

Marshall Day Acoustics Limited
Level 3, 69 Cambridge Terrace
PO Box 4071
Christchurch 8140
New Zealand
Telephone: 64 3 365 8455
Facsimile: 64 3 365 8477

PREPARED FOR: **OPUS INTERNATIONAL
CONSULTANTS**

Attention: Steve Baker

DATE: 29 November 2006

PROJECT: **STATE HIGHWAY 1 NORTHPARK
INTERSECTION UPGRADE**

REPORT NO.: 06557C

A handwritten signature in black ink, appearing to read 'P. Ibbotson', written over a horizontal line.

PREPARED BY: Peter Ibbotson

A handwritten signature in black ink, appearing to read 'Stephen Chiles', written over a horizontal line.

REVIEWED BY: Stephen Chiles

TABLE OF CONTENTS

1.0	INTRODUCTION	3
2.0	BACKGROUND	3
3.0	SITE DESCRIPTION	3
4.0	DESCRIPTION OF PROPOSED UPGRADE	4
5.0	GUIDELINES AND CRITERIA	5
6.0	NOISE MODELLING	6
7.0	NOISE MODELLING RESULTS	8
8.0	CONCLUSIONS	8

1.0 INTRODUCTION

Marshall Day Acoustics has been engaged to assess noise issues associated with the upgrade of the intersection of State Highway 1 and Northpark Road. The assessment has been performed to predict the change in noise level at the intersection before the intersection is constructed and to establish any mitigation measures required.

The report discusses the following:

- Background to the development;
- Description of the site; and
- Prediction of likely changes in noise levels as a result of the intersection.

2.0 BACKGROUND

The intersection upgrade is proposed to provide better access to a proposed industrial subdivision on Northpark Road, to the east of the intersection. Noise from the proposed industrial subdivision forms part of a different consent application and is outside the scope of this assessment.

Noise levels from vehicles operating inside the industrial subdivision and along Northpark Road between the proposed intersection and the proposed industrial subdivision have not been considered as part of this assessment. Marshall Day Acoustics is providing a separate assessment of these noise sources as part of another consent application. The scope of the current assessment covers only the change in traffic noise levels on the on- and off-ramps to the State Highway.

3.0 SITE DESCRIPTION

The proposed intersection is located at the intersection of State Highway 1 and Northpark Road, to the northeast of Ashburton.

The land surrounding the site is summarised in the following table:

Table 1: Land Use Surrounding Intersection

Direction from Intersection	Surrounding Land Use	Zone
North	Generally 5 Ha+ "lifestyle" blocks	RB
West	Generally 5 Ha+ "lifestyle" blocks The land immediately to the east is owned by Ashburton District Council	RA
South	Ashburton District Council plantation reserve CMP Canterbury Limited Residential land further to east	RR
East	Ashburton District Council plantation reserve Rural Transport Ltd site Proposed Industrial Subdivision	RB

The nearest noise sensitive receivers to the intersection are the Oakden Residence to the northwest of the intersection and the residential dwellings along Bremners Road to the southeast of the intersection.

Appendix A shows the existing intersection layout and location of nearby dwelling.

4.0 DESCRIPTION OF PROPOSED UPGRADE

The proposed intersection will not include any significant height changes to the State Highway. Access to and from the State Highway to Northpark Road will be via on- and off ramps. The on- and off- ramps on the northwestern side of the State Highway will access Northpark Road via an underpass. The State Highway will cross the underpass via a short bridge. The on- and -off ramps will be located in cuttings. The underpass will be approximately 7 metres below the State Highway.

It is proposed to surface the on- and off- ramps (and resurface the State Highway) with chip seal.

5.0 GUIDELINES AND CRITERIA

Transit New Zealand Appendix 6: Transit New Zealand's Guidelines for the Management of Road Traffic Noise give guidance on assessing noise levels from State Highways. Because of the absence of criteria for assessing noise from local roads and the fact that the off- and on- ramps are inextricably linked to the State Highway, these guidelines are the most appropriate for assessing traffic noise in this situation.

