

**Transport Noise Management  
Code of Practice  
Volume 1 – Road Traffic Noise - Appendices**

**November 2013**

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## Amendment Register

<b>Issue / Rev no.</b>	<b>Reference section</b>	<b>Description of revision</b>	<b>Authorised by</b>	<b>Date</b>
1	-	Interim Edition	GM (E&T)	Oct 2007
2	-	Revised Edition	CE (E&T)	Oct 2013

## Volume 1 – Road Traffic Noise - Appendices

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## ***Appendix Description Summary***

### **Appendix 1: Standard Recording Format for Road Traffic Noise Measurements**

The recommended template for presenting road traffic noise measurements. Data including tabulated road traffic noise measurement, time trace of the measurement, weather conditions and pavement surface type should be clearly presented for each measurement location.

### **Appendix 2: Notice Letter to Residents and Form M727 for Noise Measurements**

A notice letter and a departmental 'Notice of Entry' Form (M727) for residents where noise measurements are to be conducted in their properties.

### **Appendix 3: Calibration Factors for Traffic Noise Model for Qld Conditions**

The correction factors relative to DGA for different pavement surface types in Queensland conditions when using the Traffic Noise Model (TNM) of the American Federal Highway Administration.

### **Appendix 4: Acoustic Attributes of Qld Pavement Surface Types**

An experimental study on the acoustic attributes of Queensland pavement surface types. It presents the correction factors relative to DGA for different pavement surface types in Queensland conditions when using the CoRTN model.

### **Appendix 5: Road Traffic Noise Assessment Functional Specification Proforma for New Road / Upgrading Existing Road**

A project brief proforma for new roads / upgrading existing roads projects for road traffic noise assessment.

### **Appendix 6: Road Traffic Noise Assessment Functional Specification Proforma for Existing Road – No Roadworks**

A project brief proforma for existing roads – no roadworks projects for road traffic noise assessment.

### **Appendix 7: Example Road Traffic Noise Management Strategy Report**

An example report for road traffic noise management strategy.

### **Appendix 8: Agreement with the Department for Noise Barrier Works**

An example deed of agreement between the Department and the property owners for the Department or its agent to construct noise barriers along the property boundary.

### **Appendix 9: Agreement Not to Accept Noise Barrier Offer**

An agreement for situations where a noise barrier can be reasonably and feasibly provided in the opinion of a Regional Director and the owner(s) of a property(s) do(es) not want a noise barrier to be provided. Hence the noise sensitive building(s) on the property(s) will not be eligible for an exceptional circumstances classification. The owner(s) will be requested to sign the agreement Form to acknowledge that they do not want a noise barrier to be constructed and that they will not be eligible for an exceptional circumstances classification.

### **Appendix 10: Agreement for Exceptional Circumstances Treatments**

A suite of forms and agreements is provided for the implementation of exceptional circumstances treatments.

### **Appendix 11: Typical Noise Barrier Types**

Information about typical noise barrier types together with photographs.

### **Appendix 12: Community Engagement Templates for Proposed Noise Barriers**

Templates including: a) Information letters for distribution to Local, State and Federal Politicians for advice and input, including a proposal letter to residents, a plan showing the proposed noise barrier heights and locations and a resident's proforma information pack. b) Departmental records of distribution of the resident's information packs. c) Summary of residents' responses. d) Second letter to residents who have not responded. e) Resident letter about public consultation results.

### **Appendix 13: Noise Barrier Design Methodology for Wind Loads and Boulder Retaining Walls**

Technical information about: a) Design method for wind loads. b) Design of boulder retaining walls.

### **Appendix 14: Requirements for Road Traffic Noise Assessment Report for DA**

Requirements for road traffic noise assessment report Part A and Part B.

### **Appendix 15: Example Report for Road Traffic Noise Assessment for DA**

An example report for road traffic noise assessment for development applications.

### **Appendix 16: Building Construction Certification - Acoustics**

Two templates for RPEQ to certify that: a) Building construction (acoustics) for non-residential noise sensitive residential buildings complies with the Department of Transport and Main Roads Policy Position Statement, Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure. b) Building construction (acoustics) for residential buildings complies with Queensland Development Code MP4.4.

### **Appendix 17: Process for Tracking Road Traffic Noise Issues**

A recommended process for TMR Regions to track road traffic noise issues such as complaints.

### **Appendix 18: Example Correspondence for Complaints about Road Traffic Noise**

A set of example correspondence for public complaints: a) Noise barriers request, issues relating to standard of existing noise barriers. b) Response when a road traffic noise assessment is planned because the Regional Road Traffic Noise Management Strategy identified the area as a priority. c) Response where the measurement is above the Departmental criterion level. d) Response where the measured level is below the Departmental criterion level.

### **Appendix 19: – Example Correspondence for Complaints about Heavy Vehicle Noise**

A set of example correspondence for public complaints: a) About increased noise pollution caused by heavy vehicles. b), c) and d) Responses to complaints about engine brake noise including a brochure about limiting the use of engine brake noise.

Appendix 1: Standard recording format for road traffic noise measurements



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Road Traffic Noise Management - Noise Monitoring Data Sheet

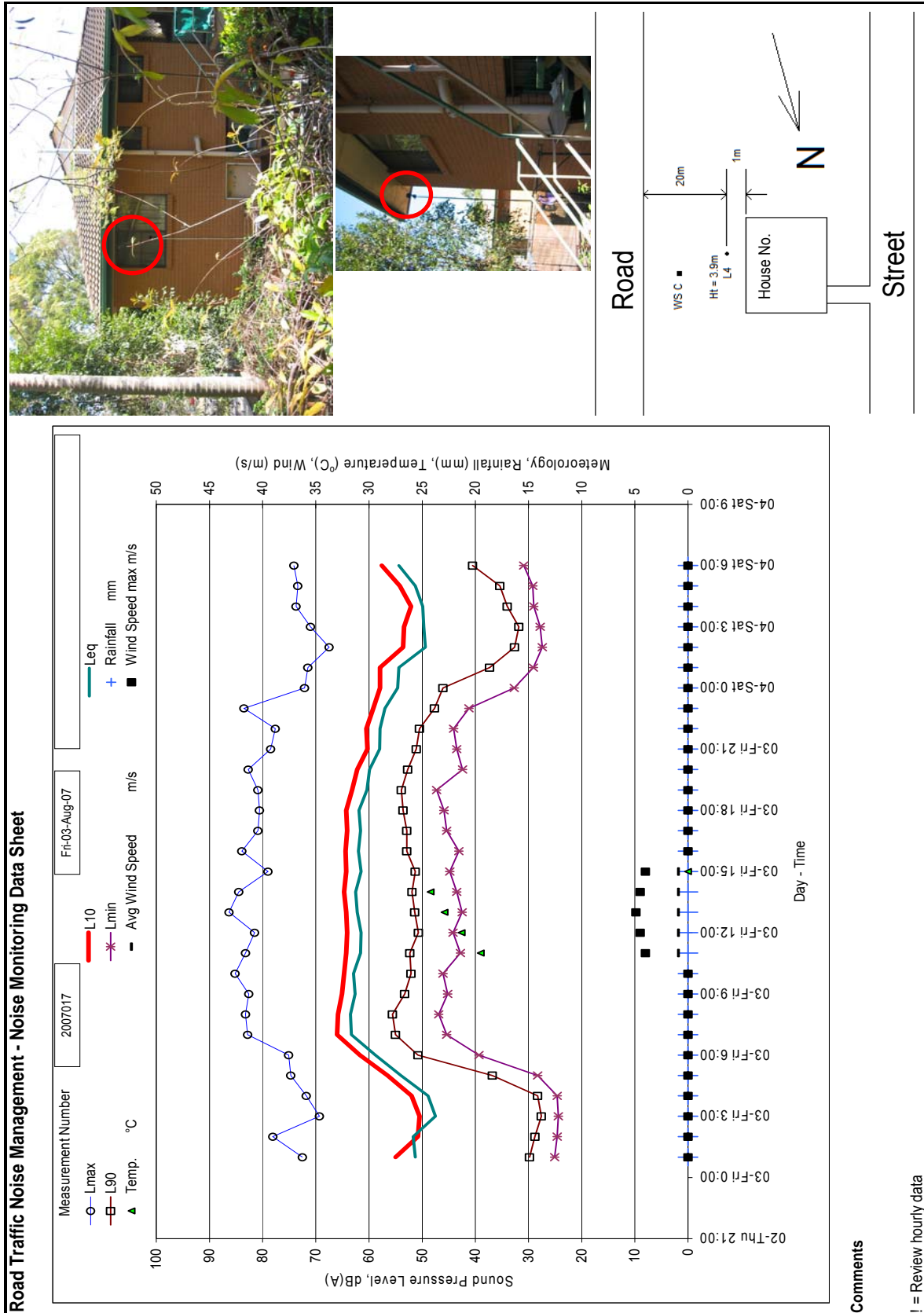
District: Metropolitan  
 State Road: 120 Redcliffe Road  
 Address: \_\_\_\_\_  
 Lot and RP numbers: \_\_\_\_\_  
 Owner: \_\_\_\_\_  
 Date: **Fr-03-Aug-07**  
 Instrument Type: **2007017**  
 Serial Number: ARL-316  
 Pre Calibration: 16-306-004  
 Post Calibration: 94.0 dB(A)  
 Sample Interval: 93.9 dB(A)  
 Operator: 60 minutes

Measurement Number: **23028**  
 AADT: \_\_\_\_\_  
 C.V: 5%  
 Distance: 20 m  
 Speed Limit: 60 km/h  
 Road Surface: Stone Mastic Asphalt  
 Microphone Ht: 3.9 m  
 Façade Corrected? Façade corrected

LA10 (18 hour): 63.5 dB(A)  
 LAeq (24 hour): 58.6 dB(A)  
 LAeq (1 hour) Night: 57.0 dB(A)  
 LAeq (1 hour) Day: 63.5 dB(A)  
 LA10 (12 hour): 64.7 dB(A)  
 LA90 (8 hour): 38.2 dB(A)  
 LA90 (18 hour): 51.9 dB(A)

Predicted 10 Year Horizon LA10 (18 hour): 65.0 dB(A)  
 based on a growth rate of 3.5 % compound per annum

Date	End Time	Lmax	L1	L10	Leq	L90	L99	Lmin	Rainfall mm	Temp. °C	Relative Humidity %	Air Pressure hPa	Wind Direction	Avg Wind Speed m/s	Wind Speed max m/s	Validity Check
03/08/2007	1:00	72.5	60.8	55	51.3	29.8	26.2	25.1	0	25.1	1029.5	1029.5	---	0.0	0.0	*
03/08/2007	2:00	78.1	64.1	50.8	51.7	28.8	26	24.6	0	24.6	1029.4	1029.4	---	0.0	0.0	*
03/08/2007	3:00	69.3	59.1	50.5	47.5	27.6	25.5	24.4	0	24.4	1028.6	1028.6	---	0.0	0.0	*
03/08/2007	4:00	71.8	59.7	52	48.9	28.3	25.8	24.6	0	24.6	1027.8	1027.8	---	0.0	0.0	*
03/08/2007	5:00	74.7	65.6	56.5	54	36.8	31.6	28.3	0	28.3	1027.9	1027.9	---	0.0	0.0	*
03/08/2007	6:00	75.1	67.2	61.7	58.8	50.8	45	39.3	0	39.3	1028.3	1028.3	---	0.0	0.0	*
03/08/2007	7:00	82.8	72.8	66	63.3	55	49.7	45.4	0	45.4	1028.9	1028.9	---	0.0	0.0	*
03/08/2007	8:00	83.2	72.6	65.8	63.5	55.6	51	46.9	0	46.9	1028.9	1028.9	---	0.0	0.0	*
03/08/2007	9:00	82.6	72.6	65.1	62.6	53.3	48.9	45.2	0	45.2	1029.4	1029.4	---	0.0	0.0	*
03/08/2007	10:00	85.2	73.4	64.7	62.9	52.1	48.3	46.1	0	46.1	1029.9	1029.9	---	0.0	0.0	*
03/08/2007	11:00	83.2	71.2	64.3	61.6	52.3	47.3	42.8	0	42.8	1029.4	1029.4	WNW	0.9	4.0	*
03/08/2007	12:00	81.5	72.3	64.1	61.5	50.7	47.1	44.2	0	44.2	1028.5	1028.5	WNW	0.9	4.5	*
03/08/2007	13:00	86.3	72.3	64.3	62.2	51.4	46.9	42.5	0	42.5	1027.4	1027.4	W	0.9	4.9	*
03/08/2007	14:00	84.5	72.6	64.7	62.5	51.9	48.1	43.5	0	43.5	1025.9	1025.9	W	0.9	4.5	*
03/08/2007	15:00	79	71.8	64.3	61.5	51.3	47.1	44.8	0	44.8	1024.5	1024.5	W	0.9	4.0	*
03/08/2007	16:00	83.9	71.6	64.4	62	52.9	48.5	43.1	0	43.1	1023.5	1023.5	---	0.0	0.0	*
03/08/2007	17:00	80.9	70.8	64.1	61.6	52.9	49.2	45.4	0	45.4	1022.8	1022.8	---	0.0	0.0	*
03/08/2007	18:00	80.6	70.8	64.3	61.9	53.6	49.3	45.9	0	45.9	1022.5	1022.5	---	0.0	0.0	*
03/08/2007	19:00	80.9	67.9	63.2	60.4	53.9	50.4	47.3	0	47.3	1022.5	1022.5	---	0.0	0.0	*
03/08/2007	20:00	82.7	68.4	62.2	59.9	52.7	49.2	42.4	0	42.4	1023.4	1023.4	---	0.0	0.0	*
03/08/2007	21:00	78.5	65.7	60.3	58	51.1	47.1	43.5	0	43.5	1024.1	1024.1	---	0.0	0.0	*
03/08/2007	22:00	77.6	67.1	60.5	57.9	50.5	46.9	44.1	0	44.1	1024.7	1024.7	---	0.0	0.0	*
03/08/2007	23:00	83.5	64.7	59.2	57	47.7	44.2	41.2	0	41.2	1025.1	1025.1	---	0.0	0.0	*
04/08/2007	0:00	72.1	62.5	57.9	54.6	46.1	38.4	32.7	0	32.7	1025.4	1025.4	---	0.0	0.0	*
04/08/2007	1:00	71.5	64.1	57.9	54.4	37.3	31.5	29.1	0	29.1	1026.2	1026.2	---	0.0	0.0	*
04/08/2007	2:00	67.5	59.8	53.6	49.4	32.6	30.2	27.4	0	27.4	1026.3	1026.3	---	0.0	0.0	*
04/08/2007	3:00	71	60	53.4	49.7	31.8	29.4	27.8	0	27.8	1026.2	1026.2	---	0.0	0.0	*
04/08/2007	4:00	73.7	61.6	52.1	49.9	34	31.1	29	0	29	1026.4	1026.4	---	0.0	0.0	*
04/08/2007	5:00	73.4	62.3	54.2	51.3	35.4	32.3	29.2	0	29.2	1026.3	1026.3	---	0.0	0.0	*
04/08/2007	6:00	74.1	65.3	57.6	54.4	40.5	34.4	30.9	0	30.9	1026.4	1026.4	---	0.0	0.0	*





**Appendix 2: Notice letter to residents and Form M727 for noise measurements**



Our ref

Your Ref  
Enquiries

<<Date>>

Dear Resident,

**Transport and Main Roads road traffic noise monitoring**

Transport and Main Roads staff have been requested to undertake noise monitoring at your property. The monitoring is required either to investigate a complaint regarding road traffic noise, or as part of the environment impact assessment of a road project, or as part of the development of a noise strategy for all State-controlled roads in Queensland.

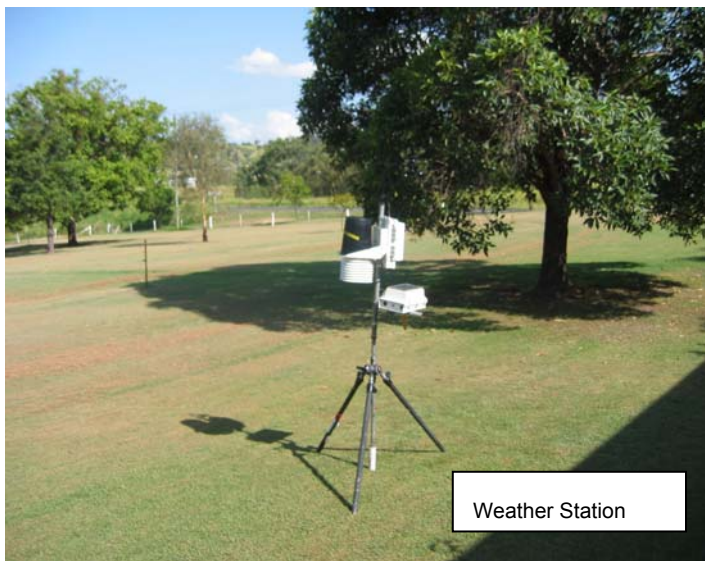
The monitoring involves placing a free standing noise monitoring device and maybe a weather station on your property for a period of four days (see attached photos). Transport and Main Roads staff may need to enter your property on occasions during the day, between 8:30am and 6:00pm to attend the measurement site. Staff will not enter property without your permission.

The monitoring equipment runs on battery power (that lasts for up to 14 days), is water proof and will be chained up if possible for its protection. The time the equipment is on your property may be increased if adverse weather conditions occur. Noise sources for example loud music, lawn mowing, pool pumps and dogs barking could potentially invalidate results or require additional monitoring time. The positioning of the equipment on the property is dependent on the most appropriate location, though Transport and Main Roads staff will endeavour to minimise the disruption to the resident. Once the monitoring is complete the site will be left in the same state as when the monitoring equipment was set up.

The noise levels are reported to the relevant Regional Office of Transport and Main Roads for their reference. Requests for the measured noise levels at your property can be made to the Environmental Officer in your region. The operator installing the equipment will give you the contact details on request.


Yours sincerely

(Name)  
(Position)  
(Contact details)



Example Setup of Monitoring Equipment

Print
Reset Form



**Queensland  
Government**

## Notice of Entry

*Transport Infrastructure Act 1994*

**Part A - Owner/Occuper to keep**

Name:

Address:

**Departmental reference information**

Reference number	<input style="width: 70%;" type="text"/>
Project number	<input style="width: 70%;" type="text"/>
Region	<input style="width: 70%;" type="text"/>
Road number	<input style="width: 70%;" type="text"/>
Road name	<input style="width: 70%;" type="text"/>
Local government	<input style="width: 70%;" type="text"/>
Property description	<input style="width: 70%;" type="text"/>

**Dear Sir/Madam**

The purpose of this notice is to seek your permission for Department of Transport and Main Roads officers or agents to enter onto the land mentioned above. The reason for this entry is to facilitate the provision of transport infrastructure – more detailed information is set out below.

This notice also serves to give you advance notice that the department wishes to enter onto your land. While the minimum notice that must be given to you is three days, the department endeavours where possible to give as much as practicable so that various matters may be addressed.

The department may enter onto your property either upon your written permission or after three days following receipt of this notice. The preferred method of entry is with your written permission. To assist us in this matter would you please grant the department entry onto your land by **completing and returning Part B to the relevant regional office (see page 4) by the specified return date.**

Frequently asked questions and a copy of the applicable sections (35, 36 and 37) of the *Transport Infrastructure Act* are printed on page 2 for your information.

If you require more details the contact person is \_\_\_\_\_ on telephone \_\_\_\_\_.

Yours sincerely,

**Regional/District Director**

**Entry details (completed by the department)**

Purpose of entry	Details or proposed use of land	
Details of things to be done on the land		
	Estimated commencement date	Period of occupation/use
Sketch plan attached?    Yes <input type="checkbox"/> No <input type="checkbox"/>		

**Entry authorisation (completed by the department)**

Officer's name	Position (Delegate of the Director-General, Department of Transport and Main Roads)
<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>
Signature	Date
<input style="width: 95%;" type="text"/>	<input style="width: 50%; text-align: center;" type="text"/>
Time	Method of delivering notice
<input style="width: 50%;" type="text"/>	<input style="width: 50%;" type="text"/>

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Notice of Entry continued... Page 2 of 4

### Frequently asked questions

#### Do I have to be there when staff or agents require entry?

It is not necessary for you to be home when the work is performed on your property provided that departmental staff or agents can gain access to your property.

#### Will your staff contact me with the exact time of their visit?

Staff will endeavour to contact you prior to entry to the property based on the information you provide in Part B. If contact cannot be made with you for whatever reason staff will enter the property to carry out their work.

#### Can I refuse entry to your staff or agents?

You may not refuse the department's staff or agents who enter your land for the purpose of occupying and using the land for road works under s35(1) of the *Transport Infrastructure Act* after the department has provided you with three days written notice or you have provided your written approval.

#### What happens if your staff injures themselves on my property?

The department's employees are covered for injury which occurs in connection with the department's activities.

#### What if my dog/animal attacks your staff?

The department will contact you so arrangements can be made to ensure our staff can have safe entry to undertake the work. If our staff are attacked, they will leave the land, taking reasonable measures to protect themselves from the animal. They will then contact their supervisor and someone from the department will contact you so we can work together with you to ensure the work can be completed safely.

#### I have a secure property and don't want to leave gates unlocked for your staff.

Access to your property will be arranged with you in this instance. At the completion of the work the property will be resecured as directed by you.

#### Will your staff be leaving anything on the property?

While the work is being done, departmental staff may leave equipment, pegs and marks on your property. All equipment will be removed once works have been completed. The department retains ownership of all equipment while it is on your land.

After the work is completed, pegs and marks may remain on your land. These pegs and marks should not impact on your normal use of the land. Generally these pegs and marks are no longer required by the department.

If you believe that these pegs or marks are going to impact on the normal use of your land, please make your concerns known in Part B under the heading 'Other relevant information you think the department might need to be aware of' so that appropriate arrangements can be made.

The department will use its reasonable endeavours not to alter or affect the land more than is reasonably practicable.

### Extract from *Transport Infrastructure Act 1994*

#### 35 Temporary occupation and use of land

1. To carry out road works, the chief executive may temporarily occupy and use land, including roads, and do anything on the land that is necessary or convenient to be done.
2. Subsection (1) does not authorise the chief executive to extract quarry material from a watercourse in a wild river area.

#### 36 Notice of entry or permission to enter

1. The person who is proposing to occupy or use land under section 35 (Temporary occupation and use of land) must—
  - a. give at least 3 days written notice to the owner or occupier of the land: *or*
  - b. obtain the written approval of the owner or occupier to the occupation or use.
2. The notice must state –
  - a. the road works to be carried out; *and*
  - b. the use proposed to be made of the land; *and*
  - c. details of the things proposed to be done on the land; *and*
  - d. an approximate period when the occupation or use is expected to continue.
3. A notice may be given under subsection (1) in relation to land even if it is proposed to resume the land for road works.

4. After the end of 3 days after service of a notice under subsection (1), or with the agreement of the owner or occupier, the land may be entered and the road works specified in the notice carried out.

5. If urgent remedial attention is required, subsection (1) does not apply but the person who is proposing to occupy or use the land must, if it is practicable, notify the owner or occupier of the land orally.

#### 37 Compensation for physical damage from entry etc.

1. An owner of land that is entered, occupied or used under section 35 (*Temporary occupation and use of land*) may give a written notice to the chief executive claiming compensation for physical damage caused by the entry, occupation or use or for the taking or consumption of materials.
2. Compensation is not payable unless a claim is received by the chief executive within 1 year after occupation or use has ended.
3. However, the chief executive may allow a claim to be made at a later time.
4. Compensation awarded under this section must not be more than the compensation that would have been awarded if the land had been acquired.

