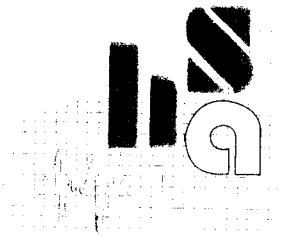
E

creating connections

Appendix E Noise Studies

Appendix E1	Acoustical Assessment Roe Highway Stage 7 South Street to Kwinana Freeway– Herring Storer Acoustics
Appendix E2	Roe Hwy – Stage 7 Traffic Noise – Barrier Design – Vipac

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
Suite 34, 11 Preston Street, Como, W.A. 6152
P.O. Box 219, Como, W.A. 6952
Telephone: (08) 9367 6200
Facsimile: (08) 9474 2579
Email: hsa@hsacoustics.com.au



ALLAN HERRING M.I.E. AUST. M.A.A.S.
LYNTON STORER M.A.I.E.A., M.A.A.S.
TIM REYNOLDS M.I.E. AUST. M.A.A.S.

ACOUSTICAL ASSESSMENT

ROE HIGHWAY STAGE 7

SOUTH STREET TO KWINANA FREEWAY

BY

HERRING STORER ACOUSTICS

AUGUST 2003

OUR REF: 1763-2-03107-1-2

CONTENTS

APPENDICES

1.0 INTRODUCTION

Herring Storer Acoustics (HSA) was commissioned by Gutteridge Haskins & Davey (GHD) to undertake an acoustic assessment for the proposed Roe Highway Stage 7, between South Street and the Kwinana Freeway. Preliminary work was previously undertaken by ERM Mitchell McCotter Pty Ltd (*Roe Highway Project Stage 7, Noise Impact Assessment Report*; June 1999, Ref: 28024), which measured the existing noise levels at residences adjacent the route and nominated suitable noise control in the form of noise barrier walls, in order to satisfy the nominated criteria. Since this time, the predicted traffic volumes have changed as well as the assessment criteria. As such, the work undertaken in the ERM report is no longer relevant, hence the purpose of this assessment.

The study involved the following:

1. A review of the ERM report, particularly the noise data logging, as these may still be relevant. However, the future predicted noise levels would be irrelevant due to new information.

2. Where necessary, repeat the noise monitoring at residences and/or measure the noise levels at other relevant locations. Note that the noise monitoring is required so as to obtain baseline noise levels and hence, establish the appropriate criteria, since this dependent upon the existing noise levels.

3. Construction of a digital model of the route for incorporation into the computer modelling programme SoundPlan 5.6 (Main Roads Western Australia (MRWA) supplied the proposed road design, existing ground contours and cadastral data).

4. Calculation of the noise propagation for the relative lines of traffic for the Years 2011 and 2031 as per the existing situation (proposed design, existing fences etc). This included both noise contour plots and single point calculations to specific residences.

5. Where exceedances to the criteria are apparent, determine suitable noise control to satisfy the criteria.

6. Recalculation of the noise propagation for the relative lines of traffic for the Years 2011 and 2031 based on the recommended noise walls.

7. Calculate the noise levels based on 4 metre high walls (considered by MRWA to be the maximum practicable height) for the length of the road.

A plan of the area of interest is contained within Appendix A. Residences of concern are located on the northern side of the Highway only, in the suburb of Leeming, with industrial, airport and park land being to the south of the road.

2.0 SUMMARY

The criteria to be satisfied at residences are:

- 63 dB(A) $L_{10(18hour)}$[1] and 55 dB(A) $L_{eq(8hour)}$[2] where the existing noise level is less than 60 dB(A) $L_{10(18hour)}$ and 52 dB(A) $L_{eq(8hour)}$ or;
- The existing noise level + 3 dB(A) where the existing noise level is more than 60 dB(A) $L_{10(18hour)}$ and 52 dB(A) $L_{eq(8hour)}$.

These criteria apply at 1 metre from a dwelling and to the ground floor only, due to the impracticality of controlling noise at upper floors.

All residences in this area have been determined to have an existing $L_{10(18hour)}$ that is less than 60 dB(A) and/or an existing $L_{eq(8hour)}$ that is less than 52 dB(A), such that the criteria to be met from Roe Highway is 63 dB(A) $L_{10(18hour)}$ and 55 dB(A) $L_{eq(8hour)}$.

Data including traffic volumes, percentage heavy vehicles, speed, road surface etc were incorporated into the computer programme SoundPlan 5.6. This programme enables the user to select a number of algorithms to predict the noise level propagation. In accordance with MRWA requirements, the *Calculation of Road Traffic Noise* (CoRTN) algorithms were selected.

From the information provided, it was calculated that the $L_{10(18hour)}$ noise levels would be the more critical. This is because the $L_{eq(8hour)}$ was calculated to be 8.5 dB(A) less than the $L_{10(18hour)}$ whereas the difference in the criteria is only 8.0 dB(A). For example, if the predicted $L_{10(18hour)}$ is 63 dB(A), the $L_{eq(8hour)}$ would be 54.5 dB(A). Hence, it is the former parameter that determines the noise control requirements.

Noise levels were predicted at each residence immediately adjacent the Highway for the Years 2011 and 2031 based on the residences existing fences. A summary of these calculations is shown in Appendices C & D as single point and noise contour calculations respectively. In 2011, the highest predicted level is 67.3 dB(A) $L_{10(18hour)}$ (4.3 dB(A) exceedance) and in 2031, the highest predicted level is 69.1 dB(A) $L_{10(18hour)}$ (6.1 dB(A) exceedance). The 63 dB(A) $L_{10(18hour)}$ criterion in 2031 is predicted to be exceeded at the majority of residences between Green Croft Gardens to Merrifield Circle, east of the Kwinana Freeway and between Stone Court and Tetlow Place, southwest of the Kwinana Freeway.

As exceedances were determined, noise controls were considered. The recommended noise control is shown in Appendix E with the resultant noise levels shown in Appendices C & F. Furthermore, as requested by MRWA, consideration was also given to constructing 4-metre high noise walls for the length of the project to reduce the noise levels as far as practicable. The results of this design are shown in Appendices C (single point calculations) and G (noise level contours). Table 2.1 below compares the total surface areas of the minimum recommended barriers and the 4 metre high barriers.

---

1 $L_{10(18hour)}$ is the arithmetic average of the L_{10} values between 0600 hours and midnight, where L_{10} is the noise level exceeded for 10% of the time.

2 $L_{eq(8hour)}$ is the logarithmic average of the Leq values between 2200 hours and 0600 hours, where the L_{eq} is the equivalent (average) noise level for the measurement period.

TABLE 2.1 – TOTAL SURFACE AREA OF NOISE WALLS

Option	Wall Surface Area (m^2)
Minimum Recommended	8,980
4m High Barriers for Length	15,660

3.0 METHODOLOGY

The existing acoustic environment was quantified by utilising three (3) automatic noise data loggers at selected residences adjacent the route. Reference was also made to the locations used in the *Roe Highway Project Stage 7, Noise Impact Assessment Report*; June 1999, Ref: 28024 by ERM Mitchell McCotter Pty Ltd, where noise monitoring was also undertaken.

Measurements were undertaken generally in accordance with Australian Standard 2702-1984 *Acoustics – Methods for the Measurement of Road Traffic Noise*. The noise loggers were set-up to record the A-weighted noise level at 1-hour intervals, with the following parameters reported:

L_1 The noise level exceeded for 1% of the time (9 seconds).
L_{10} The noise level exceeded for 10% of the time (1 ½ minutes).
L_{90} The noise level exceed for 90% of the time (ambient noise).
L_{eq} The continuous equivalent noise level (average).

From the recorded noise levels, the $L_{10(18hour)}$, $L_{eq(8hour)}$ and $L_{eq(24hour)}$ were calculated, defined as:

$L_{10(18hour)}$ The arithmetic average of the recorded L_{10} values between 0600 hours and midnight.
$L_{eq(8hour)}$ The logarithmic average of the recorded L_{eq} values between 2200 hours and 0600 hours on the same day.
$L_{eq(24hour)}$ The logarithmic average of the recorded L_{eq} values for a complete 24-hour period.

The noise logging undertaken by HSA in 2003 were situated at the following residences:

Location H1 36 Merrifield Circle, Leeming
Location H2 17 Heatherlea Parkway, Leeming
Location H3 13 Evergreen Court, Leeming

The noise logging undertaken by ERM in 1998 were situated at the following residences:

Location E1 41 Merrifield Circle, Leeming
Location E2 15 Sellen Court, Leeming
Location E3 20 Noreatt Place, Leeming
Location E4 30 Fern Leaf Court, Leeming
Location E5 13 Evergreen Court, Leeming

Traffic flow information was obtained from GHD and is attached in Appendix H. Other data used in the model is shown below in Table 3.1.

TABLE 3.1 – TNOISE INPUT DATA

Parameter	Roe Highway	Off Ramps & Side Roads
18 Hour Traffic Flow	95% of 24 hour	95% of 24 hour
8 Hour Traffic Flow	7% of 24 hour	7% of 24 hour
% Heavy Vehicles – 18 hour	14	5
% Heavy Vehicles – 8 hour	28	10
Vehicle Speed (km/hr)	100	70
Receiver Height Above Ground (m)	1.5	1.5
Façade Correction (dB(A))	2.5	2.5
Road Surface	OGA	DGA – Off Ramps OGA – Side Roads

Note: Open graded asphalt (2.5 dB(A) quieter than DGA).

The noise levels were predicted using both single point calculations and noise level contours. Single point calculations (SPC) show the noise level at a specific residence whilst noise contours show the noise levels over the surrounding areas. As the noise contour plot is dependent upon the calculation resolution and the amount of interpolation, the single point calculations are always more accurate. Where discrepancies occur between the two calculation types, it is the single point calculations that take priority. The scenarios calculated were:

1. Year 2011 Road Traffic & Existing Situation (i.e. no noise walls) – SPC only
2. Year 2031 Road Traffic & Existing Situation (i.e. no noise walls)
3. Year 2011 Road Traffic & Recommended Noise Walls – SPC only
4. Year 2031 Road Traffic & Recommended Noise Walls
5. Year 2011 Road Traffic & 4m High Noise Walls – SPC only
6. Year 2031 Road Traffic & 4m High Noise Walls

Note that where the residences have a higher relative level (RL) than the road, the noise wall was placed at the boundary of the residences. Where the residences RL is lower than the road, the noise wall has been placed at the edge of the road (2 metres from the edge of the nearest carriageway), however the practicalities of such barriers would require further investigation.

Calculations were made to the first row of houses. Compliance at this location will result in compliance at houses further away due to the attenuation provided by the first row dwellings. However, these dwellings have not been placed in the model and hence this attenuation is not evident in the noise contours.

4.0 CRITERIA

The criteria used in this project are the Main Roads Noise Level Objectives as defined below:

"Objectives are specified upper limits of traffic noise which it is intended, should not be exceeded. Objectives apply outside residential buildings, and outside public buildings such as hospitals, schools and libraries. In the case of public buildings there is a scope to relax the objectives if affected rooms are air-conditioned, and therefore normally used with windows closed.

Noise Level Objectives

Base Objective	*Objective for High Ambient Areas*
63 dB(A) $L_{10(18hour)}$	*Ambient + 3 dB(A)*
55 dB(A) $L_{eq(8hour)}$	*Ambient + 3 dB(A)*

Notes

(1) Noise levels are $L_{10\ (18hour)}$ values, from 6am to midnight, and $L_{eq(8hour)}$ values from 10 p.m. to 6 a.m.

(2) Ambient noise is the level of noise before the road project commences

(3) A high ambient area is where ambient noise is more than 60 dB(A) $L_{10(18hour)}$, or 52 dB(A) $L_{eq(8hour)}$.

(4) Due to the impracticality of controlling noise at the upper floors of multi-storey buildings, noise assessment is restricted to the ground floor level.

(5) Noise is assessed 1 metre from a building, and 1.2 to 1.5 metres above the ground floor level.

(6) The objectives apply to the expected 15 to 20 years after opening of the road project, using available traffic forecasts.

(7) Noise level objectives relate to the total traffic noise expected at a building facade, i.e. noise from the new road and any other roads.

5.0 RESULTS

The results of the noise monitoring are contained in Appendix B. Tables 5.1 and 5.2 show the calculated weekday $L_{10(18hour)}$, $L_{eq(8hour)}$ and $L_{eq(24hour)}$ of the HSA and ERM monitoring respectively.

TABLE 5.1 – HSA MEASURED $L_{10(18hour)}$, $L_{eq(8hour)}$ AND $L_{eq(24hour)}$

Location	$L_{10(18hour)}$	$L_{eq(8hour)}$	$L_{eq(24hour)}$
H1. 36 Merrifield Circle, Leeming	60	53	58
H2. 17 Heatherlea Parkway, Leeming	52	45	51
H3. 13 Evergreen Court, Leeming	51	43	49

TABLE 5.2 – ERM MEASURED $L_{10(18hour)}$, $L_{eq(8hour)}$ AND $L_{eq(24hour)}$

Location	$L_{10(18hour)}$	$L_{eq(8hour)}$	$L_{eq(24hour)}$
E1. 41 Merrifield Circle, Leeming	55	53	51
E2. 15 Sellen Court, Leeming	50	50	48
E3. 20 Noreatt Place, Leeming	49	50	49
E4. 30 Fern Leaf Court, Leeming	50	52	53
E5. 13 Evergreen Court, Leeming	53	55	56

The monitoring undertaken by ERM shows some relatively high $L_{eq(8hour)}$ values in comparison to the $L_{10(18hour)}$ values. No explanation is provided in the report to justify this anomaly. For the two HSA locations that were in similar locations (H1 & H3), the relationship between the two parameters is considered more typical. Nevertheless, the monitoring does indicate that all locations have $L_{10(18hour)}$ values of less than 60 dB(A) and therefore the applicable criteria is 63 dB(A) $L_{10(18hour)}$. The $L_{eq(8hour)}$ values are somewhat sporadic, considered mainly due to the ERM anomalies. Thus, it is considered that the acceptable $L_{eq(8hour)}$ value is also the base level of 55 dB(A).

It has been calculated that the $L_{eq(8hour)}$ would be 8.5 dB(A) less than the $L_{10(18hour)}$. As such it is the $L_{10(18hour)}$ criteria that determines the amount of noise control required as compliance with this, will result in compliance with the $L_{eq(8hour)}$ criteria. For instance, if the $L_{10(18hour)}$ predicted noise level is 63 dB(A), the $L_{eq(8hour)}$ noise level will be 54.5 dB(A), hence compliance with both criteria.

Noise levels in the Years 2011 and 2031 were predicted based on the existing standard residential fences. Noise levels were predicted to be up to 67.3 dB(A) $L_{10(18hour)}$ (4.3 dB(A) exceedance) in 2011 and 69.1 dB(A) $L_{10(18hour)}$ (6.1 dB(A) exceedance) in 2031. The results of these calculations can be seen in Appendix C as single point calculations. Noise contour plots are also contained in Appendix D for the Year 2031. The 63 dB(A) $L_{10(18hour)}$ criterion in 2031 is predicted to be exceeded at the majority of residences between Green Croft Gardens to Merrifield Circle, east of the Kwinana Freeway and between Stone Court and Tetlow Place, southwest of the Kwinana Freeway.

As exceedances were calculated, noise control is required to satisfy the MRWA criteria. A number of options are available to minimise road traffic noise and in this instance, noise barriers are considered the most practicable. Where the relative level (RL) of the road is higher than that at the residences, the barriers have been placed adjacent the road (2 metres from the edge of the nearest carriageway). Where the RL of the road is lower than that of the residences, the barrier has been placed at the boundary of the residences. The practicalities of either option, particularly a barrier on the road reserve, have not been explored at this stage.

The minimum length and height of the noise walls are given in Appendix E. Both the height of the barrier and top RL of the barriers are shown on the drawings. The barriers are required to be at the specified height (or higher) for the length of the wall until the next height is nominated, reading from left to right. Remembering that these are the minimum heights, it may be more aesthetic to construct barriers of a more consistent height. Note that the barriers are required to have a surface mass of more than 10kg/m^2 and not contain any gaps.

Appendix C contains the single point calculations to each of the residences for the Years 2011 and 2031 with the minimum recommended noise walls. Noise contour plots are contained in Appendix F for the 2031 scenario.

It is considered that a 4 metre high noise wall is the maximum practicable height of barrier that would be constructed. Contained in Appendices C and G are the predicted noise levels if such walls were constructed for the length of the road.

A comparison of the surface areas of the minimum recommended barriers and the 4 metre high barriers is shown below in Table 5.3.

TABLE 5.3 – TOTAL SURFACE AREA OF NOISE WALLS

Option	Wall Surface Area (m^2)
Minimum Recommended	8,980
4m High Barriers for Length	15,660

For: **HERRING STORER ACOUSTICS**

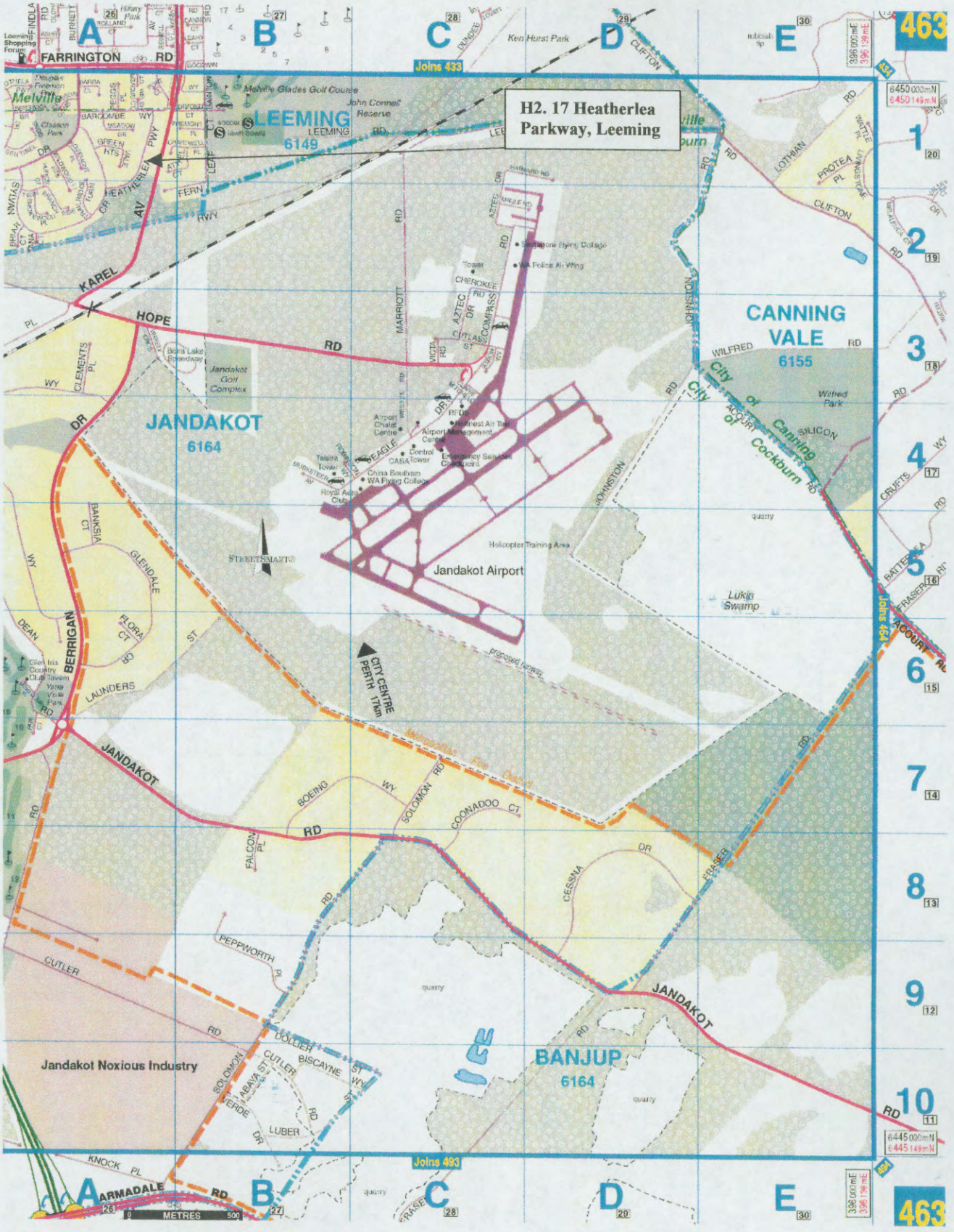
Terry George

Checked: Lynton Storer

8 August 2003

APPENDIX A

GENERAL LOCALITY MAP


H2. 17 Heatherlea Parkway, Leeming
LEEMING
6149
JANDAKOT
6164
CANNING VALE
6155
BANJUP
6164
Jandakot Airport
Jandakot Noxious Industry
FARRINGTON RD
HOPE RD
KAREL AV
BERRIGAN DR
JANDAKOT RD
CLIFTON
CITY CENTRE PERTH 17km
Joins 433
Joins 493
Joins 464
METRES


H3. 13 Evergreen Court, Leeming
NORTH LAKE
6163
BIBRA LAKE
6163
SOUTH LAKE
6164
YANGEBUP
6164
City of Cockburn
Beeliar Regional Park
Bibra Lake
Yangebup Lake
South Lake
Little Rush Lake
COOLBELLUP
BEELIAR
PERTH BG34


H3. 13 Evergreen Court, Leeming
NORTH LAKE
6163
BIBRA LAKE
6163
SOUTH LAKE
6164
YANGEBUP
6164
COOLBELLUP
6163
BEELIAR
6163
City of Cockburn
Beeliar Regional Park
Bibra Lake
North Lake
Yangebup Lake
South Lake
Lakes Shopping Centre
Adventure World
Lakelands
Jandakot Industrial Area
Joins 432
Joins 451
Joins 492
PERTH RG34