The guidelines refer to the CoRTN algorithm when calculating L_{eq} values from L_{10} values.

The conversion formulae contained in the guidelines are as follows:

- $L_{eq} (24 \text{ hour}) = L_{10} (18 \text{ hour}) - 3 \text{ dB}$
- $L_{eq} (1 \text{ hour}) = L_{10} (1 \text{ hour}) - 3 \text{ dB}$

The Transit Guidelines also contain Average Noise Design Levels for residential buildings and educational facilities. These are summarised in the following table.

Table 2: Transit Average Noise Design Levels

Noise Area	Noise Descriptor	Ambient Noise Level (dBA)	Average Noise Design Level (dBA)
Low	$L_{eq} (24 \text{ hour})$	Less than 43	55
		43 - 50	Ambient + 12
Medium	$L_{eq} (24 \text{ hour})$	50 - 59	62
		59 - 67	Ambient + 3
High	$L_{eq} (24 \text{ hour})$	67 - 70	70
		More than 70	Ambient

The Transit Guidelines state that the Single Event Noise Design Noise Level at dwellings or receivers near state highways must be less than 78 dBA L_{max} . The Transit Guidelines also state that where a dwelling is greater than 12 metres away from the inside edge road carriageway, this limit will generally be met. Given that there will be no noise sensitive receivers closer than 12 metres to the inside of the State Highway carriageways of the proposed intersection upgrade (or on- or off- ramps), we have not considered L_{max} noise levels further.

Marshall Day Acoustics uses the following table when assessing the change in sound level from a particular source and the resultant impact on a listener.

Table 3: Change in Sound Level vs. Subjective Response

Change in Sound Level dBA	Subjective Reaction	Impact/RMA Adverse Effect
>12	More than a doubling of loudness	Severe
9 - 11	Doubling of loudness	Substantial
5 - 7	Appreciable Change	Noticeable
3 - 4	Just perceptible change	Slight/minor
0 - 2	Imperceptible change	Negligible/less than minor

From the above table, in order to ensure the effects from the proposed intersection are no more than minor the increase in noise level due to the change in intersection layout should be less than 4 dBA.

6.0 NOISE MODELLING

To determine the change in noise environment in the area due to the proposed intersection we have performed noise modelling of the intersection using the noise modeling package SoundPLAN.

In order to predict traffic noise levels in the area, the traffic data in Table 4 has been used. The present and future traffic volumes and the composition of heavy vehicles have been obtained from the traffic engineer assuming the high end traffic scenario. The future traffic volumes have been based proposed industrial subdivision being fully developed. The remainder of the information in Table 4 was obtained during our site visit.

Table 4: Traffic Parameters (Scenario B)

Road	Parameter					
	Traffic Volume Evening Peak (VPH)	Traffic Volume Morning Peak (VPH)	% Heavy Vehicles	Vehicle Speed km/h	Road Gradient	Road Surface
State Highway 1	1000	600	13 %	100	0%	Coarse Chip Seal
Northbound On-Ramp	47	31	20 %	100	5%	Coarse Chip Seal
Northbound Off-Ramp	341	237	20 %	100	10%	Coarse Chip Seal
Southbound On-Ramp	421	231	20%	100	5%	Coarse Chip Seal
Southbound Off-Ramp	33	46	20 %	100	10%	Coarse Chip Seal

The vehicle per day (AADT) traffic flows are not available for this project. We have used the information in Table 4 to predict the $L_{10 (1 \text{ hour})}$ and $L_{eq (24 \text{ hour})}$ noise levels from the existing site. The $L_{eq (24 \text{ hour})}$ contours are shown in Appendix B and the noise levels at the nearest receivers summarised in the following Table. We have predicted the $L_{eq (24 \text{ hour})}$ noise levels using the formulae contained in Section 5.