**Privacy Statement:** The department collects the information on this form such as your name and signature for the purpose of giving notification under the *Transport Infrastructure Act* to occupy and/or use the land as specified above. Authorised departmental officers have access to this information and will not disclose your personal details to a third party without your consent unless required by law.

Notice of Entry continued... Page 3 of 4

**Part B - Please return this section to the department**

**Property Entry Authorisation**

**Departmental reference information (completed by the department)**

Reference number	Project number	<b>Please return to the department by:</b>
<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>	
Road number	Road name	
<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>	
Property address		
<input style="width: 95%; height: 60px;" type="text"/>		
Contact name	Contact details	
<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>	
Purpose of entry	Details or proposed use of land	
<input style="width: 95%;" type="text"/>	<input style="width: 95%; height: 30px;" type="text"/>	
Details of things to be done on the land		
<input style="width: 95%; height: 60px;" type="text"/>	Estimated commencement date	Period of occupation/use
	<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>
<input style="width: 95%; height: 30px;" type="text"/>		

**Owner/Occupier to complete the following section**

**Are you the owner or occupier** (that is, renting/leasing the property)?  
 Owner and Occupier     Owner     Occupier

**Preferred contact phone number/s and best time to make contact**

Do you require telephone notification prior to entry?    Yes     No

**Does the property contain an animal that the department should be aware of?**    Yes     No

Animal details

Do you wish to be present when the work is performed?    Yes     No

Does the property have locked gates preventing entry?    Yes     No

**Other relevant information you think the department might need to be aware of** (that is, environmental (Parthenium Weed), access issues etc.). Please attach any documents or extra information if there is insufficient room.

I authorise officer/s or agents of the department to enter/temporarily occupy the above mentioned land from this date for the duration and purpose specified above.

Owner/Occupier's full name (please print)	Signature	Date
<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>	<input style="width: 95%; text-align: center;" type="text"/>

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Notice of entry continued... Page 4 of 4

**Relevant office is circled below:**

**List of departmental regional offices**

**Central Queensland Region – Barcaldine Office**

69 Ash Street, Barcaldine Qld 4725  
PO Box 3, Barcaldine Qld 4725

**Metropolitan Region – Brisbane Office**

313 Adelaide Street, Brisbane, Qld 4000  
PO Box 70, Spring Hill Qld 4004

**Downs South West Region – Toowoomba Office**

1-5 Phillip Street, Toowoomba Qld 4350  
PO Box 645, Toowoomba Qld 4350

**North Coast Region – Maroochydore Office**

12 First Avenue, Maroochydore Qld 4558  
PO Box 1600, Sunshine Plaza Post Shop  
Maroochydore Qld 4558

**Downs South West Region – Warwick Office**

306 Wood Street, Warwick Qld 4370  
Locked Bag 1, Warwick Qld 4370

**North Queensland Region – Cloncurry Office**

16-22 Ramsay Street, Cloncurry Qld 4824  
PO Box 338, Cloncurry Qld 4824

**Far North Queensland Region – Cairns Office**

Floor 4/15 Lake Street, Cairns Qld 4870  
PO Box 6185, Cairns Mail Centre Qld 4870

**North Queensland Region – Townsville Office**

445 Flinders Street, Townsville Qld 4810  
PO Box 1089, Townsville Qld 4810

**Central Region – Emerald Office**

83 Esmond Street, Emerald Qld 4720  
PO Box 1787, Emerald Qld 4720

**South Coast Region – Gold Coast Office**

36-38 Cotton Street, Nerang Qld 4211  
PO Box 442, Nerang Qld 4211

**Central Region – Rockhampton Office**

31 Knight Street, North Rockhampton Qld 4701  
PO Box 5096, Central Qld Mail Centre Qld 4702

**Downs South West Region – Roma Office**

30 McDowall Street, Roma Qld 4455  
Locked Bag 1, Roma Qld 4455

**Mackay/Whitsunday Region – Mackay Office**

46 Gordon Street, Mackay Qld 4740  
PO Box 62, Mackay Qld 4740

**Wide Bay/Burnett Region – Bundaberg Office**

23 Quay Street, Bundaberg Qld 4670  
Locked Bag 486, Bundaberg Qld 4670

**Metropolitan Region – Brisbane Office**

313 Adelaide Street, Brisbane, Qld 4000  
PO Box 70, Spring Hill Qld 4004

**Wide Bay/Burnett Region – Gympie Office**

50 River Road, Gympie Qld 4570  
PO Box 183, Gympie Qld 4570

### **Appendix 3: Calibration factors for Traffic Noise Model for QLD conditions**

The American Federal Highway Administration produced the Traffic Noise Model (TNM) after several years of well-publicised research and development. The first version of TNM was released in 1998 (Menge et al 1998) and two updated versions have subsequently been released. These updated versions incorporate enhancements to the TNM software. TNM has also been evaluated in Queensland (Samuels and Batstone 2000, Samuels and Parnell 2002) and in other states across Australia (e.g. Samuels, Huybregts, Batstone and West 2001). All these evaluation studies showed that TNM performed to a similar degree of accuracy as CoRTN.

On the basis of the information presented in Samuels and Parnell (2002), calibration factors for TNM in Queensland were determined. In this case, the calibration factors apply to free field conditions over a range of pavement surface types. In Table 1 the model calibration factors for Queensland conditions are shown and these shall be added to the calculated or predicted noise level when using TNM. Also shown in Table 1 is the sample size (i.e. the number of sites at which data were measured and calculated) obtained by Samuels and Parnell (2002) for each pavement surface type. Note that the sample sizes for the pavement surfaces are quite low which means that the calibration factors for these pavement surfaces are not as scientifically robust as those that were determined for use with CoRTN. The calibration factors for these pavement surfaces should be considered (cautiously) on an interim basis until further data become available.

**Table 1 - TNM calibration factors and accuracies for Queensland conditions**

<b>Pavement surface type</b>	<b>Calibration factor (dB(A))</b>	<b>Accuracy of calibrated calculation (dB(A))</b>	<b>Sample size</b>
All sites	- 2.5	± 9.0	15
CS sites	- 5.0	± 4.0	5
PCC sites	- 5.5	± 2.2	2
DGA sites	+ 2.3	± 4.4	6
OGA sites	- 7.6	± 2.2	2

The accuracies in Table 1 represent the 95% confidence limits around the calibrated calculations or predictions.

The primary reasons for the interest in TNM are firstly that it incorporates some of the latest technological developments in areas such as vehicle noise source types and outputs and in relation to noise propagation theory. In addition, TNM has been configured to calculate and predict the noise descriptor  $L_{Aeq}$ . Any calculation or prediction determined using TNM requires a conversion to the relevant noise descriptor (i.e.  $L_{A10}$  (18h) or  $L_{A10}$  (1h)) in order to be assessable against the relevant criteria outlined in Chapter 3 of this CoP. The conversion relationship shall be representative of the conditions at each site as determined by noise measurement. It should be noted that a conversion relationship introduces an additional factor for uncertainty in the calculation or prediction.

TNM is a computerised model that includes some powerful interactive data input and output routines and using TNM requires running a sophisticated computer package. However, the care to detail in translating any given situation into values of model input parameters necessary to conduct calculations and predictions with CoRTN is also required when using TNM. With the application of the TNM calibration factors, the results determined by the modelling need to be interpreted carefully.

## **Appendix 4: Acoustic attributes of QLD pavement surface types**

### **1 Pavement surface types**

Since pavement surface type is such an important factor in the generation of road traffic noise, much research has been conducted in Australia and internationally on this topic (Samuels 1982, Samuels and Dash 1996, Samuels and Parnell 2002, Sandberg and Ejsmont 2002). The acoustic performances of various pavement surface types that have been scientifically investigated in Queensland are set out in great detail in *The QDMR Pavement Surface Noise Resource Manual* (Samuels 2008). This Manual primarily focuses on the following pavement surface types which are widely used throughout Queensland and indeed throughout Australia and internationally:

- Bituminous Seal (BS) - a thin pavement surfacing comprising a layer of bitumen onto which cover aggregate has been placed and compacted by a rolling process.
- Portland Cement Concrete (PCC) - a cement concrete pavement (reinforced or unreinforced) that may have various surface textures applied by tyning or other techniques.
- Asphalt – in general, comprised of mineral aggregate in a bituminous binder. Asphalt surfacings differ by the proportion of different size aggregate (crushed rock,) the amount of bitumen added and the presence of other additives and material.
- Dense Graded Asphalt (DGA) is a smooth, uniform aggregate graded pavement surfacing. The depth depends on the purpose of the pavement surface layer (i.e. structural or surface layer).
- Stone Mastic Asphalt (SMA) - an asphalt mix design typically that has a higher proportion of the larger stones and fine particles but relatively few stones of the intermediate size as opposed to the other asphalt mix designs.
- Open Graded Asphalt (OGA) - comprised of a porous layer, usually a minimum of 25 to 45 mm thick, which is usually overlaid on a DGA and which provides a water drainage path within the porous layer. OGA has a higher proportion of the larger stones (compared with DGA) and a smaller percentage of small stones and fine particles. This type of pavement surface is also referred to as an Open Graded Friction Course in some references.

### **2 Method to determine the acoustic attributes**

Investigations undertaken for the Department have been directed at determining the acoustic attributes of various pavement surface types. The conduct and outcomes of these investigations have been fully documented in *The QDMR Pavement Surface Noise Resource Manual* (Samuels 2008). In these investigations, collection of the required pavement surface noise data was undertaken according to what is known as the statistical passby technique. In total, 29 sites of varying pavement surface types were included in the investigations and of these 21 were in South East Queensland and 8 were in the Townsville environs.

These data have been analysed to determine the values of the Statistical Passby Index (SPBI) for each of the pavement surfaces. Originating from European work on pavement surface noise conducted during the 1990s, the Statistical Passby Index was developed as an index that could be used to quantify the overall effects of pavement surface type on road traffic noise. The concept here was that the contributions of various vehicle types to the road traffic noise generated on a given pavement surface could be incorporated in an index which is a function of their noise emissions, their



proportions in the total traffic volume and their speeds. It should be noted that the SPBI was not devised as a road traffic noise descriptor, such as the  $L_{Aeq}$  (1h) or the  $L_{A10}$  (1h). The SPBI is defined below (ISO 1997):

$$SPBI = 10 \log (W_1 \times 10^{L_1/10} + W_{2a} (V_1/V_{2a}) \times 10^{L_{2a}/10} + W_{2b} (V_1/V_{2b}) \times 10^{L_{2b}/10}) \quad (2.1)$$

Where

SPBI	Statistical Passby Index of a given pavement surface
Lx	Passby noise level of Vehicle Type X on the given pavement surface at a reference speed of $V_x$ and at a reference distance of 7.5 m (dB(A))
Wx	Proportion of Vehicle Type X in the traffic
Vx	Reference speed of Vehicle Type X (km/h)

There are three vehicle types involved and these, which are designated by the subscripts 1, 2a and 2b in Equation 2.1, are Cars (1), Medium Trucks (2a) and Heavy Trucks (2b). The SPBI may be calculated for three speed conditions, known as “high”, “medium” and “low”.

Within each of these conditions, vehicles are assigned the following Reference Speeds:

- High - Cars 110 km/h and trucks 85 km/h
- Medium - Cars 80 km/h and trucks 70 km/h
- Low - Cars 50 km/h and trucks 50 km/h

In order to calculate the SPBI for a particular pavement surface according to Equation 2.1, it is necessary firstly to determine the values of  $L_1$ ,  $L_{2a}$  and  $L_{2b}$  for the pavement surface. This has been done as part of the pavement surface noise investigations which are documented in *The QDMR Pavement Surface Noise Resource Manual* (Samuels 2008).

**Table 2.1 - Traffic conditions adopted for the SPBI calculations**

Traffic condition identifier	Traffic Composition (%)		
	Cars	Medium Trucks	Heavy Trucks
100 – 0 – 0	100	0	0
95 – 0 – 5	95	0	5
95 – 2.5 – 2.5	95	2.5	2.5
90 – 5 – 5	90	5	5
80 – 5 – 15	80	5	15
70 – 10 – 20	70	10	20
60 – 10 – 30	60	10	30
50 – 10 – 40	50	10	40

A key feature of the SPBI is that it includes the influence of traffic composition and this is achieved through the parameters  $W_1$ ,  $W_{2a}$  and  $W_{2b}$ . Thus, in order to calculate the SPBI it is necessary to specify the values of these three parameters. A set of eight traffic compositions which are listed below in Table 2.1 has been used for this purpose. These compositions cover a suitably wide range from the situation of traffic comprising cars only to that comprising 10% medium trucks in addition to 40% heavy trucks. Thus SPBIs have been determined for each of these eight traffic compositions, at the

“high”, “medium” and “low” speed conditions for every one of the 29 pavement surfaces mentioned above. By analysing these SPBIs and aggregating them by pavement surface type, the relative acoustic attributes of the pavement surface types has been obtained. Again refer to *The QDMR Pavement Surface Noise Resource Manual* (Samuels 2008) for further details.

### 3 Results of the acoustic attributes

#### 3.1 The relative acoustic performance of the pavement surfaces over time according to an analysis of the Statistical Passby Indices

The Statistical Passby Indices were determined for the 2002, 2003, 2005, 2006 and 2007 data. From there these five sets of SPBIs were compared amongst one another in Table 3.1 (a) and in Figures 3.1 (a) and 3.2 (b) for just the 90-5-5 traffic and “high” speed conditions. It was not necessary to undertake this comparison at other traffic compositions or speeds, as the outcomes would be the same as those below.

**Table 3.1 (a) - Comparisons of the SPBIs from the 2002, 2003, 2005, 2006 and 2007 Studies**

Pavement surface type	Average (and Standard Deviation) SPBI (dB(A))				
	2007 Study	2006 Study	2005 Study	2003 Study	2002 Study
OGA	82.9 (1.9)	81.4 (1.5)	80.4 (1.4)	78.9 (1.1)	79.1 (1.5)
SMA	81.9 (1.4)	81.2 (1.8)	80.6 (1.5)	80.1 (1.2)	79.4 (1.4)
DGA	81.4 (2.2)	81.4 (2.3)	80.9 (1.4)	81.1 (1.2)	80.8 (1.8)
CS	84.2 (1.4)	84.0 (1.2)	83.2 (1.3)	83.9 (0.8)	85.0 (0.8)
PCC	85.8 (2.0)	86.3 (1.9)	85.5 (1.9)	85.0 (1.3)	83.8 (0.6)
OGA – DGA	1.5	0.0	-0.5	-2.2	- 1.7
SMA – DGA	0.5	-0.2	-0.3	-1.0	- 1.4
DGA – DGA	0.0	0.0	0.0	0.0	0.0
CS – DGA	2.8	2.6	2.3	2.8	4.2
PCC – DGA	4.4	4.9	4.6	3.9	3.0
PCC – OGA	2.9	4.9	5.1	6.1	4.7
CS - OGA	1.3	2.6	2.8	5.0	5.9

#### Notes

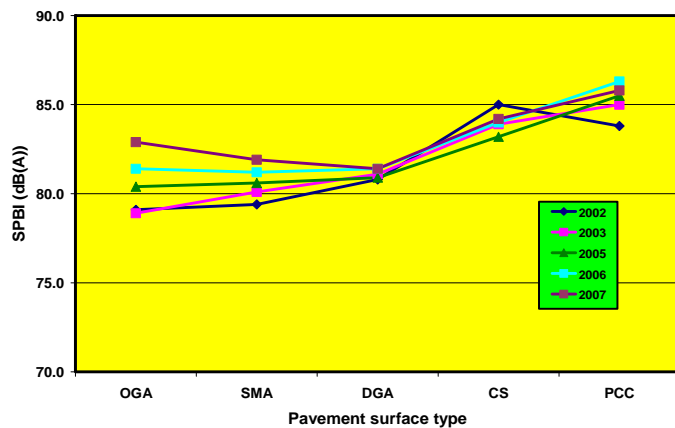
SPBIs are presented for “high” speed conditions which are 110 km/h for cars, 85 km/h for medium trucks and 85 km/h for heavy trucks.

SPBIs are presented for one set of traffic compositions which is 90% cars, 5% medium trucks and 5% heavy trucks.

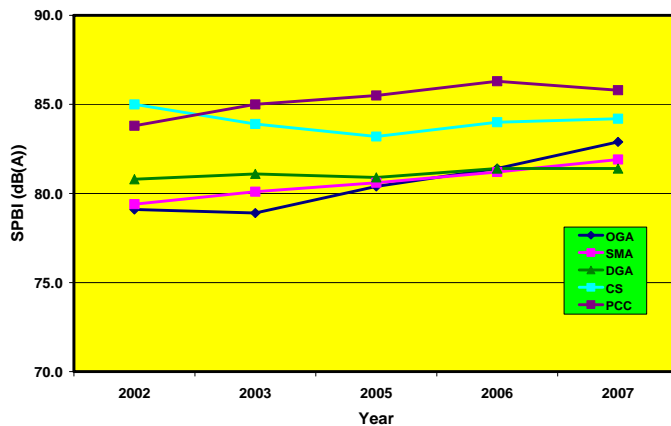
All the data in Table 3.1 (a) have been rounded by Excel.

Note firstly in Table 3.1 (a) that the standard deviations of the five sets of SPBI data are very consistent with one another. This is an expected result, given the nature of the pass noise levels for each vehicle type in the 2002, 2003, 2005, 2006 and 2007 Studies. It is apparent in both Figures 3.1 (a) and 3.1 (b) and in Table 3.1 (b) that there have been only small variations in the SPBIs over the 2002-2003-2005-2006-2007 periods for each pavement surface type. While there have been some changes in the relativities set out in the middle and lower parts of Table 3.1 (a) over the five studies, overall, the trends in the data are similar. The differences between the SPBIs determined in the 2002, 2003, 2005, 2006 and 2007 studies were explored further in Table 3.1 (b).

**Figure 3.1 (a) - Average SPBIs determined in the 2002, 2003, 2005, 2006 and 2007 Studies for 90-5-5 traffic composition and high speed traffic conditions.**



**Figure 3.1 (b) - Alternative presentation of the average SPBIs determined in the 2002, 2003, 2005, 2006 and 2007 Studies for 90-5-5 traffic composition and high speed traffic conditions.**



**Table 3.1 (b) - Changes in “High speed” Statistical Passby Noise Indices over time for 90-5-5 traffic composition**

Pavement Surface Type	Average SPBI (2003 Data) – Average SPBI (2002 Data) (dB(A))	Average SPBI (2005 Data) – Average SPBI (2003 Data) (dB(A))	Average SPBI (2006 Data) – Average SPBI (2005 Data) (dB(A))	Average SPBI (2007 Data) – Average SPBI (2006 Data) (dB(A))	Average SPBI (2007 Data) – Average SPBI (2002 Data) (dB(A))
OGA	-0.2	1.5	1.0	1.5	3.8
SMA	0.7	0.5	0.6	0.7	2.5
DGA	0.3	-0.2	0.5	0.0	0.6
CS	-1.1	-0.7	0.8	0.2	-0.8
PCC	1.2	0.5	0.8	-0.5	2.0

The figures in Table 3.1 (b) above indicate the changes in road traffic noise levels that would have occurred on the five pavement surfaces over the 2002-2003-2005-2006-2007 periods. The trends

apparent in Table 3.1 (b) are listed below. Note that these trends are based on the premise that the “high speed”, 90-5-5 traffic compositions remained constant throughout the 2002-2003-2005-2006-2007 periods.

- On the OGAs, road traffic noise levels would have remained essentially stable from 2002 to 2003, increased slightly from 2003 to 2005, increased slightly again from 2005 to 2006 and increased further from 2006 to 2007. On average, in 2007 the road traffic noise levels on the OGAs would have been 3.8 dB(A) higher than in 2002.
- On the SMAs, road traffic noise levels would have very slightly increased from 2002 to 2003, subsequently increased very slightly more from 2003 to 2005, increased slightly more from 2005 to 2006 and then increased slightly more from 2006 to 2007. On average, in 2007 the road traffic noise levels on the SMAs would have been 2.5 dB(A) higher than in 2002.
- Road traffic noise levels on the DGAs would have remained essentially stable over the 2002-2003-2005-2006-2007 periods, being, on average, only 0.6 dB(A) higher in 2007 than in 2002.
- On the CSs, road traffic noise levels would have slightly decreased from 2002 to 2003, subsequently decreased very slightly more from 2003 to 2005, then increased very slightly from 2005 to 2006 and subsequently remained essentially stable from 2006 to 2007. On average, in 2007 the road traffic noise levels on the CSs would have been 0.8 dB(A) lower than in 2002.
- On the PCCs, road traffic noise levels would have slightly increased from 2002 to 2003, subsequently increased very slightly more from 2003 to 2005, increased slightly more again from 2005 to 2006 and then reduced very slightly from 2006 to 2007. On average, in 2007 the traffic noise levels on the PCCs would have been 2.0 dB(A) higher than in 2002.

It is also of importance to note the relevance here of what is known as “within type” variability in pavement surface noise data. This particular type of variability occurs for any type of pavement surface for which data are collected at several sites (Samuels and Dash 1996). Put simply, this means that the noise produced by a given pavement surface at one site will not always be exactly the same as that measured on the same surface at another site.

In pursuing this issue a little further, the within pavement surface type variabilities in the 2007, 2006, 2005, 2003 and 2002 data were determined and appear in Table 3.1 (c). These variabilities are, in fact, the standard deviations associated with the average SPBIs in the upper part of Table 3.1 (a). It is quite apparent that the within type variabilities of Table 3.1 (c) were all very small over the five pavement surface types of the 2007, 2006, 2005, 2003 and 2002 data and this observation is in accord with expectation (Samuels and Dash 1996). Overall, the average within type variabilities of 1.8, 1.7, 1.5, 1.1 and 1.2 dB(A) for the five data sets shown in Table 3.1 (c) are very consistent with one another. What has now become apparent is that the magnitudes of these within pavement surface type variabilities are comparable to the magnitudes of the SPBI differences over time in Table 3.1 (b). This is a rather important observation which assists in explaining the fluctuations evident in the data of Figures 3.1 (a) and 3.1 (b) and in Tables 3.1 (a) and 3.1 (b).