APPENDIX B

NOISE MONITORING RESULTS

TABLE B1 – NOISE MONITORING RESULTS, dB(A)

Location / Date	$L_{10(18hour)}$	$L_{eq(8hour)}$	$L_{eq(24hour)}$
36 Merrifield Circle, Leeming			
19/03/03	60.8	58.1	53.8
20/03/03	61.1	58.1	53.0
25/03/03	59.0	56.6	53.1
Average	**60**	**58**	**53**
17 Heatherlea Parkway, Leeming			
18/03/03	52.1	50.2	43.7
19/03/03	52.5	51.3	45.2
24/03/03	52.4	51.5	47.1
Average	**52**	**51**	**45**
13 Evergreen Court, Leeming			
24/03/03	50.9	49.5	44.5
25/03/03	49.8	47.8	40.1
26/03/03	51.2	49.3	44.8
Average	**51**	**49**	**43**

TRAFFIC NOISE MEASUREMENT

Results

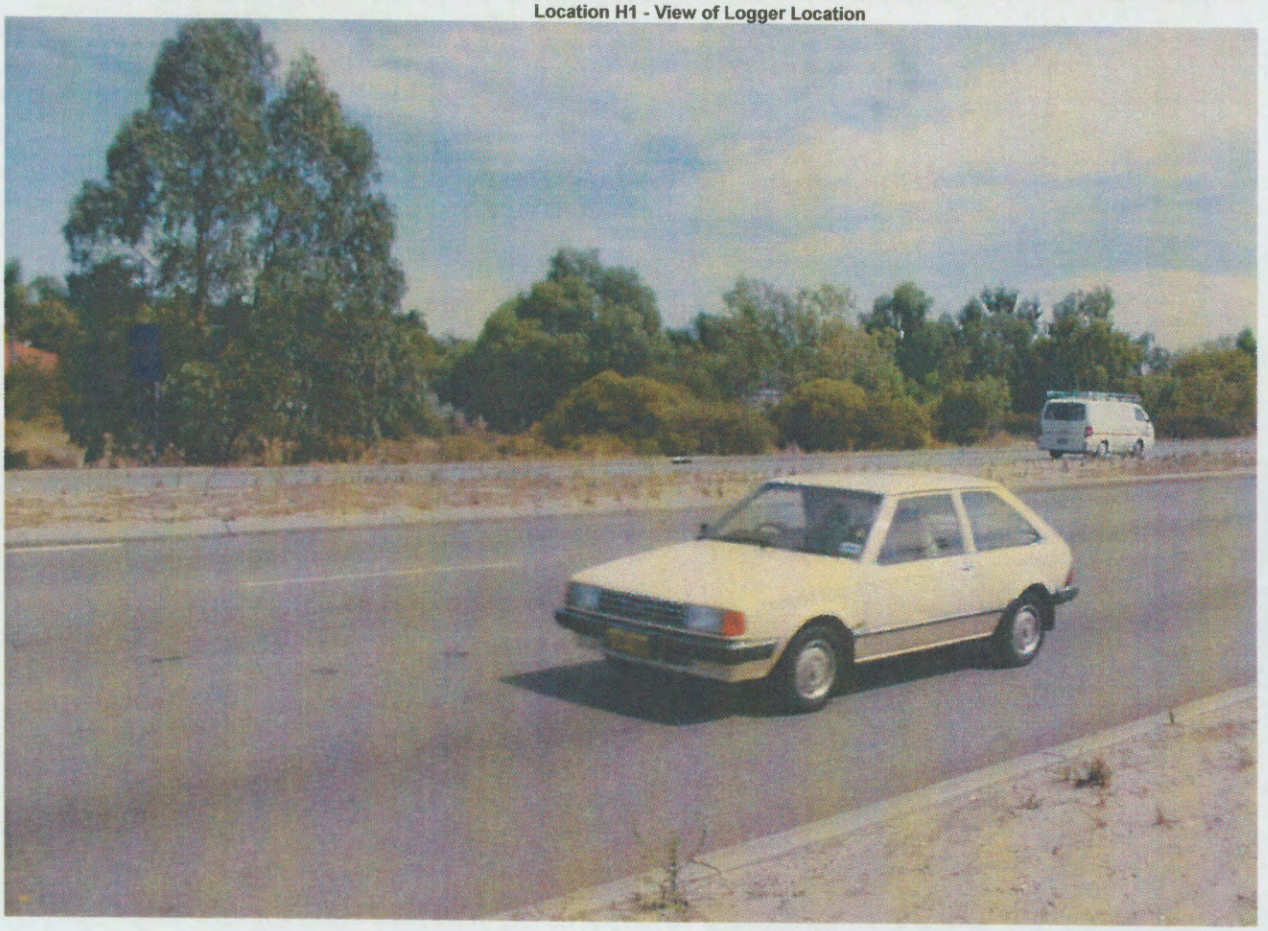
Site Data	
Location	
Project:	Roe Highway Stage 7 - South Street to Kwinana Freeway
Street Address	36 Merrifield Circle
Locality:	Leeming
Occupier	Kirkpatrick
Dates :	17/03/02 to 27/03/02
Category:	*Main Roads will provide this information*
Site	
Distance from the microphone to the kerb	45m
Height of the road in relation to the ground	same
Road Surface Type:	open-graded-asphalt
Speed Zone:	70kmph
Absorbing Ground	60%
Angle of View:	100 degrees
Road Gradient:	Flat
Traffic Flow	*Main Roads will provide this information*
Heavy Vehicles	*Main Roads will provide this information*
House-Road Orientation:	South
Carriageways and lanes:	2,6
Comment	
Comment:	Before opening of Roe Highway Stage 7.
	Logger at rear of property, 1 metre from wall and 1.5 metres above ground
	Main source of noise is from South Street
	Aircraft and freight train noise may influence levels.
References	
AMG Z50 E/N	*Main Roads will provide this information*
Road Name	South Street
EXCEL file	17 Heatherlea S1.xls
Raw data file	Heather Logger.xls
Equipment	
Analyser Number:	91
Microphone Number	N/A
Calibrator Number	5
Calibrator Values:	94.0, 94.0
Operator:	HSA/TG
Weather	
Wind:	Acceptable wind conditions were obtained on the 19, 20 & 25 March 2003

CRTN: Calculation of Road Traffic Noise, by UK Department of Transport, 1988

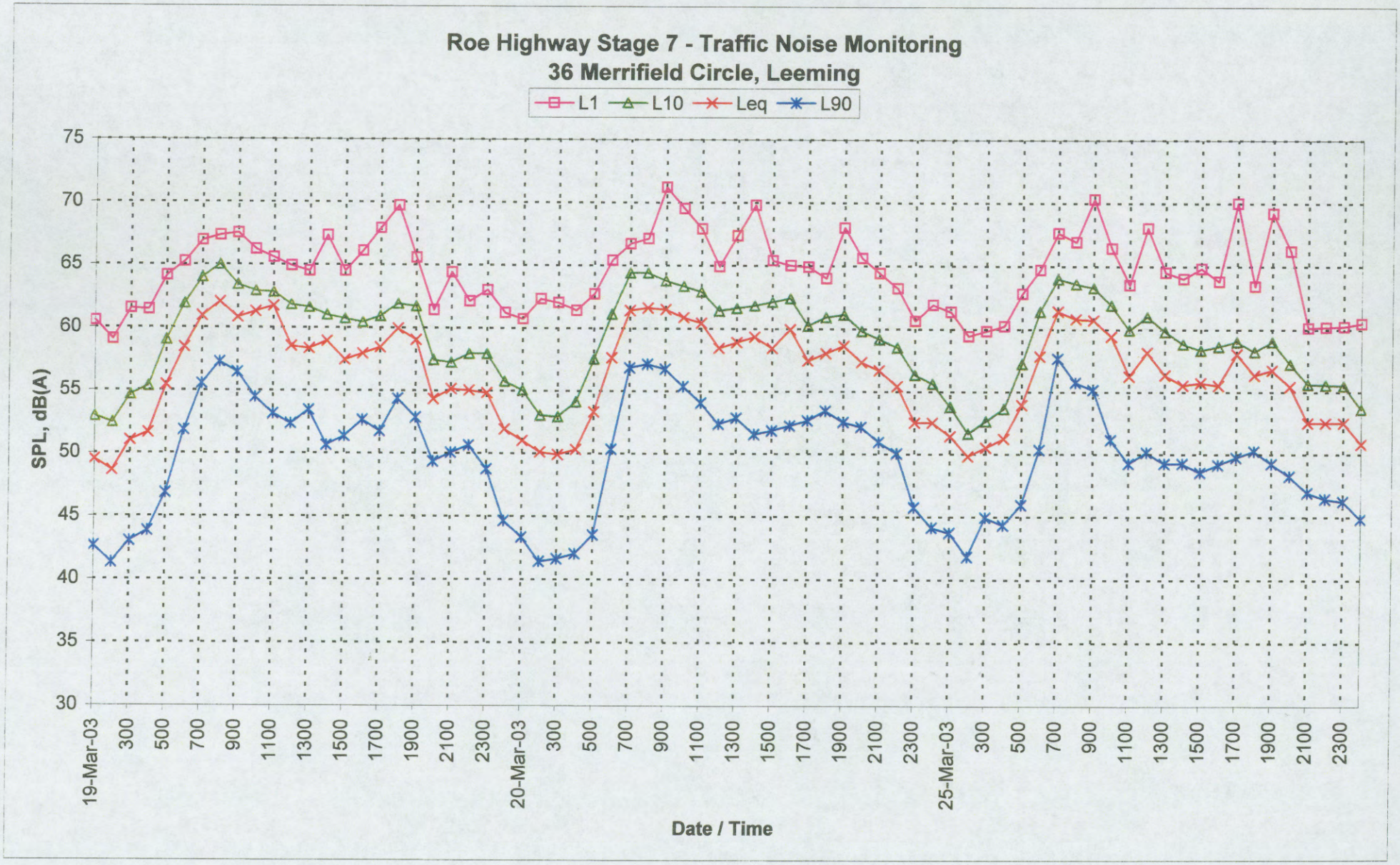
Hourly Noise Level Data

Date	Time	L1	L10	Leq	L90	Wind Dir	Wind Speed (knots)	Rainfall (mm)
19-Mar	100	60.5	52.9	49.5	42.6	100	11	0.0
19-Mar	200	59.0	52.4	48.6	41.3	100	15	0.0
19-Mar	300	61.5	54.6	51.0	43.0	90	13	0.0
19-Mar	400	61.4	55.3	51.6	43.8	90	13	0.0
19-Mar	500	64.1	59.0	55.4	46.8	80	15	0.0
19-Mar	600	65.2	61.9	58.4	51.8	80	15	0.0
19-Mar	700	66.9	64.0	60.9	55.5	80	13	0.0
19-Mar	800	67.3	65.0	62.0	57.2	80	11	0.0
19-Mar	900	67.5	63.4	60.8	56.4	80	17	0.0
19-Mar	1000	***66.2***	62.9	***61.3***	54.4	90	17	0.0
19-Mar	1100	***65.6***	62.8	61.7	53.1	70	19	0.0
19-Mar	1200	64.9	61.8	58.5	52.3	100	13	0.0
19-Mar	1300	64.5	61.6	58.3	53.4	80	11	0.0
19-Mar	1400	67.3	61.0	58.9	50.6	70	13	0.0
19-Mar	1500	64.5	60.7	57.4	51.3	80	11	0.0
19-Mar	1600	66.1	60.4	***57.9***	52.6	200	19	0.0
19-Mar	1700	***67.9***	60.9	***58.4***	51.7	200	***20***	0.0
19-Mar	1800	69.7	61.9	59.9	54.3	220	17	0.0
19-Mar	1900	***65.6***	61.7	59.0	52.8	340	6	0.0
19-Mar	2000	61.4	57.4	54.3	49.3	0	0	0.0
19-Mar	2100	64.4	57.2	55.1	50.0	0	0	0.0
19-Mar	2200	62.1	57.9	55.0	50.6	160	7	0.0
19-Mar	2300	63.0	57.9	54.8	48.7	110	7	0.0
19-Mar	0	61.2	55.7	51.9	44.6	80	11	0.0
20-Mar	100	60.7	55.0	51.0	43.3	100	11	0.0
20-Mar	200	62.3	53.0	50.1	41.4	90	15	0.0
20-Mar	300	62.0	52.9	49.9	41.6	90	13	0.0
20-Mar	400	61.4	54.1	50.3	42.0	90	17	0.0
20-Mar	500	62.7	57.5	53.3	43.5	80	13	0.0
20-Mar	600	65.4	61.1	57.6	50.3	70	13	0.0
20-Mar	700	66.7	64.4	61.4	56.8	80	15	0.0
20-Mar	800	67.1	64.4	61.6	57.1	90	11	0.0
20-Mar	900	71.2	63.8	61.5	56.7	60	17	0.0
20-Mar	1000	69.5	***63.4***	***60.9***	55.3	60	19	0.0
20-Mar	1100	67.9	62.9	***60.4***	54.0	70	15	0.0
20-Mar	1200	64.9	61.4	58.4	52.3	50	15	0.0
20-Mar	1300	***67.4***	***61.6***	***58.9***	52.8	70	11	0.0
20-Mar	1400	69.8	61.8	***59.3***	51.5	90	13	0.0
20-Mar	1500	65.4	62.1	58.4	51.8	70	11	0.0
20-Mar	1600	65.0	62.4	***59.9***	52.2	80	9	0.0
20-Mar	1700	64.9	60.2	57.4	52.6	80	9	0.0
20-Mar	1800	64.0	60.9	58.0	53.4	100	9	0.0
20-Mar	1900	68.0	61.1	***58.6***	52.5	90	7	0.0
20-Mar	2000	***65.6***	***59.8***	***57.3***	52.1	90	9	0.0
20-Mar	2100	***64.4***	***59.2***	***56.7***	50.9	90	11	0.0
20-Mar	2200	63.2	58.5	55.4	50.0	90	11	0.0
20-Mar	2300	60.6	56.3	52.5	45.7	90	13	0.0
20-Mar	0	61.9	55.6	52.5	44.1	100	9	0.0
25-Mar	100	***61.4***	***53.8***	***51.4***	43.7	0	0	0.0
25-Mar	200	59.4	51.6	49.8	41.8	0	0	0.0
25-Mar	300	***59.8***	***52.6***	***50.5***	44.9	160	6	0.0
25-Mar	400	60.2	53.6	51.2	44.3	160	6	0.0
25-Mar	500	62.8	57.2	53.9	45.9	160	2	0.0
25-Mar	600	64.7	61.4	57.8	50.3	90	7	0.0
25-Mar	700	67.6	64.0	61.4	57.6	90	7	0.0
25-Mar	800	66.9	63.6	60.8	55.7	80	11	0.0
25-Mar	900	70.3	63.3	60.7	55.1	70	7	0.0
25-Mar	1000	66.4	61.9	***59.4***	51.1	70	7	0.0
25-Mar	1100	63.5	59.9	56.2	49.2	50	6	0.0
25-Mar	1200	68.0	61.0	58.1	50.1	120	4	0.0
25-Mar	1300	64.5	59.8	56.3	49.2	330	7	0.0
25-Mar	1400	64.0	58.8	55.5	49.2	220	17	0.0
25-Mar	1500	64.8	58.3	55.7	48.5	240	15	0.0
25-Mar	1600	63.8	58.6	55.5	49.1	230	17	0.0
25-Mar	1700	70.0	59.0	58.0	49.7	230	17	0.0
25-Mar	1800	63.4	58.2	56.3	50.2	220	17	0.0
25-Mar	1900	69.2	59.0	56.7	49.2	200	17	0.0
25-Mar	2000	66.2	57.2	55.4	48.2	180	13	0.0
25-Mar	2100	60.1	55.6	52.5	46.9	190	13	0.0
25-Mar	2200	***60.2***	***55.6***	***52.5***	46.4	180	13	0.0
25-Mar	2300	60.2	55.5	52.5	46.2	170	9	0.0
25-Mar	0	***60.5***	***53.6***	***50.8***	44.8	160	4	0.0

Location H1 - View of Logger Location



Location H1 - View of Road Layout


Roe Highway Stage 7 - Traffic Noise Monitoring
36 Merrifield Circle, Leeming
L1
L10
Leq
L90
SPL, dB(A)
75
70
65
60
55
50
45
40
35
30
19-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
20-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
25-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
Date / Time

TRAFFIC NOISE MEASUREMENT

Results

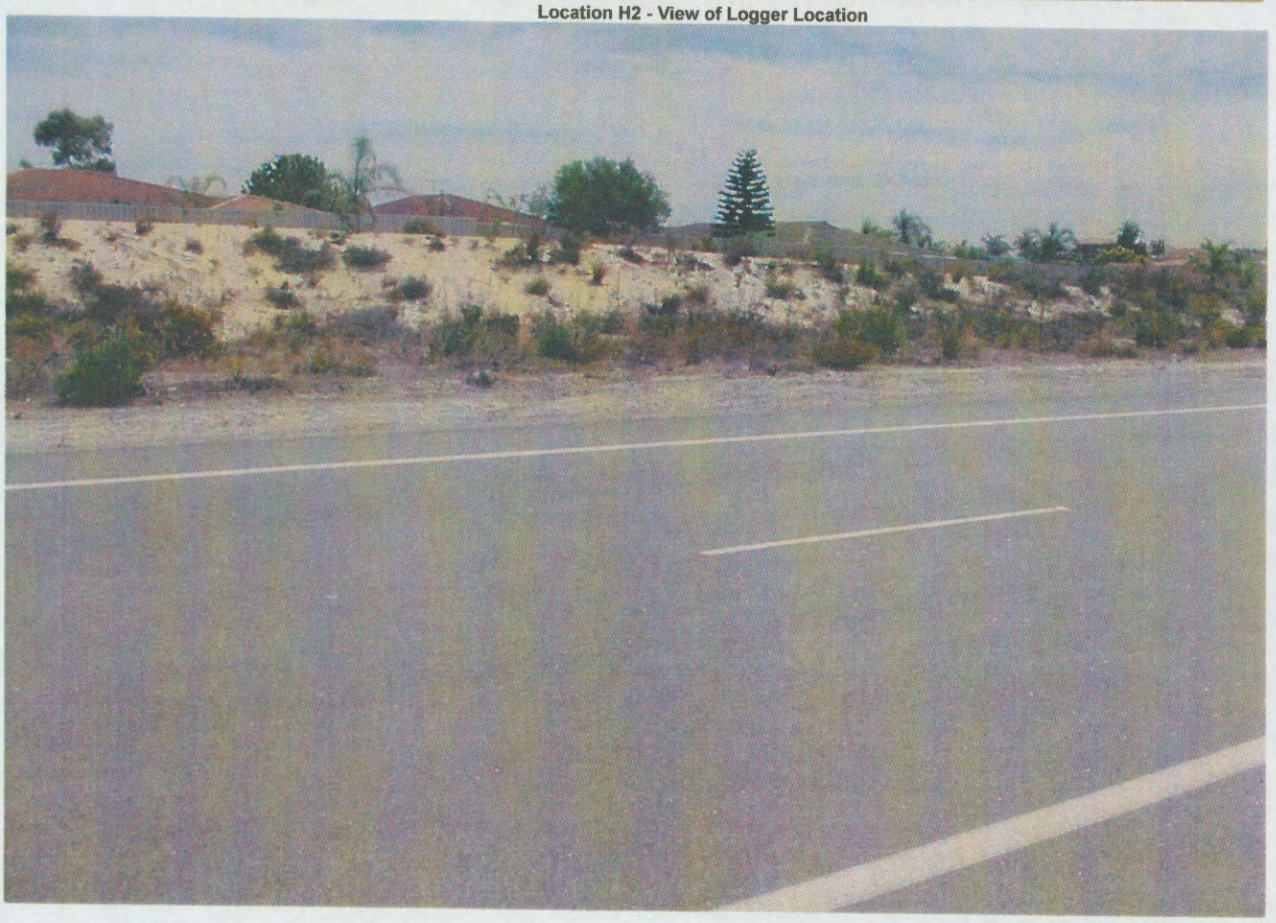
Site Data	
Location	
Project:	Roe Highway Stage 7 - South Street to Kwinana Freeway
Street Address	17 Heatherlea Parkway
Locality:	Leeming
Occupier	Ashworth
Dates :	17/03/02 to 27/03/02
Category:	*Main Roads will provide this information*
Site	
Distance from the microphone to the kerb	50m
Height of the road in relation to the ground	-3m
Road Surface Type:	open-graded-asphalt
Speed Zone:	70kmph
Absorbing Ground	50%
Angle of View:	100 degrees
Road Gradient:	Flat
Traffic Flow	*Main Roads will provide this information*
Heavy Vehicles	*Main Roads will provide this information*
House-Road Orientation:	East
Carriageways and lanes:	1,2
Comment	
Comment:	Before opening of Roe Highway Stage 7.
	Logger at rear of property, 1 metre from wall and 1.5 metres above ground
	Main source of noise is from Karel Avenue
	Aircraft noise may influence levels.
References	
AMG Z50 E/N	*Main Roads will provide this information*
Road Name	Karel Avenue
EXCEL file	17 Heatherlea S1.xls
Raw data file	Heather Logger.xls
Equipment	
Analyser Number:	71
Microphone Number	N/A
Calibrator Number	5
Calibrator Values:	94.0, 93.8
Operator:	HSA/TG
Weather	
Wind:	Acceptable wind conditions were obtained on the 18, 19 & 24 March 2003