Table 5: Noise Levels at Nearby Receivers

Receiver	Predicted Noise Level $L_{eq (24 \text{ hour})}$ dBA
Oakden Dwelling, Mitcham Road	58
Dwellings along Bremners Road	49

Table 2 states that areas with noise levels of between 50 to 59 dBA $L_{eq (24 \text{ hour})}$ are "moderate" noise areas and the Average Design Noise Level in these situations should be 62 dBA $L_{eq (24 \text{ hour})}$. The intersection should therefore be designed to ensure that noise levels at existing dwellings do not exceed 62 dBA $L_{eq (24 \text{ hour})}$.

The intersection will service the proposed industrial subdivision to the east of the proposed intersection. Once this subdivision is constructed and developed it is likely to significantly increase the peak flows of traffic using the State Highway 1 / Northpark Road intersection. As the peak traffic flows on the on- and off- ramps will

likely represent 25- 45% of the total daily traffic flows, the increase in noise level during the peak hour will represent the worst case noise level increase (i.e the increase in $L_{10 (1 \text{ hour})}$ noise level is likely to be greater than the increase in $L_{eq (24 \text{ hour})}$ noise level). Therefore, provided the $L_{10 (1 \text{ hour})}$ noise level from the intersection does not increase by more than 4 dBA, the existing $L_{eq (24 \text{ hour})}$ noise level from the intersection (58 dBA $L_{eq (24 \text{ hour})}$) will also not increase by more than 4 dBA, and the Average Design Noise Level of 62 dBA $L_{eq (24 \text{ hour})}$ will be achieved.

7.0 NOISE MODELLING RESULTS

The SoundPLAN noise model has been used to generate noise level difference maps between the existing traffic scenario and the proposed intersection upgrade. These have been performed for the peak hour periods of traffic flow on the intersection on- and off-ramps as this is expected to represent the worst case change in noise level. The result is expressed as an $L_{10 (1 \text{ hour})}$ noise level difference. These results are summarised in Appendices C (Evening Peak) and D (Morning Peak).

It is evident from these noise contour plots that the difference in noise level is less than 2 dBA $L_{10 (1 \text{ hour})}$ at all surrounding dwellings. The noise criteria contained in Section 5 states that a noise increase of less than 2 dBA will result in less than minor noise effects.

The peak period $L_{10 (1 \text{ hour})}$ noise levels represent the worst case change in noise level (Refer to Section 6.0). It is concluded that noise levels in the area will therefore remain at less than the Transit Average Design Noise Level of 62 dBA $L_{eq (24 \text{ hour})}$.