**Table 3.1 (c) - Within pavement surface type variabilities in the “high speed” SPBIs for 90-5-5 traffic composition**

Pavement Surface Type	Magnitude of SPBI Variability (dB(A))				
	2007 Data	2006 Data	2005 Data	2003 Data	2002 Data
OGA	1.9	1.5	1.4	1.1	1.5
SMA	1.4	1.8	1.5	1.2	1.4
DGA	2.2	2.3	1.4	1.2	1.8
CS	1.4	1.2	1.3	0.8	0.8
PCC	2.0	1.9	1.8	1.3	0.6
Mean	1.8	1.7	1.5	1.1	1.2
Standard Deviation	0.4	0.4	0.2	0.2	0.5

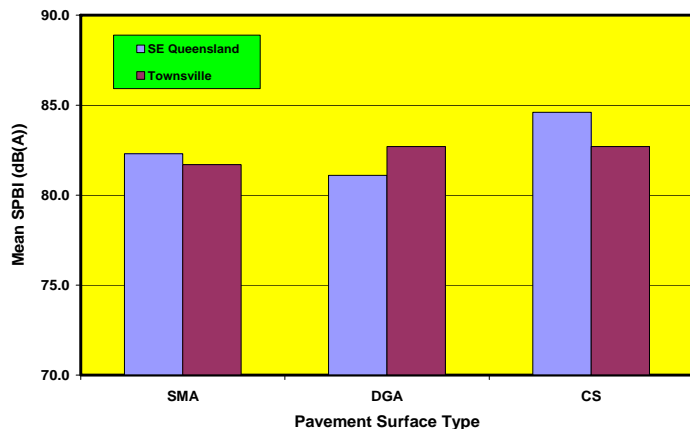
### **3.2 Comparison of the acoustic performance of some of the South East Queensland and the Townsville pavement surfaces**

The question is sometimes raised as to whether there are any differences between the acoustic performance of the pavement surfaces in South East Queensland and those in Townsville. To address this question the SPBI data from both areas were examined. Again it was only necessary to undertake this investigation for the 90-5-5 traffic composition and high speed traffic since the outcomes for the other traffic and speed scenarios would be the same. Initially this examination was conducted on the 2007 data from which SPBI values were aggregated into sub populations by pavement surface type and by location and the means and standard deviations of these sub populations determined. Subsequently this process was repeated using all the SPBI data pooled from the 2002, 2003, 2005, 2006 and 2007 Studies. The results appear below in Table 3.2 and in Figures 3.2 (a) and 3.2 (b). Note that this analysis was confined to just the SMA, DGA and CS pavement surfaces since there were no OGAs or PCCs studied in Townsville. As shown in Table 3.2 the sample sizes of the sub populations of the 2007 data were all rather small, especially with only one DGA and one CS in Townsville. Therefore statistical analyses of the 2007 data in Table 3.2 were not possible. Furthermore, because of the nature of the pooled data in Table 3.2, statistical analyses of these data were not possible.

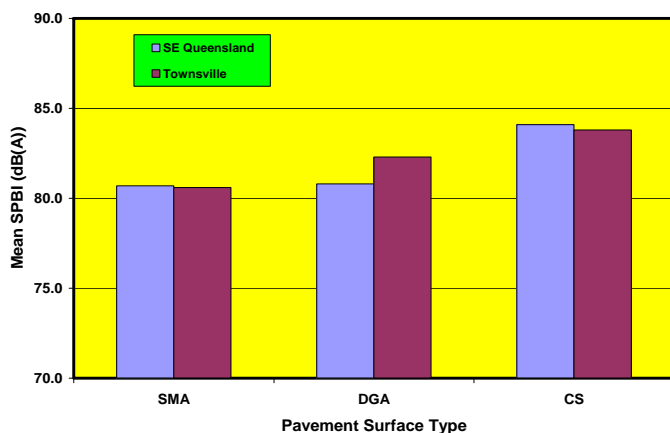
**Table 3.2 - Comparison of SPBIs from South East Queensland and Townsville**

Pavement Surface Type	Location	SPBIs for High Speed, 90-5-5 Traffic (dB(A)) & Sample Size (-)					
		2007 Data			2002, 2003, 2005, 2006 & 2007 Pooled Data		
		Mean	Standard Deviation	Sample Size	Mean	Standard Deviation	Sample Size
SMA	SE Qld	82.3	0.9	3	80.7	0.7	16
	Townsville	81.7	1.7	6	80.6	1.7	34
DGA	SE Qld	81.1	2.4	5	80.8	0.2	23
	Townsville	82.7	0	1	82.3	0.7	6
CS	SE Qld	84.6	1.3	3	84.1	1.1	14
	Townsville	82.7	0	1	83.8	0.7	5

**Figure 3.2 (a) - Comparison of mean SPBIs from South East Queensland and Townsville for 90-5-5 traffic composition and high speed traffic conditions determined from the 2007 Study.**



**Figure 3.2 (b) - Comparison of mean SPBIs from South East Queensland and Townsville for 90-5-5 traffic composition and high speed traffic conditions for the pooled data from the 2002, 2003, 2005, 2006 and 2007 Studies.**



Inspecting firstly the 2007 data of Table 3.2 and Figure 3.2 (a), it is initially apparent that for the SMAs, the Townsville SPBIs were, on average, equal to their South East Queensland counterparts. In

addition it appears that in the case of the DGAs, the Townsville SPBI was, on average, 1.6 dB(A) higher than the South East Queensland DGA SPBIs. Conversely, it appears that for the CSs, the South East Queensland SPBIs were, on average, 1.9 dB(A) higher than their corresponding Townsville SPBIs. However when interpreting these three observations, both the standard deviations and the extremely small sample sizes of the six 2007 sub populations, particularly the Townsville DGA and CS sub populations, must also be considered. Moreover, the magnitudes of the SPBI differences involved in the above three observations are consistent with the within pavement surface type variabilities of Table 3.2. Taking all these factors into account leads to the conclusion that the 2007 data of Table 3.2 and Figure 3.2 (a) suggest that it is unlikely that there were any differences in the acoustic performances between the SMA pavement surfaces, between the DGA pavement surfaces and between those of the CS pavement surfaces in South East Queensland and in Townsville in 2007. However these conclusions must be regarded as tentative, because of the small DGA and CS sample sizes in Townsville.

Considering now the pooled data of Table 3.2 and Figure 3.2 (b), the means of the Townsville SPBIs for the SMAs and the CSs appear to be, on average, equal to their South East Queensland counterparts. In addition it appears that in the case of the DGAs, the Townsville SPBIs were, on average, 1.5 dB(A) higher than the corresponding South East Queensland SPBIs. All of the comments in the paragraph above apply to these results. Consequently it was also tentatively concluded on the basis of the pooled data of Table 3.2 and Figure 3.2 (b) that it is unlikely that there have been any differences between the acoustic performances of the SMA pavement surfaces, between the DGA pavement surfaces and between the CS pavement surfaces in South East Queensland and in Townsville over the 2002-2003-2005-2006-2007 periods.

### **3.3 Prediction of road traffic noise levels over time**

The process involved here commences with the prediction of road traffic noise levels in what might be termed a base study year on pavement surfaces whose ages correspond to those of the pavement surfaces included in the 2002 Study. Subsequently this process allows the prediction of road traffic noise levels on these pavement surfaces as they age over the next five years, based on the outcomes of the 2003, 2005, 2006 and 2007 Studies. This process requires the application of pavement surface correction factors. The correction factors required here have been derived from the data of Tables 3.1 (a) and 3.1 (b) which present the SPBIs determined in the 2002, 2003, 2005, 2006 and 2007 Studies. Consequently it is only possible herein to provide pavement surface correction factors for scenarios up to five years out from the base study year. However, there will be a limit to this process for some pavement surfaces as they are subjected to periodical maintenance procedures.

The process set out in Samuels 2008 was applied to all pavement surface types to produce the pavement surface correction factors of Table 3.3. These factors are presented for a base study year (based on the 2002 data) and subsequently for one, three, four and five years beyond the base study year (based on the 2003, 2005, 2006 and 2007 data respectively). Note that for each pavement surface type, the factors of Table 3.3 are only applicable to pavement surfaces whose ages correspond to those set out in Table 3.3.

**Table 3.3 - Queensland pavement surface correction factors for application in predicting the levels of road traffic noise in Queensland in an initial year and up to five years beyond.**

Pavement Surface Type	Pavement Surface Correction Factor (dB(A)) (Pavement Surface Age (Years))				
	Base Study Year	One year out from base study year	Three years out from base study year	Four years out from base study year	Five years out from base study year
OGA	- 1.7 (3)	-2.2 (4)	-0.5 (6)	0.0 (7)	1.5 (8)
SMA	-1.4 (1)	-1.0 (2)	-0.3 (4)	-0.2 (5)	0.5 (6)
DGA	0.0 (1)	0.0 (2)	0.0 (4)	0.0 (5)	0.0 (6)
CS	4.2 (3)	2.8 (4)	2.3 (6)	2.6 (7)	2.8 (8)
PCC	3.0 (2)	3.9 (3)	4.6 (5)	4.9 (6)	4.4 (7)

### **3.4 The effect of pavement surface cleaning on the acoustic performance of an OGA pavement surface**

The porosity and voids incorporated in OGA pavement surfaces interrupt the generation of tyre/road noise that occurs in the tyre/road contact area. This generation mechanism is one of air pumping within the tyre tread and the road pavement surface (Samuels 1982, Samuels and Glazier 1990, Sandberg and Ejsmont 2002). When the air is pumped out of and in to the tyre/road contact zone, noise is generated. Thus the voids in an OGA pavement surface offer alternative paths for some of the air to be pumped into the pavement surface thereby reducing the volume of air pumped out to atmosphere. In this way the strength of noise generation mechanism is reduced and the resulting noise levels are also reduced.

Recent research has been indicating that the effectiveness of an OGA pavement surface in reducing tyre/road noise depends largely on the nature of the porosity and voids present within the pavement surface (Sandberg and Ejsmont 2002). In particular the pavement surface should be clean and free of foreign matter that might clog the voids and therefore diminish the capacity of the pavement surface to reduce the strength of the noise generation mechanism. One way of ensuring that the voids are not clogged is to clean the pavement surface regularly and this is routinely done in Europe and Scandinavia where OGA pavements are particularly prone to clogging. Another advantage of pavement cleaning is that it enhances other properties of the pavement wearing course such as skid resistance (Sandberg and Ejsmont 2002).

Pavement cleaning is usually carried out with a purpose built truck. High pressure water is sprayed on to the pavement surface underneath the truck and the resulting slurry is retrieved with a suction device mounted at the back of the truck. This process occurs as the truck drives along the pavement surface at about 2 km/h.

A limited investigation was conducted on the effect of pavement surface cleaning on the acoustic attributes of an OGA pavement surface in Bermuda Street at Burleigh Waters.

These trials involved before and after studies of a number of factors, but obviously only the noise issue is covered. Statistical passby data were collected before cleaning and immediately after



cleaning. All the noise data were collected and analysed in accordance with the methods set out in Chapter 2 of Samuels 2008.

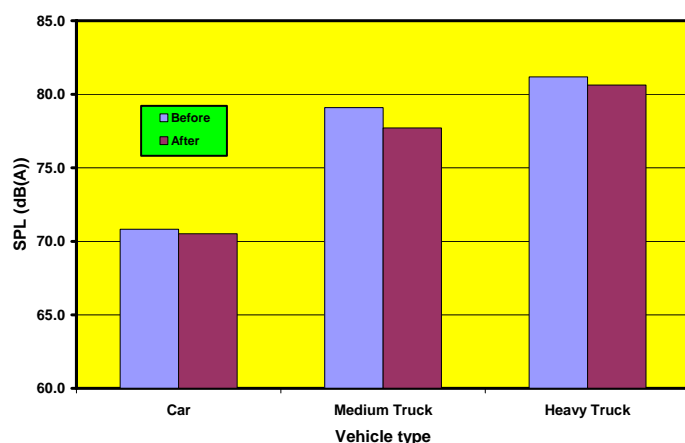
The statistical passby noise data are summarised in Table 3.4 (a) and in Figure 3.4. Inspecting firstly Table 3.4 (a), it is apparent that good sample sizes were obtained as required for all vehicle types in both measurements. Moreover, the standard deviations of the 6 data sub-populations all fell within the range 1.8 to 3.9 dB(A) and this is a reasonably good outcome (Samuels 1982, Samuels and Dash 1996). Consequently, the data collected for the cleaning trial were regarded as being of high scientific quality and therefore satisfied the requirements of the trial.

The data trends apparent in Table 3.4 (a) and Figure 3.4 were therefore explored further. In concert with the data presented, the vehicle noise emission levels from the three vehicle types spanned a range of about 10 dB(A) during both measurements. In addition, the consistent trend for the noise emissions of heavy trucks to be the greatest, followed by medium trucks and cars in descending order was observed. Again these observations are consistent with those studies mentioned above and of the experiences in the USA (Fleming et al 1995). Furthermore, the noise levels of Table 3.4 (a) may be regarded as those from a low noise pavement.

The observed noise effects of the pavement surface cleaning treatment are shown in Table 3.4 (b) where it is clear that the change in noise levels ensuing from the cleaning treatment were very small indeed. Overall, the cleaning treatment had the effect of a small, almost negligible reduction in noise for the medium trucks. For the cars and the heavy trucks there was no effect. Taking all car and truck data together and considering both the means and the standard deviations of the data, allows the following conclusion to be drawn. As far as overall traffic noise is concerned, it appears that the pavement surface cleaning treatment had a negligible effect on the noise attributes of the OGA pavement surface in Bermuda Street. An alternative expression of this particular conclusion is that the cleaning treatment was found to have no adverse effects on the low noise properties of the OGA pavement surface tested.

**Table 3.4 (a) - Statistical passby noise data at 80 km/h and 7.5 m before and after pavement surface cleaning**

Site condition	Statistical Parameter	SPL (dB(A)) and Sample Size		
		Car	Medium Truck	Heavy Truck
Before cleaning	Mean	70.8	79.1	81.2
	Std Dev	2.8	2.9	3.9
	Samples	95	28	18
After cleaning	Mean	70.5	77.7	80.6
	Std Dev	1.9	2.4	1.8
	Samples	98	18	14

**Figure 3.4 - Mean passby noise levels at 80 km/h and 7.5 m before and after cleaning.****Table 3.4 (b) - Pavement surface cleaning effects on noise**

Change in mean passby noise level from before to after cleaning treatment (dB(A))		
Cars	Medium trucks	Heavy trucks
-0.3	-1.4	-0.6

This pavement surface cleaning investigation included just one site and this is indeed a very small sample size. Consequently the Table 3.4 (b) results may only be applied to the pavement surface studied in Bermuda Street. A more substantial investigation which incorporates a greater sample size would be required to make more generalised statements concerning the effects of pavement surface cleaning on OGA pavement surface noise.

In noting this conclusion, it must be recognised that no information was available to the investigation of the pavement surface properties such as permeability before and after the pavement surface cleaning process was conducted.

A similar investigation of the acoustic effects of OGA pavement surface cleaning was conducted in NSW for RTA NSW (Samuels and Parnell 2003). In this investigation two sites along the Sydney – Newcastle (F3) Expressway were involved. The results of this investigation have been reproduced below in Table 3.4 (c) and were very similar indeed to those of the Bermuda Street trial. Again the comments in the paragraphs above also apply to the Table 3.4 (c) outcomes.

**Table 3.4 (c) - Results of RTA NSW pavement surface cleaning noise study**

Site	Change in mean passby noise level from before to after cleaning treatment (dB(A))		
	Cars	Medium trucks	Heavy trucks
1	1.0	0.1	0.6
2	0.8	0.0	+0.7

## **Appendix 5: Road traffic noise assessment functional specification proforma for New Road / Upgrading Existing Road**

### **1 Background**

Road traffic noise generated by traffic on the department's road network is a major source of noise in urban and some rural areas. With an increase in population and development in the region, there have been significant increases in traffic volumes on this road network and a subsequent increase in road traffic noise levels.

(Paragraph on background of proposed new road) OR (Region) Region proposed to upgrade (Existing Road) between (Start Street) and (End Road) from (number) to (number) lanes to support this regional growth.

Road traffic noise impacts of the proposed new road/upgrading of (Existing Road) between (Start Street) and (End Road) are to be addressed as part of the proposed project. For this reason, the Department seeks to engage a suitably qualified consultant to ensure that the surrounding and general community are not significantly affected by the proposed (new road/upgrading of existing road) with respect to road traffic noise impact.

Construction of the (new road/upgrading of existing road) between (Start Street) and (End Road) is planned to commence in (Year) with a programmed (opening/completion of works) of the (new road/upgrading of existing road) in (Year).

This assessment shall specifically address those existing noise sensitive receptor locations adjacent to the proposed (new road/upgrading of existing road) between (Start Street) and (End Road).

#### **1.1 Purpose**

The purpose of this assessment is to assist the Department in making road traffic noise impact management decisions by:

- establishing the existing noise environment along the proposed new or upgraded road corridor
- determining the relevant assessment criteria for road traffic noise along the new or upgraded road corridor
- developing and verify a road traffic noise calculation model for Year (existing year) using current data sources and noise measurement results for the study area) – upgrading only/ new road if influenced by existing road
- calculating road traffic noise levels for Year (existing year) at existing noise sensitive receptor locations in the study area – upgrading only
- assessing the existing impact of road traffic noise levels on noise sensitive receptors along the proposed upgraded road section – upgrading only
- predicting road traffic noise levels for Year (road opening/completion of upgrading) at existing noise sensitive receptor locations in the study area with the (proposed new road/road upgrade)
- predicting road traffic noise levels for the Years (5 Year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading) at existing noise sensitive receptor locations in the study area with the (proposed new road/road upgrade)

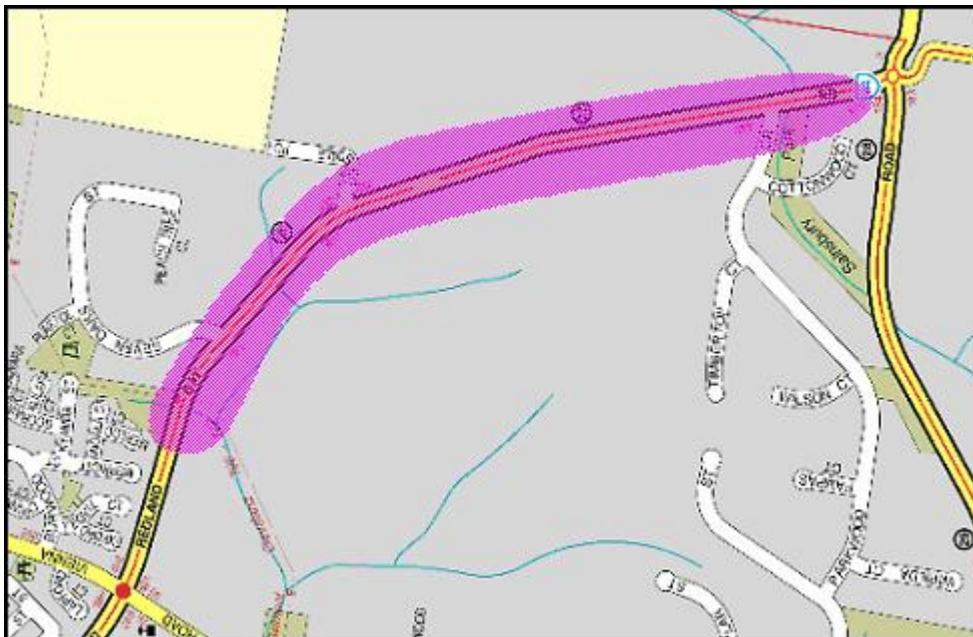
- assessing the impact of noise generated by road traffic on the (new road/road upgrade) at existing noise sensitive receptor locations in the study area in accordance with the relevant criteria for Years (road opening/completion of upgrading), (5 Year following road opening / completion of upgrading ) and (10 Year following road opening/completion of upgrading )
- identifying the need to provide noise attenuation strategies for existing noise sensitive receptor locations within the study area as part of the (new road/road upgrade) project
- presenting options of suitable noise attenuation strategies for the (new road/road upgrade), if required at existing noise sensitive receptor locations, and
- recommending practical noise attenuation strategies (if required) for (number) years (road opening/completion of upgrading), (5 Year following road opening/completion of upgrading and 10 Year following road opening/completion of upgrading) for the study area to incorporate into the (new road/road upgrade) project.

### 1.2 Scope of Work

The road is approximately (length of road) in length. The road proposal connects (Start Street) at (Suburb) and extends to the (End Road) at (Suburb).

The study area extends along (Existing Road/proposed new road corridor), both sides of the road from (Start Street) to (End Road) at (Suburb). Figure 1.2 depicts the study area for this road traffic noise assessment.

**Figure 1.2 - Study area (example only)**



### 1.3 Road traffic noise assessment criteria

The road traffic noise assessment shall be considered against the applicable criteria contained in the department's *Transport Noise Management: Code of Practice Volume 1 – Road Traffic Noise (CoP)*.

## 2 Road traffic noise measurements

Road traffic noise measurements including the selection of suitable measurement sites shall be undertaken in accordance with the department's CoP including post construction measurements.

The Consultant shall submit a road traffic noise monitoring proposal to the Project Manager for approval prior to conducting road traffic noise measurements. The proposal shall detail the nominated noise measurement sites proposed and schedule for the monitoring to be carried out.

The Project Manager may request (with justification) changes to, or additional noise measurement sites to be included in the Consultant's road traffic noise monitoring proposal.

### **3 Road traffic noise calculation and prediction model**

#### **3.1 Data inputs**

##### **3.1.1 Digital feature and terrain model**

A 3D digital feature and terrain model of the study area will be made available to the Consultant within one week of commissioning the assessment work or when otherwise nominated by the Project Manager.

The model shall be provided to the minimum specifications as outlined in the department's CoP.

##### **3.1.2 Road design model**

A 3D digital road design model for each design option will also be provided to the Consultant within one week of commissioning the assessment work or otherwise nominated by the Project Manager.

This model/s shall also be prepared to the minimum specifications as outlined in the department's CoP.

##### **3.1.3 Road and traffic data**

Road and traffic data will be supplied to the Consultant for the road traffic noise calculation model on or before commencement of the assessment work. For upgrading only:

- Existing road pavement surface type and applicable road pavement surface correction factor in accordance with the department's CoP.
- Existing traffic volumes (hourly or daily) for all traffic flows and turning movements along the subject road segment as well as for any service roads, on and off-ramps, and local roads that may contribute to the road traffic noise environment in the study area. Unless otherwise determined, the 18 hour traffic count can be estimated at 94% of the AADT.
- Existing traffic compositions of all road segments within the study area. This can be expressed as the percentage of heavy vehicles for each traffic flow and turning movement, and
- Existing sign posted speeds along all road segments within the study area. Where actual traffic speeds along road segments within the study area have been observed and recorded significantly higher or lower than the sign posted speeds, the Project Manager may nominate a traffic speed to be adopted for specific road segments based on supporting speed survey data.

The following road and traffic data shall also be provided to the Consultant for the road traffic noise prediction model Years (road opening/completion of upgrading), (5 year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading) on or before commencement of the assessment work:

- Proposed road pavement surface type for the new road/road upgrade and applicable pavement surface correction factor in accordance with the department's CoP.

- Predicted traffic volumes for all road segments within the study area for Years (road opening/completion of upgrading), (5 year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading).
- Predicted traffic compositions for all road segments within the study area for Years (road opening/completion of upgrading), (5 year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading), and
- Proposed sign posted speeds along all road segments within the study area for the new road/road upgrade.

#### **3.1.4 Noise sensitive receptor details**

The usual practice will be for the Consultant to determine all noise sensitive receptors, both ground floor and first floor as applicable. However, where required, the Department may provide reference details of all noise sensitive receptors within the study area. In most instances, the reference shall be representative of the street address for each noise sensitive receptor.

#### **3.2 Road traffic noise modelling**

The Consultant shall conduct calculations and predictions of road traffic noise at noise sensitive receptors within the study area using the road traffic noise calculation and prediction models in accordance with the department's CoP.

The Consultant is required to first demonstrate verification of the noise traffic noise calculation model for Year (current year) prior to proceeding with the road traffic noise prediction modelling for Years (road opening/completion of upgrading), (5 year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading) – upgrading only. (new road if influenced by existing road).

### **4 Road traffic noise attenuation strategy**

Should the calculations and/or predictions identify that noise attenuation treatments are required for existing noise sensitive receptors along the new road corridor/proposed road upgrade in the study area, the Consultant shall investigate and provide suitable attenuation strategies/options to be considered in the project planning and design stage.

The department's CoP outlines a selection of methods and design considerations when investigating strategies/options for the management of the impact of road traffic noise.