CRTN: Calculation of Road Traffic Noise, by UK Department of Transport, 1988

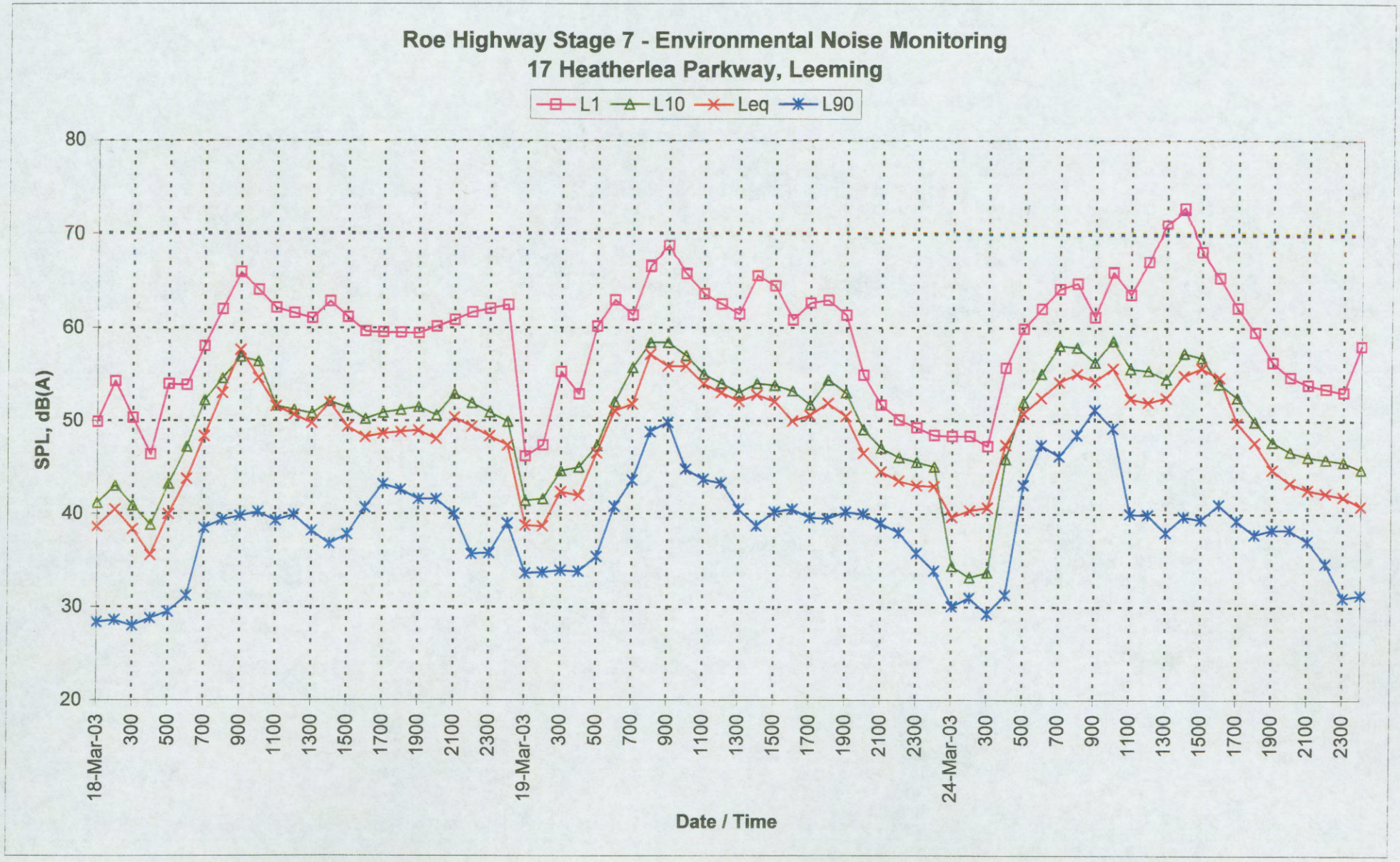
Hourly Noise Level Data

Date	Time	L1	L10	Leq	L90	Wind Dir	Wind Speed (knots)	Rainfall (mm)
18-Mar	100	***49.9***	***41.2***	***38.7***	***28.4***	220	9	0.0
18-Mar	200	54.3	43.0	***40.5***	28.6	140	2	0.0
18-Mar	300	***50.4***	***40.9***	***38.4***	28.0	140	2	0.0
18-Mar	400	46.4	38.8	35.6	28.8	160	9	0.0
18-Mar	500	54.0	43.2	40.0	29.5	150	7	0.0
18-Mar	600	53.9	47.2	43.8	31.2	160	9	0.0
18-Mar	700	58.1	52.2	48.4	38.5	140	9	0.0
18-Mar	800	***62.1***	***54.6***	***53.1***	***39.4***	150	15	0.0
18-Mar	900	66.0	56.9	57.7	***39.8***	150	19	0.0
18-Mar	1000	***64.1***	56.4	***54.7***	40.2	190	19	0.0
18-Mar	1100	62.2	51.6	51.6	39.3	170	***20***	0.0
18-Mar	1200	***61.7***	***51.2***	***50.7***	39.9	180	17	0.0
18-Mar	1300	61.1	50.8	49.8	38.2	210	***20***	0.0
18-Mar	1400	62.9	52.1	52.0	36.8	200	15	0.0
18-Mar	1500	61.2	51.4	49.4	37.8	210	***20***	0.0
18-Mar	1600	59.7	50.2	48.3	40.7	200	***22***	0.0
18-Mar	1700	***59.6***	***50.9***	***48.7***	43.2	210	***22***	0.0
18-Mar	1800	***59.6***	***51.2***	***48.8***	42.6	210	***24***	0.0
18-Mar	1900	59.5	51.5	***49.0***	41.6	190	***20***	0.0
18-Mar	2000	***60.2***	50.6	***48.1***	41.6	170	15	0.0
18-Mar	2100	60.9	52.9	***50.4***	40.0	170	15	0.0
18-Mar	2200	***61.7***	51.9	***49.4***	35.7	170	11	0.0
18-Mar	2300	***62.1***	***50.9***	***48.4***	35.8	140	6	0.0
18-Mar	0	62.5	49.9	***47.4***	39.0	110	7	0.0
19-Mar	100	46.2	41.4	38.8	33.6	100	11	0.0
19-Mar	200	47.4	41.6	38.7	33.7	100	15	0.0
19-Mar	300	55.3	44.6	42.4	33.9	90	13	0.0
19-Mar	400	52.9	45.0	42.0	33.8	90	13	0.0
19-Mar	500	60.2	47.3	***46.6***	35.4	80	15	0.0
19-Mar	600	63.0	52.0	51.1	40.8	80	15	0.0
19-Mar	700	61.4	55.7	51.8	43.6	80	13	0.0
19-Mar	800	66.6	58.4	57.2	48.8	80	11	0.0
19-Mar	900	68.8	58.4	***55.9***	49.8	80	17	0.0
19-Mar	1000	65.8	57.0	55.9	44.8	90	17	0.0
19-Mar	1100	***63.7***	***55.0***	***54.0***	43.7	70	19	0.0
19-Mar	1200	***62.6***	***54.0***	***53.1***	43.3	100	13	0.0
19-Mar	1300	61.5	53.0	52.1	40.5	80	11	0.0
19-Mar	1400	65.6	54.0	52.8	38.7	70	13	0.0
19-Mar	1500	64.5	53.8	52.1	40.2	80	11	0.0
19-Mar	1600	60.9	53.2	50.0	40.5	200	19	0.0
19-Mar	1700	62.7	51.7	50.6	39.6	200	***20***	0.0
19-Mar	1800	63.0	54.4	***51.9***	39.5	220	17	0.0
19-Mar	1900	61.4	53.0	***50.5***	40.2	340	6	0.0
19-Mar	2000	55.0	49.1	***46.6***	40.0	0	0	0.0
19-Mar	2100	51.7	47.1	***44.6***	39.0	0	0	0.0
19-Mar	2200	50.1	46.1	***43.6***	38.0	160	7	0.0
19-Mar	2300	49.3	45.6	***43.1***	35.8	110	7	0.0
19-Mar	0	48.5	45.1	43.0	33.9	80	11	0.0
24-Mar	100	48.4	34.4	39.7	30.1	240	17	0.0
24-Mar	200	48.4	33.2	40.4	31.0	220	7	0.0
24-Mar	300	47.3	33.7	40.7	29.3	0	0	0.0
24-Mar	400	***55.8***	***45.9***	***47.5***	31.3	0	0	0.0
24-Mar	500	***60.0***	***52.0***	***50.8***	43.1	0	0	0.0
24-Mar	600	***62.1***	***55.1***	***52.5***	47.4	0	0	0.0
24-Mar	700	64.2	58.1	54.2	46.2	170	7	0.0
24-Mar	800	64.8	57.9	55.1	48.5	160	***20***	0.0
24-Mar	900	61.2	56.3	54.3	51.2	160	15	0.0
24-Mar	1000	66.0	58.6	55.7	49.2	150	15	0.0
24-Mar	1100	63.6	55.6	52.4	40.0	140	13	0.0
24-Mar	1200	67.1	55.4	52.0	39.9	180	15	0.0
24-Mar	1300	71.1	54.5	52.5	38.0	220	17	0.0
24-Mar	1400	72.8	57.3	54.9	39.7	210	***22***	0.0
24-Mar	1500	68.2	56.8	55.7	39.4	200	17	0.0
24-Mar	1600	65.4	54.0	54.7	41.0	220	***20***	0.0
24-Mar	1700	62.2	52.5	49.8	39.3	220	19	0.0
24-Mar	1800	59.6	49.9	47.7	37.8	210	13	0.0
24-Mar	1900	***56.4***	***47.8***	***44.8***	38.3	200	13	0.0
24-Mar	2000	***54.7***	***46.7***	***43.4***	38.3	180	9	0.0
24-Mar	2100	***53.9***	***46.1***	***42.6***	37.1	170	11	0.0
24-Mar	2200	***53.5***	***45.9***	***42.3***	34.7	160	9	0.0
24-Mar	2300	53.1	45.6	41.9	31.0	0	0	0.0
24-Mar	0	58.1	44.8	40.9	31.3	0	0	0.0

Location H2 - View of Logger Location



Location H2 - View of Road Layout


Roe Highway Stage 7 - Environmental Noise Monitoring
17 Heatherlea Parkway, Leeming
L1
L10
Leq
L90
SPL, dB(A)
80
70
60
50
40
30
20
18-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
19-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
24-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
Date / Time

TRAFFIC NOISE MEASUREMENT

Results

Site Data	
Location	
Project:	Roe Highway Stage 7 - South Street to Kwinana Freeway
Street Address	13 Evergreen Court
Locality:	Leeming
Occupier	Mitchell
Dates :	17/03/02 to 27/03/02
Category:	*Main Roads will provide this information*
Site	
Distance from the microphone to the kerb	
Height of the road in relation to the ground	
Road Surface Type:	
Speed Zone:	
Absorbing Ground	
Angle of View:	
Road Gradient:	
Traffic Flow	*Main Roads will provide this information*
Heavy Vehicles	*Main Roads will provide this information*
House-Road Orientation:	South
Carriageways and lanes:	
Comment	
Comment:	Before opening of Roe Highway Stage 7.
	Logger at rear of property, 1 metre from wall and 1.5 metres above ground
	Main source of noise is from Kwinana Freeway
	Aircraft and freight train noise may influence levels.
References	
AMG Z50 E/N	*Main Roads will provide this information*
Road Name	*Main Roads will provide this information*
EXCEL file	13 Evergreen S1.xls
Raw data file	Evergreen Logger.xls
Equipment	
Analyser Number:	69
Microphone Number	N/A
Calibrator Number	5
Calibrator Values:	94.0, 93.9
Operator:	HSA/TG
Weather	
Wind:	Acceptable wind conditions were obtained on the 24, 25 & 26 March 2003

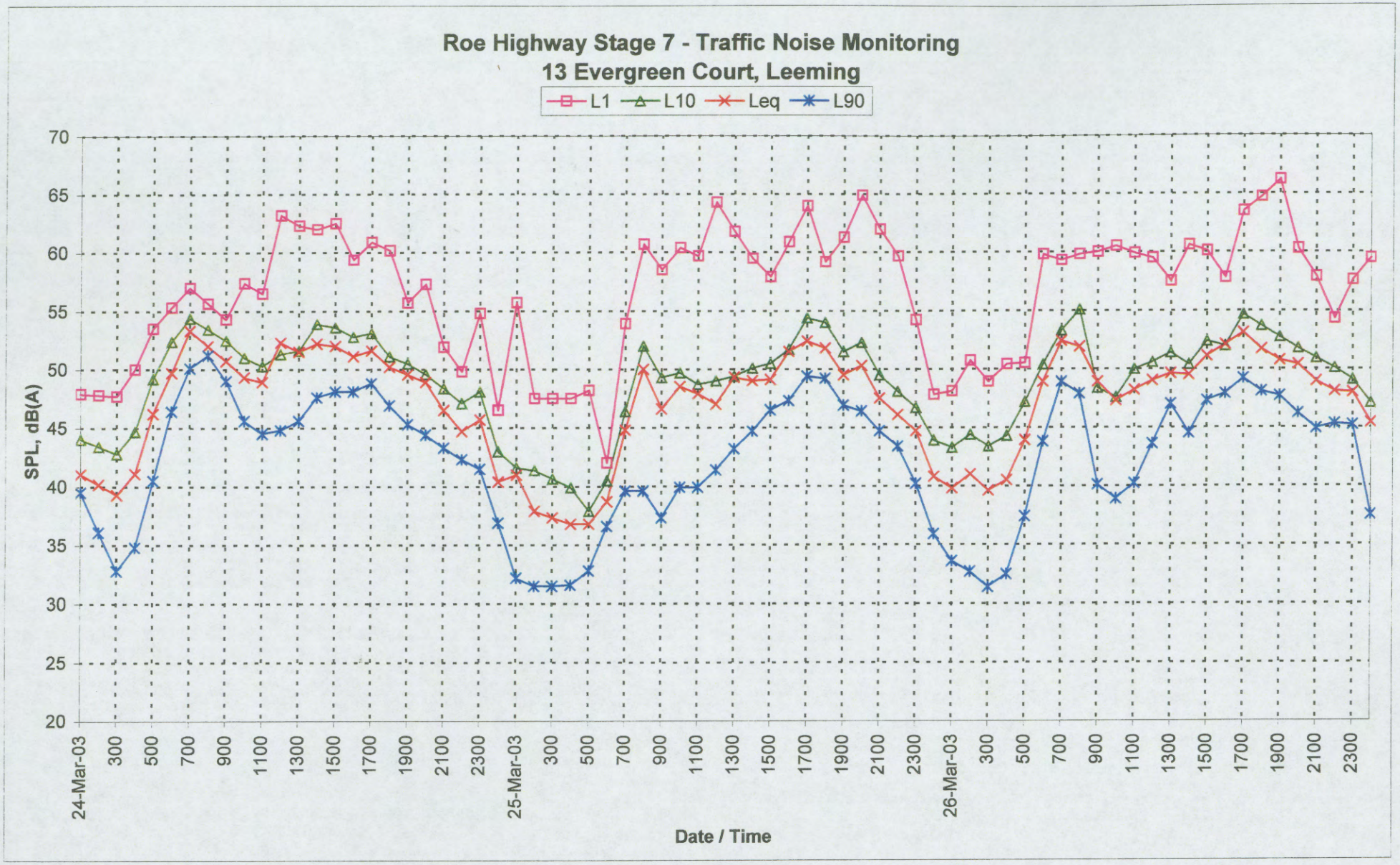
CRTN: Calculation of Road Traffic Noise, by UK Department of Transport, 1988

Hourly Noise Level Data

Date	Time	L1	L10	Leq	L90	Wind Dir	Wind Speed (knots)	Rainfall (mm)
24-Mar	100	***47.9***	***44.1***	***41.1***	39.5	240	17	0.0
24-Mar	200	***47.8***	***43.4***	***40.2***	36.1	220	7	0.0
24-Mar	300	47.7	42.8	39.3	32.8	0	0	0.0
24-Mar	400	50.0	44.7	41.1	34.8	0	0	0.0
24-Mar	500	53.5	49.2	46.2	40.5	0	0	0.0
24-Mar	600	55.3	52.4	49.7	46.4	0	0	0.0
24-Mar	700	57.0	54.4	53.3	50.1	170	7	0.0
24-Mar	800	***55.7***	***53.5***	***52.0***	51.2	160	*20*	0.0
24-Mar	900	54.3	52.5	50.7	49.0	160	15	0.0
24-Mar	1000	57.4	51.0	49.3	45.6	150	15	0.0
24-Mar	1100	56.5	50.3	48.9	44.5	140	13	0.0
24-Mar	1200	63.2	51.3	52.3	44.8	180	15	0.0
24-Mar	1300	62.3	51.6	51.5	45.6	220	17	0.0
24-Mar	1400	62.0	53.9	52.2	47.6	210	*22*	0.0
24-Mar	1500	62.5	53.6	52.0	48.1	200	17	0.0
24-Mar	1600	59.4	52.8	51.1	48.1	220	*20*	0.0
24-Mar	1700	60.9	53.1	51.6	48.8	220	19	0.0
24-Mar	1800	60.2	51.1	50.2	46.9	210	13	0.0
24-Mar	1900	55.7	50.5	***49.6***	45.3	200	13	0.0
24-Mar	2000	57.3	49.6	48.9	44.4	180	9	0.0
24-Mar	2100	51.9	48.4	46.5	43.3	170	11	0.0
24-Mar	2200	49.8	47.1	44.7	42.3	160	9	0.0
24-Mar	2300	54.8	48.1	45.7	41.5	0	0	0.0
24-Mar	0	46.5	43.0	40.4	36.9	0	0	0.0
25-Mar	100	55.7	41.6	41.0	32.2	0	0	0.0
25-Mar	200	47.5	41.4	37.9	31.5	0	0	0.0
25-Mar	300	***47.5***	***40.7***	***37.4***	31.5	160	6	0.0
25-Mar	400	47.5	39.9	36.8	31.6	160	6	0.0
25-Mar	500	48.2	37.9	36.8	32.8	160	2	0.0
25-Mar	600	42.0	40.5	38.7	36.6	90	7	0.0
25-Mar	700	53.9	46.4	44.8	39.6	90	7	0.0
25-Mar	800	60.7	52.0	***50.0***	39.6	80	11	0.0
25-Mar	900	58.5	49.3	46.6	37.3	70	7	0.0
25-Mar	1000	60.4	49.7	48.5	39.9	70	7	0.0
25-Mar	1100	59.7	48.7	47.9	39.9	50	6	0.0
25-Mar	1200	64.3	49.0	***47.0***	41.4	120	4	0.0
25-Mar	1300	61.8	49.4	49.3	43.2	330	7	0.0
25-Mar	1400	59.5	50.1	49.0	44.7	220	17	0.0
25-Mar	1500	57.9	50.5	49.1	46.5	240	15	0.0
25-Mar	1600	60.9	51.7	51.5	47.3	230	17	0.0
25-Mar	1700	64.0	54.4	***52.4***	49.4	230	17	0.0
25-Mar	1800	59.2	54.0	51.8	49.2	220	17	0.0
25-Mar	1900	61.3	51.5	***49.5***	46.9	200	17	0.0
25-Mar	2000	64.9	52.3	***50.3***	46.4	180	13	0.0
25-Mar	2100	62.0	***49.5***	***47.5***	44.7	190	13	0.0
25-Mar	2200	59.7	***48.1***	***46.1***	43.4	180	13	0.0
25-Mar	2300	54.2	46.7	44.7	40.2	170	9	0.0
25-Mar	0	47.8	43.9	40.8	35.9	160	4	0.0
26-Mar	100	48.1	43.3	39.8	33.6	170	7	0.0
26-Mar	200	50.7	44.4	41.0	32.7	190	2	0.0
26-Mar	300	48.9	43.4	39.6	31.4	180	9	0.0
26-Mar	400	50.4	44.3	40.5	32.5	180	6	0.0
26-Mar	500	50.5	47.2	43.9	37.4	170	7	0.0
26-Mar	600	59.8	50.4	48.9	43.8	160	4	0.0
26-Mar	700	59.3	53.3	52.4	48.9	170	7	0.0
26-Mar	800	59.8	55.1	51.9	47.9	160	13	0.0
26-Mar	900	60.0	48.4	48.9	40.1	140	9	0.0
26-Mar	1000	60.5	47.6	47.3	38.9	130	7	0.0
26-Mar	1100	59.9	50.0	48.2	40.2	230	13	0.0
26-Mar	1200	59.5	50.6	49.0	43.6	210	15	0.0
26-Mar	1300	57.5	51.4	49.6	47.0	200	15	0.0
26-Mar	1400	60.6	50.4	49.5	44.5	200	13	0.0
26-Mar	1500	60.1	52.4	51.1	47.3	240	15	0.0
26-Mar	1600	57.8	52.0	***52.1***	47.9	220	19	0.0
26-Mar	1700	63.5	54.7	53.1	49.2	210	20	0.0
26-Mar	1800	64.7	53.7	***51.7***	48.1	210	17	0.0
26-Mar	1900	66.2	***52.8***	***50.8***	47.7	210	17	0.0
26-Mar	2000	60.3	51.8	50.4	46.2	200	11	0.0
26-Mar	2100	57.9	***51.0***	***49.0***	44.9	180	9	0.0
26-Mar	2200	54.3	50.1	48.1	45.3	180	7	0.0
26-Mar	2300	57.6	49.1	48.0	45.2	0	0	0.0
26-Mar	0	59.5	47.1	45.4	37.5	0	0	0.0

Location H3 - View of Logger Location

Location H3 - View Towards Future Road


Roe Highway Stage 7 - Traffic Noise Monitoring
13 Evergreen Court, Leeming
L1
L10
Leq
L90
SPL, dB(A)
70
65
60
55
50
45
40
35
30
25
20
24-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
25-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
26-Mar-03
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
Date / Time