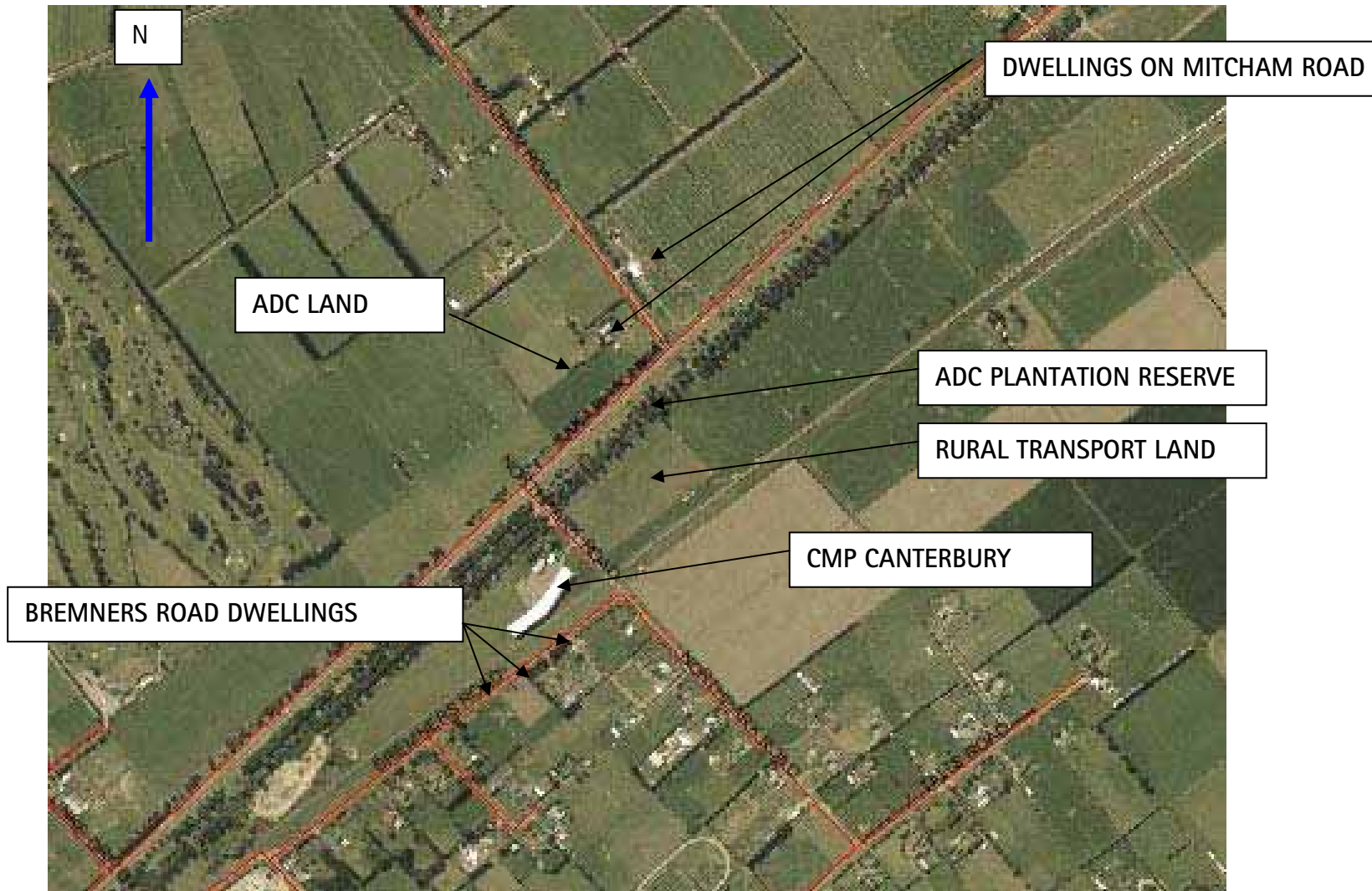
8.0 CONCLUSIONS

Marshall Day Acoustics has assessed noise issues associated with the upgrade of the intersection of State Highway 1 and Northpark Road. The assessment has been performed to predict the change in noise level at the intersection before it is constructed and to establish any mitigation measures required.