If a noise barrier is proposed, the height given for the noise barrier shall be its height above the existing ground level or road edge line level as applicable.

### **5 Deliverables**

#### **5.1 Road traffic noise monitoring proposal**

The consultant shall submit a road traffic noise monitoring proposal to the Project Manager for approval within two weeks of commencement of the assessment works. The Consultant shall obtain approval from the Project Manager prior to conducting the road traffic noise monitoring.

#### **5.2 Road Traffic Noise Assessment Report**

The Consultant shall submit a draft of the 'Road Traffic Noise Assessment Report' to the Project Manager within [number] weeks of the date of commission, or the date of delivery of all the departmental supplied data, whichever is the later.

Five (5) hard copies of the finalised 'Road Traffic Noise Assessment Report' shall be supplied to the Project Manager within two weeks following receipt of the department's review comments of the draft report. The report shall be of A4 format with A3 Figures (as required).

The report shall contain as a minimum:

- Executive summary of the findings and recommendations of the assessment
- Assessment methodology (including the verification process)
- Road traffic noise monitoring proposal
- Summary of the road traffic noise measurement results including a layout plan depicting the site locations and positions of the noise measurements conducted for the assessment
- Measurement data sheets and site attendance records/site notes taken by the noise measurement officer at each measurement site
- Documentation of all road traffic noise model input data and assessment criteria adopted
- Verification results, comparing the measured and calculated road traffic noise levels for Year (current year) – upgrading only; (new road if influenced by existing road)
- Tabulation of calculated road traffic noise levels for all noise sensitive receptors in the study area for Year (current year)(without noise attenuation treatments) – upgrading only
- Tabulation of predicted road traffic noise levels for all noise sensitive receptors in the study area for Years (road opening/completion of upgrading), (5 year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading)(without noise attenuation treatments)
- Noise Level contours for calculated (existing year – upgrading only) and predicted noise levels for years (5 year) and (10 years) with and without noise attenuation treatments (if required)
- Summary of noise sensitive receptors where the calculated and/or predicted road traffic noise levels exceed the relevant noise criterion levels (without noise attenuation treatments) for Years (current year- upgrading only), (road opening/completion of upgrading), (5 year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading)
- Outline of the investigation process in determining the preferred road traffic noise attenuation strategies/options, if required
- Tabulation of predicted road traffic noise levels for all noise sensitive receptors in the study area for Years (road opening/completion of upgrading), (5 year following road opening/completion of upgrading) and (10 year following road opening/completion of upgrading) with suitable noise attenuation treatments/options
- Text descriptions and layout plan (where appropriate e.g. noise barrier option) of the length, height and location for all existing and recommended noise attenuation treatments/options, and
- Any other explanatory notes.

An electronic copy on CD of the final report (PDF format) and modelling data files shall also be provided to the Project Manager. The contents of the CD shall be suitably labelled.

## **6 Hold Points**

The Consultant shall not proceed past hold points without prior approval from the Project Manager. The hold points for this assessment are listed below:

- Road traffic noise monitoring proposal
- Road traffic noise monitoring report
- Applicable assessment criteria
- Verification of the road traffic noise calculation model – upgrading only (new road if influenced by existing road)
- Consideration of road traffic noise level calculations and predictions at noise sensitive receptors against the relevant criterion levels
- Attenuation strategy/options, if required
- Draft report, and
- Post construction noise measurements (provisional item).

## **7 Consultant's Offer**

The Consultant is invited to provide an offer in accordance with the attached Invitation to Offer for Supply of Goods and/or Services. The following information shall also be submitted with the offer:

- Offer for Supply of Goods and/or Services
- Project budget
- Project methodology including number of site visits (at least 2)
- Nominated personnel
- Time hourly rates for nominated personnel (if further work is required)
- Proposed schedule dates to complete hold points and the final report for the study area.

The Consultant shall submit their fixed fee for the work described in this Brief. The Consultant shall allow in the offer for the appropriate number of site visits and sufficient liaison, including informal meetings, with the Department throughout the assessment and particularly at hold points. Meetings shall be attended by at least the Consultant's nominated Project Manager unless otherwise agreed.

Any proposed changes to the nominated personnel by the Consultant over the duration of the consultancy period shall be submitted in writing to the Project Manager for approval.

## **8 Project management**

The Consultant shall liaise with and report to the Project Manager throughout the assessment. Contact details for the department's Project Manager are provided below:

(Project Manager)

Ph:

Fax:

Email:



All written correspondence and reports shall be forwarded to the Project Manager. Invoicing may be presented monthly, and for the amounts shown below:

On submission of draft report                      up to 80% of Total Fixed Fee

On submission of final report                      20% of Total Fixed Fee

Payment on invoicing due on submission of the draft report may be withheld if the draft report does not accord with the requirements of this Brief, or if it contains errors or omissions that require substantive rework.

## **9 Community engagement**

At this stage, it is not envisaged that the Consultant will need to consult with representatives of the community or community groups with respect to this assessment except for direct contact with the owner/occupier at the nominated road traffic noise measurement sites.

Any enquiries received from the community by the Consultant whilst conducting the assessment shall be referred promptly to the Project Manager.

Should the Consultant be requested by the Project Manager to undertake community engagement, work will be carried out at an agreed time rate plus expenses basis consistent with the Consultant's offer.

## **10 Data to be supplied by the department**

- Invitation to Offer for Supply of Goods and/or Services
- Offer for Supply of Goods and/or Services
- Project Brief
- 3D digital feature and terrain model of the study area (250 mm contour interval preferred)
- 3D digital road design model/s
- Road and traffic data
- Noise sensitive receptor reference details where required
- Electronic copy of the department's Noise Measurement Datasheet.

## **Appendix 6: Road traffic noise assessment functional specification proforma for Existing Road – No Roadworks**

### **1 Background**

Road traffic noise generated by traffic on the department's road network is a major source of noise in urban and some rural areas. With an increase in population and development in the region, there have been significant increases in traffic volumes on this road network and a subsequent increase in road traffic noise levels.

In order to manage road traffic noise along the existing road corridors under the jurisdiction of the Department within (Region Name) Region, a road traffic noise management strategy has been prepared.

This strategy identifies and prioritises road segments within the Region's State-controlled road network for further detailed assessment based on predicted road traffic noise levels and the number of existing noise sensitive receptor locations along each road segment. The strategy allows the Region to progressively assess the impact of road traffic noise on existing noise sensitive receptor locations adjacent to the Region's road network in accordance with the departmental *Transport Noise Management: Code of Practice* and implement road traffic noise attenuation treatments, where required.

The road segment along (Existing Road) between (Start Street and End Road, Suburb) has been identified in the strategy for further detailed assessment.

This assessment shall specifically address those existing noise sensitive receptor locations adjacent to the section of the (Existing Road) between (Start Street) and (End Road).

#### **1.1 Purpose**

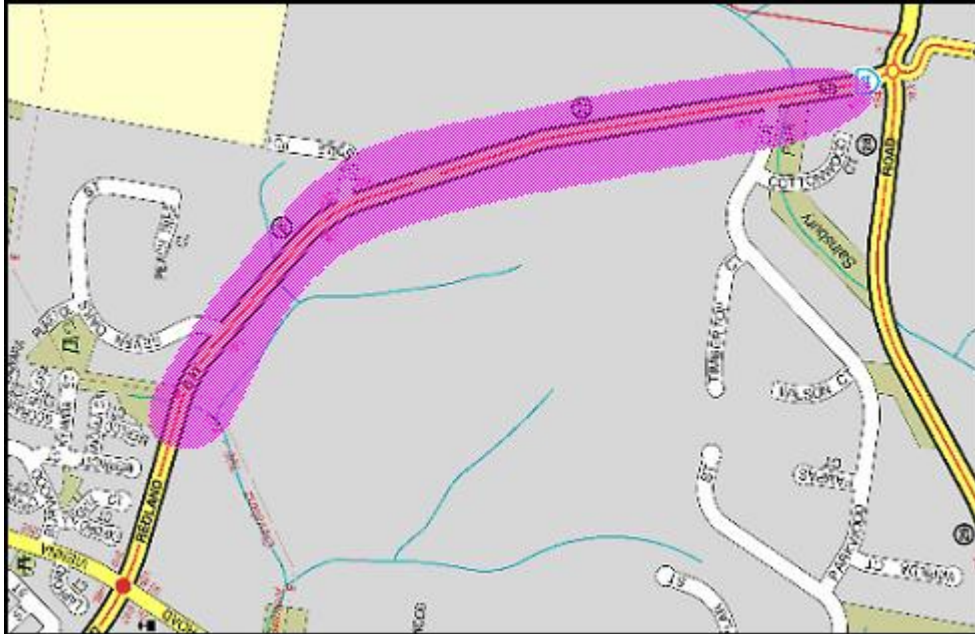
The purpose of this assessment is to assist the Department in making road traffic noise management decisions by:

- developing and verifying a road traffic noise calculation model using current data sources and measurement results for the study area
- calculating road traffic noise levels for Year (current year) at existing noise sensitive receptor locations in the study area
- predicting road traffic noise levels for the Years (5 year) and (10 year) at existing noise sensitive receptor locations in the study area
- assessing the impact of noise generated by road traffic on (Existing Road) at existing noise sensitive receptor locations in the study area in accordance with the relevant criteria for Years (current year), (5 year) and (10 year)
- identifying the need to provide noise attenuation strategies for existing noise sensitive receptor locations within the study area
- presenting options of suitable noise attenuation strategies, if required at existing noise sensitive receptor locations, and
- recommending practical noise attenuation strategies (if required) for Years, (5 year) (10 year) for the study area.

## 1.2 Scope of Work

The study area extends along (Existing Road), both sides of the road from (Start Street) to (End Road) at (Suburb). Figure 1.2 depicts the study area for this road traffic noise assessment.

**Figure 1.2 - Study area (example only)**



## 2 Road traffic noise assessment criteria

The road traffic noise assessment shall be considered against the applicable criteria contained in the department's CoP.

## 3 Road traffic noise measurements

Road traffic noise measurements, including the selection of suitable road traffic noise measurement sites, shall be undertaken in accordance with the department's CoP including post construction measurements.

The consultant shall submit a road traffic noise monitoring proposal to the Project Manager for approval prior to conducting road traffic noise measurements. The proposal shall detail the nominated noise measurement sites proposed and schedule for the monitoring to be carried out.

The Project Manager may request (with justification) changes to, or additional noise measurement sites to be included in the Consultant's road traffic noise monitoring proposal.

## 4 Road traffic noise calculation and prediction model

### 4.1 Data inputs

#### 4.1.1 Digital feature and terrain model

A 3D digital feature and terrain model of the study area will be made available to the Consultant within one week of commissioning the assessment work or when otherwise nominated by the Project Manager.

The model will be provided to the minimum data requirements and format specified in the department's CoP.

#### **4.1.2 Road and traffic data**

Road and traffic data shall be supplied to the Consultant for the road traffic noise calculation model (i.e. current year) on or before commencement of the assessment work:

- Existing road pavement surface type and applicable road pavement surface correction factors in accordance with the department's CoP
- Existing traffic volumes (hourly or daily) for all traffic flows and turning movements along the subject road segment as well as for any service roads, on and off-ramps, and local roads that may contribute to the road traffic noise environment in the study area. Unless otherwise determined, the 18 hour traffic count can be estimated at 94% of the AADT
- Existing traffic compositions of all road segments within the study area. This can be expressed as the percentage of heavy vehicles for each traffic flow and turning movement
- Existing sign posted speeds along all road segments within the study area. Where actual traffic speeds along road segments within the study area have been observed and recorded significantly higher or lower than the sign posted speeds, the Project Manager may nominate a traffic speed to be adopted for specific road segments based on supporting speed survey data.

The following road and traffic data will also be provided to the Consultant for the road traffic noise prediction model Years (5 year) and (10 year) on or before commencement of the assessment work:

- Predicted traffic growth rates for all road segments within the study area for the five (5) and ten (10) year traffic planning horizons or predicted traffic volumes for all road segments in the study area for Years (5 year) and (10 year)
- Predicted traffic compositions for all road segments within the study area for Years (5 year) and (10 year)
- Proposed road pavement surface type(s) if any and the applicable pavement surface correction factor in accordance with the department's CoP.

#### **4.1.3 Noise sensitive receptor details**

The usual practice will be for the consultant to determine all noise sensitive receptors, both ground floor and first floor as applicable. However, where required, the Department may provide reference details of all noise sensitive receptors within the study area. In most instances, the reference shall be representative of the street address for each noise sensitive receptor.

#### **4.2 Road traffic noise modelling**

The Consultant shall conduct calculations and predictions of road traffic noise at noise sensitive receptors within the study area using the road traffic noise calculation and prediction models in accordance with the department's, CoP.

The Consultant is required to first demonstrate verification of the road traffic noise calculation model for Year (current year) prior to proceeding with the road traffic noise prediction modelling for Years (5 year) and (10 year).

### **5 Road traffic noise attenuation strategy**

Should the calculations and/or predictions identify that noise attenuation treatments are required for existing noise sensitive receptors along the subject road segment in the study area, the Consultant shall investigate and provide suitable attenuation strategies/options.

The department's CoP outlines a selection of methods and design considerations when investigating strategies/options for the management of road traffic noise.

If a noise barrier is proposed, the height given for the noise barrier shall be its height above the existing ground level and/or edge line level as applicable.

## **6 Deliverables**

### **6.1 Road traffic noise monitoring proposal**

The Consultant shall submit a road traffic noise monitoring proposal to the Project Manager for approval within two weeks of commencement of the assessment work. The Consultant shall obtain approval from the Project Manager prior to conducting the road traffic noise monitoring.

### **6.2 Road Traffic Noise Assessment Report**

The Consultant shall submit a draft of the 'Road Traffic Noise Assessment Report' to the Project Manager within [number] weeks of the date of commission, or the date of delivery of all the departmental supplied data, whichever is the later.

Five (5) hard copies of the finalised 'Road Traffic Noise Assessment Report' shall be supplied to the Project Manager within two weeks following receipt of the department's review comments of the draft report. The report shall be of A4 format with A3 Figures (as required).

The report shall contain as a minimum:

- Executive summary of the findings and recommendations of the assessment
- Assessment methodology (including the verification process and relevant assessment criteria)
- Road traffic noise monitoring proposal
- Summary of the road traffic noise measurement results including a layout plan depicting the site locations and positions of the noise measurements conducted for the assessment
- Measurement data sheets and site attendance records/site notes taken by the noise measurement officer at each measurement site
- Documentation of all road traffic noise model input data and assessment criteria adopted
- Verification results, comparing the measured and calculated road traffic noise levels for Year (current year)
- Tabulation of calculated road traffic noise levels for all noise sensitive receptors in the study area for Year (current year)(without noise attenuation treatments)
- Tabulation of predicted road traffic noise levels for all noise sensitive receptors in the study area for Years (5 year) and (10 year)(without noise attenuation treatments)
- Noise Level contours for calculated and predicted noise levels for years (5 year) and (10 years) with and without noise attenuation treatments (if required)
- Summary of noise sensitive receptors where the calculated and/or predicted road traffic noise levels exceed the relevant noise criterion levels (without noise attenuation measures) for Years (current year), (5 year), and (10 year)
- Outline of the investigation process in determining the preferred road traffic noise attenuation strategies/options, if required

- Tabulation of predicted road traffic noise levels for all noise sensitive receptors in the study area for Years (current year), (5 year), and (10 year) with suitable noise attenuation treatments/options
- Text descriptions and layout plan (where appropriate i.e. noise barrier option) of the length, height and location for all existing and recommended noise attenuation treatments/options, and
- Any other explanatory notes.

An electronic copy on CD of the final report (PDF format) and modelling data files shall also be provided to the Project Manager. The contents of the CD shall be suitably labelled.

## **7 Hold Points**

The Consultant shall not proceed past hold points without prior approval from the Project Manager. The hold points for this assessment are listed below:

- Road traffic noise monitoring proposal
- Road traffic noise monitoring report
- Verification of the road traffic noise calculation model
- Consideration of road traffic noise level calculations and predictions at noise sensitive receptors against the relevant criterion levels
- Attenuation strategy/options, if required
- Draft report, and
- Post construction measurements (provisional item).

## **8 Consultant's offer**

The Consultant is invited to provide an offer in accordance with the attached 'Invitation to Offer for Supply of Goods and/or Services'. The following information shall also be submitted with the offer:

- Offer for Supply of Goods and/or Services (Form No. P203)
- Project budget
- Project methodology including number of site visits (at least 2)
- Nominated personnel
- Time hourly rates for nominated personnel (if further work is required)
- Proposed schedule dates to complete hold points and the final report for the study area.

The Consultant shall submit their fixed fee for the work described in this Brief. The Consultant shall allow in the offer for the appropriate number of site visits and sufficient liaison, including informal meetings, with the Department throughout the assessment and particularly at hold points. Meetings shall be attended by at least the Consultant's nominated Project Manager unless otherwise agreed.

Any proposed changes to the nominated personnel by the Consultant over the duration of the consultancy period shall be submitted in writing to the Project Manager for approval.

## 9 Project management

The Consultant shall liaise with and report to the Project Manager throughout the assessment. Contact details for the department's Project Manager are provided below:

(Project Manager)

Ph:

Fax:

Email:

All written correspondence and reports shall be forwarded to the Project Manager. Invoicing may be presented monthly, and for the amounts shown below:

On submission of draft report                      up to 80% of Total Fixed Fee

On submission of final report                      20% of Total Fixed Fee

Payment on invoicing due on submission of the draft report may be withheld if the draft report does not accord with the requirements of this Brief, or if it contains errors or omissions that require substantive rework.

## 10 Community engagement

At this stage, it is not envisaged that the Consultant will need to consult with representatives of the community or community groups with respect to this assessment except for direct contact with the owner/occupier at the nominated road traffic noise measurement sites.

Any enquiries received from the community by the Consultant whilst conducting the assessment shall be referred promptly to the Project Manager.

Should the consultant be requested by the Project Manager to undertake community engagement, the work will be carried out at an agreed time rate plus expenses basis consistent with the Consultant's offer.

## 11 Data to be supplied by the department

- Invitation to Offer for Supply of Goods and/or Services
- Offer for Supply of Goods and/or Services
- Project Brief
- 3D digital feature and terrain model of the study area (250 mm contour interval preferred)
- Road and traffic data
- Noise sensitive receptor reference details where required
- Electronic Copy of the department's Noise Measurement Datasheet.

## **Appendix 7: Example road traffic noise management strategy report**

### **1 Executive summary**

[consultant] has been engaged to develop this Regional Road Traffic Noise Management Strategy (RRTNMS) for the Region in accordance with the Department's *Transport Noise Management: Code of Practice (CoP)*.

The purpose of the RRTNMS is to quantify the current and future noise levels for existing dwellings contiguous with existing State-controlled roads within [Region] by applying a suitable noise prediction methodology. The predicted noise levels are to be assessed in terms of the relevant residential noise criterion level described in the CoP. All other noise sensitive land uses are outside the scope of this assessment.

The RRTNMS study does not include areas where current departmental construction projects are underway or have recently been completed. Also excluded are areas where funds have been committed in the Queensland Transport and Main Roads, Investment Program (QTRIP) for future construction projects. The road traffic noise exposure in these areas is being addressed on a project-by-project basis.

In accordance with the CoP, the relevant criterion level for assessment of dwellings contiguous with an existing State-controlled road with no roadworks is 68 dB(A)  $L_{A10}$  (18h), as described in Section 3.

Traffic data, pavement surface information, road gradient categories and aerial photography have been supplied by [Region] as described in Section 4.

Numerous assumptions have been made throughout the development of the RRTNMS as described in Section 5. These include assumptions for CoRTN modelling, the relationship between texture depth and aggregate size for bituminous seal pavement surfaces and the cost of construction for noise barriers.

The State-controlled road network within [Region] was initially divided into road segments according to changes in traffic or road parameters. For each of these road segments, road traffic noise levels were predicted for three time horizons [Year] [Year] [Year]) and the number of dwellings predicted to exceed the departmental criterion level was determined.

Areas of access-control (treatable with noise barriers) were identified, as were areas of direct driveway access (untreatable with noise barriers). In areas of full or partial access-control, clusters of dwellings were identified and reassessed for access-control. Clusters were defined by six (6) or more dwellings on one side of the road and having a density of at least one (1) dwelling per 100 m.

Road segments and clusters for which noise barriers are not a viable treatment option are listed in Appendix D. For these areas, resurfacing has been assessed as a possible treatment option. Where resurfacing of the road is able to achieve the departmental criterion level, the minimum pavement surface requirements have been listed. Where resurfacing is not able to meet the criterion level, the predicted noise level with a low noise pavement surface (e.g. open graded asphalt) has been provided.

The use of a "quieter" pavement surface type depends on the limitations attached to available funding e.g. element management funding is only for noise barriers.



Each access-controlled cluster was assigned a Prioritisation Score by use of a Prioritisation Tool described in Section 7. A higher score indicates a higher priority for further assessment of road traffic noise levels and possible attenuation treatments.

Appendix E contains the list of access-controlled clusters ranked by Prioritisation Score (highest priority at top). These sections of road should undergo a more detailed assessment to determine more accurately the future road traffic noise levels and the attenuation treatments required to achieve the departmental criterion level.

## **2 Introduction**

### **2.1 Project overview**

[Region] is undertaking a strategic review to prepare its RRTNMS in accordance with the Department's *Transport Noise Management: Code of Practice Volume 1 – Road Traffic Noise (CoP)*. [Consultant] has been engaged to develop this RRTNMS.

There has been a significant increase in traffic volumes and roadside development in the [Region] and it is expected that there has been a similarly significant increase in the number of dwellings affected by the impact of road traffic noise.

The purpose of the RRTNMS is to quantify the current and future noise levels for existing dwellings adjacent to State-controlled roads within the [Region] by applying a suitable noise prediction methodology. The predicted noise levels are to be representative of current and expected future traffic volumes travelling on these roads and are to be assessed in terms of the relevant residential noise criterion level described in the CoP. All other noise sensitive land uses are outside the scope of this assessment.

The objectives of the RRTNMS are to:

- Provide an estimate of the number of dwellings likely to be affected by high levels of road traffic noise resulting from traffic travelling on State-controlled roads under the jurisdiction of [Region].
- Provide a 68 dB(A)  $L_{A10}$  (18h) road traffic noise level contour for State-controlled roads under the jurisdiction of [Region] for presentation in MapInfo GIS format.
- Define the extent of those areas which may be affected by high levels of road traffic noise and propose suitable treatments and estimates of costs of treatments that will reduce road traffic noise to below the relevant criterion.
- Prioritise noise ameliorative treatments for areas identified as noise affected according to the number of dwellings affected, the cost of the proposed treatment, provision of existing noise barriers, and the duration and level of exposure to noise levels above the relevant criterion.
- Prepare an implementation strategy that works towards addressing the Department's obligations to provide noise attenuation treatments in accordance with the CoP.

The development of this RRTNMS has involved the following stages:

- Preliminary Assessment
- Prioritisation
- Development of Draft RRTNMS

- Finalisation of RRTNMS

This RRTNMS documents the pertinent outcomes of the Preliminary Assessment and Prioritisation stages of the project.

## 2.2 Study area

The study area for the RRTNMS is limited to areas contiguous with existing State-controlled roads under the jurisdiction of [Region] where noise attenuation treatments are able to be provided within the designated road reserve. The RRTNMS study does not include areas where current departmental construction projects are underway or have been recently completed. Also excluded are areas where funds have been committed in the QTRIP for future construction projects. The road traffic noise exposure in these areas is being addressed on a project-by-project basis.