APPENDIX C

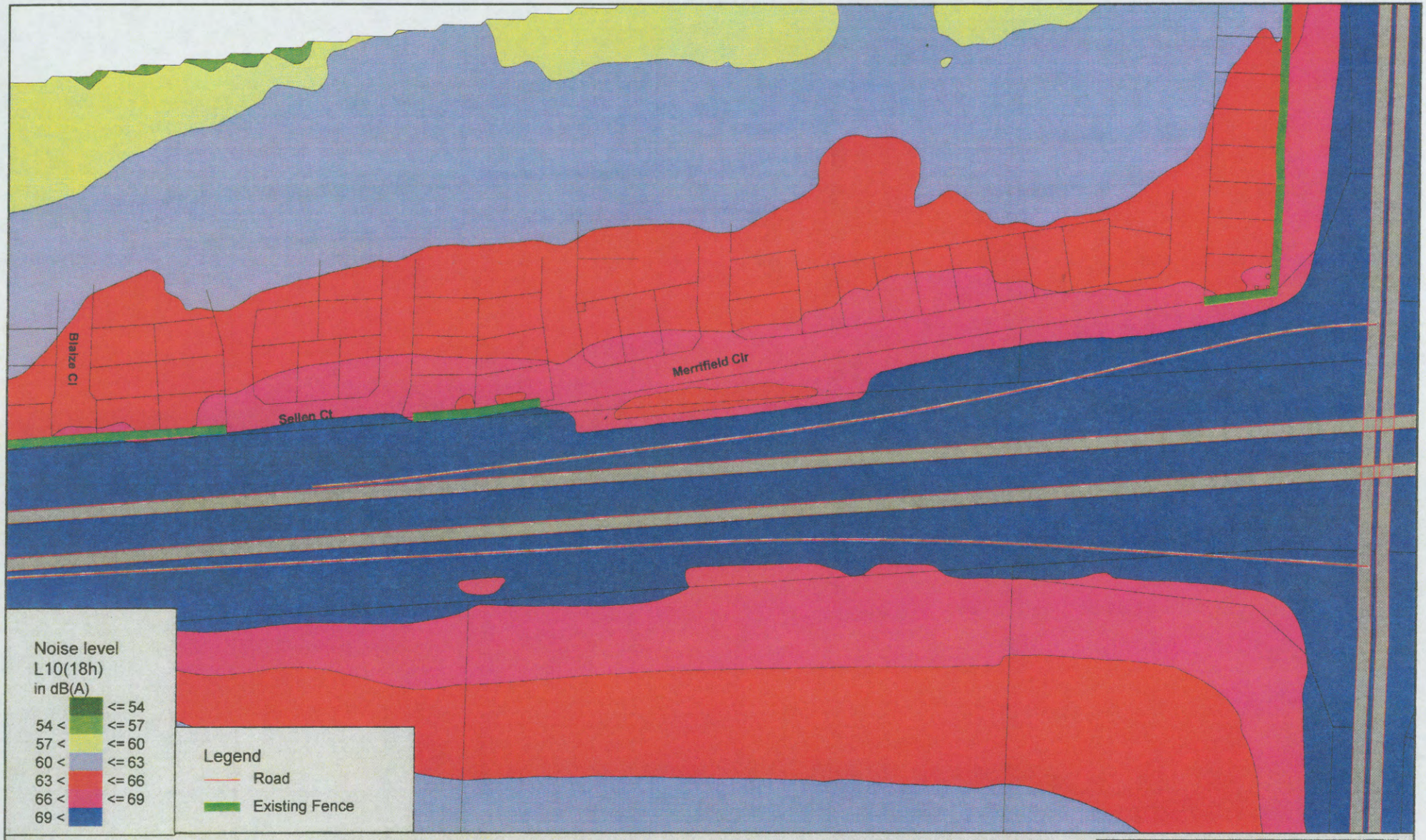
PREDICTED NOISE LEVELS TO RESIDENCES
SINGLE POINT CALCULATIONS

RNo	Name	Noise Level With Existing Fences		Exceedance to 63 dB(A) L10(18hour) Criteria		Noise Level With Recomended Walls		Noise Level With 4m Walls	
		2011 L10(18hour) dB(A)	2031 L10(18hour) dB(A)	2011 L10(18hour) dB(A)	2031 L10(18hour) dB(A)	2011 L10(18hour) dB(A)	2031 L10(18hour) dB(A)	2011 L10(18hour) dB(A)	2031 L10(18hour) dB(A)
1	Athel Crt 1	62.0	63.2			61.7	62.9	59.4	60.7
2	Athel Crt 2	60.7	62.0			59.6	60.9	58.1	59.5
3	Athel Crt 3	62.1	63.6		0.6	61.1	62.6	60.2	61.6
4	Blaize Cl 1	62.2	63.9		0.9	59.6	61.3	58.1	59.8
5	Blaize Cl 2	64.1	65.8	1.1	2.8	60.0	61.7	57.8	59.5
6	Briar Crt 1	66.2	68.3	3.2	5.3	59.1	61.2	56.2	58.4
7	Briar Crt 2	66.8	68.9	3.8	5.9	59.9	62.0	56.4	58.5
8	Briar Crt 3	67.0	69.1	4.0	6.1	60.5	62.6	57.8	59.9
9	Capill Cnr 2	66.7	68.4	3.7	5.4	61.2	62.9	59.9	61.6
10	Capill Cnr 3	65.9	67.6	2.9	4.6	60.9	62.6	59.2	60.9
11	Capill Cnr 4	66.1	67.8	3.1	4.8	60.8	62.5	59.1	60.8
12	Capill Cnr 5	65.6	67.3	2.6	4.3	59.6	61.3	59.1	60.8
13	Capill Cnr 6	65.9	67.6	2.9	4.6	61.1	62.8	60.4	62.1
14	Chipper Cl 1	65.5	67.2	2.5	4.2	61.3	63.0	60.4	62.1
15	Chipper Cl 2	65.5	67.2	2.5	4.2	60.4	62.1	59.4	61.1
16	Chipper Cl 3	64.5	66.2	1.5	3.2	58.8	60.5	58.0	59.7
17	Chipper Cl 4	65.9	67.6	2.9	4.6	61.0	62.7	60.3	62.0
18	Currie Place 1	62.0	63.9		0.9	59.4	61.3	58.1	59.9
19	Currie Place 2	61.8	63.7		0.7	60.5	62.3	55.9	57.7
20	Evergreen Ct 1	59.5	61.6			59.3	61.4	54.2	56.2
21	Evergreen Ct 2	59.9	62.0			58.7	60.8	54.5	56.5
22	Evergreen Ct 3	61.5	63.6		0.6	60.6	62.7	55.2	57.3
23	Evergreen Ct 4	59.7	61.9			58.3	60.4	53.9	55.9
24	Evergreen Ct 5	59.8	62.0			58.3	60.4	54.1	56.1
25	Fern Leaf Crt 1	62.7	64.2		1.2	61.4	62.9	60.5	62.0
26	Fern Leaf Crt 10	64.2	65.9	1.2	2.9	60.9	62.6	57.8	59.5
27	Fern Leaf Crt 11	64.4	66.2	1.4	3.2	61.0	62.8	58.0	59.7
28	Fern Leaf Crt 12	64.9	66.7	1.9	3.7	61.0	62.7	58.4	60.2
29	Fern Leaf Crt 13	64.7	66.5	1.7	3.5	60.4	62.1	58.4	60.1
30	Fern Leaf Crt 2	63.4	64.8		1.8	60.6	62.1	59.5	61.0
31	Fern Leaf Crt 3	64.0	65.2	1.0	2.2	60.0	61.6	59.2	60.7
32	Fern Leaf Crt 4	65.0	66.4	2.0	3.4	60.1	61.6	59.6	61.1
33	Fern Leaf Crt 5	65.5	67.0	2.5	4.0	61.0	62.6	60.3	61.8
34	Fern Leaf Crt 6	65.2	66.7	2.2	3.7	60.7	62.3	59.1	60.7
35	Fern Leaf Crt 7	63.2	64.8		1.8	61.1	62.8	58.2	59.8
36	Fern Leaf Crt 8	63.2	64.9		1.9	61.1	62.8	57.6	59.3
37	Fern Leaf Crt 9	63.5	65.2		2.2	61.2	62.9	57.8	59.4
38	Green Croft	61.8	64.0		1.0	58.4	60.6	55.2	57.3
39	Green Croft	64.8	67.0	1.8	4.0	60.8	63.0	57.2	59.3
40	Green Croft	65.3	67.4	2.3	4.4	59.4	61.6	56.8	58.9
41	Greenlea Rise 1	65.7	67.9	2.7	4.9	58.8	60.9	56.6	58.8
42	Greenlea Rise 2	66.5	68.6	3.5	5.6	58.7	60.8	56.2	58.3
43	Greenlea Rise 3	66.6	68.6	3.6	5.6	59.0	61.1	56.2	58.3
44	Greenlea Rise 4	66.4	68.5	3.4	5.5	59.2	61.3	56.5	58.6
45	Heatherlea Pwy	61.2	62.6			61.0	62.3	57.1	58.5
46	Heatherlea Pwy	60.3	61.6			60.3	61.6	56.1	57.5
47	Heatherlea Pwy	59.7	61.0			61.5	62.7	55.4	56.8
48	Hollingworth	64.9	66.6	1.9	3.6	60.6	62.3	58.5	60.2
49	Hollingworth	63.6	65.3	0.6	2.3	61.0	62.7	59.2	60.9
50	Lovatt Crt 1	65.5	67.2	2.5	4.2	61.0	62.7	59.2	61.0
51	Lovatt Crt 2	65.5	67.2	2.5	4.2	61.2	62.9	59.2	60.9
52	Lovatt Crt 3	65.6	67.3	2.6	4.3	60.9	62.6	58.6	60.3
53	Lovatt Crt 4	64.9	66.6	1.9	3.6	59.0	60.7	57.9	59.6
54	Merrifield Circle	64.9	66.6	1.9	3.6	59.9	61.6	58.4	60.1
55	Merrifield Circle	65.2	66.8	2.2	3.8	61.9	63.5	61.5	63.0
56	Merrifield Circle	64.6	66.2	1.6	3.2	61.2	62.7	61.0	62.4
57	Merrifield Circle	63.8	65.3	0.8	2.3	60.9	62.3	60.7	62.2

RNo	Name	Noise Level With Existing Fences		Exceedance to 63 dB(A) L10(18hour) Criteria		Noise Level With Recomended Walls		Noise Level With 4m Walls	
		2011	2031	2011	2031	2011	2031	2011	2031
		L10(18hour)	L10(18hour)	L10(18hour)	L10(18hour)	L10(18hour)	L10(18hour)	L10(18hour)	L10(18hour)
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
58	Merrifield Circle	63.5	65.0		2.0	60.8	62.2	60.7	62.1
59	Merrifield Circle	63.4	64.8		1.8	60.5	61.8	60.6	61.9
60	Merrifield Circle	65.0	66.2	2.0	3.2	59.9	61.0	60.8	61.9
61	Merrifield Circle	64.5	65.6	1.5	2.6	61.9	63.1	62.3	63.5
62	Merrifield Circle	64.2	65.3	1.2	2.3	62.0	63.2	62.1	63.3
63	Merrifield Circle	63.9	65.0	0.9	2.0	61.9	63.0	61.9	63.0
64	Merrifield Circle	63.6	64.6	0.6	1.6	61.8	62.9	61.8	62.9
65	Merrifield Circle	64.8	66.5	1.8	3.5	57.9	59.6	57.0	58.7
66	Merrifield Circle	63.1	64.1		1.1	61.4	62.5	61.4	62.5
67	Merrifield Circle	62.2	63.2			60.3	61.4	60.3	61.4
68	Merrifield Circle	62.0	62.9			60.0	61.1	60.0	61.1
69	Merrifield Circle	61.4	62.3			59.3	60.4	59.3	60.4
70	Merrifield Circle	64.8	66.5	1.8	3.5	57.8	59.5	57.1	58.8
71	Merrifield Circle	64.5	66.2	1.5	3.2	57.6	59.3	57.0	58.7
72	Merrifield Circle	64.3	66.0	1.3	3.0	57.9	59.6	57.5	59.2
73	Merrifield Circle	64.6	66.3	1.6	3.3	59.2	60.9	58.2	59.9
74	Merrifield Circle	65.0	66.7	2.0	3.7	60.8	62.5	59.2	60.9
75	Merrifield Circle	65.0	66.7	2.0	3.7	61.3	62.9	59.7	61.4
76	Merrifield Circle	65.2	66.8	2.2	3.8	62.0	63.5	61.1	62.7
77	Noreatt Pl 1	65.6	67.3	2.6	4.3	61.2	62.9	60.6	62.3
78	Noreatt Pl 2	67.3	69.0	4.3	6.0	60.2	61.9	59.7	61.4
79	Noreatt Pl 3	64.2	65.9	1.2	2.9	58.3	60.0	57.5	59.2
80	Noreatt Pl 4	66.9	68.6	3.9	5.6	60.4	62.1	59.3	61.0
81	Randwood	59.7	61.8			58.0	60.1	54.1	56.2
82	Randwood	59.7	61.8			57.8	59.9	53.9	56.0
83	Randwood	61.2	63.3			58.7	60.8	54.6	56.7
84	Sellen Ct 1	64.8	66.5	1.8	3.5	60.3	62.0	56.4	58.1
85	Sellen Ct 2	65.1	66.8	2.1	3.8	60.1	61.8	58.8	60.5
86	Sellen Ct 3	65.3	67.0	2.3	4.0	60.0	61.7	58.7	60.4
87	Sellen Ct 4	65.3	67.0	2.3	4.0	59.6	61.3	58.2	59.9
88	Sellen Ct 5	65.2	66.9	2.2	3.9	60.6	62.3	59.0	60.7
89	Stone Court 1	59.5	61.5			59.5	61.5	56.6	58.5
90	Stone Court 2	61.1	63.1			57.6	59.5	61.1	63.0
91	Sylvan Cr 1	61.0	63.1			59.2	61.4	55.7	57.9
92	Sylvan Cr 10	64.9	67.0	1.9	4.0	60.9	62.9	57.8	59.9
93	Sylvan Cr 11	63.8	65.9	0.8	2.9	60.1	62.2	57.5	59.6
94	Sylvan Cr 12	63.6	65.7	0.6	2.7	60.5	62.6	57.2	59.2
95	Sylvan Cr 13	62.7	64.7		1.7	60.4	62.4	56.6	58.6
96	Sylvan Cr 14	62.3	64.3		1.3	60.5	62.4	56.2	58.3
97	Sylvan Cr 2	61.2	63.3			59.5	61.6	55.8	57.9
98	Sylvan Cr 3	61.5	63.7		0.7	60.1	62.2	56.2	58.3
99	Sylvan Cr 4	61.3	63.5			60.1	62.2	56.2	58.3
100	Sylvan Cr 5	61.3	63.5			60.0	62.1	56.1	58.2
101	Sylvan Cr 6	62.3	64.5		1.5	60.4	62.5	56.6	58.7
102	Sylvan Cr 7	60.0	62.1			58.7	60.9	55.6	57.7
103	Sylvan Cr 8	61.5	63.6		0.6	60.1	62.3	56.7	58.8
104	Sylvan Cr 9	62.6	64.7		1.7	59.7	61.7	56.6	58.6
105	Tana Crt 1	66.3	68.5	3.3	5.5	60.8	62.9	57.9	60.1
106	Tana Crt 2	64.5	66.6	1.5	3.6	60.5	62.6	57.1	59.3
107	Tana Crt 3	62.7	64.9		1.9	60.3	62.5	56.6	58.8
108	Tetlow Place 1	61.7	63.6		0.6	61.1	63.0	56.9	58.6
109	Tetlow Place 2	60.4	62.2			60.4	62.1	58.2	59.9
110	Tetlow Place 3	60.5	62.2			60.5	62.2	58.1	59.8
111	Tetlow Place 4	60.6	62.3			60.6	62.3	59.1	60.8