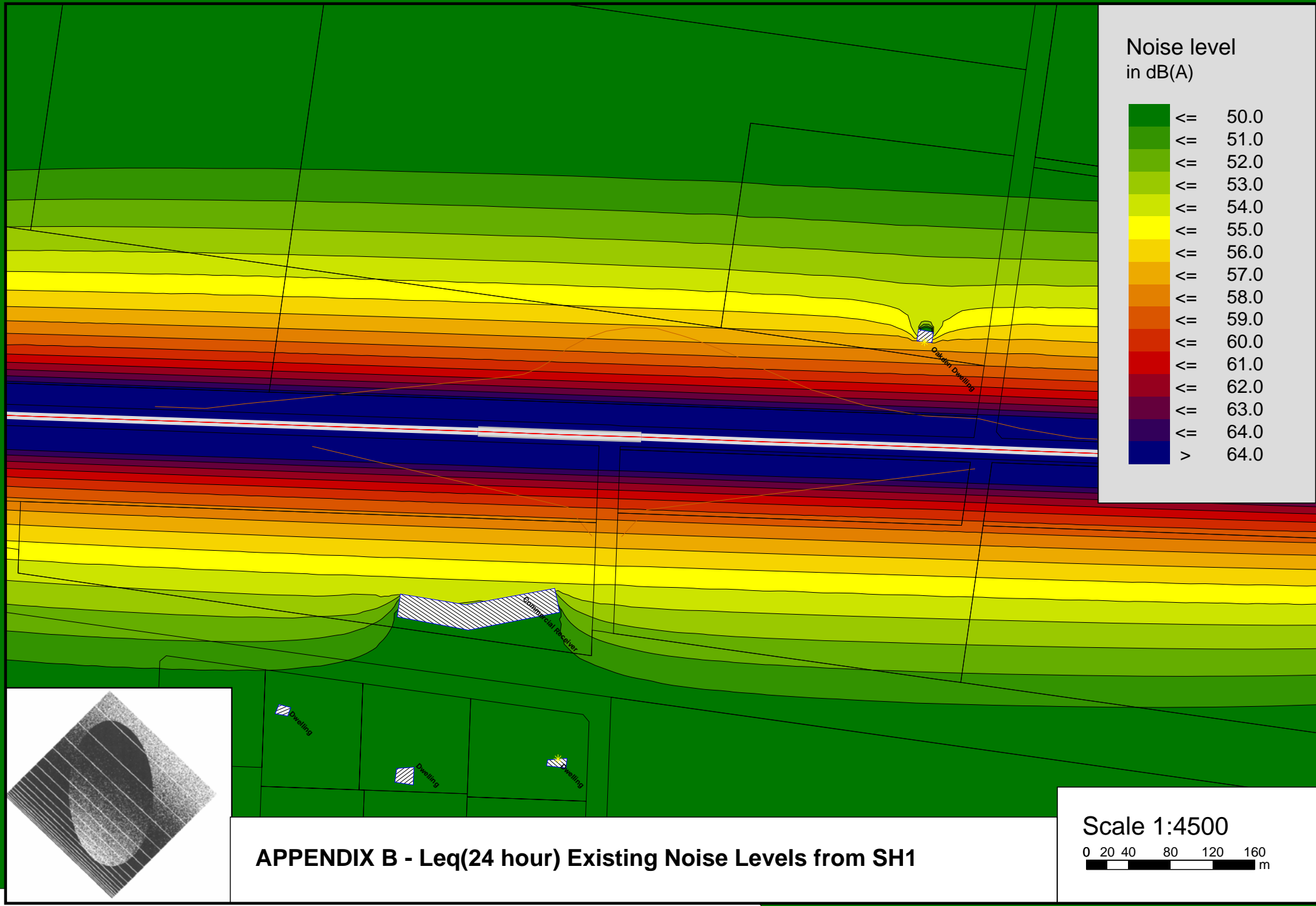
A SoundPLAN noise model has been constructed for the intersection. The change in noise level from the proposed intersection has been determined at all nearby dwellings. The change in noise level is predicted to be less than 2 dBA at all dwellings. The noise level in the area is predicted to remain at less than the Transit Average Design Noise Level of 62 dBA $L_{eq (24 \text{ hour})}$.

The noise effects from the proposed intersection are therefore concluded to be no more than minor.

APPENDIX A – EXISTING INTERSECTION

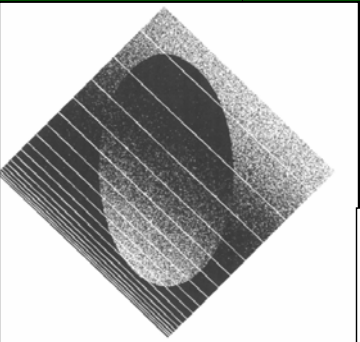


Note: This document may be reproduced in full but not in part without the written consent of Marshall Day Acoustics Limited



Noise level
in dB(A)

Dark Green	<=	50.0
Light Green	<=	51.0
Yellow-Green	<=	52.0
Yellow	<=	53.0
Light Yellow	<=	54.0
Yellow-Orange	<=	55.0
Orange	<=	56.0
Light Orange	<=	57.0
Orange-Red	<=	58.0
Red	<=	59.0
Dark Red	<=	60.0
Red-Orange	<=	61.0
Orange-Red	<=	62.0
Red-Orange	<=	63.0
Dark Red	<=	64.0
Dark Blue	>	64.0



APPENDIX B - Leq(24 hour) Existing Noise Levels from SH1

Scale 1:4500

0 20 40 80 120 160 m