The following additional limitations were set down at the beginning of the project:

- Only State-controlled roads to be assessed
- On/off ramps to be assessed in problem locations only (as nominated by [Region])
- [Region] Specific limitation e.g. Road omitted from study.

## 3 Project criteria

The [Region] RRTNMS is to be developed in accordance with the Department's *Transport Noise Management: Code of Practice Volume 1 – Road Traffic Noise (CoP)*. The CoP provides road traffic noise criteria for proposed roads, road upgrades, existing roads, residential land use developments and other noise sensitive land uses.

Only existing dwellings have been assessed for this RRTNMS. No educational and health buildings or parks, outdoor educational and recreational areas have been assessed as they are deemed to be outside the scope of this project.

Table 3 presents relevant noise criteria for this project, based on the CoP.

**Table 3 - CoP noise criterion level**

Description	Noise Criteria (within 10 years of assessment)
Existing Roads – No Roadworks	>68 dB(A) L <sub>10</sub> (18h) <sup>1</sup>

Note 1: Assessed 1m from the most exposed façade

It should be noted that the noise assessment criterion level presented within the CoP is a guideline for consideration of the impact of road traffic noise on noise sensitive development. Consideration needs to be given to technical feasibility, cost effectiveness, aesthetics, equity, community engagement and practicality in recommending noise attenuation treatment. This acknowledges that in some instances, the Department may not recommend certain noise attenuation treatments.

## 4 Design inputs

Traffic data (AADT, % heavy vehicles, % growth) has been taken from the [year] Traffic Census for all roads. Posted speed limit data has been taken from the [year] Speed Census. Amendments to the [year] Speed Census were supplied by [Region] and incorporated into this assessment.

[Region Specific Road Status information e.g. New road constructed, road upgraded etc.]

Pavement surface information for each road was collated from the Department's Chartview. The appropriate pavement surface correction factor contained in Table 4 (a) was then applied to each road segment. If a road segment contained more than one type of pavement surface, the highest of the relevant correction factors was applied. All road surface correction factors contained in Table 4 (a) were supplied by the Department.

**Table 4 (a) - Pavement surface correction factors**

Pavement Surface Type	Pavement Surface Correction Factor
Unsealed	+7dBA
16 – 20 mm Bituminous Seal	+5 dBA
Concrete	+5 dBA
10 – 14 mm Bituminous Spray Seal	+3 dBA
7 mm Bituminous Spray Seal	+2 dBA
5 mm Bituminous Spray Seal	+1 dBA
Dense Graded Asphalt (DGA)	+0 dBA
Stone Mastic Asphalt (SMA)	-1 dBA
Open Graded Asphalt (OGA)	-2 dBA

Gradient information for each road was supplied by [Region] via the Data Browser interface. Gradients were categorised as "Level", "Rolling" or "Mountainous" and were classified by [Region] as described in Table 4 (b) below. In cases where more than one gradient category was contained within a road segment (as defined for the Preliminary Assessment) the most conservative (i.e. highest) road gradient was used for the assessment.

**Table 4 (b) - Gradient categories**

Gradient Category	Road Gradient	Gradient to Apply for DRTNMS
Level	< 5%	2.5%
Rolling	5% - 10%	7.5%
Mountainous	> 10%	12.5%

Aerial photography covering the entire [Region] State-controlled road network was examined to determine which road segments contained dwellings exceeding the departmental criterion level as described in Section 3. The aerial photographs were at a scale of 1 x and were taken between the [year] and [year]. Only dwellings existing at the time the aerial photographs were taken have been assessed.

## 5 Assumptions

### 5.1 CoRTN modelling assumptions

For the purposes of this analysis, a number of assumptions have been made to simplify the CoRTN calculations. These assumptions are detailed in Table 5.1 and have been used to predict road traffic noise levels within the study area.

**Table 5.1 - CoRTN modelling assumptions**

Parameter	Value
18-hour traffic volume	94% of AADT
Angle of view to road	180°
Distance from nearest edge of road segment to receiver	20 m
Facade correction	+2.5 dBA
Noise barriers	Not included
Receiver height above ground	2.0 m
Soft ground	50%
Terrain between road and receptor	Flat
Time horizon	[Year] [Year] [Year]

Note: It was considered that the assumptions contained in Table 5.1 would produce a conservative assessment of the road traffic noise within [Region]

### 5.2 Bituminous aggregate sizes

For bituminous seal pavement surfaces, the pavement surface correction factor depends upon the stone size of the pavement surface seal. The pavement surface information retrieved from Chartview did not differentiate between different sized bituminous seals. In the absence of aggregate size information, the texture depth (sand patch equivalent – Between Wheel Path [BWP]) was used to differentiate between different bituminous pavement surfaces. To approximate the stone sizes, the relationship between texture depth and road surface correction factor contained in Table 5.2 has been assumed. This relationship, supplied by the Department, has been applied to the weighted average of the texture depth along each bituminous seal road segment.

**Table 5.2 - Assumed relationship between texture depth and bituminous seal pavement surface types**

Texture Depth (Sand Patch Equivalent - BWP <sup>1</sup> )	Bituminous Seal Aggregate Size	Bituminous Seal Pavement Surface Correction Factor
< 1.0 mm	5 mm	+1 dB(A)
1.0 mm to < 1.5 mm	7 mm	+2 dB(A)
1.5 mm to < 4.0 mm	10-14 mm	+3 dB(A)
> 4.0 mm	16-20 mm	+5 dB(A)

<sup>1</sup> BWP - Between Wheel Path

### 5.3 Noise barrier costs

Where noise barriers are feasible and warranted, the approximate cost of constructing a noise barrier has been estimated. For the purposes of this estimation, the required noise barrier height has been adopted according to the predicted noise level as shown in Table 5.3.

**Table 5.3 - Assumed noise barrier heights**

Predicted $L_{A10}(18h)$ Noise Level (dB(A))	Noise Barrier Height (m)
≤ 70	2
71 – 74	3
75 – 79	4
80 – 85	5

Based on this assumed noise barrier height and the assessed length, the total area of the required noise barrier has been estimated and a cost of [\$/m<sup>2</sup>] has been adopted to estimate the overall cost of the noise barrier.

The noise barrier heights contained in Table 5.3 are designed to estimate the cost of noise barriers for each cluster only. They are not to be used as a substitute for a detailed assessment and noise barrier design.

## 6 Methodology

An outline of the steps taken in developing this RRTNMS is illustrated by the flow chart in Appendix A.

### 6.1 CoRTN modelling

The CoRTN (Calculation of Road Traffic Noise) 1988 prediction technique was utilised within a consultant spreadsheet to predict the road traffic noise emission. The CoRTN model typically considers ground elevation, road elevation, distance between road and receptor, height of receptor above ground, traffic volume and composition, traffic speed, pavement surface characteristics and any intervening topography, structures or noise barriers. CoRTN is recommended in the CoP and is a recognised model used throughout Australia.

In accordance with standard CoRTN, all road traffic was modelled at a source height of 0.5 m above ground and at a distance of 3.5 m from the nearest road edge line. All other parameters have been modelled as described in Section 4 and Section 5.

The State-controlled road network within the [Region] was divided into road segments. Road segments were defined by a change in:

- traffic volume (AADT)
- % heavy vehicles
- posted speed limit
- road gradient, or
- pavement surface type.

In cases where adjacent sections of road had very similar (but slightly different) traffic parameters (AADT, % heavy vehicles, % growth) these sections were considered as one road segment using the most conservative of the differing values.

For adjacent sections of road with the same traffic parameters but different road gradients or pavement surfaces, separate road segments were only defined where the sub-segment with the lower gradient or quieter pavement surface was predicted to contain no dwellings exceeding the departmental criterion level

The predicted  $L_{A10}$  (18h) noise level at 20 m from the road edge line for each road segment is shown in Appendix B.

### **6.2 Determination of number of dwellings over the criterion level**

The number of residential receptors predicted to exceed 68 dB(A)  $L_{10}$  (18h) in [year] for each road segment was determined by a review of aerial photography.

For each road segment assessed, the distance between the nearest road edge line and any identified residential receptors was estimated. This distance was then compared to the CoRTN modelling results to determine if the road traffic noise level was predicted to exceed 68 dB(A)  $L_{10}$  (18h) at that distance. The dwellings predicted to exceed 68 dB(A)  $L_{10}$  (18h) were then counted for each road segment. If no dwellings were predicted to exceed 68 dB(A)  $L_{10}$  (18h), the road segment was excluded from further analysis.

In some cases it was unclear from the aerial photography whether a building was residential or commercial/industrial. These buildings were flagged as possibilities and checked using the Digital Video Road (DVR) Software. Buildings which could not be clearly identified as non-residential were assumed to be residential.

The number of dwellings identified as exceeding the departmental criterion level in Year [year] in each road segment is shown in Appendix B.

### **6.3 Determination of access control**

The aerial photography described in Section 2 was subsequently used to identify areas of Access Control where it would be possible to consider noise barriers as a feasible treatment option. Each road segment with dwellings predicted to exceed the departmental criterion level was examined to determine the level of Access Control within the segment. The level of Access Control was divided into five (5) categories as described in Table 6.3.

**Table 6.3 - Levels of access control**

<b>Level of Access Control Category</b>	<b>% of Road Segment Treatable by Noise Barriers</b>
Y	100%
S1	> 80%
S2	40 – 80%
S3	< 40%
N	0%

Note: The level of Access Control determined for each road segment is shown in Appendix B

### **6.4 Application of dwelling density criteria**

Due to cost-benefit considerations, two density criteria were applied to the road segments at the end of the Preliminary Assessment. In order to be considered for further assessment a road segment must have:

- more than 1 dwelling exceeding the departmental criterion level identified within the road segment, or
- 2 or more dwellings per 100 m exceeding the departmental criterion level, taking into consideration dwellings on both sides of the road.

Where the first Density Criterion has not been met, the road segment has not undergone any further analysis.

Where the second Density Criterion has not been met, the road segment has subsequently been examined to identify any “clusters” of dwellings within the road segment.

### **6.5 Identification of residential clusters**

All road segments were examined to identify any “clusters” of dwellings within the road segment. A cluster was defined as:

- having a minimum of 6 dwellings exceeding the departmental criterion level
- being located on one side of the road only, and
- having a density of at least 1 dwelling per 100 m on one side of the road (being equivalent to 2 dwellings per 100 m on both sides of the road).

All road segments with more than 1 dwelling predicted to exceed the departmental criterion level were examined for clusters regardless of overall dwelling density.

The assessed length of each cluster was defined as the measured length of the cluster plus 100 m. The assessed length is an estimate of the length of noise barrier required to provide noise attenuation to the cluster. A noise barrier designed to protect a line of dwellings would generally need to extend beyond the dwellings at either end to provide sufficient protection to the dwellings at each end. In this case, an extension of 50 m at each end (2 x 50 m = 100 m) has been assumed.

For each cluster, the offset distance from the road edge line to the nearest dwelling was measured and is documented in Appendix C. This distance was then used to predict the  $L_{A10}$  (18h) noise level for each time horizon at the nearest dwelling. Where the nearest dwelling appeared to be less than 20 m from the road edge, the noise levels were predicted at 20 m.

The identified clusters were subsequently reviewed by [Region] classified as either access-controlled or non-access-controlled (category “Y” or “N” in Table 6.3 respectively).

Following the region’s review, overlapping clusters on opposite sides of the road or adjacent clusters (separated by 200 m or less) on any side of the road were subsequently consolidated into a single cluster. Where clusters were combined, the assessed length was taken to be the sum of the assessed lengths of each component cluster.

The finalised clusters are shown in Appendix C. Appendix C also contains the number of dwellings within each cluster and whether the cluster is access-controlled.

### **6.6 Prioritisation**

The ranking tool (Regional Prioritisation Tool) was defined as:

$$\text{Prioritisation Score} = \frac{R \times (PNL[\text{Year}] - MRCL)}{L}$$

where:

R = Number of Dwellings Exceeding the departmental Criterion level in [Year]

PNL [Year] = Predicted [Year] Noise Level ( $L_{A10}$  (18h)) at nearest dwelling

MRCL = The departmental Criterion Level (68 dB(A)  $L_{10}$  (18h)), and

L = Length of Road Segments.

Each of the road segments was assigned a Prioritisation Score using the Region's Prioritisation Tool.

A higher score indicates a higher priority for further assessment of road traffic noise levels and possible attenuation treatments

## 7 Project outcomes

Road traffic noise predictions have been undertaken for all State-controlled roads within the [Region] as described above.

All predictions are façade corrected and include a 2.5 dB(A) facade correction.

It should be noted that the CoRTN methodology requires a minimum 18-hour traffic volume of 1000 vehicles. For some road segments, the assessed 18-hour traffic volume is less than 1000 vehicles for all or some time horizons as indicated in the result tables in the appendices. Where the 18-hour traffic volume is less than 1000 vehicles, it would be expected that the  $L_{A10}$  (18hour) CoRTN prediction would be inherently conservative based upon previous measurements undertaken on lightly trafficked roads and the simplistic traffic flow corrections contained within the CoRTN methodology.

All predicted noise levels contained in the appendices are shaded red if greater than 68 dB(A)  $L_{10}$  (18h) or blue if less than or equal to 68 dB(A)  $L_{10}$  (18h).

Predicted road traffic noise levels for all road segments within the study area are shown in Appendix B. Predicted road traffic noise levels for all identified clusters are shown in Appendix C. In these appendices, the Recommended Actions and Comments shown in Table 7 (a) and Table 7 (b) are referenced.

The Recommended Actions e.g. Priority Listing shall be "ground truthed" for reliability by a site visit(s) and measurement e.g. CoRTN shortened measurement method.

**Table 7 (a) - Recommended actions**

Code	Recommended Action
RA-1	No further action required
RA-2	Monitor by complaint where considered necessary
RA-3	Input to Rehabilitation Works Program
RA-4	Further assessment required based on priority
RA-5	Refer to Appendix C for identified clusters
RA-6	Refer to Appendix E for priority for conducting further investigation

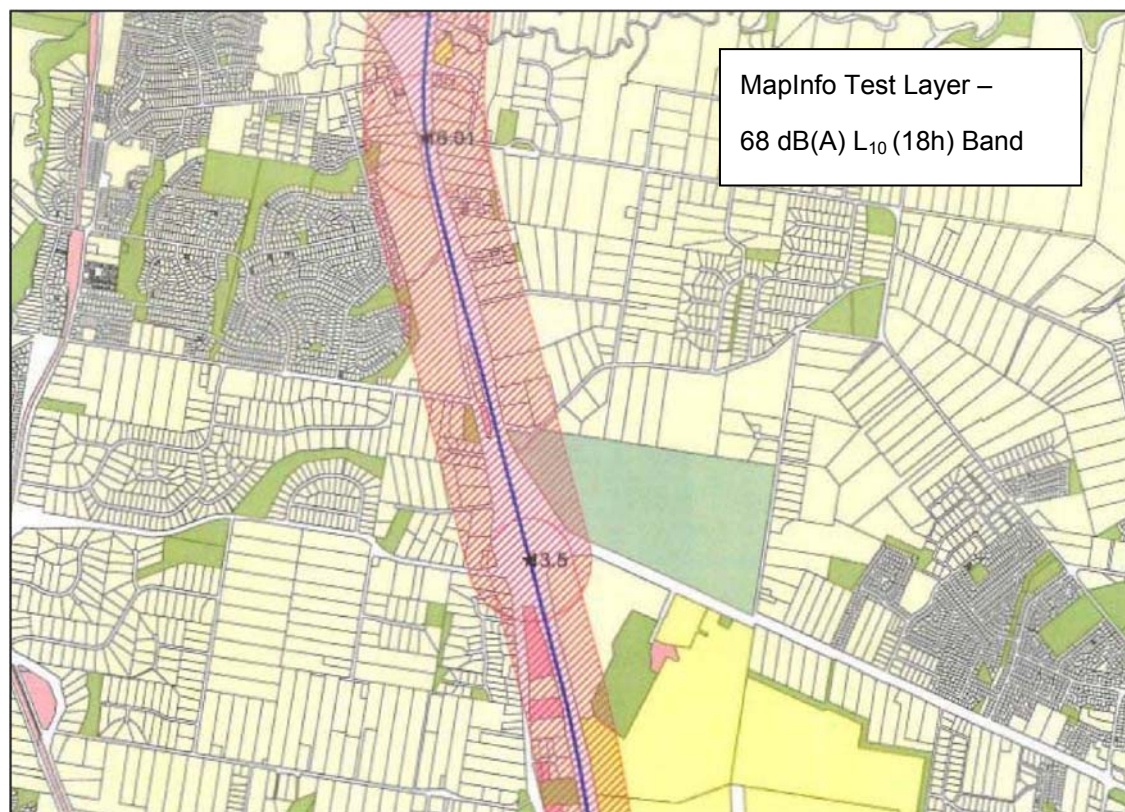


**Table 7 (b) - Comments**

Code	Comment
C-1	Predicated [Year] noise level $\leq$ departmental criterion level
C-2	No dwellings exceeding the departmental criterion level
C-3	No feasible treatment option in road reserve
C-4	Only 1 dwelling exceeding the departmental criterion level
C-5	Number of dwellings exceeding criterion level is less than 2 per 100 m and/or no clusters identified.
C-6	On "Roads Implementation Program"
C-7	Refer to Appendix C for priority for clusters identified in road segment
C-8	Resurfacing is a possible treatment option (refer to Appendix D) as noise barrier not feasible
C-9	Refer to Priority List for ranking (Appendix E)

### 7.1 MapInfo layer

A MapInfo layer has been designed by the Department's Engineering and Technology (E&T) Branch with data for each road segment in Appendix B. The layer shows the area predicted to exceed the departmental criterion level adjacent to each road segment. An example of this layer is shown in Figure 7.1.

**Figure 7.1 - Example of MapInfo layer**

It should be noted that the extent of the road traffic noise contour indicated in the MapInfo layer is subject to the same assumptions and hence limitations as all other predictions in this report.

### 7.2 Areas not treatable with noise barriers

All road segments and clusters with direct driveway access to road (i.e. level of access control = “N”) are not treatable with noise barriers. For some of these sections of road, it is possible to achieve compliance with the departmental criterion level by resurfacing the road with a “quieter” pavement surface type depending on the limitations attached to the available funding e.g. element management funding is only for noise barriers.

The road segments and clusters identified as not treatable with noise barriers are listed in Appendix D. For each road segment or cluster in Appendix D, the minimum pavement surface type required to meet the departmental criterion level (if possible) is indicated.

### 7.3 Areas treatable with noise barriers

[number] of clusters of dwellings were identified in access-controlled areas and have been assigned a Prioritisation Score as described in Section 6. It is expected that noise barriers could be constructed in these areas to reduce noise levels.

Clusters treatable with noise barriers and ranked by Prioritisation Score are listed in Appendix E. These same clusters are also listed in Appendix F, sorted by Road Number and chainage. Table 7.3 contains a summary of the distribution of Prioritisation Scores assigned to the clusters.

**Table 7.3 - Distribution of prioritisation scores**

Prioritisation Score	Number of Clusters
> 1000	1
701 - 1000	3
401 - 700	6
201 - 400	16
102 - 200	26
< 100	22

An estimate of the cost of noise barriers required to treat the cluster has been made. It is important to note that the noise barrier heights used to calculate the treatment cost are an estimate only, based on the assumptions described in Section 5. As noise barrier requirements are strongly influenced by factors such as topography, a detailed road traffic noise assessment is required to determine the actual noise barrier requirements for these sections of road.

These sections of road should undergo a more detailed assessment to determine more accurately the future road traffic noise levels and the attenuation treatments required to achieve the departmental criterion level

## 8 Conclusions

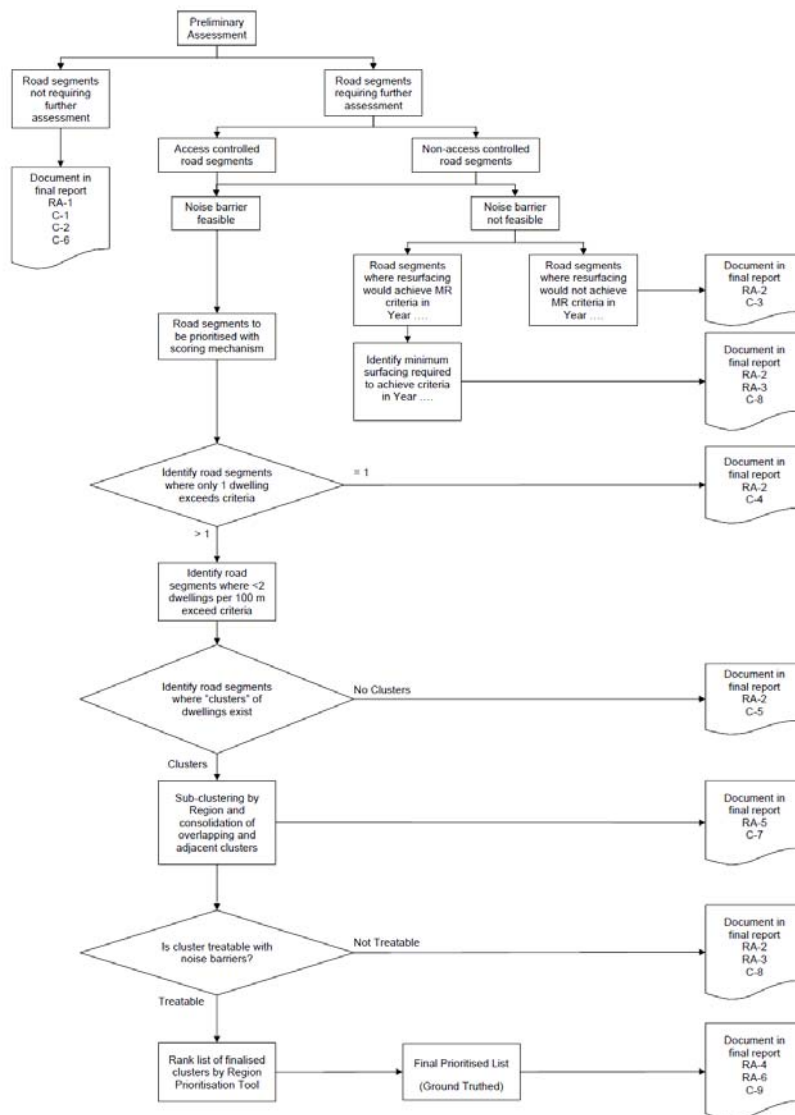
[Consultant] has been engaged to develop this Regional Road Traffic Noise Management Strategy (RRTNMS) for [Region] in accordance with the Department’s *Road Traffic Noise Management: Code of Practice* (CoP) to quantify the current and future noise levels for existing dwellings adjacent to State-controlled roads within [Region]. All other noise sensitive land uses are outside the scope of this assessment.

Road segments and clusters for which noise barriers are not a viable treatment option are listed in Appendix D. For these areas, resurfacing has been assessed as a possible treatment option. Where

resurfacing of the road is able to achieve the Department's criterion level, the minimum pavement surface requirements have been listed depending on the limitations attached to available funding e.g. element management funding is only for noise barriers. Where resurfacing is not able to meet the criterion level, the predicted noise level with a quieter pavement surface (e.g. open graded asphalt) has been provided.

Appendix E contains the list of access-controlled clusters ranked by Prioritisation Score (highest priority at top). These sections of road should undergo a more detailed assessment to determine more accurately the future road traffic noise levels and the attenuation treatments required to achieve the Department's criterion level.