APPENDIX D

PREDICTED 2031 NOISE LEVELS TO SURROUNDING AREAS
– NOISE LEVEL CONTOUR PLOTS: EXISTING FENCES



ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
Existing Fences

Length scale 1:3000
0 15 30 60 90 120
m

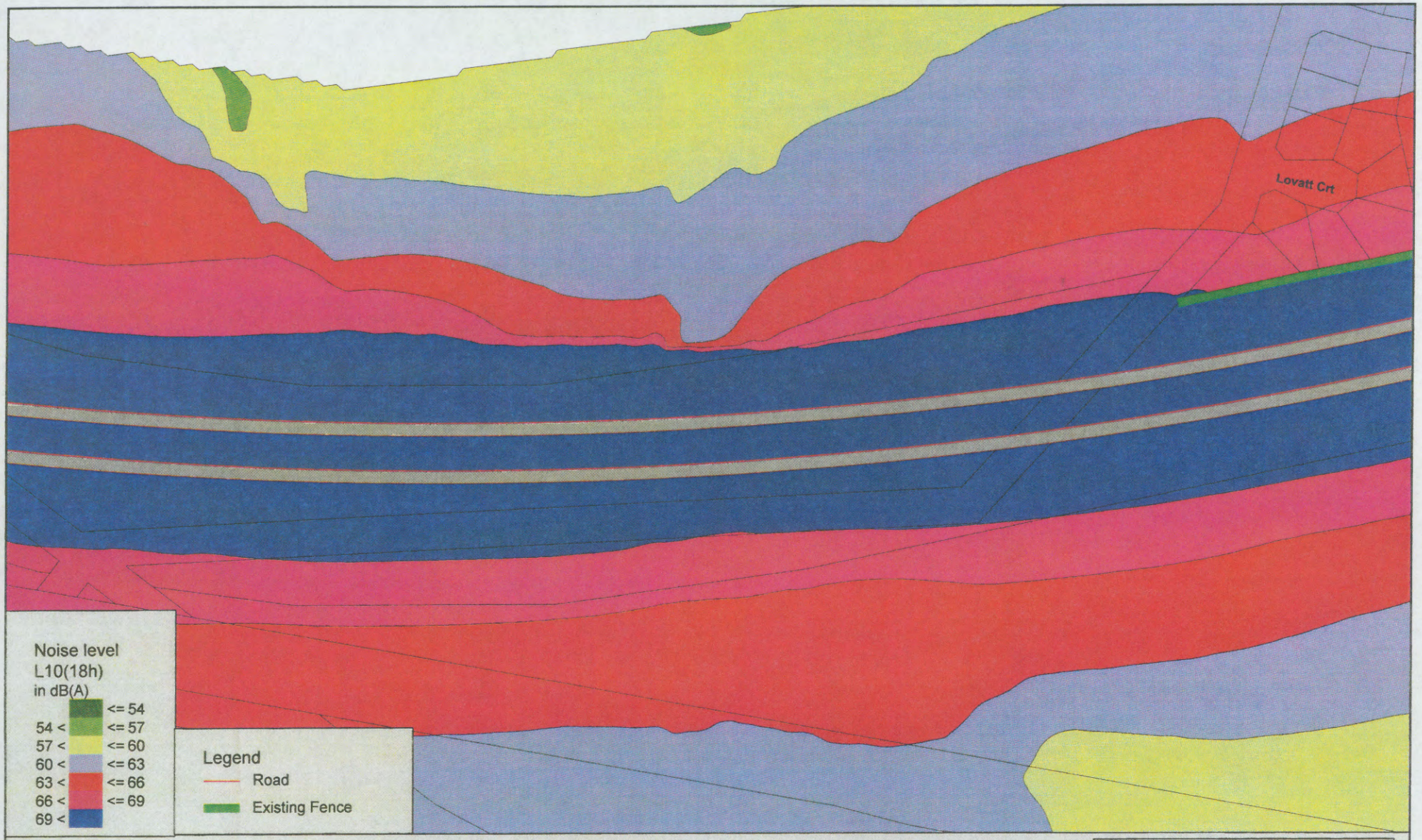
Herring Storer Acoustics

Figure 03107-1-2/ 2031 / D01

ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Herring Storer Acoustics

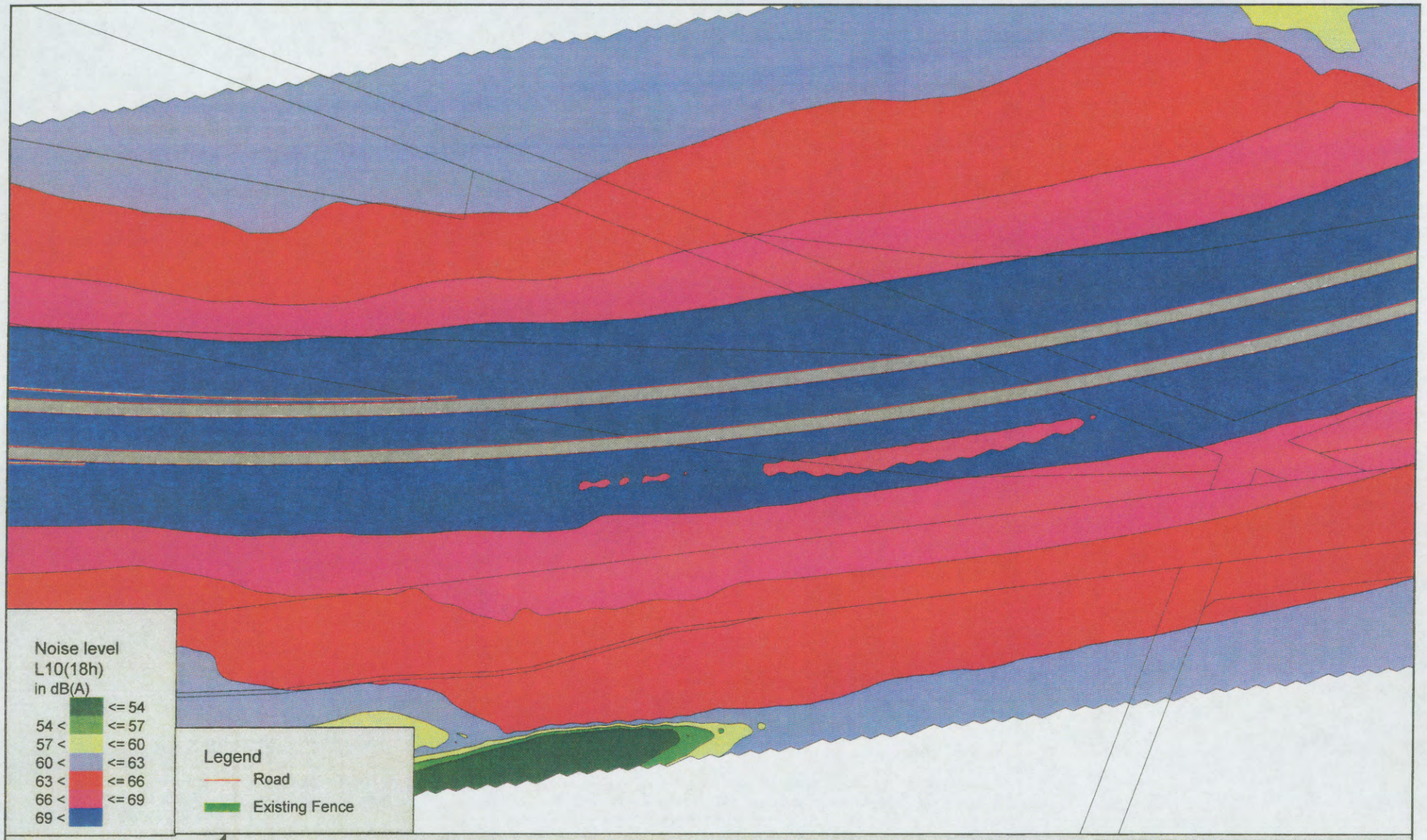
Figure 03107-1-2/ 2031 / D02



ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Herring Storer Acoustics

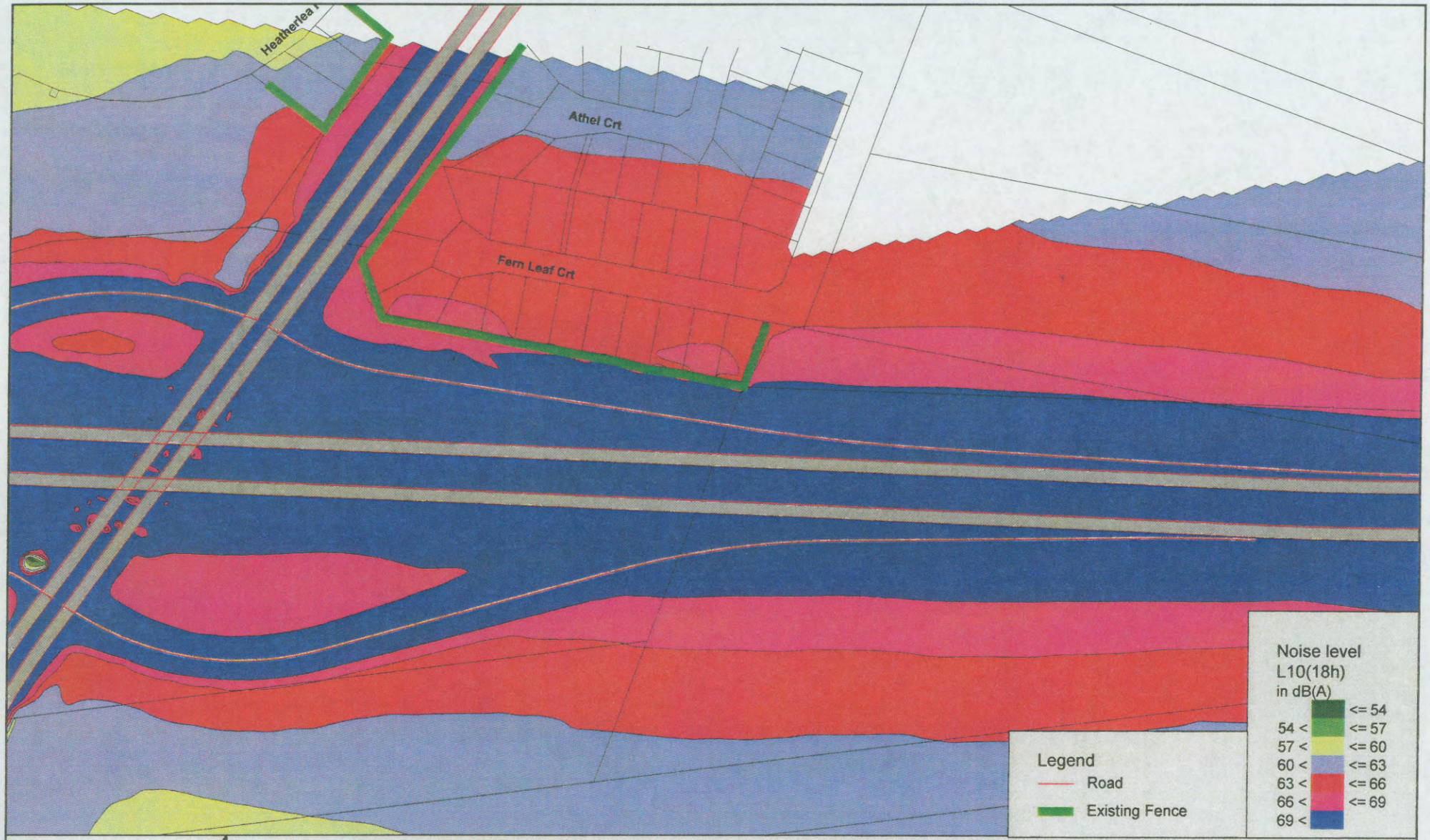
Figure 03107-1-2/ 2031 / D03



ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / D04

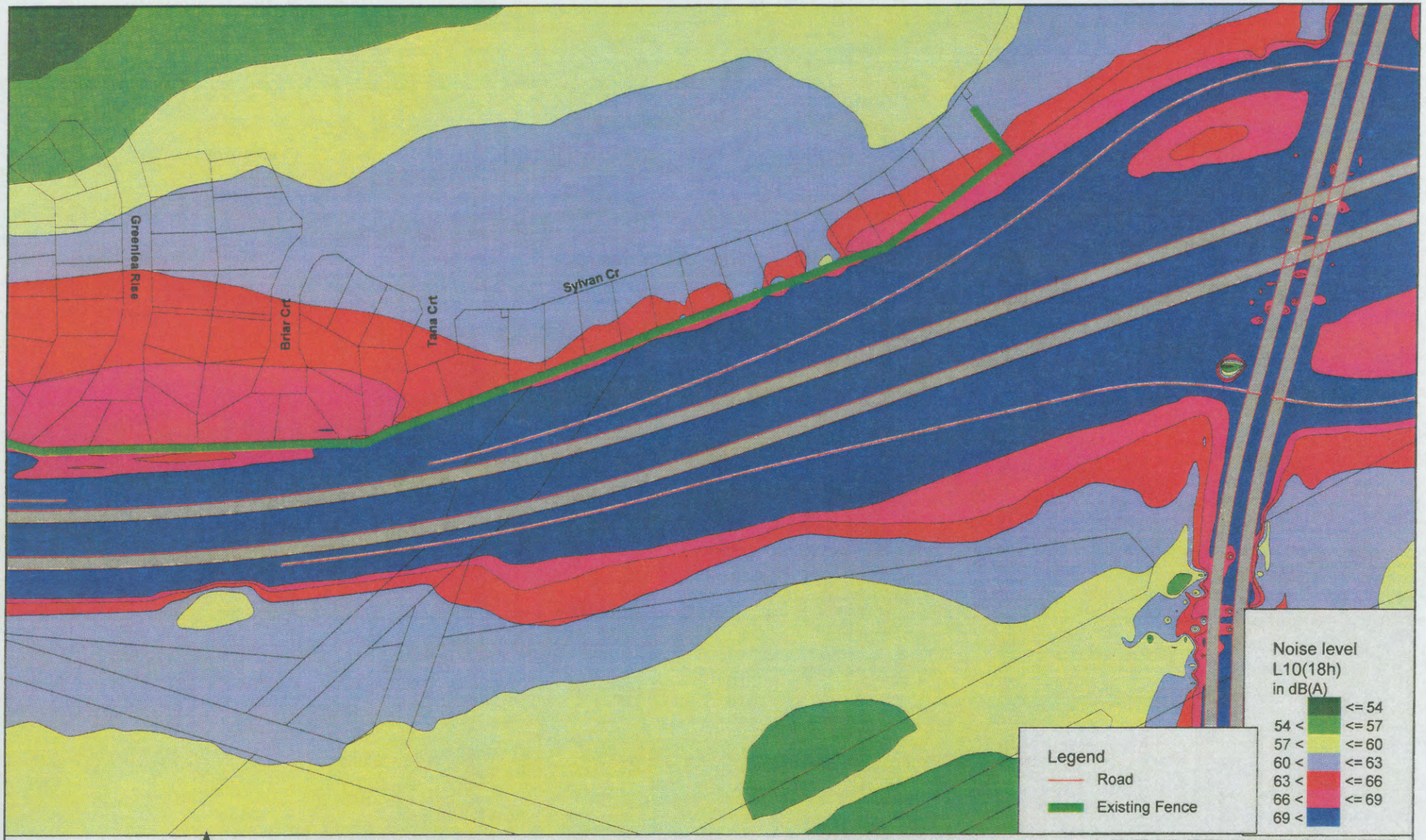


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / D05

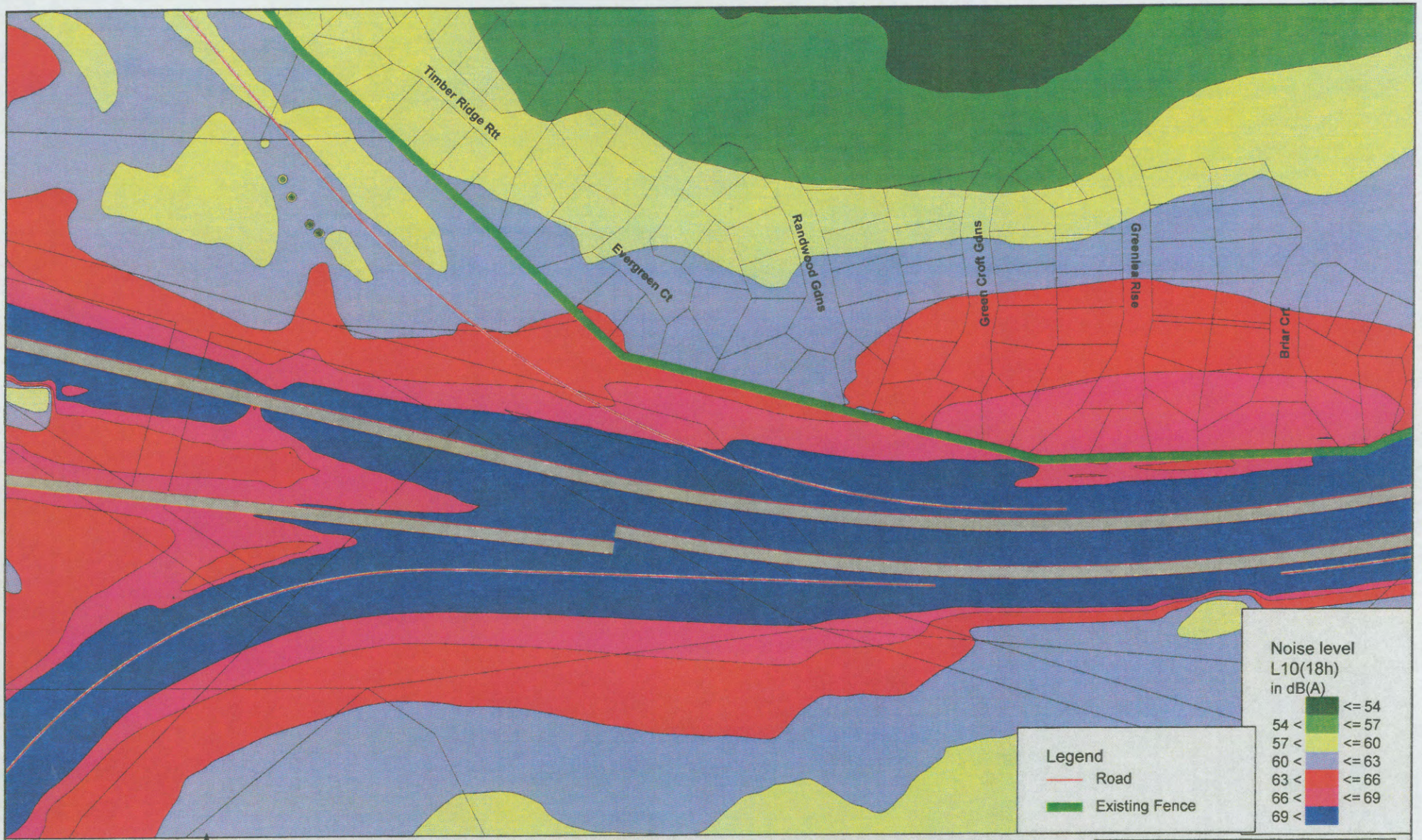


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / D06

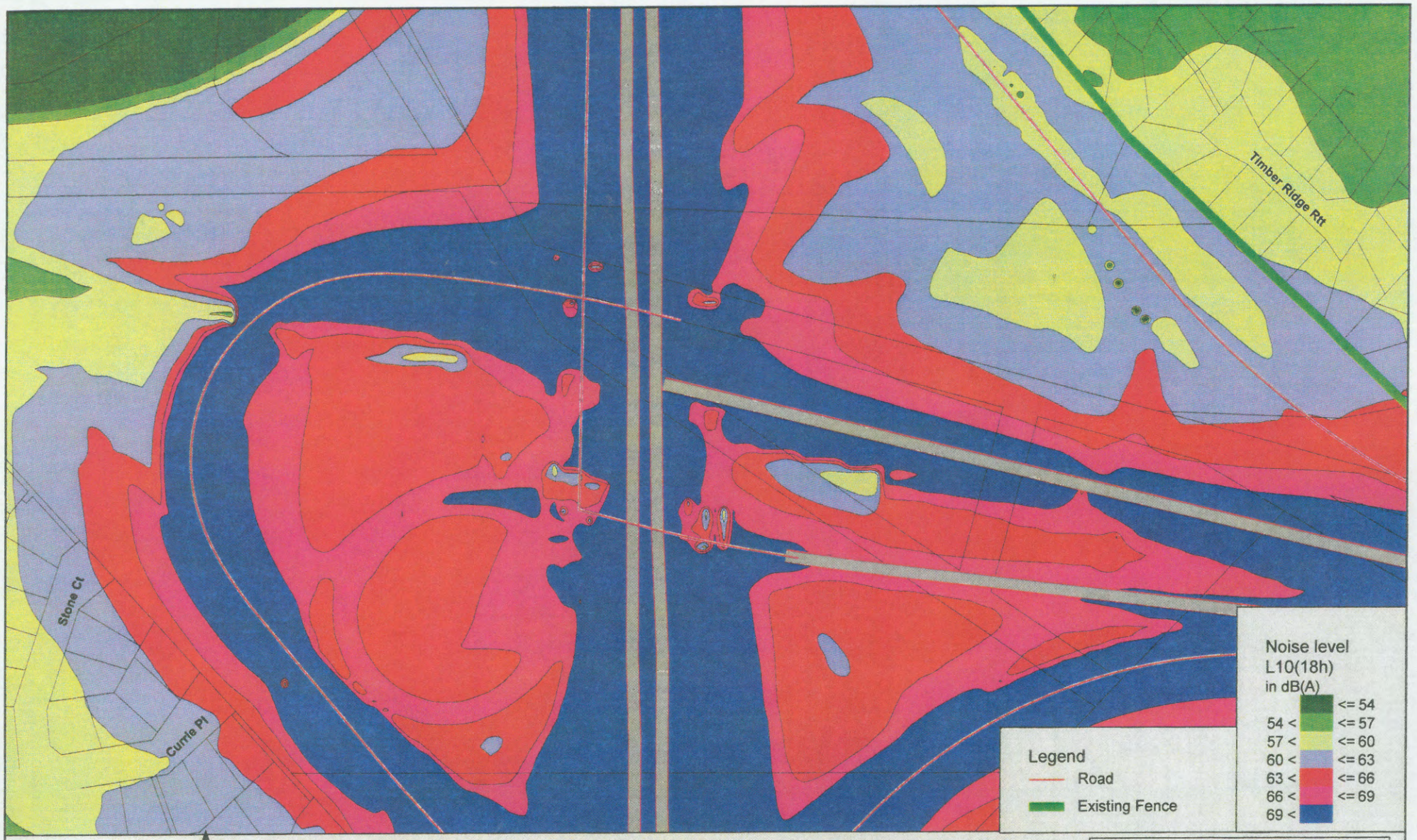


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / D07

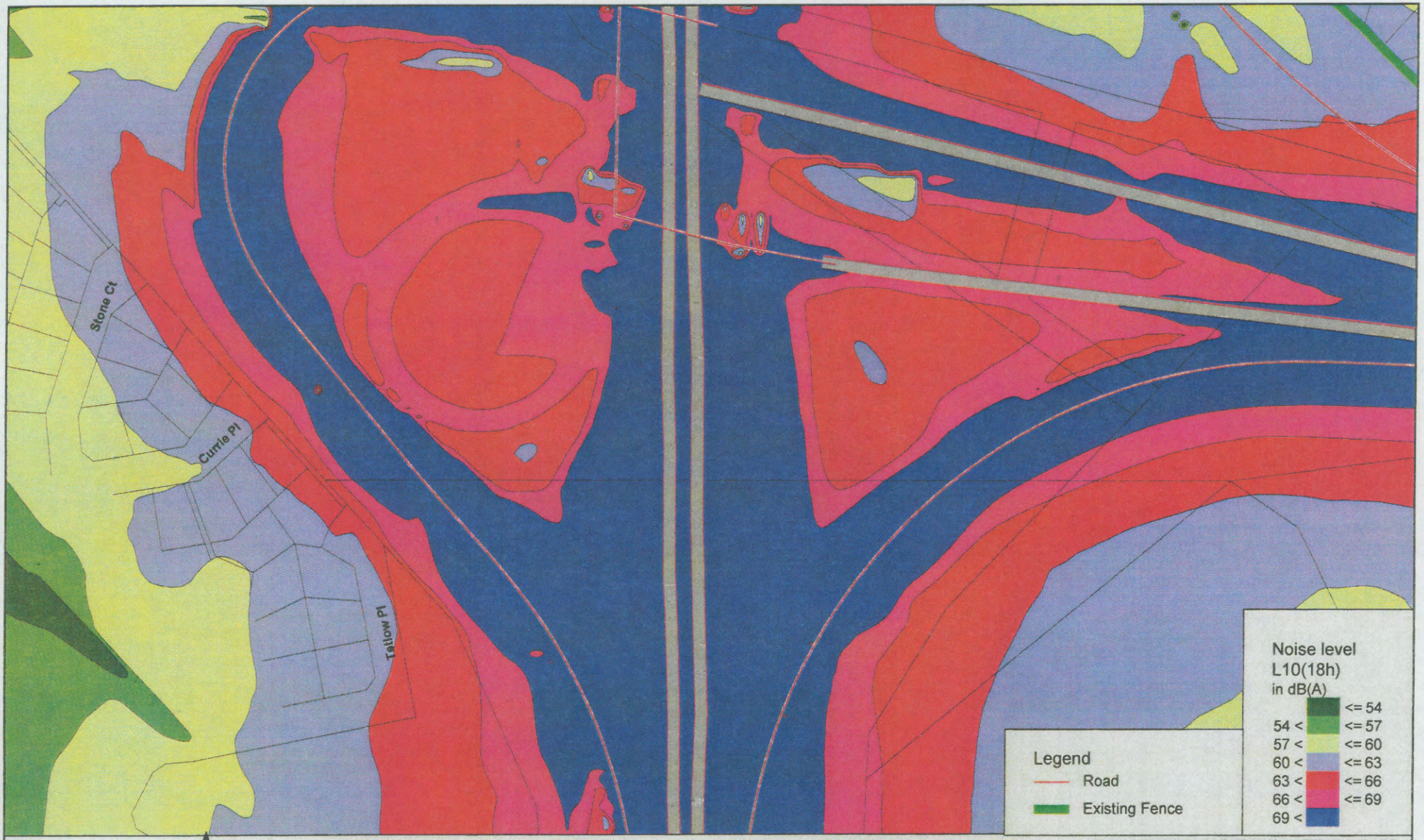


