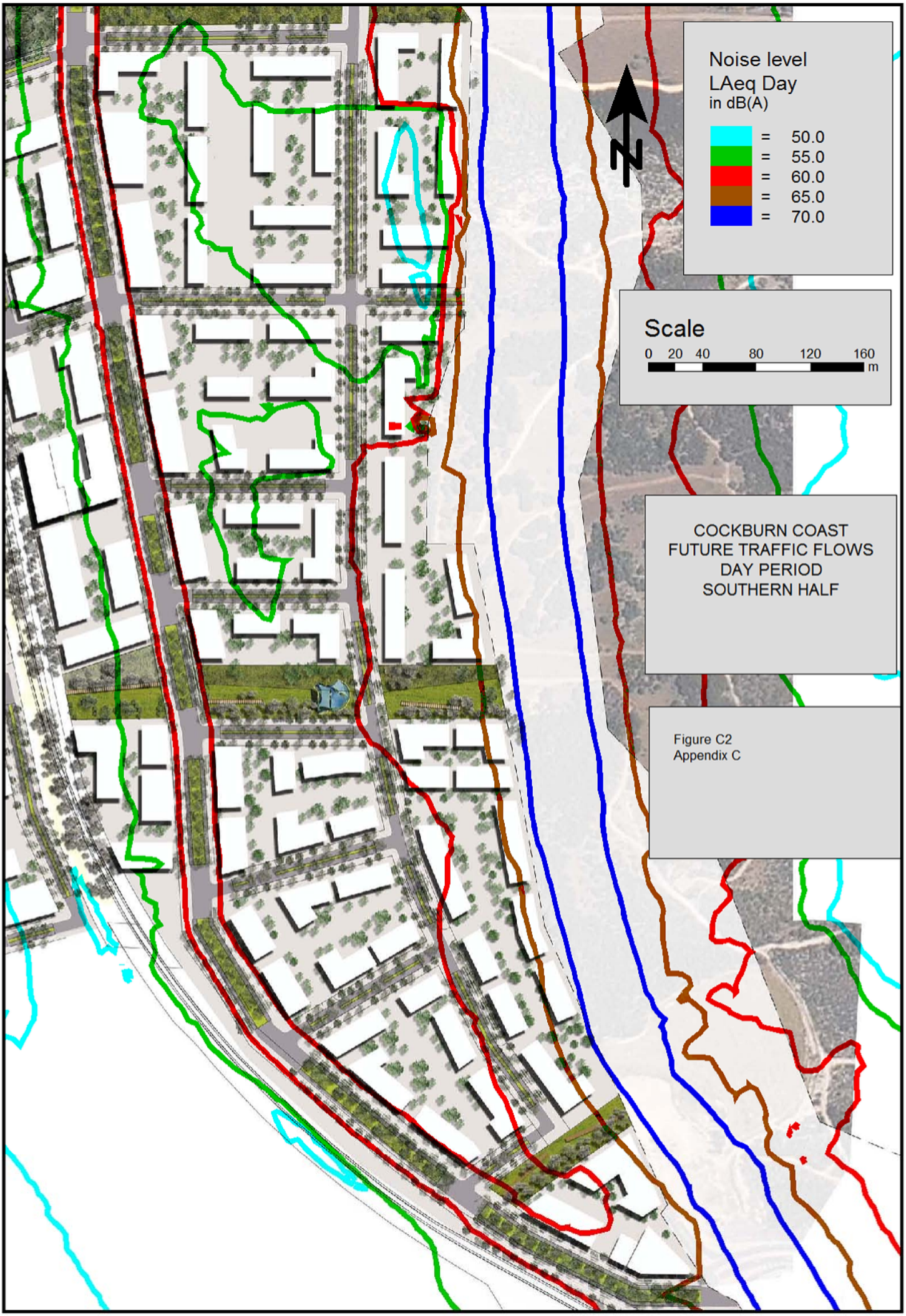

Herring Storer Acoustics
Job No : 11070
File : Logger

Figure B1
Appendix B

# APPENDIX C

## NOISE CONTOUR PLOTS





# APPENDIX D

## NOISE LEVELS FOR QUIET HOUSE DESIGN