### Road Traffic Noise Management Strategy Development Flow Chart



Recommended Action (RA)	Comments (C)
No further action required	Predicted [Year] noise level Transport and Main Roads criterion level
Monitor by complaint where considered necessary	No dwellings exceeding the Transport and Main Roads Criterion level
Input to Rehabilitation Works Program	No feasible treatment option in road reserve
Further Assessment Required based on priority	Only 1 dwelling exceeding the Transport and Main Roads criterion level
Refer to Appendix C for identified clusters	Number of dwellings exceeding the criterion level is less than 2 per 100 m and/or no clusters identified
Refer to Appendix E for priority for conducting further Investigation	On "Roads Implementation Program"
	Refer to Appendix C for clusters identified in road segment
	Resurfacing is a possible treatment option (refer to Appendix D) as noise barrier not feasible
	Refer to Priority List for ranking (Appendix E)

CORTN Modelling Predictions for all Road Segments

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CORTN MODELLING PREDICTIONS FOR ALL ROAD SEGMENTS

Road No	Road	Road Segment	Segment Start	Segment End	Segment Length (km)	AADT (2000)	%CV	Posted Speed Limit (km/h)	Growth Rate	Lockout Road	Work Category	Predicted L <sub>50</sub> (dB) at 50 m			No of Overlays Exceeding 68 dBA	Access Control	Recommended Action	Comments
												2004	2009	2014				
10A	Bunce Highway (Bidacore - Oymple)	Rd 485 Keworth-Spring Cr Rd to Trevelyan Rd	121.06	121.83	0.87	92,100	19%	100	4%	SMA	Roading	73	74	75	71	0	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Rd 485 Keworth-Spring Cr Rd to Trevelyan Rd	121.83	122.53	0.80	92,100	19%	100	4%	SMA	Roading	73	74	75	71	2	RA-2	C-5
10A	Bunce Highway (Bidacore - Oymple)	Rd 485 Keworth-Spring Cr Rd to Trevelyan Rd	122.53	123.78	1.25	121,000	19%	100	4%	SMA	Roading	73	74	75	71	0	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Rd 485 Keworth-Spring Cr Rd to Trevelyan Rd	123.78	124.18	0.40	92,100	19%	100	4%	SMA	Roading	73	74	75	71	1	RA-2	C-4
10A	Bunce Highway (Bidacore - Oymple)	Rd 485 Keworth-Spring Cr Rd to Trevelyan Rd	124.18	125.35	1.17	92,100	19%	100	4%	SMA	Roading	73	74	75	71	0	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Rd 485 Keworth-Spring Cr Rd to Trevelyan Rd	125.35	127.13	1.78	92,100	19%	100	4%	SMA	Roading	73	74	75	71	4	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Trevelyan Rd to Rd 143 Tr. Can Way Rd (DYMARE) [100mth section]	127.13	129.08	1.95	13,400	17%	100	5%	SMA	Roading	79	80	81	248	0	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Trevelyan Rd to Rd 143 Tr. Can Way Rd (DYMARE) [100mth section]	129.08	133.75	4.67	13,400	17%	100	5%	SMA	Roading	79	80	81	248	12	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Trevelyan Rd to Rd 143 Tr. Can Way Rd (DYMARE) [100mth section]	133.75	135.46	1.71	13,400	17%	100	5%	SMA	Roading	79	80	81	248	0	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Trevelyan Rd to Rd 143 Tr. Can Way Rd (DYMARE) [100mth section]	135.46	139.20	3.74	13,400	17%	100	5%	SMA	Roading	79	80	81	248	17	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Trevelyan Rd to Rd 143 Tr. Can Way Rd (DYMARE) [100mth section]	139.20	140.43	1.23	13,400	17%	100	5%	SMA	Roading	79	80	81	248	0	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Trevelyan Rd to Rd 143 Tr. Can Way Rd (DYMARE) [100mth section]	140.43	141.26	0.83	13,400	17%	80	5%	DOA	Roading	79	73	74	61	4	RA-2	C-5
10A	Bunce Highway (Bidacore - Oymple)	Rd 143 Tr. Can Way Rd (DYMARE) to Rd 483M Pleasant Rd	141.26	143.57	2.31	14,500	17%	80	5%	DOA	Roading	73	74	75	103	39	RA-1	C-2
10A	Bunce Highway (Bidacore - Oymple)	Rd 483M Pleasant Rd to Excelsior Rd (80mth section)	143.57	144.25	0.68	16,800	15%	80	5%	SMA	Roading	73	74	75	69	10	RA-5	C-7
10A	Bunce Highway (Bidacore - Oymple)	Rd 483M Pleasant Rd to Excelsior Rd (80mth section)	144.25	144.50	0.27	16,800	15%	80	5%	DOA	Roading	73	74	75	76	1	RA-2	C-4
10A	Bunce Highway (Bidacore - Oymple)	Excelsior Rd to Mt of Iron to Bear Rd	144.50	145.26	0.76	20,200	13%	60	5%	DOA	Roading	74	75	76	84	40	RA-2	C-4
10A	Bunce Highway (Bidacore - Oymple)	Excelsior Rd to Mt of Iron to Bear Rd	145.26	145.68	0.41	14,300	18%	60	5%	DOA	Roading	73	74	75	72	4	RA-2	C-5
10B	Bunce Highway (Oymple - Mayponough)	NR 019 Bear Rd to Rd 8002 Moulden St - Rd 100	2.00	2.23	0.23	9,300	14%	60	5%	DOA	Roading	73	74	75	82	13	RA-2	C-3
10B	Bunce Highway (Oymple - Mayponough)	Rd 8002 Moulden St - Rd 100 to Rd 1411 Oymple Connection Rd	2.23	1.62	-0.61	16,600	14%	60	5%	DOA	Roading	73	74	75	73	59	RA-2	C-3
10B	Bunce Highway (Oymple - Mayponough)	Rd 1411 Oymple Connection Rd to Chatsworth Rd	1.62	1.97	0.35	12,000	16%	60	5%	DOA	Roading	72	73	74	59	22	RA-2	C-3
10B	Bunce Highway (Oymple - Mayponough)	Chatsworth Rd to Reynolds Rd (100mth section)	1.97	2.15	0.18	12,000	16%	60	5%	DOA	Roading	72	73	74	59	1	RA-2	C-3
10B	Bunce Highway (Oymple - Mayponough)	Chatsworth Rd to Reynolds Rd (100mth section)	2.15	3.08	0.93	12,000	16%	60	5%	DOA	Roading	72	74	75	79	0	RA-1	C-2
10B	Bunce Highway (Oymple - Mayponough)	Chatsworth Rd to Reynolds Rd (100mth section)	3.08	3.61	0.52	12,000	16%	60	5%	DOA	Roading	75	76	77	105	0	RA-1	C-2
10B	Bunce Highway (Oymple - Mayponough)	Chatsworth Rd to Reynolds Rd (100mth section)	3.61	7.14	3.53	12,000	16%	100	5%	SMA	Roading	73	74	75	72	10	RA-2	C-5
10B	Bunce Highway (Oymple - Mayponough)	Reynolds Rd (100mth section) to Rd 44A Wide Bay Hwy	7.14	8.36	1.22	10,500	18%	100	6%	SMA	Roading	72	74	75	74	7	RA-2	C-5
10B	Bunce Highway (Oymple - Mayponough)	Reynolds Rd (100mth section) to Rd 44A Wide Bay Hwy	8.36	12.21	3.85	10,500	18%	100	6%	SMA	Roading	72	74	75	74	0	RA-1	C-2
10B	Bunce Highway (Oymple - Mayponough)	Rd 44A Wide Bay Hwy to Coobool Shear/Sea Shore Boundary	12.21	14.03	1.82	8,000	19%	100	6%	SMA	Roading	78	79	80	196	4	RA-2	C-5
40A	Djulgall Highway (Caboolture - Kiooy)	Old Oymple Rd to Rd 9002 Caboolture Connection Rd (80mth section)	5.00	1.52	-3.48	5,200	14%	60	4%	SMA	Roading	66	67	67	500	0	RA-1	C-1, C-2, C-4
40A	Djulgall Highway (Caboolture - Kiooy)	Old Oymple Rd to Rd 9002 Caboolture Connection Rd (80mth section)	1.52	2.71	1.19	5,200	14%	60	4%	SMA	Roading	67	68	69	23	0	RA-1	C-4
40A	Djulgall Highway (Caboolture - Kiooy)	Old Oymple Rd to Rd 9002 Caboolture Connection Rd (80mth section)	2.71	4.15	1.44	5,200	14%	60	4%	SMA	Roading	67	68	69	23	0	RA-1	C-4
40A	Djulgall Highway (Caboolture - Kiooy)	Rd 9002 Caboolture Connection Rd to Cambridge Pocket Rd (80mth section)	4.15	5.09	0.94	9,400	13%	80	4%	10-14mm Blumens Spray Seal	Roading	76	77	77	116	0	RA-1	C-6
40A	Djulgall Highway (Caboolture - Kiooy)	Rd 9002 Caboolture Connection Rd to Cambridge Pocket Rd (100mth section)	5.09	5.33	0.24	9,400	13%	100	4%	10-14mm Blumens Spray Seal	Roading	77	78	79	156	0	RA-1	C-6
40A	Djulgall Highway (Caboolture - Kiooy)	Rd 9002 Caboolture Connection Rd to Cambridge Pocket Rd (100mth section)	5.33	7.39	2.06	9,400	13%	100	4%	10-14mm Blumens Spray Seal	Roading	77	78	79	156	17	RA-1	C-6
40A	Djulgall Highway (Caboolture - Kiooy)	Rd 9002 Caboolture Connection Rd to Cambridge Pocket Rd (80mth section)	7.39	8.52	1.13	9,400	13%	80	4%	DOA	Roading	76	77	77	118	17	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Rd 9002 Caboolture Connection Rd to Cambridge Pocket Rd (80mth section)	8.52	8.90	0.38	9,400	13%	80	4%	DOA	Roading	70	71	71	37	0	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Rd 9002 Caboolture Connection Rd to Cambridge Pocket Rd (80mth section)	8.90	9.19	0.29	9,400	13%	80	4%	DOA	Roading	68	69	70	27	0	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Rd 9002 Caboolture Connection Rd to Cambridge Pocket Rd (80mth section)	9.19	9.46	0.27	9,400	13%	60	4%	DOA	Roading	68	69	70	27	3	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (80mth section)	9.46	9.86	0.39	7,300	14%	60	4%	DOA	Roading	67	68	69	22	1	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (80mth section)	9.86	10.25	0.39	7,300	14%	60	4%	DOA	Roading	67	68	69	22	0	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	10.25	12.98	2.73	7,300	14%	100	4%	DOA	Roading	70	71	72	41	0	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	12.98	14.25	1.27	7,300	14%	100	4%	DOA	Roading	72	73	74	61	6	RA-2	C-5
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	14.25	15.14	0.89	7,300	14%	100	4%	DOA	Roading	72	73	74	61	0	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	15.14	15.54	0.40	7,300	14%	100	4%	DOA	Roading	70	71	72	41	1	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	15.54	17.85	2.31	7,300	14%	100	4%	DOA	Roading	71	72	73	50	0	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	17.85	18.15	0.30	7,300	14%	100	4%	SMA	Roading	71	72	73	50	1	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	18.15	19.37	1.22	7,300	14%	100	4%	10-14mm Blumens Spray Seal	Roading	76	77	77	117	24	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	19.37	20.44	1.07	7,300	14%	100	4%	10-14mm Blumens Spray Seal	Roading	76	77	78	130	7	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	20.44	21.14	0.70	7,300	14%	100	4%	DOA	Roading	72	73	74	61	0	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	21.14	22.04	0.90	7,300	14%	100	4%	DOA	Roading	76	77	78	130	7	RA-2	C-3
40A	Djulgall Highway (Caboolture - Kiooy)	Cambridge Pocket Rd to Woodford-Neurum Rd/Acher St (100mth section)	22.04	23.88	1.84	7,300	14%	60	4%	10-14mm Blumens Spray Seal	Roading	73	74	75	72	56	RA-1	C-2
40A	Djulgall Highway (Caboolture - Kiooy)	Woodford-Neurum Rd/Acher St to Rd 487 Kiooy-Bearwah Rd	23.88	24.57	0.69	4,000	14%	100	3%	DOA	Roading	74	75	76	82	0	RA-1	C-2

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**Appendix D**  
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**ROAD SEGMENTS WITH RESURFACING AS ONLY TREATMENT OPTION**

Road No	Road	Road Segment	Start Change	End Change	Assessed Length (km)	Distance (m)	Predicted LA <sub>10th</sub> (h) with Existing Pavement			No of Dwellings with 68 dBA	Road Surface at Primary Assessment	Minimum Surface Required to Achieve Criteria in Year 2014
							2004	2009	2014			
138	Yandina-Coolburn Road	Yandina Rd to Tooborough Rd	6.85	9.28	2.43	20	72	74	75	10	10 - 14 mm Blurred Spurry Seal	Predicted to not achieve criteria with current available pavement surface type. 68 dBA with Low Noise Pavement.
138	Yandina-Coolburn Road	Tooborough Rd to Rd 133 (COOL LUM)	14.75	15.50	0.75	20	68	70	71	3	SMA	Predicted to not achieve criteria with current available pavement surface type. 71 dBA with Low Noise Pavement.
138	Yandina-Coolburn Road	Sherwood/Sherburn, Coolburn Rd to Rd 133 (COOL LUM)	17.08	18.57	1.49	20	67	68	69	52	DDA	Low Noise Pavement (eg DDA)
141	Kiri Kiri Road	Summit Rd to Rd 142 Coony Connection Rd (100km/h section)	50.50	50.60	0.40	20	70	71	72	1	DDA	DDA
145	Coony Connection Road	Rd 142 Coony-Abosha Rd to Parsons Rd	1.96	3.09	1.13	20	67	69	70	19	DDA	Low Noise Pavement (eg DDA)
153	Nicklin Way	Raeburn St to Balala St/Budburin St	2.80	3.21	1.14	20	74	74	75	51	DDA	Predicted to not achieve criteria with current available pavement surface type. 75 dBA with Low Noise Pavement.
153	Nicklin Way	Railers St/Budburin St to Ering St	3.21	3.74	0.53	20	75	76	78	50	DDA	Predicted to not achieve criteria with current available pavement surface type. 78 dBA with Low Noise Pavement.
153	Nicklin Way	Ering St to Pringa St/Burne St	3.74	4.89	1.15	20	74	75	77	109	DDA	Predicted to not achieve criteria with current available pavement surface type. 75 dBA with Low Noise Pavement.
153	Nicklin Way	Pringa St/Burne St to Meridian St/Burne St	4.89	6.37	2.14	20	75	76	77	82	DDA	Predicted to not achieve criteria with current available pavement surface type. 75 dBA with Low Noise Pavement.
153	Nicklin Way	Meridian St/Burne St to Kewena Island Boulevard/Walkena Dr Kewena Island Boulevard/Parsons Dr to Marawa Drive/Point Cartwright Dr	7.16	10.97	4.88	20	75	76	77	682	DDA	Predicted to not achieve criteria with current available pavement surface type. 75 dBA with Low Noise Pavement.
153	Nicklin Way	Marawa Drive/Point Cartwright Dr to Kensington Drive/Jessica Boulevard	11.56	11.83	0.38	55	69	70	71	10	SMA	Predicted to not achieve criteria with current available pavement surface type. 71 dBA with Low Noise Pavement.
406	Burpengary-Caboobure Road	Rd 807/Aquatic Dr to Graham Rd (80km/h section)	1.18	2.19	1.01	20	71	71	72	7	SMA	Predicted to not achieve criteria with current available pavement surface type. 72 dBA with Low Noise Pavement.
406	Burpengary-Caboobure Road	Church St to Elliot St/Burne Av	6.26	7.14	1.52	20	73	75	76	65	DDA	Predicted to not achieve criteria with current available pavement surface type. 74 dBA with Low Noise Pavement.
483	Gympie-Brookes Road	Nicklin Ck Rd to Medallion/Hackthorn Rd (100km/h section)	11.66	12.06	0.40	20	69	70	71	1	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
483	Gympie-Brookes Road	Dobson Rd (To Bruce Highway) to Kandranga-Inal Rd	20.96	21.26	0.30	20	68	69	69	1	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
483	Gympie-Brookes Road	Dobson Rd (To Bruce Highway) to Kandranga-Inal Rd	22.32	22.72	0.40	20	68	69	69	1	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
484	Eumundi-Keweenaw Road	Riviera Rd to Rd 485 Keweenaw/Sydney Ck Rd Access Rd/Rd 485	16.37	18.77	0.40	20	70	71	72	2	16 - 20 mm Blurred Spurry Seal	10 - 14 mm Spurry Seal
484	Eumundi-Keweenaw Road	Rd 485 Keweenaw/Sydney Ck Rd Access Rd/Rd 485 to Rd 482 Old Ode Rd	17.86	18.50	0.55	20	68	70	70	1	16 - 20 mm Blurred Spurry Seal	10 - 14 mm Spurry Seal
484	Eumundi-Keweenaw Road	Rd 485 Keweenaw/Sydney Ck Rd Access Rd/Rd 485 to Rd 482 Old Ode Rd	30.29	30.47	0.25	20	68	70	70	1	16 - 20 mm Blurred Spurry Seal	10 - 14 mm Spurry Seal
489	Nambour Connection Road	Riviera St to McKewen Rd (80km/h section)	3.81	4.01	0.40	20	72	72	73	20	SMA	Predicted to not achieve criteria with current available pavement surface type. 73 dBA with Low Noise Pavement.
489	Nambour Connection Road	McKewen Rd to Avondale Av/Para Rd (80km/h section)	6.82	7.12	0.40	20	71	71	71	13	SMA	Predicted to not achieve criteria with current available pavement surface type. 71 dBA with Low Noise Pavement.
489	Nambour Connection Road	On Ramp to Rd 10A SR to End of Road/Start of Rd 907 (80km/h section)	19.28	19.53	0.35	20	75	75	76	3	DDA	Predicted to not achieve criteria with current available pavement surface type. 76 dBA with Low Noise Pavement.
490	Gleashouse Mountains Road	SF Access to Caboobure St to Rd 490B Mooroolbath Connection Rd (100km/h section)	22.29	22.72	0.50	20	75	76	76	3	DDA	Predicted to not achieve criteria with current available pavement surface type. 76 dBA with Low Noise Pavement.
490	Gleashouse Mountains Road	SF Access to Caboobure St to Rd 490B Mooroolbath Connection Rd (100km/h section)	26.50	26.64	0.14	20	75	76	78	1	DDA	Predicted to not achieve criteria with current available pavement surface type. 78 dBA with Low Noise Pavement.
492	Kooye-Bawean Road	Peachester Road/Para Rd to Old Gympie Rd (100km/h section)	22.70	24.10	1.40	20	74	74	75	8	10 - 14 mm Blurred Spurry Seal	5mm Spurry Seal
494	Landsborough-Maley Road	Gympie St to Old Gympie Rd to Mountain View Rd (80km/h section)	1.42	1.82	0.40	20	71	71	71	1	10 - 14 mm Blurred Spurry Seal	5mm Spurry Seal
494	Landsborough-Maley Road	Mountain View Rd to Rd 487 Maley-Mountville Rd	10.58	10.84	0.35	20	72	73	74	6	10 - 14 mm Blurred Spurry Seal	Low Noise Pavement (eg DDA)
494	Landsborough-Maley Road	Rd 487 Maley-Mountville Rd to Bunyols St (80km/h section)	14.12	14.36	0.24	20	71	72	73	3	10 - 14 mm Blurred Spurry Seal	Low Noise Pavement (eg DDA)
495	Maley-Mountville Road	Road St to Villa Rd (80km/h section)	1.30	1.40	0.10	20	69	69	69	3	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
496	Nambour-Magilton Road	Hospital Rd to Parsons St/Stray Rd Rd	1.84	2.42	0.58	20	69	70	70	28	DDA	Low Noise Pavement (eg DDA)
496	Nambour-Magilton Road	Center Rd to Savelle Rd	2.99	4.08	1.07	20	68	69	70	59	DDA	Low Noise Pavement (eg DDA)
496	Nambour-Magilton Road	Services Rd to Dulung Rd/lookout (80km/h section)	5.20	6.00	0.80	20	68	69	70	7	DDA	Low Noise Pavement (eg DDA)
497	Maley-Mountville Road	Rd 494 Landsborough-Maley Rd to Rd 498/Rd 498 (80km/h section)	0.00	0.87	0.87	20	69	69	70	8	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
497	Maley-Mountville Road	Rd 494 Landsborough-Maley Rd to Rd 498/Rd 498 (70km/h section)	7.85	8.30	0.45	20	68	69	69	6	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
497	Maley-Mountville Road	Rd 494 Landsborough-Maley Rd to Rd 498/Rd 498 (70km/h section)	8.75	9.05	0.40	20	68	69	69	7	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
498	Woombie-Mountville Road	Start Northern Roundabout to Access Rd - One Way	0.23	0.59	0.36	20	69	70	71	7	DDA	Predicted to not achieve criteria with current available pavement surface type. 69 dBA with Low Noise Pavement.
498	Woombie-Mountville Road	Access Rd - One Way to Frewell St (80km/h section)	0.59	0.78	0.19	20	68	70	71	1	DDA	Predicted to not achieve criteria with current available pavement surface type. 68 dBA with Low Noise Pavement.
498	Woombie-Mountville Road	Access Rd - One Way to Frewell St (80km/h section)	2.18	2.83	1.25	20	71	72	73	31	DDA	Predicted to not achieve criteria with current available pavement surface type. 71 dBA with Low Noise Pavement.
498	Woombie-Mountville Road	Access Rd - One Way to Frewell St (80km/h section)	3.15	3.79	0.64	20	69	70	71	24	DDA	Predicted to not achieve criteria with current available pavement surface type. 69 dBA with Low Noise Pavement.
498	Woombie-Mountville Road	Frewell St to Hunchy Rd	3.79	5.70	1.91	20	68	69	70	4	5 mm Blurred Spurry Seal	Low Noise Pavement (eg DDA)
499	Mountville-Magilton Road	Rd 498 - Rd 497 to Rd 492 - Rd 498 (MAPLETON (80km/h section))	8.14	8.18	0.54	20	67	68	69	13	DDA	Low Noise Pavement (eg DDA)
901	Burpengary Service Road	Station Road Roundabout to Rd 498 Burpengary-Caboobure Rd (80km/h section)	3.27	3.67	0.50	20	70	70	70	1	DDA	Low Noise Pavement (eg DDA)
1305	Yandina-El Rd Road	Yee Rd to Camp Rd/Rd 10 (100km/h section)	8.27	8.67	0.50	20	64	67	68	1	10 - 14 mm Blurred Spurry Seal	7mm Spurry Seal
1421	Bowen Point-Tewantin Road	Pioneer Rd to Rd 141 Kiri Kiri Road (80km/h section)	2.95	3.30	0.35	20	68	69	71	9	10 - 14 mm Blurred Spurry Seal	5mm Spurry Seal
1421	Bowen Point-Tewantin Road	Ringtail Ck Rd to Lake Doonabin Rd	6.76	7.16	0.40	20	69	71	72	4	10 - 14 mm Blurred Spurry Seal	DDA
4006	Gympie-Woolloga Road	Ringtail Ck Rd to Lake Doonabin Rd	8.43	8.88	1.46	20	69	71	72	4	10 - 14 mm Blurred Spurry Seal	DDA
4006	Gympie-Woolloga Road	Rd 10A/Rd 10B - Monkland St to Shurrin Rd (80km/h section)	0.00	0.27	0.27	20	69	69	70	7	DDA	Low Noise Pavement (eg DDA)
4006	Gympie-Woolloga Road	Rd 10A/Rd 10B - Monkland St to Shurrin Rd (70km/h section)	0.50	0.70	0.20	20	70	70	70	1	DDA	Low Noise Pavement (eg DDA)
4006	Gympie-Woolloga Road	Rd 10A/Rd 10B - Monkland St to Shurrin Rd (80km/h section)	0.70	0.80	0.10	20	69	68	68	1	DDA	Low Noise Pavement (eg DDA)
4006	Gympie-Woolloga Road	Rennery Rd to Rd Ck Rd	1.33	1.43	0.10	20	68	68	68	1	DDA	Low Noise Pavement (eg DDA)