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / D08

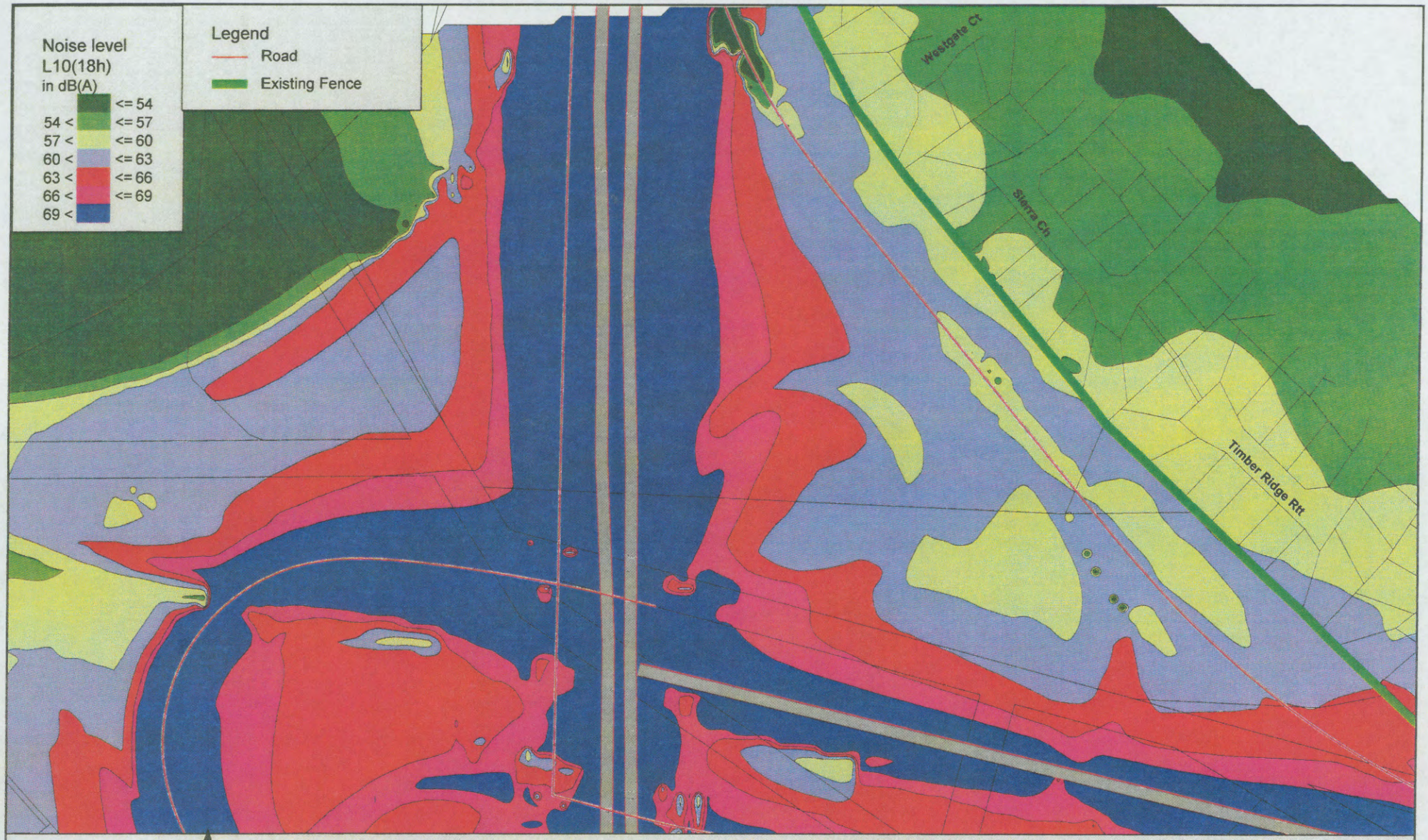


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Existing Fences

Length scale 1:3000
0 15 30 60 90 120
m

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / D09



Herring Storer Acoustics

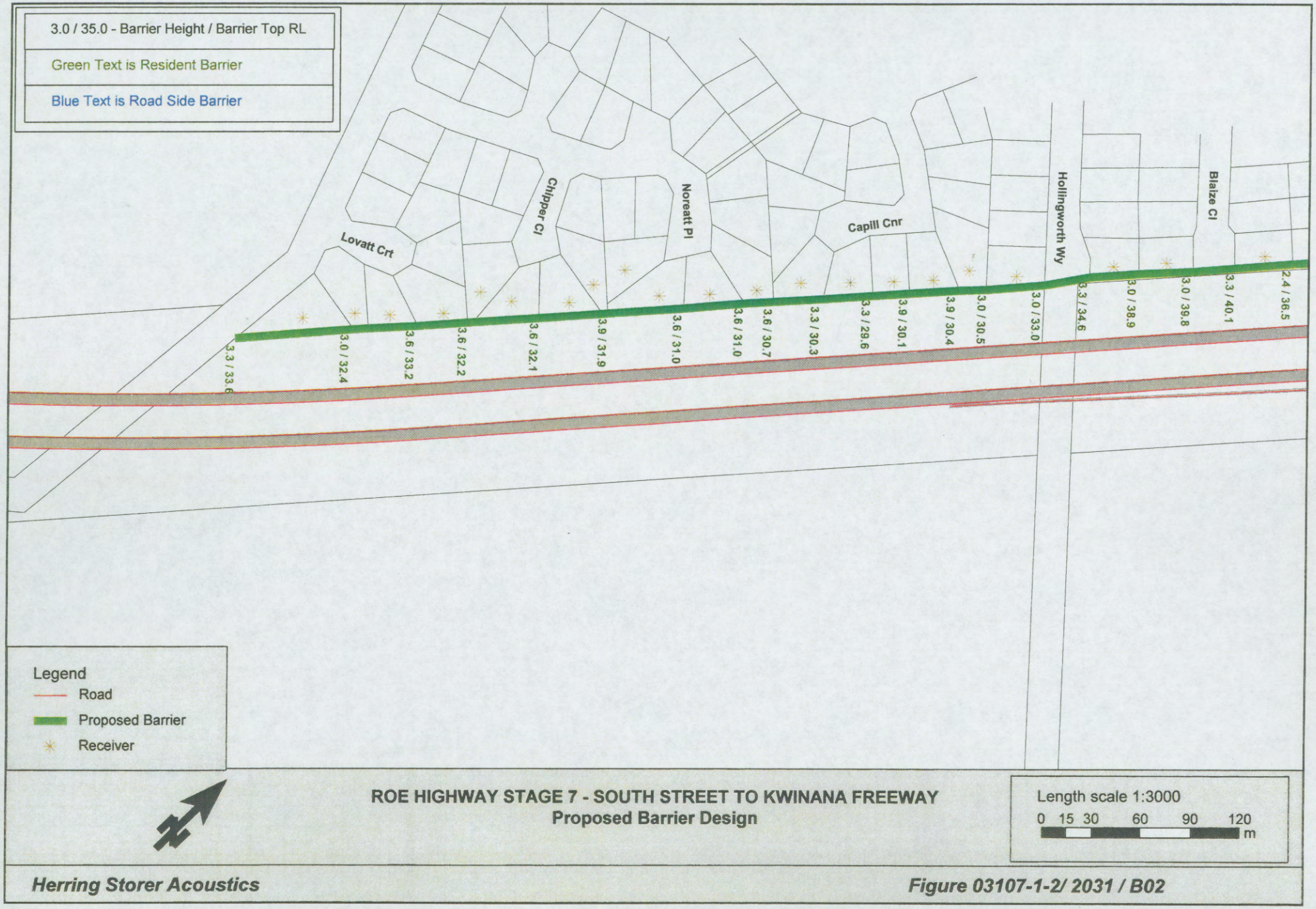
Figure 03107-1-2/ 2031 / D10

APPENDIX E

MINIMUM RECOMMENDED NOISE WALLS

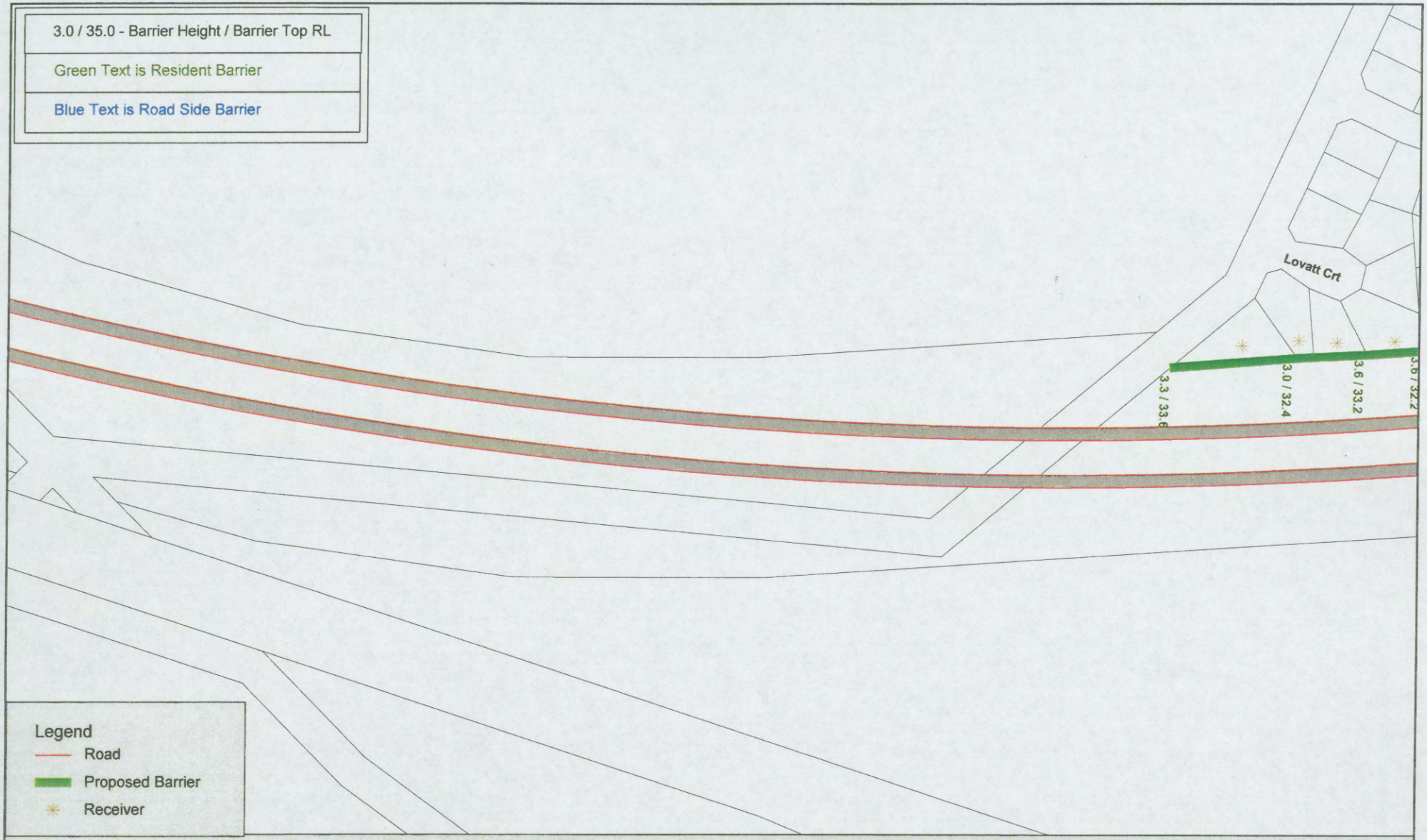
Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B01



Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B02

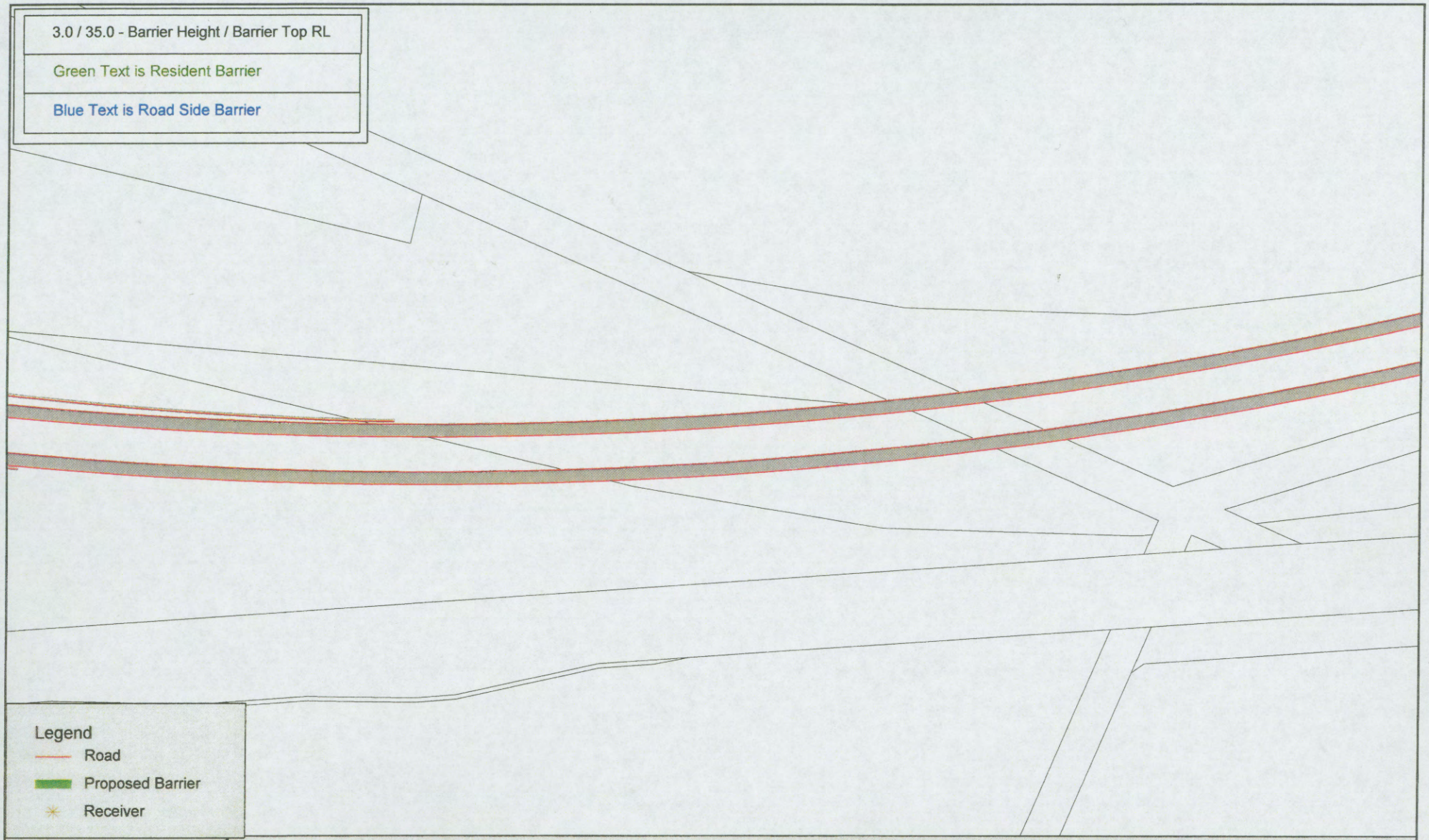


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
Proposed Barrier Design

Length scale 1:3000
0 15 30 60 90 120 m

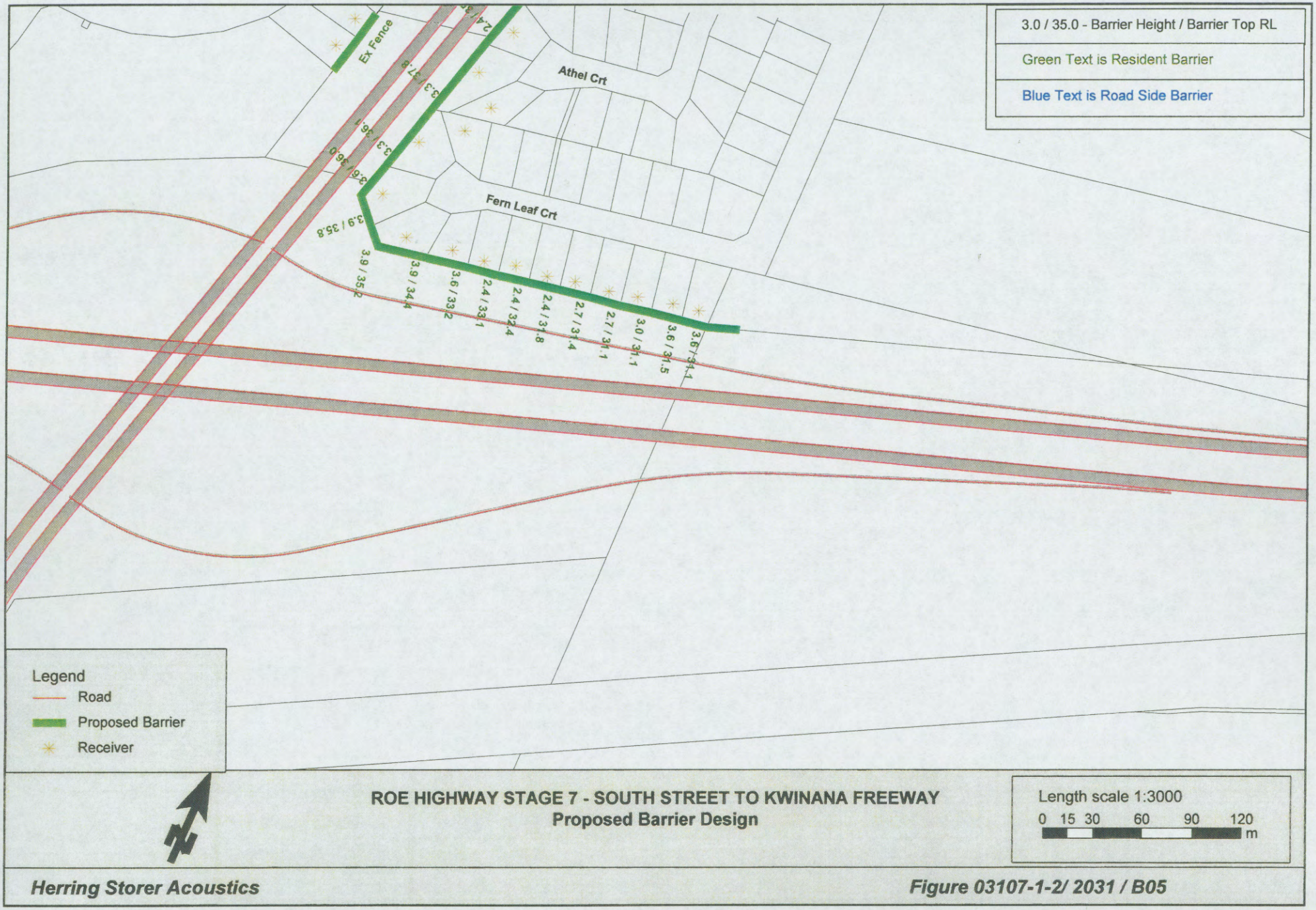
Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B03



Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B04



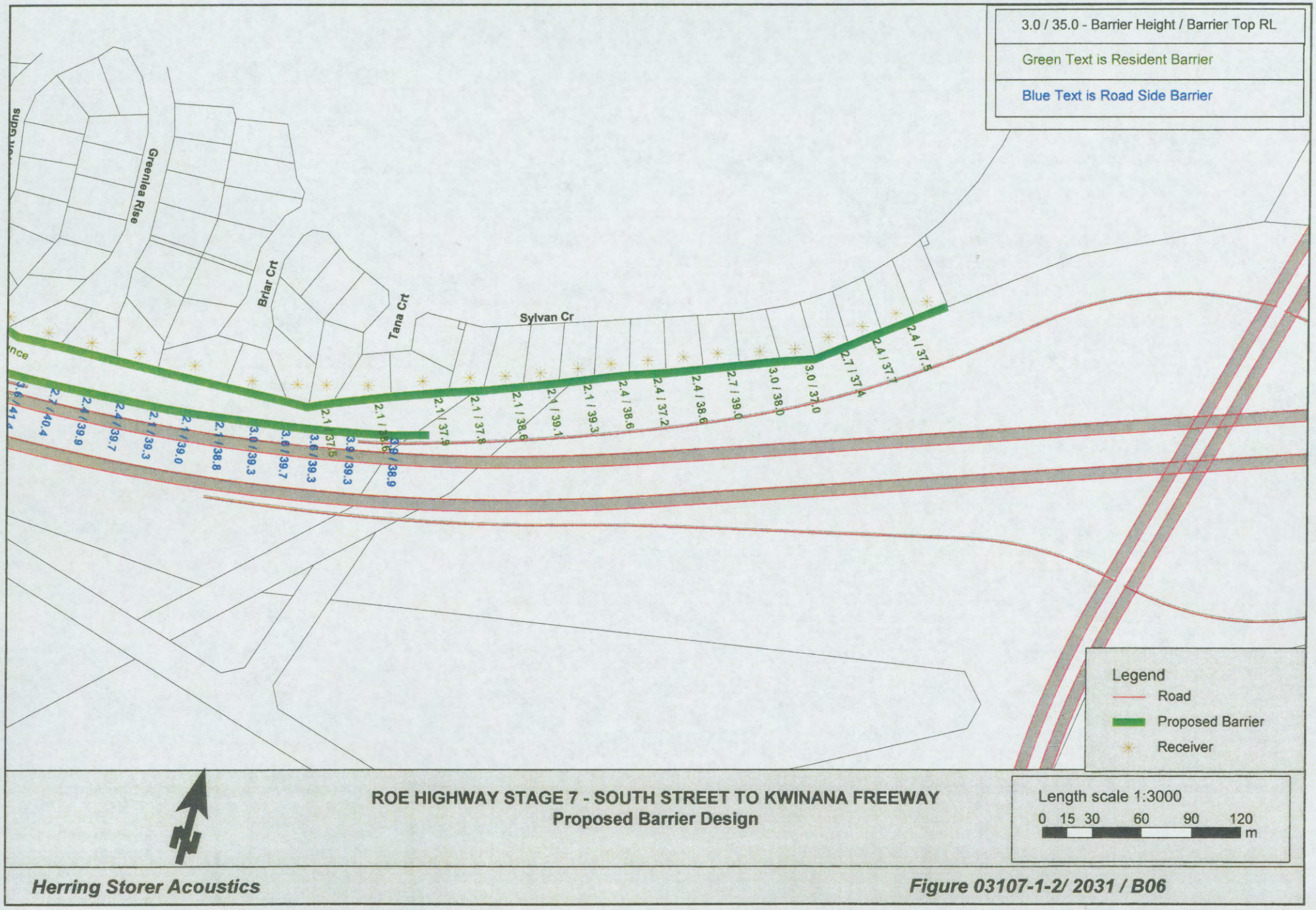
Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B05

ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
Proposed Barrier Design

Herring Storer Acoustics

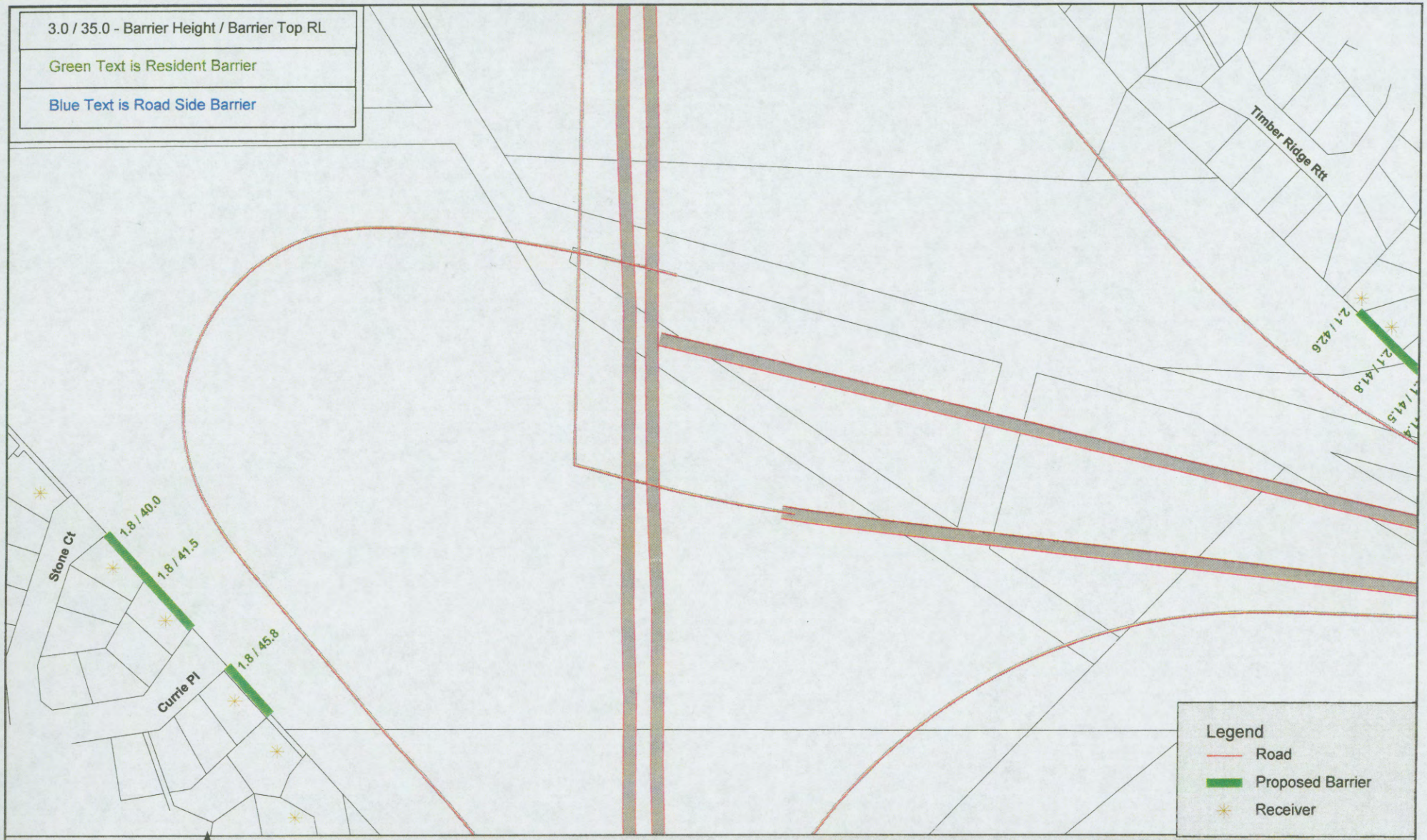
Figure 03107-1-2/ 2031 / B07



ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
Proposed Barrier Design

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B06



ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
Proposed Barrier Design

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B08

ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
Proposed Barrier Design

Herring Storer Acoustics

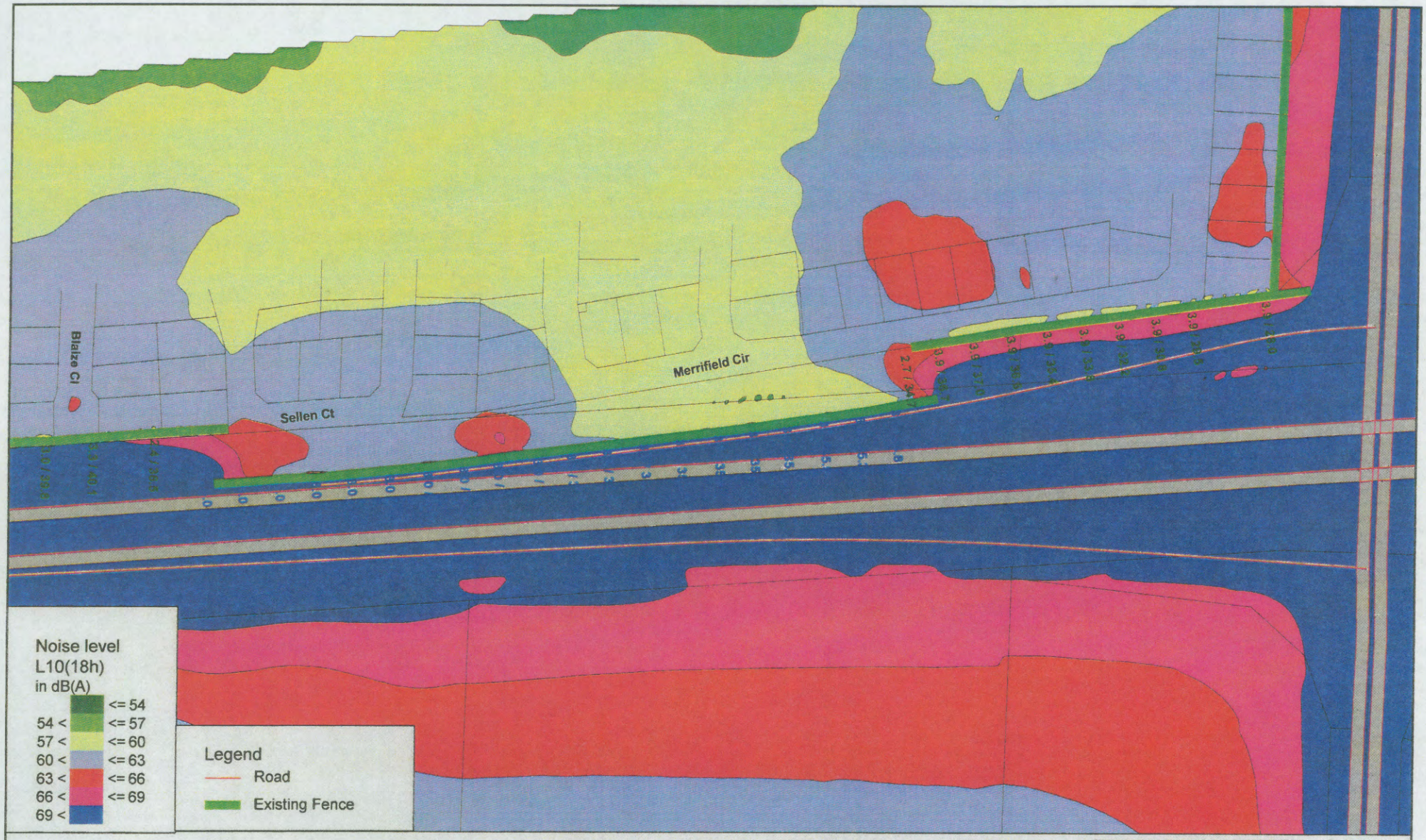
Figure 03107-1-2/ 2031 / B09

Herring Storer Acoustics

Figure 03107-1-2/ 2031 / B10

APPENDIX F

PREDICTED 2031 NOISE LEVELS TO SURROUNDING AREAS-
NOISE LEVEL CONTOUR PLOTS:
RECOMMENDED NOISE WALLS

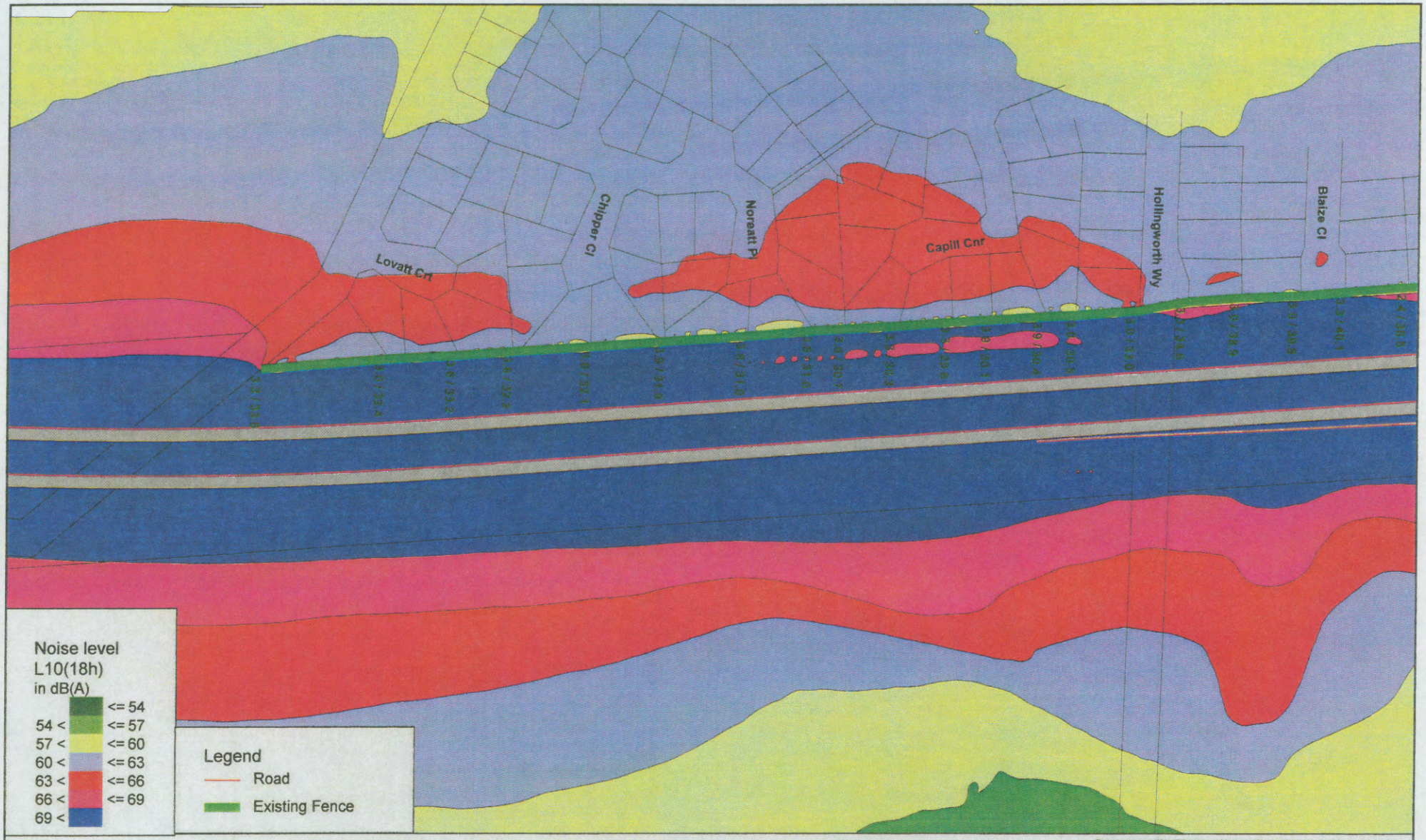


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031NC / D01

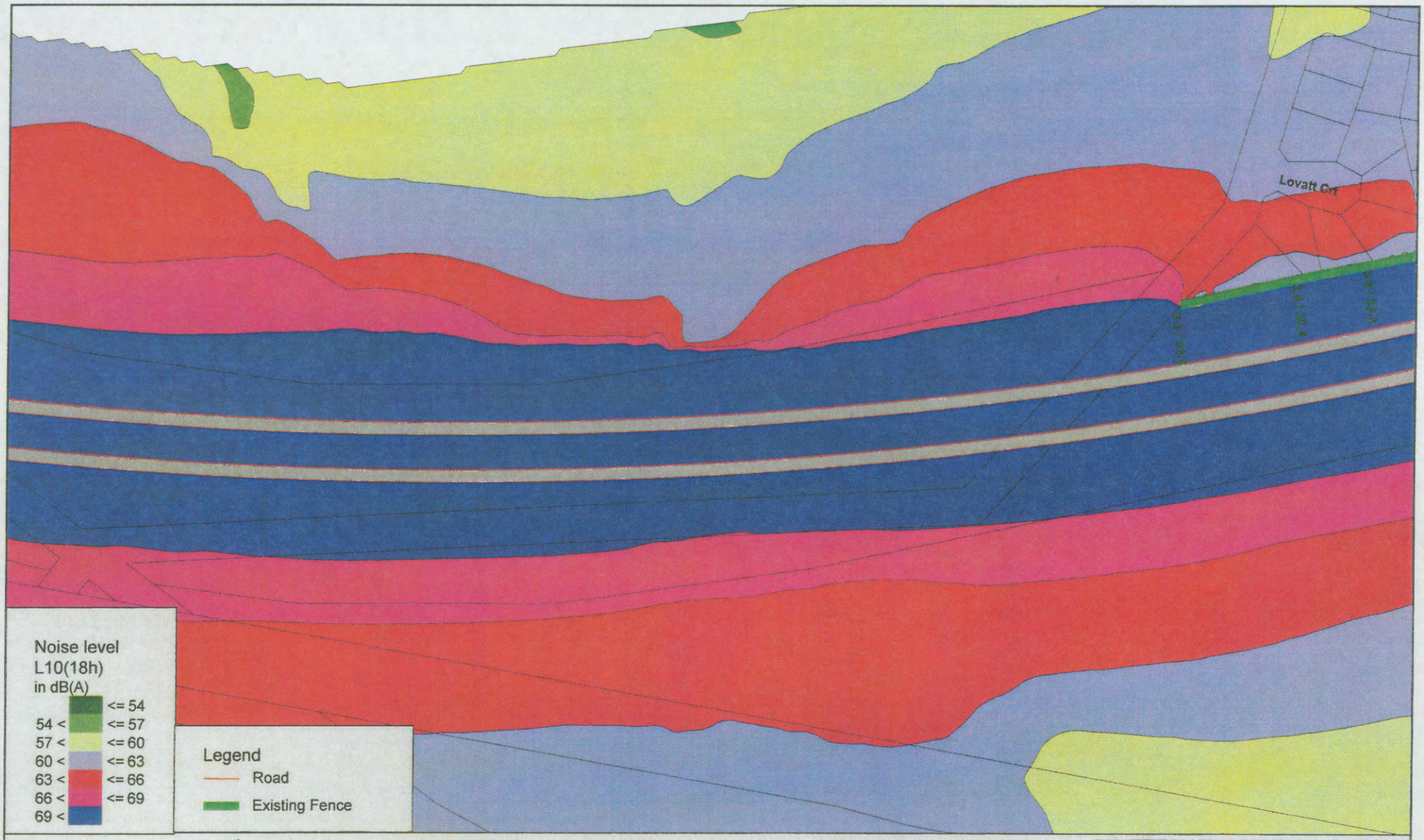


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

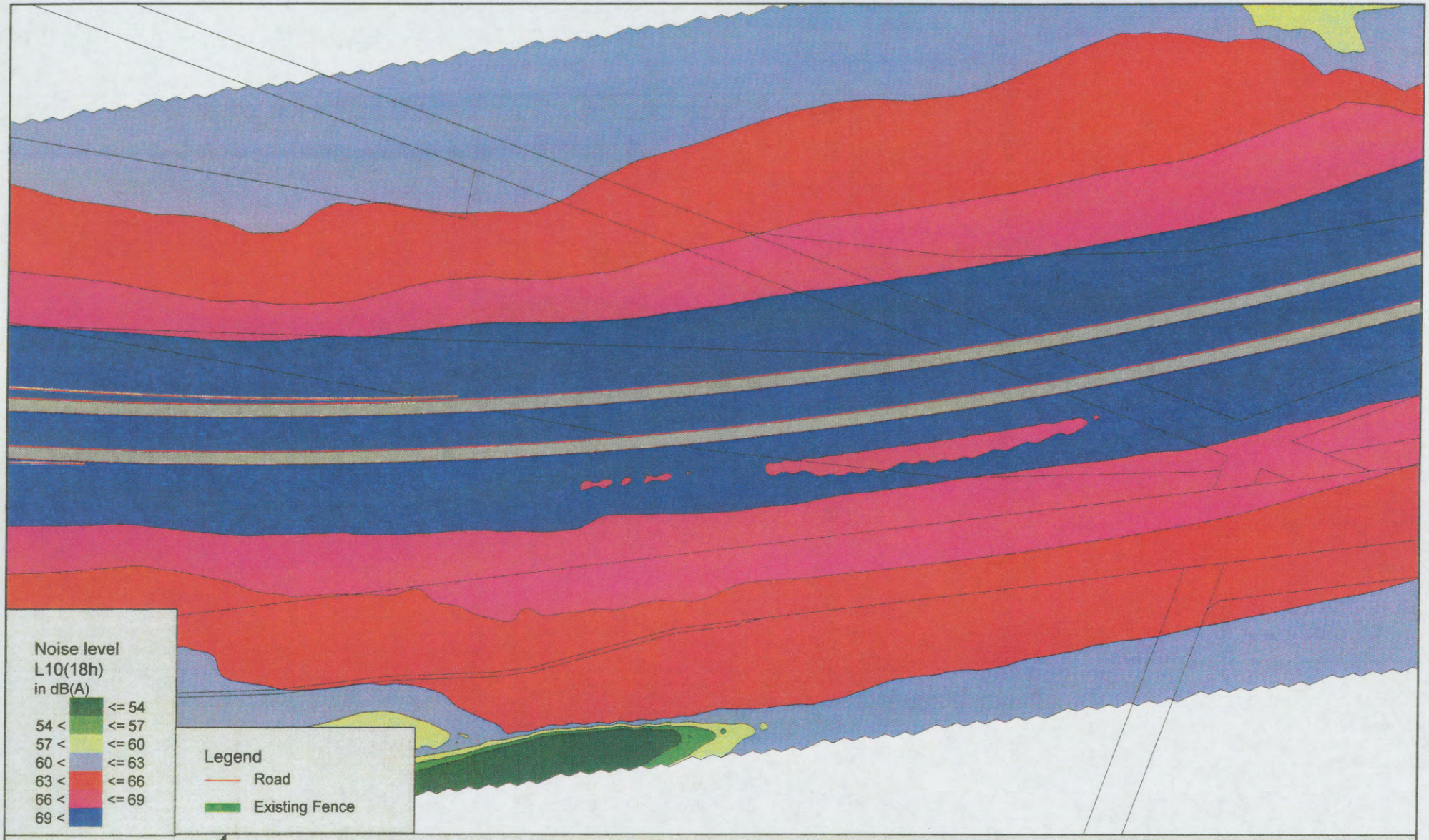
Figure 03107-1-2/ 2031NC / D02



ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls

Herring Storer Acoustics

Figure 03107-1-2/ 2031NC / D03

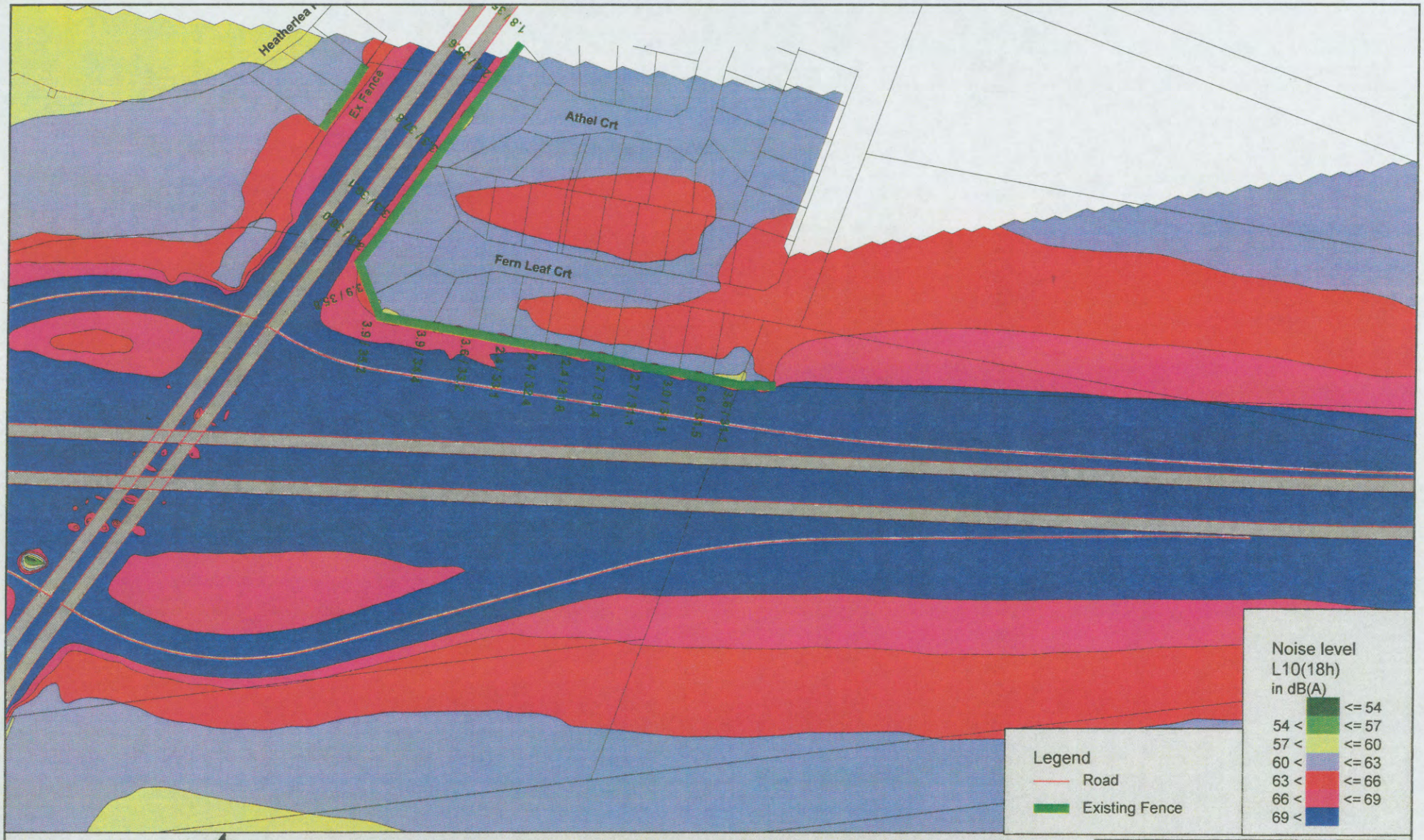


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recomended Walls