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**PRIORITY LIST RANKED BY PRIORITY**

Road No	Road	Road Segment	Start Change	End Change	Assessed Length (m)	ADT (2003)	%CV	Posted Speed Limit	Growth Rate	Assessed Road Surface	Assessed Gradient Category	Distance to Dwelling	Cluster Provided at Nearest Dwelling (m)			Forecasting Score	Forecasting Ranking	Estimated Height (m)	Estimated Noise Treatment Costs (\$)	
													2004	2009	2014					
153	Nackin Way	Pringa St/Aruva St to Meridian St/Beach Dr	4.95	5.74	1.16	38,000	5%	70	5%	DGA	Level	20	75	76	77	163	1	4	\$1,362,000	
153	Nackin Way	Kawera Island Boulevard/Palena Dr to Marawa Dr/Point Cartwright Dr	9.44	10.00	0.66	44,000	4%	70	5%	DGA	Level	20	75	76	77	62	2	4	\$792,000	
490	Gleashouse Mountains Road	Road 490/Maunawatu St to Rd 492/Maunawatu St	13.52	13.82	0.50	10,500	12%	100	5%	10 - 14 mm Blumens Spray Seal	Rolling	20	78	79	80	33	3	5	\$750,000	
490	Gleashouse Mountains Road	Road 490/Maunawatu St to Rd 494/Harwood Rd (100m section)	18.25	18.80	0.65	11,400	9%	100	7%	10 - 14 mm Blumens Spray Seal	Rolling	20	78	79	81	38	4	5	\$870,000	
153	Nackin Way	Meridian St/Beach Dr to Kawera Island Boulevard/Palena Dr	6.98	7.16	0.28	42,200	3%	70	5%	DGA	Level	20	75	76	77	20	643	5	4	\$336,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 130 Nambour-BI Rd to Parklands Interchange	80.58	80.98	0.40	24,900	13%	110	9%	SMA	Rolling	30	74	76	77	25	605	6	4	\$480,000
132	Colbourne Road	Rd 153 Nackin Way to West Tool/Balchin St	8.43	8.68	0.36	33,200	6%	60	6%	5 mm Blumens Spray Seal	Level	20	74	76	77	28	591	7	4	\$420,000
490	Gleashouse Mountains Road	Rd 492/Maunawatu St to Rd 494/Harwood Rd (100m section)	10.94	11.27	0.43	44,000	4%	70	5%	DGA	Level	20	75	76	77	25	583	8	5	\$1,275,000
153	Nackin Way	Kawera Island Boulevard/Palena Dr to Marawa Dr/Point Cartwright Dr	10.94	11.27	0.43	44,000	4%	70	5%	DGA	Level	20	75	76	77	25	583	9	4	\$516,000
153	Nackin Way	Brisbane Rd On Ramp to Mooloolah River - Sh/Abut (70m/h section)	12.31	12.42	0.21	39,200	9%	70	6%	SMA	Level	20	73	74	76	12	457	10	4	\$920,000
490	Gleashouse Mountains Road	Road 490/Maunawatu St to Rd 492/Maunawatu St	11.05	11.45	0.20	10,500	12%	100	5%	10 - 14 mm Blumens Spray Seal	Rolling	35	75	76	77	21	378	11	4	\$600,000
490	Gleashouse Mountains Road	Rd 492/Maunawatu St to Rd 494/Harwood Rd (100m section)	19.20	19.80	0.80	11,400	9%	100	7%	10 - 14 mm Blumens Spray Seal	Rolling	20	78	79	81	21	341	12	5	\$1,200,000
153	Nackin Way	Beaumaris St to Belara St/Balchin St	4.40	2.88	0.76	29,500	5%	70	3%	DGA	Rolling	20	74	74	75	37	322	13	4	\$886,000
132	Colbourne Road	Parklands Blvd/Phoebe Av to Sugar Bag Rd (100m section)	2.50	7.04	4.08	28,500	6%	80	6%	DGA	Mountainous	20	77	78	79	106	285	14	4	\$4,908,000
133	Maccoydyone-Noise Road	Mudjimba Beach Rd to Warren Rd (80m/h section)	19.22	19.52	0.70	13,950	5%	80	5%	DGA	Level	20	71	72	73	39	279	15	3	\$930,000
40A	D'Aguilar Highway (Caboolture - Kiloys)	Cambella Pocket Rd to Woodford-Neuman Rd/Phoebe St (80m/h section)	22.30	23.00	1.45	7,300	14%	60	4%	10 - 14 mm Blumens Spray Seal	Rolling	20	73	74	75	55	268	16	4	\$1,740,000
490	Gleashouse Mountains Road	Road 490/Maunawatu St to Rd 492/Maunawatu St	15.02	15.42	0.50	10,500	12%	100	5%	10 - 14 mm Blumens Spray Seal	Rolling	20	78	79	80	11	264	17	5	\$750,000
134	Mooloolah Road	William St to Lindsay Rd/Balinger Rd (80m/h section)	3.20	3.53	0.43	15,500	6%	60	2%	DGA	Mountainous	20	72	72	73	22	256	18	3	\$387,000
10B	Bruce Highway (Brisbane - Meryborough)	Chatsworth Rd to Reynolds Rd/Hammill Rd (80m/h section)	1.74	1.97	0.33	12,000	16%	60	5%	DGA	Rolling	20	72	73	74	14	265	19	3	\$297,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 143 Tin Can Bay Rd (37M/PE) to Rd 483/Ma Pheasant Rd	142.50	143.35	0.95	14,500	17%	80	6%	DGA	Rolling	20	74	75	77	26	246	20	4	\$1,140,000
133	Maccoydyone-Noise Road	Rd 144 Enru Mountain Rd to Maccoydyone-Noise Shire Boundary (80m/h section)	27.37	28.10	0.83	13,650	5%	80	2%	DGA	Rolling	20	72	72	73	40	241	21	3	\$747,000
121	Deception Bay Road	Bay Av/Meriton Downs Dr to Webster Rd	5.32	7.07	2.65	29,850	3%	70	1%	DGA	Rolling	20	74	74	74	104	235	22	3	\$2,385,000
690S	Caboolture Connection Road	Webster Rd to Corn St North (70m/h section)	5.51	6.70	1.29	9,800	7%	70	9%	DGA	Rolling	20	72	72	73	60	233	23	3	\$1,161,000
10A	Bruce Highway (Brisbane - Oymylle)	Valley Dr/Shopping Centre Entrance to Rd 40A - D'Aguilar Highway (70m/h section)	102.60	103.50	1.10	12,400	19%	100	3%	DGA	Level	30	72	73	74	42	229	24	3	\$890,000
10A	Bruce Highway (Brisbane - Oymylle)	Parklands Interchange to Rd 130S Yendina-Coomah Rd	85.98	86.16	0.40	24,000	13%	110	4%	Concrete	Level	80	75	76	77	10	225	25	4	\$480,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 489 Nambour Connection Rd/Rd 136 Maccoydyone Rd to Rd 130 Nambour-BI Rd	77.64	78.74	1.20	22,400	15%	110	5%	10 - 14 mm Blumens Spray Seal	Rolling	40	79	80	81	20	217	26	5	\$1,860,000
10B	Bruce Highway (Oymylle - Meryborough)	Rd 141 Oymylle Connection Rd to Chatsworth Rd	0.60	1.10	0.60	16,600	14%	60	5%	DGA	Rolling	20	73	74	75	17	168	27	4	\$720,000
133	Maccoydyone-Noise Road	Mudjimba Beach Rd to Warren Rd (80m/h section)	16.42	16.72	0.40	13,650	5%	80	5%	5 mm Blumens Spray Seal	Level	20	72	73	74	13	195	28	3	\$960,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 150A Sunshine Motorway to Chevallum Rd/More Rd Overbridge	65.69	66.79	1.20	28,800	15%	110	9%	SMA	Rolling	20	77	78	80	19	190	29	5	\$1,890,000
1421	Brown Point-Tawarua Road	Lake Coorabrah Rd to Noosa Shire Council	11.98	12.31	0.45	4,900	8%	100	9%	10 - 14 mm Blumens Spray Seal	Level	20	73	75	77	9	180	30	4	\$540,000
490	Gleashouse Mountains Road	Road 490/Maunawatu St to Rd 492/Maunawatu St	12.85	13.10	0.35	10,500	12%	100	5%	10 - 14 mm Blumens Spray Seal	Rolling	35	75	76	77	7	180	31	4	\$420,000
136	Maccoydyone Road	Main Rd/Chick St to Balmuccia Rd/Phoebe St	9.00	9.82	1.02	29,700	3%	60	6%	DGA	Rolling	20	73	74	75	26	178	32	4	\$1,254,000
133	Maccoydyone-Noise Road	Mudjimba Beach Rd to Warren Rd (80m/h section)	17.46	18.24	0.88	13,950	5%	80	5%	5 mm Blumens Spray Seal	Level	20	72	73	74	24	164	33	3	\$792,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 489 Nambour Connection Rd/Rd 136 Maccoydyone Rd to Rd 130 Nambour-BI Rd	75.41	76.31	1.00	22,400	15%	110	5%	10 - 14 mm Blumens Spray Seal	Rolling	60	77	78	79	14	154	34	4	\$1,200,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 150A Sunshine Motorway to Chevallum Rd/More Rd Overbridge	70.18	70.68	0.60	28,800	15%	110	9%	DGA	Rolling	35	74	76	77	10	150	35	4	\$720,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 483/Ma Pheasant Rd to Excelsior Rd (80m/h section)	143.65	143.85	0.30	16,800	15%	80	5%	SMA	Rolling	20	73	74	75	6	140	36	4	\$490,000
40A	D'Aguilar Highway (Caboolture - Kiloys)	Woodford-Neuman Rd/Abner St to Rd 492 Kiloys-Banweela Rd	24.68	25.23	0.65	4,600	14%	60	3%	10 - 14 mm Blumens Spray Seal	Rolling	35	72	72	73	18	138	37	3	\$585,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 143 Tin Can Bay Rd (37M/PE) to Rd 483/Ma Pheasant Rd	141.69	141.94	0.35	14,500	17%	80	6%	DGA	Rolling	25	71	72	74	8	137	38	3	\$315,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 484/PE 156 D'Aguilar Hwy/Caboolture-Brisbane Island Rd to Pumicestone Rd/Rd 120A (1.0km/h section)	27.44	28.14	0.80	46,000	11%	110	6%	DGA	Level	65	74	75	77	12	135	39	4	\$860,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 130 Nambour-BI Rd to Parklands Interchange	81.30	82.28	1.18	24,900	13%	110	9%	SMA	Mountainous	95	70	71	73	31	131	40	3	\$1,062,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 489 Nambour Connection Rd/Rd 136 Maccoydyone Rd to Rd 130 Nambour-BI Rd	74.30	75.20	1.60	22,400	15%	110	5%	DGA	Rolling	30	76	77	78	21	131	41	4	\$870,000
130	Nambour-BI Rd Road	Akswen Rd to Rd 130S Yendina-BI Rd (80m/h section)	7.03	7.50	0.97	11,600	7%	60	2%	DGA	Rolling	20	70	70	71	49	130	42	3	\$873,000
10A	Bruce Highway (Brisbane - Oymylle)	Rd 130S Yendina-BI Rd to Rd 133 Maccoydyone-Noise Rd (BI Rd)	67.33	68.23	1.00	28,800	15%	110	6%	SMA	Rolling	40	74	75	76	16	128	43	4	\$1,200,000
144	Enru Mountain Road	Rd 150B Motorway - Yaren Rd to Eumarella Rd (100m/h section)	1.74	1.89	0.25	10,150	7%	100	8%	16 - 20 mm Blumens Spray Seal	Level	130	68	70	72	8	128	44	3	\$225,000
10A	Bruce Highway (Brisbane - Oymylle)	Chevallum Rd/More Rd Overbridge to Rd 488 Nambour Connection Rd/Rd 136 Maccoydyone Rd	72.67	73.07	0.50	35,500	13%	110	7%	SMA	Rolling	40	75	76	77	7	128	45	4	\$600,000
126	Caboolture-Brisbane Island Road	Lake Rd/Phoebe St to Beaumaris Rd (100m/h section)	8.15	8.45	0.40	17,400	7%	100	6%	SMA	Level	20	72	74	75	7	123	46	4	\$480,000
489	Nambour Connection Road	Off Ramp from Rd 488 (Woombye-Mortville Rd) to Backall St (80m/h section)	2.79	3.61	0.86	17,700	6%	90	3%	SMA	Rolling	10	72	73	73	24	122	47	3	\$882,000
134	Mooloolah Road	Tawarua Rd/Tawarua Tourist Dr to William St (80m/h section)	2.11	2.99	1.30	5,150	6%	60	7%	10 - 14 mm Blumens Spray Seal	Mountainous	20	71	73	74	26	120	48	3	\$1,170,000



**Appendix F**  
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**PRIORITY LIST SORTED BY ROAD/CHAINAGE**

Road No	Road	Road Segment	Start Chainage	End Chainage	Assessed Length (km)	AAVT (2003)	%CV	Road Speed Limit	Growth Rate	Assessed Road Surface	Assessed Category	Distances to Dwellings (m)	Cluster Predicted at Nearest Dwelling (dBA)			No of Dwellings in DMA	Proficiency Scores	Proficiency Rating	Estimated Height (m)	Estimated Noise Treatment Costs
													2004	2009	2014					
10A	Bruce Highway (Brisbane - Oymale)	Rd 10A/Rd 128 D'Aguliar Hwy/Cabocharre-Erba Island Rd to Pumicestone Ruffs Rd (1.10km section)	26.40	26.95	0.65	46,500	11%	110	6%	DGA	Level	220	69	70	8	25	70	2	\$390,000	
10A	Bruce Highway (Brisbane - Oymale)	Rd 10A/Rd 128 D'Aguliar Hwy/Cabocharre-Erba Island Rd to Pumicestone Ruffs Rd (1.10km section)	27.44	28.14	0.80	46,500	11%	110	6%	DGA	Level	65	74	75	12	135	39	4	\$860,000	
10A	Bruce Highway (Brisbane - Oymale)	Pumicestone Ruffs Rd to Rd 160 Glasshouse Mountains Rd	29.70	30.20	0.60	42,000	11%	110	6%	DGA	Level	135	70	71	11	73	60	3	\$450,000	
10A	Bruce Highway (Brisbane - Oymale)	Rd 150A Sunshine Motorway to Chesham Rd/More Rd Overbridge	65.69	66.79	1.20	28,800	15%	110	6%	SMA	Riding	20	77	78	80	190	29	5	\$1,400,000	
10A	Bruce Highway (Brisbane - Oymale)	Rd 150A Sunshine Motorway to Chesham Rd/More Rd Overbridge	67.33	68.25	1.00	28,800	15%	110	6%	SMA	Riding	40	74	75	16	128	43	4	\$1,200,000	
10A	Bruce Highway (Brisbane - Oymale)	Rd 150A Sunshine Motorway to Chesham Rd/More Rd Overbridge	70.18	70.68	0.60	28,800	15%	110	6%	DGA	Riding	35	74	75	10	150	35	4	\$720,000	
10A	Bruce Highway (Brisbane - Oymale)	Chesham Rd/More Rd Overbridge to Rd 160 Glasshouse Mountains Rd	72.67	73.07	0.60	33,500	13%	110	7%	SMA	Riding	40	75	76	17	126	45	4	\$650,000	
10A	Bruce Highway (Brisbane - Oymale)	Rd 160 Glasshouse Mountains Rd to Rd 152 Nambour-Bl Rd	74.30	75.20	1.00	22,400	15%	110	5%	DGA	Riding	30	76	77	78	21	131	41	4	\$1,000,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 160 Glasshouse Mountains Rd to Rd 152 Nambour-Bl Rd	75.41	76.31	1.00	22,400	15%	110	5%	10 - 14 mm Blume Spray Seal	Riding	60	77	78	14	154	34	4	\$1,200,000	
10A	Bruce Highway (Brisbane - Oymale)	Rd 160 Glasshouse Mountains Rd to Rd 152 Nambour-Bl Rd	76.63	77.13	0.60	22,400	15%	110	5%	10 - 14 mm Blume Spray Seal	Riding	150	72	73	74	11	110	49	3	\$540,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 160 Glasshouse Mountains Rd to Rd 152 Nambour-Bl Rd	77.64	78.74	1.20	22,400	15%	110	5%	10 - 14 mm Blume Spray Seal	Riding	40	70	80	81	20	217	26	5	\$1,800,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 130 Nambour-Bl Rd to Parklands Interchange	80.58	80.88	0.40	24,800	13%	110	8%	SMA	Riding	30	74	75	78	25	695	6	4	\$480,000
10A	Bruce Highway (Brisbane - Oymale)	Parklands Interchange to Rd 130 Nambour-Bl Rd	81.30	82.28	1.18	24,800	13%	110	8%	SMA	Riding	80	70	71	73	31	131	40	3	\$1,080,000
10A	Bruce Highway (Brisbane - Oymale)	Parklands Interchange to Rd 130 Nambour-Bl Rd	82.70	84.45	2.65	24,800	13%	110	4%	Concrete	Level	80	75	76	77	31	105	50	4	\$3,180,000
10A	Bruce Highway (Brisbane - Oymale)	Parklands Interchange to Rd 130 Nambour-Bl Rd	86.88	88.18	0.40	24,800	13%	110	4%	Concrete	Level	80	75	76	77	10	225	25	4	\$480,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 145 Coony Connection Rd to (Cudgulla Dr)	102.60	103.50	1.10	12,000	18%	100	3%	DGA	Level	30	72	73	74	42	229	24	3	\$990,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 145 Coony Connection Rd to (Cudgulla Dr)	103.60	103.66	0.36	13,000	17%	100	5%	DGA	Level	20	73	74	75	2	39	65	4	\$432,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 143 Tin Can Bay Rd (DYMPE) to Rd 483M Pleasant Rd	141.69	141.94	0.35	14,500	17%	80	6%	DGA	Riding	25	71	72	74	8	137	38	3	\$115,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 143 Tin Can Bay Rd (DYMPE) to Rd 483M Pleasant Rd	142.50	143.38	0.95	14,500	17%	80	6%	DGA	Riding	20	74	75	77	26	246	20	4	\$1,140,000
10A	Bruce Highway (Brisbane - Oymale)	Rd 483M Pleasant Rd to Escalator Rd (Biberm section)	143.65	143.85	0.30	16,800	15%	80	5%	SMA	Riding	20	73	74	75	6	140	36	4	\$360,000
10B	Bruce Highway (Oymale - Maryborough)	Rd 1411 Oymale Connection Rd to Chesworth Rd	0.00	1.10	0.60	16,800	14%	80	5%	DGA	Riding	20	73	74	75	17	188	27	4	\$720,000
10B	Bruce Highway (Oymale - Maryborough)	Chesworth Rd to Reynolds Rd/Marud Rd (Biberm section)	1.74	1.87	0.33	12,000	16%	80	5%	DGA	Riding	20	72	73	74	14	255	19	3	\$290,000
10A	D'Aguliar Highway (Cabocharre - Kicoy)	Rd 902 Cabocharre Connection Rd to Camille Pocket Rd (100m section)	6.08	6.09	0.09	8,400	13%	100	4%	10 - 14 mm Blume Spray Seal	Riding	35	75	75	76	11	88	53	4	\$1,980,000
10A	D'Aguliar Highway (Cabocharre - Kicoy)	Camille Pocket Rd to Woodford-Hurum Rd/Wharfedale Rd (Biberm section)	22.30	23.00	1.45	7,300	14%	80	4%	10 - 14 mm Blume Spray Seal	Riding	20	73	74	75	55	295	16	4	\$1,740,000
10A	D'Aguliar Highway (Cabocharre - Kicoy)	Woodford-Hurum Rd/Wharfedale Rd to Rd 482 Kicoy-Meehan Rd	24.68	25.25	0.65	4,600	14%	100	3%	10 - 14 mm Blume Spray Seal	Riding	35	72	72	73	18	138	37	3	\$685,000
10A	D'Aguliar Highway (Cabocharre - Kicoy)	Rd 482 Kicoy-Meehan Rd to Kicoy Meat Works Entry	36.47	36.87	0.60	4,800	13%	100	4%	10 - 14 mm Blume Spray Seal	Riding	25	73	74	75	8	93	54	4	\$720,000
121	Deception Bay Road	Bay Av/Morton Downs Dr to Webster Rd	5.32	7.07	2.65	29,850	3%	70	1%	DGA	Riding	20	74	74	74	104	235	22	3	\$2,385,000
126	Cabocharre-Erba Island Road	Webster Rd to Cornin St North (P/C 2178) (70m section)	8.15	8.45	0.40	17,400	7%	100	6%	SMA	Level	20	72	74	75	7	123	46	4	\$480,000
126	Cabocharre-Erba Island Road	Lee Rd/Pear Rd to Beismann Rd (100m section)	9.81	10.16	0.45	17,400	7%	100	6%	SMA	Level	30	70	72	73	7	78	58	3	\$405,000
130	Nambour-Bl Rd	Alverson Rd to Rd 1305 Yandehra-Bl Rd (Biberm section)	7.03	7.50	0.97	11,600	7%	60	2%	DGA	Riding	20	70	70	71	42	130	42	3	\$873,000
132	Caloundra Road	Rd 1305 Yandehra-Bl Rd to Rd 133 Maryborough-Nooka Rd (Bl Rd)	4.50	7.04	4.09	29,500	6%	80	6%	DGA	Mountainous	20	77	78	79	108	285	14	4	\$4,908,000
132	Caloundra Road	Penrives Rd/Inverness Av to Sugar Bag Rd	6.41	7.75	1.64	10,800	3%	80	2%	DGA	Level	20	74	75	77	23	591	7	4	\$420,000
132	Caloundra Road	Sugar Bag Rd to Lachman Dr (70m section)	8.43	8.69	0.35	33,200	6%	80	2%	DGA	Riding	20	74	75	77	41	75	59	3	\$1,776,000
133	Maryborough-Noosa Road	Pinet Cr Rd to Shopping Centre (Biberm section)	16.42	16.72	0.40	13,850	5%	80	5%	5 mm Blume Spray Seal	Level	20	72	73	74	13	195	28	3	\$360,000
133	Maryborough-Noosa Road	Mudjimba Beach Rd to Warren Rd (Biberm section)	17.48	18.24	0.80	13,950	5%	80	5%	5 mm Blume Spray Seal	Level	20	72	73	74	24	164	33	3	\$792,000
133	Maryborough-Noosa Road	Mudjimba Beach Rd to Warren Rd (Biberm section)	18.28	19.25	0.70	13,950	5%	80	5%	DGA	Level	20	71	72	73	39	279	15	3	\$650,000
133	Maryborough-Noosa Road	Mudjimba Beach Rd to Warren Rd (Biberm section)	27.37	28.10	0.83	13,950	5%	80	2%	DGA	Riding	20	72	72	73	40	241	21	3	\$147,000
134	Maryborough-Noosa Road	Rd 144 Erba-Mountain Rd to Merooby Shore/Noosa Shore Boundary (Biberm section)	2.11	2.89	1.30	5,130	6%	80	7%	DGA	Mountainous	20	71	73	74	26	120	49	3	\$1,170,000
134	Maryborough-Noosa Road	Tannahill Dr/Tannahill Tourist Dr to William St (Biberm section)	3.20	3.83	0.43	15,000	6%	60	2%	DGA	Mountainous	20	72	72	73	22	258	18	3	\$387,000
134	Maryborough-Noosa Road	William St to Linsley Rd/Bellinger Rd (Biberm section)	9.70	10.30	1.30	20,400	3%	60	2%	DGA	Riding	10	71	72	72	33	102	52	3	\$1,170,000
135	Maryborough-Noosa Road	Eastern X-over to Pacific Tce	1.71	3.82	2.31	29,750	2%	60	3%	DGA	Level	20	72	72	73	41	89	55	3	\$2,079,000
136	Maryborough-Noosa Road	Shinn Av to Pacific Tce	9.00	9.82	1.02	29,700	3%	60	6%	DGA	Riding	20	73	74	75	28	178	32	4	\$1,254,000
142	Erba-Mountain Road	Pacific Tce to Rd 134 Maryborough Rd	0.28	0.61	0.45	7,400	7%	60	2%	DGA	Riding	10	69	68	69	12	27	69	2	\$270,000
144	Coony Mountain Road	Rd 145 COONY to South D'Aguliar Rd (Biberm section)	1.74	1.89	0.25	10,150	7%	100	8%	16 - 20 mm Blume Spray Seal	Level	130	60	70	72	8	128	44	3	\$255,000
153	Nicklin Way	Rd 105B Motorway - Yarrim Rd to Eumarella Rd (100m section)	2.40	2.88	0.78	26,000	5%	70	3%	DGA	Riding	20	74	74	75	37	329	13	4	\$990,000
153	Nicklin Way	Beermun St to Bealrae St/Budlem St	4.95	5.74	1.16	38,000	5%	70	5%	DGA	Level	20	75	76	77	163	1065	1	4	\$1,382,000
153	Nicklin Way	Prings St/Wharfedale St to Merdon St/Inverness Dr	6.98	7.16	0.29	42,300	5%	70	5%	DGA	Level	20	75	76	77	20	643	5	4	\$336,000
153	Nicklin Way	Merkins St/Beach Dr to Kewanna Island Boulevard/Parkers Dr	9.44	10.00	0.66	44,000	4%	70	5%	DGA	Level	20	75	76	77	62	845	2	4	\$792,000
153	Nicklin Way	Kewanna Island Boulevard/Parkers Dr to Meevals Dr/Point Cairnwright Dr	9.44	10.00	0.66	44,000	4%	70	5%	DGA	Level	20	75	76	77	62	845	2	4	\$792,000

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(20-1469) R2.DOC

**Appendix 8: Agreement with the Department for noise barrier works**

Job Name

Location

Job No.