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031NC / D04

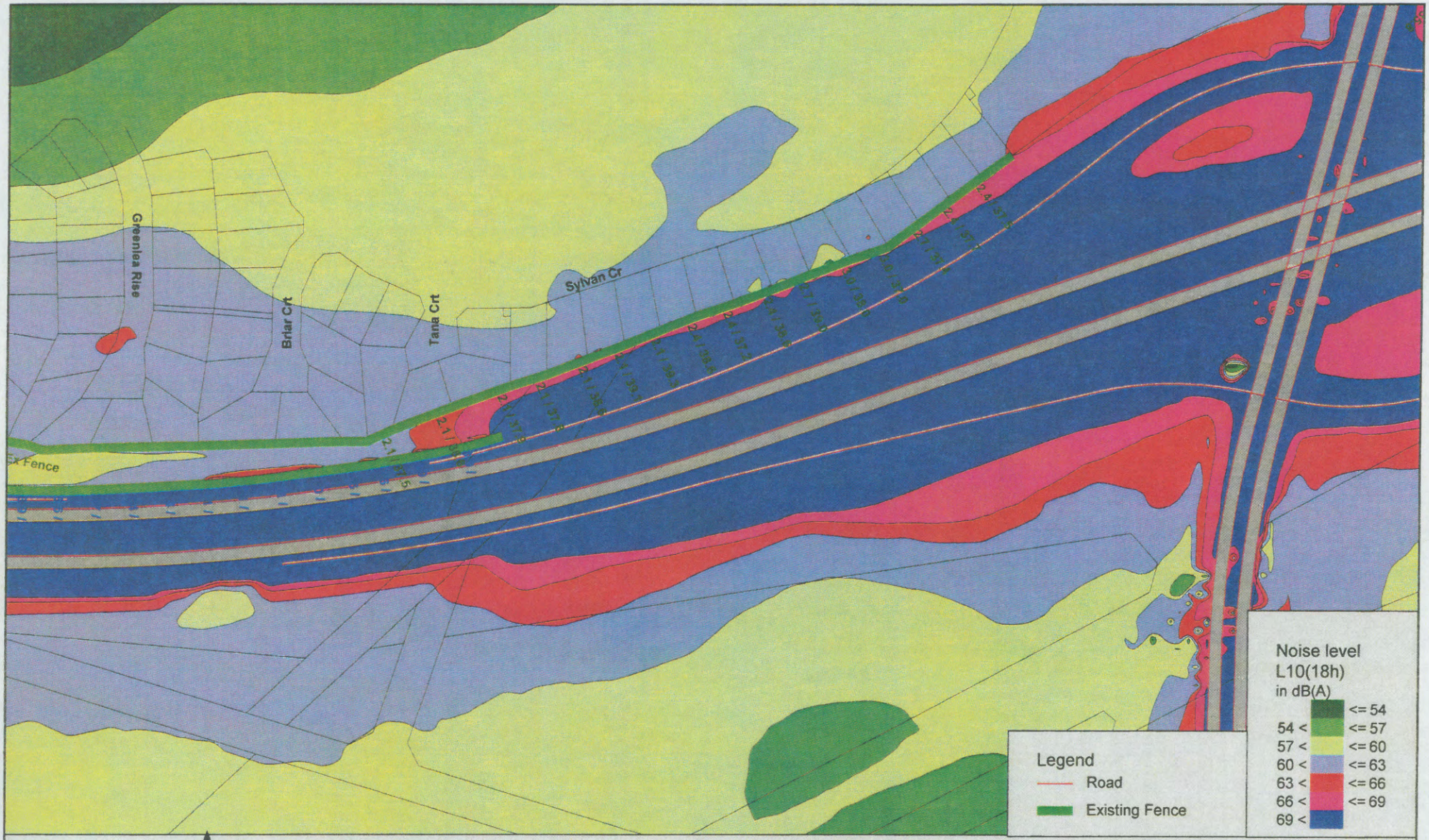


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031NC / D05

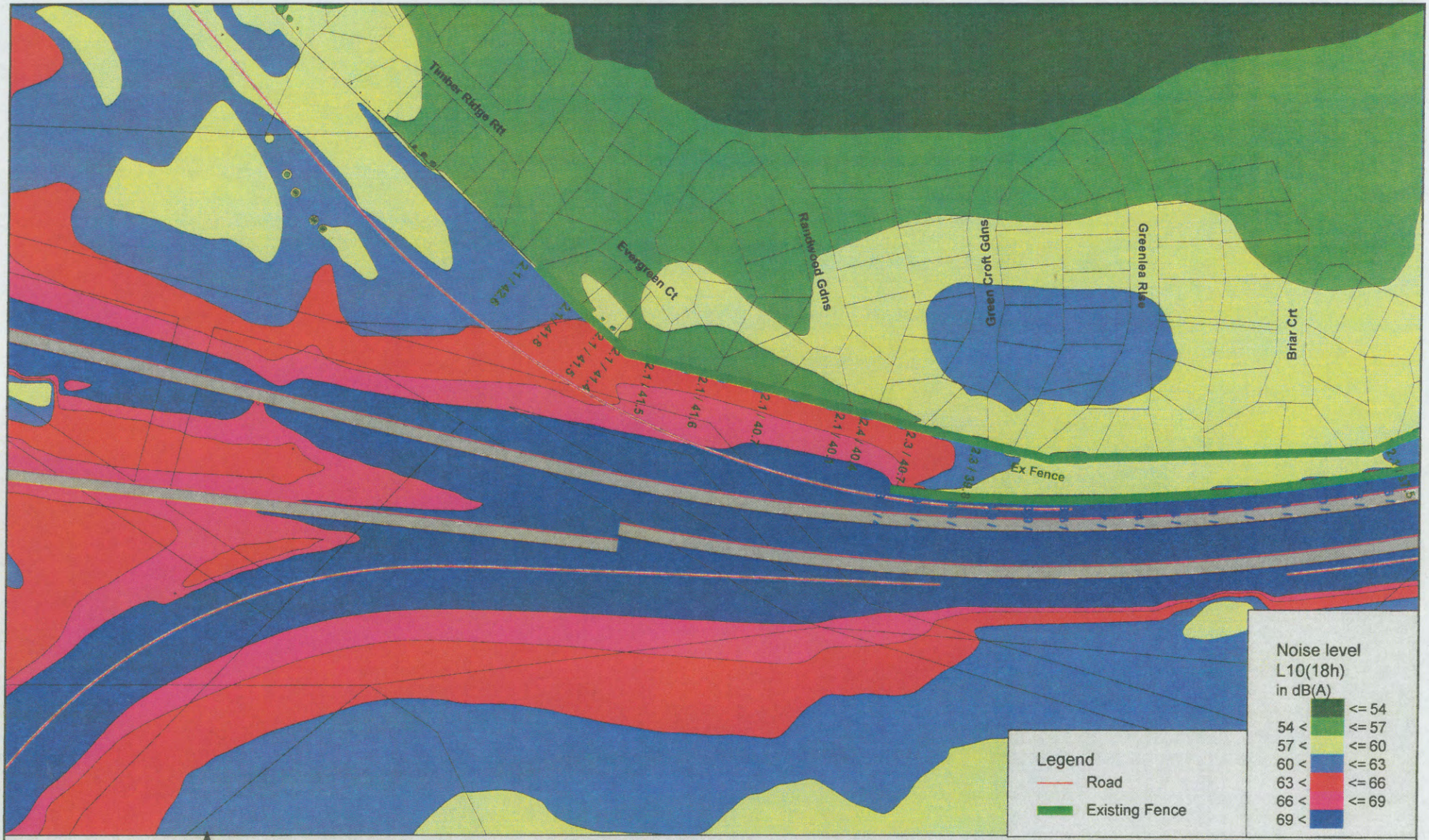


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls

Length scale 1:3000
0 15 30 60 90 120 m

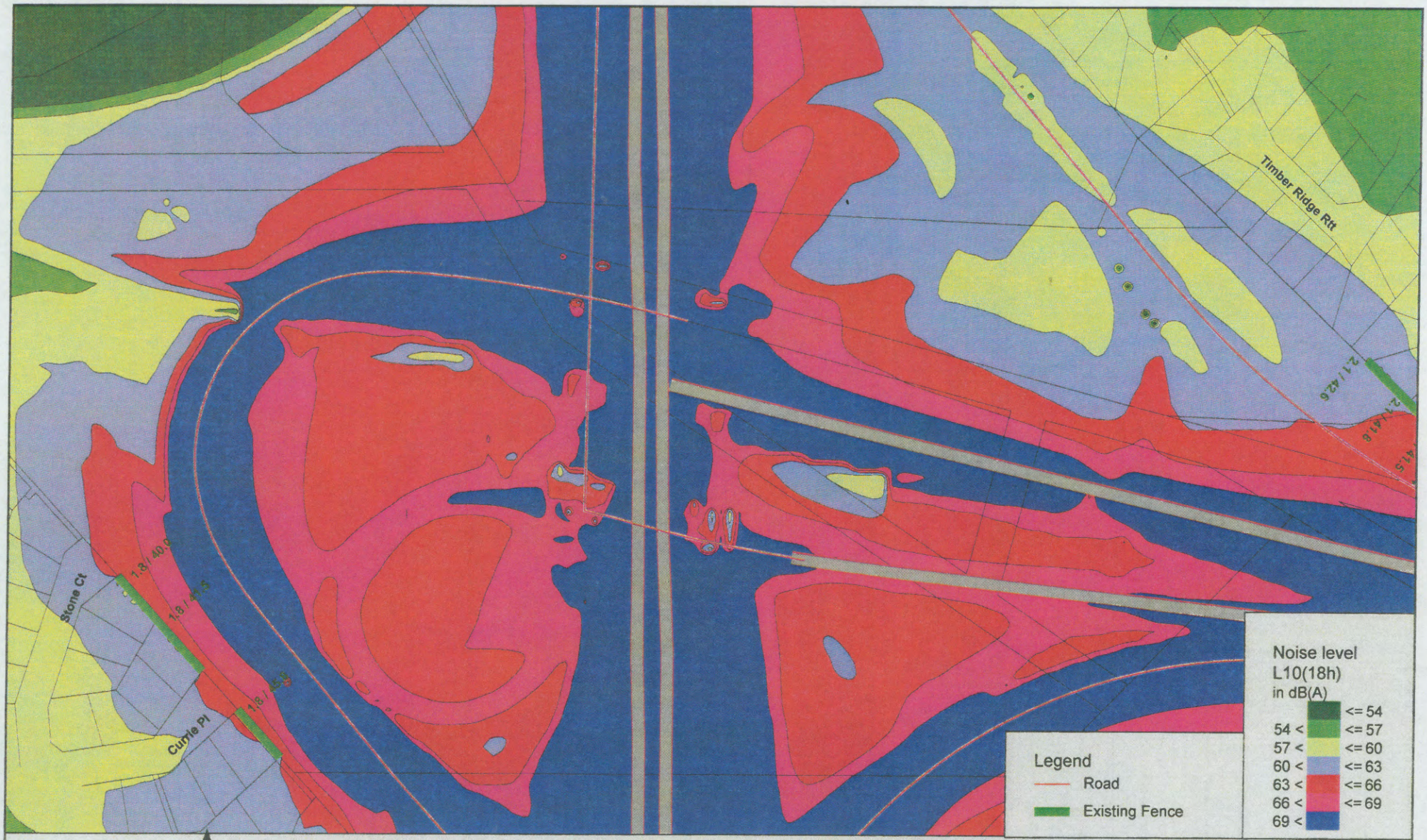
Herring Storer Acoustics

Figure 03107-1-2/ 2031NC / D06



Herring Storer Acoustics

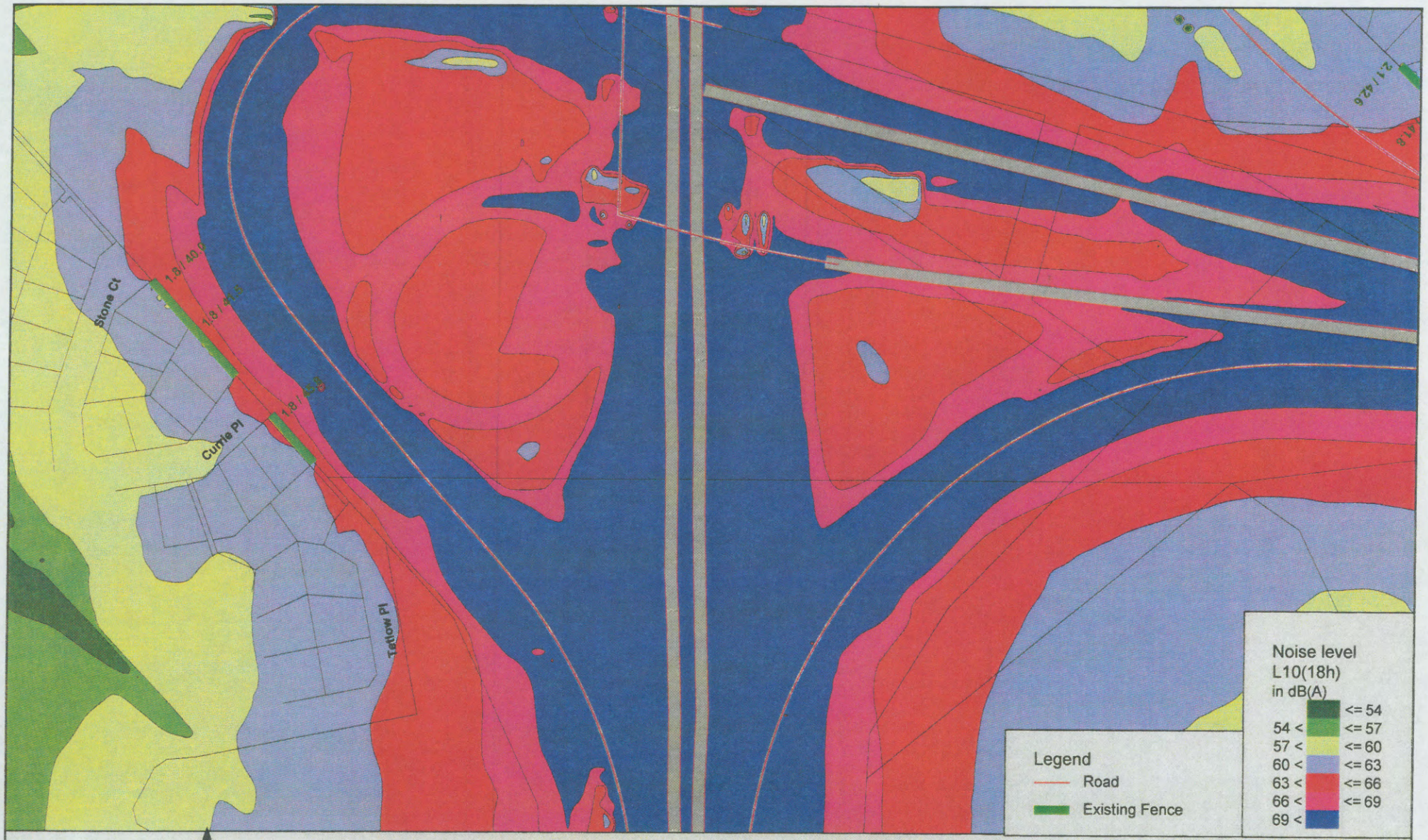
Figure 03107-1-2/ 2031NC4 / D07



ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls

Herring Storer Acoustics

Figure 03107-1-2/ 2031NC / D08

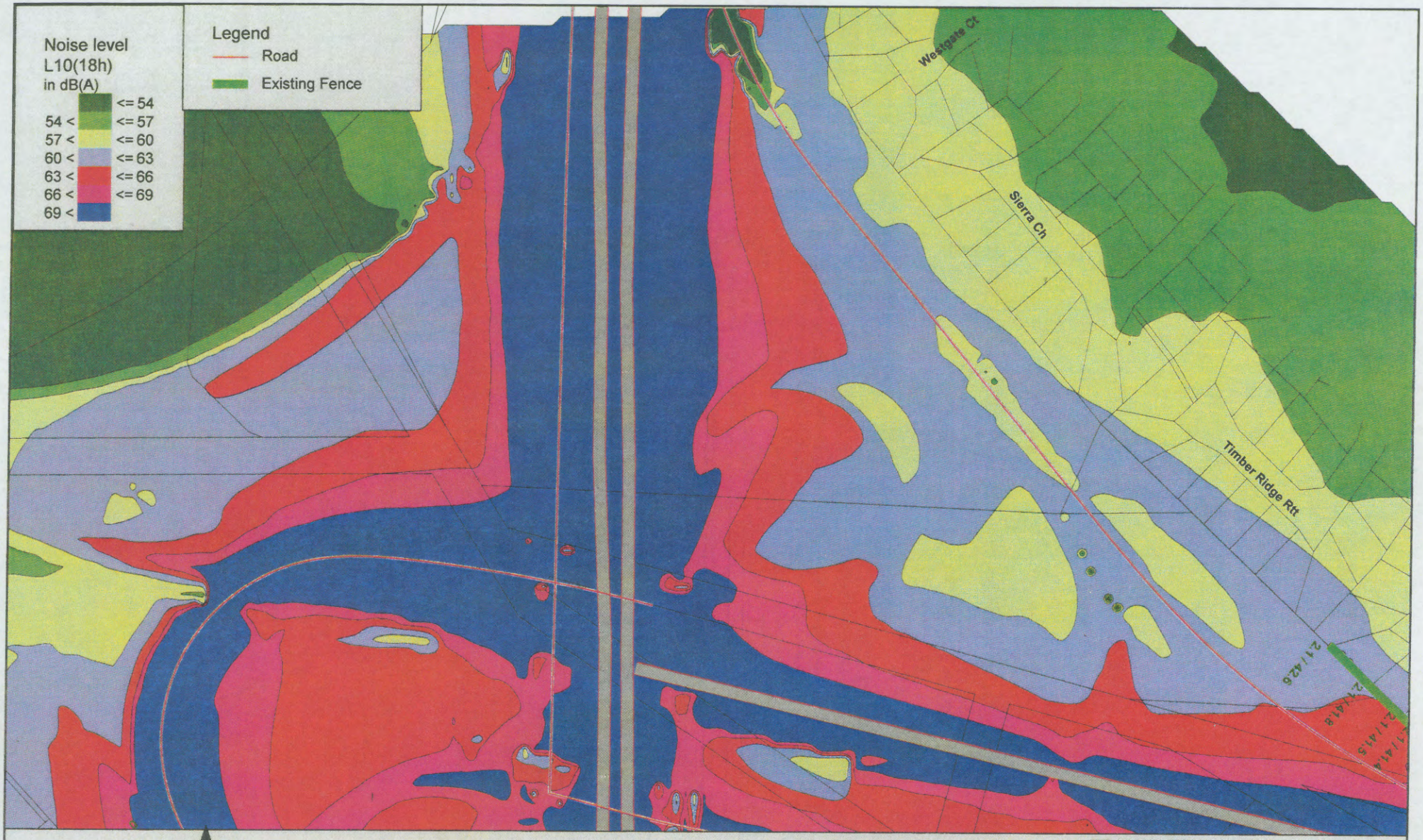


ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls

Length scale 1:3000
0 15 30 60 90 120 m

Herring Storer Acoustics

Figure 03107-1-2/ 2031NC / D09


Noise level
L10(18h)
in dB(A)
<= 54
54 < <= 57
57 < <= 60
60 < <= 63
63 < <= 66
66 < <= 69
69 <
Legend
Road
Existing Fence
Westgate Ct
Sierra Ch
Timber Ridge Rtt
2.1/42.6
2.1/42.8
2.1/41.5
2.1/41.4
N
ROE HIGHWAY STAGE 7 - SOUTH STREET TO KWINANA FREEWAY
L10(18hour) Noise Level Contours - Year 2031
With Recommended Walls
Length scale 1:3000
0 15 30 60 90 120
m
Herring Storer Acoustics
Figure 03107-1-2/ 2031NC / D10