THIS DEED is made by

Owners Name

\_\_\_\_\_  
("The Owner")

of

\_\_\_\_\_  
(Street Address of Property)

**RECITALS**

- a) The Owner is the registered owner/s of the land described in the attached Schedule ("the Land").
- b) The State of Queensland acting through the Department of Transport and Main Roads intends to construct and maintain a noise barrier on the existing fence line of the Land.
- c) The Owner has agreed to consent to the department entering onto the Land to remove the existing fence (if required) and to construct and maintain the noise barrier on the terms and conditions mentioned below

**THIS DEED WITNESSES**

**1. DEFINITIONS**

For the purpose of this Deed -

"Principal" means the State of Queensland (acting through the Department of Transport and Main Roads).

"Licence" means this document and all schedules attached to this document.

"Approved Works" means the approved noise barrier to be constructed on the property boundary alignment.

**2. GRANT OF LICENCE**

The Owner HEREBY GRANTS an irrevocable licence to the Principal together with its agents, servants, contractors and other authorised persons with or without necessary plant equipment and machinery, at any time, to enter upon and go to and from the Land and DOES HEREBY CONSENT to the said Principal, its agents, servants and contractors constructing and maintaining the Approved Works on the property boundary alignment and to do all such acts and things thereon as are reasonable and necessary to construct and maintain the said Approved Works.

**3. OWNERSHIP AND MAINTENANCE OF APPROVED WORKS**

The Principal is the owner of the Approved Works and shall be responsible for all the maintenance and repair of the Approved Works. The exceptions to this are:

- a) Any damage or unauthorised work caused by the owner, tenants or persons they have authorised to enter the property; and
- b) The painted surface of the noise barrier on the private property side of the barrier.

**4. CONDITIONS BINDING OWNER**

The Owner shall observe and comply with, and shall ensure that any tenant or lessee of the Land observes and complies with, the following conditions:

- a) No refurbishment of any type, or maintenance, to be carried out on any part, or section, of the Approved Works.
- b) No existing (or future planting of) vegetation is to obstruct the Principal, its agents, servants or contractors in undertaking maintenance of the Approved Works at any time.
- c) No building or structure of any type is to be erected within local government development restrictions to the Approved Works so as to hinder the Principal, its agents, servants or contractors in carrying out repairs or maintenance to the Approved Works or in a manner that may compromise the integrity of the noise barrier..

**5. NO PREJUDICE**

This licence shall not in any way prejudice or be construed as a waiver of any lawful cause of action that may arise for any damage or injury done or occasioned by means of or in consequence of the construction and carrying out of the said Approved Works.

EXECUTED AS A DEED:

SIGNED, SEALED AND DELIVERED by

\_\_\_\_\_

(Owner/s Name) \*

\_\_\_\_\_

(Owner/s Signature) \*

on the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

In the presence of:

\_\_\_\_\_

(Witness' Name)

\_\_\_\_\_

(Witness' Signature)

All registered owners must sign to provide a valid agreement. (Power of attorney must be attached if used).

## SCHEDULE


### Description of Owner's Land

**Lot: x, RPxxxxxx Parish of: xxxxxx, County of xxxxxx**

Design and Construction of the Noise Barriers will be undertaken in accordance with the Department of Transport and Main Roads Standard Specification, MRTS15 *Noise Fences*, and in accordance with the following drawings:

Doc Ref / Drawing No.	Rev	Title
MP-4-2-001	B	Gen. Layout, Locality Plan & Dwg Index
MP-4-2-002	C	Survey Station Details
MP-4-2-101	C	Noise Barrier Location Plan Sheet 1 of 4
MP-4-2-102	B	Noise Barrier Location Plan Sheet 2 of 4
MP-4-2-103	B	Noise Barrier Location Plan Sheet 3 of 4
MP-4-2-104	C	Noise Barrier Location Plan Sheet 4 of 4
MP-4-2-201	C	Noise Barrier Details Sheet 1 of 8
MP-4-2-202	D	Noise Barrier Details Sheet 2 of 8
MP-4-2-203	C	Noise Barrier Details Sheet 3 of 8
MP-4-2-204	C	Noise Barrier Details Sheet 4 of 8
MP-4-2-205	C	Noise Barrier Details Sheet 5 of 8
MP-4-2-206	B	Noise Barrier Details Sheet 6 of 8
MP-4-2-207	E	Noise Barrier Details Sheet 7 of 8
MP-4-2-208	C	Noise Barrier Details Sheet 8 of 8
MP-4-2-301	C	Noise Barrier Longitudinal Section Sheet 1 of 11
MP-4-2-302	C	Noise Barrier Longitudinal Section Sheet 2 of 11
MP-4-2-303	C	Noise Barrier Longitudinal Section Sheet 3 of 11
MP-4-2-304	C	Noise Barrier Longitudinal Section Sheet 4 of 11
MP-4-2-305	C	Noise Barrier Longitudinal Section Sheet 5 of 11
MP-4-2-306	C	Noise Barrier Longitudinal Section Sheet 6 of 11
MP-4-2-307	C	Noise Barrier Longitudinal Section Sheet 7 of 11
MP-4-2-308	C	Noise Barrier Longitudinal Section Sheet 8 of 11
MP-4-2-309	C	Noise Barrier Longitudinal Section Sheet 9 of 11
MP-4-2-310	C	Noise Barrier Longitudinal Section Sheet 10 of 11
MP-4-2-311	C	Noise Barrier Longitudinal Section Sheet 11 of 11

**Appendix 9: Agreement not to accept noise barrier offer**

<p><b>Agreement</b></p> <p>Department of Transport and Main Roads</p> 
---

The State of Queensland represented by the Department of Transport and Main Roads, (Region) has upgraded part of the (Road). This includes (Description and extent of road works).

The State has identified the Property described below as being eligible for attenuation treatment in the form of noise barriers as it exceeds the Criteria stated in *Transport Noise Management: Code of Practice*. The Owner enters into this Agreement with the State on the terms and conditions attached.

Item	Reference Schedule				
1.	Offer Date				
2.	State's Details				
	Addresses				
	Telephone		Facsimile		
	Position	The Regional Director			
	Email				
3.	Owner's Details <i>Parties to this Agreement must own the property or be authorised signatories of the Body Corporate and not be an occupant only – proof of ownership (copy of current rate account and photo ID) should be shown</i>				
	Name/s	(Insert full names)			
	Postal Address	House/Unit No. Street Name		State	
		Suburb			
		Postcode			
	Contact Numbers	Home			
		Work			
		Mobile			
Facsimile					
Email					
Authorised Representative (If applicable)	Name/s -				
	Contact Number -				
4.	Property Description <i>Details may be obtained from the local government rate notice produced by the Owner and should be verified by DTMR.</i>				
	Street Address	House/Unit No. Street Name		State	
		Suburb			

	Postcode						
	Lot	RP/SP/BUP			County	Parish	
	Title Reference			Name of Body Corporate (if applicable)			
5.	Property Type Tick the box following the most appropriate description of the structure to which works are to be conducted						
	Detached house	<input type="checkbox"/>	Townhouse	<input type="checkbox"/>	Apartment/ Unit	<input type="checkbox"/>	Other (describe below) <input type="checkbox"/>
6.	State's Offer: Construction of a noise barrier(s) in accordance with the road traffic noise assessment (Report)						
7.	<p>Property Owner's Choice:</p> <p>The owner(s) has requested that a noise barrier(s) not be constructed and accepts the following:</p> <p>That the Transport and Main Roads criteria will be exceeded with respect to their property; and</p> <p>That the building(s) on their property will not be eligible for an 'Exceptional Circumstances Classification' i.e. treatments outside the road corridor will not be provided.</p>						

**State's Offer**

The State offer is as noted in Item 6 in the Reference Schedule.

**Indemnity**

The Owner -

- a) indemnifies; and
- b) releases and discharges

the State from and against all actions, proceedings, claims, demands, costs, losses, damages and expenses which may be brought against the State, or which the State may pay, sustain or be put to by reason of, in consequence of or in connection with the impact of road traffic noise from the (Road) Project on the property.

**Affected Parties**

- This Clause 3 applies if the Property is part of a Community Titles Scheme.
- This Agreement is conditional upon the State receiving agreement from all Affected Parties on terms acceptable to the State regarding the (Road) In-house Treatment Project or carrying out the Works no later than 3 calendar months after the Commencement Date.
- The State agrees to notify the Owner no later than one month after the date referred to in Clause 3.2 as to whether this Agreement will proceed or otherwise pursuant to the condition in Clause 3.2.
- The date described in Clause 3.2 may be extended by the State by written notice to the Owner at any time.

- Despite Clause 3.2, the State may, at its own discretion, elect to proceed with this Agreement although it has not received agreement from all Affected Parties.

#### ***Advice of Completed Agreements***

- The State shall retain a data base of all properties where this type of agreement has been undertaken.
- If requested, Transport and Main Roads will advise a requestor that this type of agreement has been undertaken.

#### ***Notices***

- Notices under this Agreement may be delivered by hand, by registered mail, by facsimile or by email to the addresses specified in the Reference Schedule or any substitute address as may have been notified in writing by the relevant addressee from time to time.
- Notice is deemed to be given –
  - a) 2 Business Days after deposit in the mail with postage prepaid;
  - b) when delivered by hand; or
  - c) if sent by facsimile transmission, upon an apparently successful transmission being noted by the sender's facsimile machine prior to close of business at 5.00pm. Facsimile transmissions received after 5.00pm will be deemed to be received at the start of the next working day, as the case may be.

#### ***Governing Law***

This Agreement will be governed by and construed according to the law of the State of Queensland and the parties agree to submit to the jurisdiction of the Courts of the State of Queensland.

#### ***Waiver***

No right under this Agreement shall be deemed to be waived except by notice in writing signed by the party waiving that right.

#### ***Variation***

This Agreement may not be varied at any time except by a written agreement executed by all parties.

#### ***Execution***

The parties agree that if this Agreement is not executed by all parties on the same date, this Agreement will commence on and from the last of the dates of execution.

#### ***Entire Agreement***

This Agreement constitutes the entire agreement between the parties. Any prior arrangements, agreements, representations or undertakings are superseded by the Agreement.

#### ***Definitions***

In this Agreement, the following terms have the meanings prescribed below unless the context otherwise requires or the contrary intention appears:

**'Affected Parties'** means any owner of a lot within a Community Titles Scheme and the Body Corporate of the Community Titles Scheme which the State has identified as meeting the Criteria.

**‘Agreement’** means this document and all schedule(s) to this document.

**‘Approvals’** means an approval from any government body or authority necessary to lawfully carry out the Works.

**‘Authorised Representative’** means the person described in Item 3 of the Reference Schedule.

**‘Body Corporate’** means the body corporate for the Community Titles Scheme as listed in Item 4 of the Reference Schedule.

**‘Business Day’** means a day (other than a Saturday, Sunday or public holiday) on which banks are open for business in Queensland.

**‘Commencement Date’** is the date the last party signs this Agreement in accordance with clause 9.

**‘Community Titles Scheme’** has the meaning given to it under the Body Corporate and Community Management Act.

**‘Criteria’** means that –criteria in accordance with the Department of Transport and Main Roads, Road Traffic Noise Management: Code of Practice.

**‘Exceptional Circumstances Classification’** means that a building may be eligible for treatments outside the road corridor at the discretion of the Regional Director which may include the following:

- Mechanical ventilation / air conditioning;
- Upgraded windows and glazing and solid core doors;
- Upgraded window and door seals;
- Sealing of wall vents; and
- Installation of court yard noise fences.

**‘Offer Date’** means the date described in Item 1 of the Reference Schedule.

**‘Owner’** means the person or persons as described in Item 3 of the Reference Schedule.

**‘Property’** means the property located on land described in Item 4 of the Reference Schedule upon which is constructed a building of the type described in Item 5 of the Reference Schedule.

**‘State’** means the State of Queensland represented by the Department of Transport and Main Roads, (Region) and includes its employees and agents.

### ***Interpretation***


#### ***In this Agreement –***

- a) a reference to a person includes a reference to other legal entities;
- b) a reference to a statute, regulation, ordinance or local law extends to all statutes, regulations, ordinances or local laws amending, consolidating or replacing them;
- c) the headings to the clauses have been inserted for convenience only and are not intended to be part of or to affect the meaning or interpretation of this Agreement;
- d) the singular includes the plural and vice versa;
- e) words importing one gender shall include a reference to all other genders;



- f) a right or obligation under this Agreement which is held by the Company shall be held by them jointly and severally;
- g) a reference to a clause, schedule or attachment is a reference to a clause, schedule or attachment to this Agreement;
- h) where any act, matter or things is to be done on a day that is not a Business Day, such an act, matter or thing may be done on the next Business Day; and
- i) in the case of any inconsistency between the Schedules and a clause contained in this Agreement, the provisions of the clause shall prevail to the extent of any inconsistency.

**Appendix 10: Agreement for Exceptional Circumstances Treatments**

<p><b>Agreement</b> Department of Transport and Main Roads</p>	 <b>Queensland Government</b>
--	---

The State of Queensland represented by the Department of Transport and Main Roads, (Region) has upgraded part of the (Road). This includes (Description and extent of road works).

The State has identified the Property described below as being eligible for treatment as it meets the Criteria relevant to In-house Treatments. The Owner enters into this Agreement with the State on the terms and conditions attached.

Item	Reference Schedule			
1.	<b>Offer Date</b>			
2.	<b>State's Details</b>			
	<b>Addresses</b>			
	<b>Telephone</b>			<b>Facsimile</b>
	<b>Position</b>	<b>The Regional Director</b>		
	<b>Email</b>			
3.	<b>Owner's Details</b> <i>Parties to this Agreement must own the property or be authorised signatories of the Body Corporate and not be an occupant only – proof of ownership (copy of current rate account and photo ID) should be shown</i>			
	<b>Name/s</b>	(Insert full names)		
	<b>Postal Address</b>	House/Unit No. Street Name		
		Suburb	State	Postcode
	<b>Contact Numbers</b>	<b>Home</b>		
		<b>Work</b>		
		<b>Mobile</b>		
		<b>Facsimile</b>		
<b>Email</b>				
<b>Authorised Representative</b> (If applicable)	<b>Name/s</b>			
	<b>Contact Number</b>			
4.	<b>Property Description</b> Details may be obtained from the local government rate notice produced by the Owner and should be verified by DTMR.			

	<b>Street Address</b>	House/Unit No. Street Name					
		Suburb			State	Postcode	
	Lot	RP/SP/BUP		County		Parish	
	Title Reference	Name of Body Corporate (if applicable)					
5.	<b>Property Type</b> Tick the box following the most appropriate description of the structure to which works are to be conducted						
	Detached house	<input type="checkbox"/>	Townhouse	<input type="checkbox"/>	Apartment/Unit	<input type="checkbox"/>	
					Other (describe below)	<input type="checkbox"/>	
6.	<b>State's Offer</b> Refer attached Schedule 1						
	State will carry out the Works on the Property	<input type="checkbox"/>	State will carry out the Works to the Property and/or pay the Current Equipment Rebate to the Owner	<input type="checkbox"/>			
7.	Amount of Current Equipment Rebate						
	\$ (AUS)						

### **State's Offer**

**The State offer is as noted in Item 6 in the Reference Schedule.**

### **Indemnity**

The Owner -

- a) indemnifies; and
- b) releases and discharges

the State from and against all actions, proceedings, claims, demands, costs, losses, damages and expenses which may be brought against the State, or which the State may pay, sustain or be put to by reason of, in consequence of or in connection with the impact of road traffic noise from the (Road) Project on the property.

### **Affected Parties**

- This clause 3 applies if the Property is part of a Community Titles Scheme.
- This Agreement is conditional upon the State receiving agreement from all Affected Parties on terms acceptable to the State regarding the (Road) In-house Treatment Project or carrying out the Works no later than 3 calendar months after the Commencement Date.
- The State agrees to notify the Owner no later than one month after the date referred to in clause 3.2 as to whether this Agreement will proceed or otherwise pursuant to the condition in clause 3.2.
- The date described in clause 3.2 may be extended by the State by written notice to the Owner at any time.
- Despite clause 3.2, the State may, at its own discretion, elect to proceed with this Agreement although it has not received agreement from all Affected Parties.

### **Advice of Completed Agreements**

- The State shall retain a data base of all properties where this type of agreement has been undertaken.
- If requested, Transport and Main Roads will advise a requestor that this type of agreement has been undertaken.

### **Notices**

- Notices under this Agreement may be delivered by hand, by registered mail, by facsimile or by email to the addresses specified in the Reference Schedule or any substitute address as may have been notified in writing by the relevant addressee from time to time.
- Notice is deemed to be given –
  - a) 2 Business Days after deposit in the mail with postage prepaid;
  - b) when delivered by hand; or
  - c) if sent by facsimile transmission, upon an apparently successful transmission being noted by the sender's facsimile machine prior to close of business at 5.00pm. Facsimile transmissions received after 5.00pm will be deemed to be received at the start of the next working day, as the case may be.

### **Governing Law**

This Agreement will be governed by and construed according to the law of the State of Queensland and the parties agree to submit to the jurisdiction of the Courts of the State of Queensland.

### **Waiver**

No right under this Agreement shall be deemed to be waived except by notice in writing signed by the party waiving that right.

### **Variation**

This Agreement may not be varied at any time except by a written agreement executed by all parties.

### **Execution**

The parties agree that if this Agreement is not executed by all parties on the same date, this Agreement will commence on and from the last of the dates of execution.

### **Entire Agreement**

This Agreement constitutes the entire agreement between the parties. Any prior arrangements, agreements, representations or undertakings are superseded by the Agreement.

### **Definitions**

In this Agreement, the following terms have the meanings prescribed below unless the context otherwise requires or the contrary intention appears –

**'Affected Parties'** means any owner of a lot within a Community Titles Scheme and the Body Corporate of the Community Titles Scheme which the State has identified as meeting the Criteria.

**'Agreement'** means this document and all schedule(s) to this document.

**'Approvals'** means an approval from any government body or authority necessary to lawfully carry out the Works.

**'Authorised Representative'** means the person described in Item 3 of the Reference Schedule.

**'Body Corporate'** means the body corporate for the Community Titles Scheme as listed in Item 4 of the Reference Schedule.

**'Business Day'** means a day (other than a Saturday, Sunday or public holiday) on which banks are open for business in Queensland.

**'Commencement Date'** is the date the last party signs this Agreement in accordance with clause 9.

**'Community Titles Scheme'** has the meaning given to it under the Body Corporate and Community Management Act.

**'Criteria'** means that –criteria in accordance with the Department of Transport and Main Roads, Road Traffic Noise Management: Code of Practice.

**'Exceptional Circumstances Classification'** means that a building may be eligible for treatments outside the road corridor at the discretion of the Regional Director which may include the following:

- Mechanical ventilation / air conditioning;
- Upgraded windows and glazing and solid core doors;
- Upgraded window and door seals;
- Sealing of wall vents; and
- Installation of court yard noise fences.

**'Offer Date'** means the date described in Item 1 of the Reference Schedule.

**'Owner'** means the person or persons as described in Item 3 of the Reference Schedule.

**'Property'** means the property located on land described in Item 4 of the Reference Schedule upon which is constructed a building of the type described in Item 5 of the Reference Schedule.

**'State'** means the State of Queensland represented by the Department of Transport and Main Roads, (Region) and includes its employees and agents.

### **Interpretation**

#### **In this Agreement –**

- a) a reference to a person includes a reference to other legal entities;

- b) a reference to a statute, regulation, ordinance or local law extends to all statutes, regulations, ordinances or local laws amending, consolidating or replacing them;
- c) the headings to the clauses have been inserted for convenience only and are not intended to be part of or to affect the meaning or interpretation of this Agreement;
- d) the singular includes the plural and vice versa;
- e) words importing one gender shall include a reference to all other genders;
- f) a right or obligation under this Agreement which is held by the Company shall be held by them jointly and severally;
- g) a reference to a clause, schedule or attachment is a reference to a clause, schedule or attachment to this Agreement;
- h) where any act, matter or things is to be done on a day that is not a Business Day, such an act, matter or thing may be done on the next Business Day;  
and
- i) in the case of any inconsistency between the Schedules and a clause contained in this Agreement, the provisions of the clause shall prevail to the extent of any inconsistency.

## Signing Page

Executed as an Agreement on the dates set out below

<b>Signature of the State of Queensland</b>	
<p><b>Signed</b> for and on behalf of <b>THE STATE OF QUEENSLAND</b>                      this _____ day of 20____                      by.....                      (full name)                      .....                      (designation)                      who is a duly authorised officer                      in the presence of:                      .....                      (signature of witness)                      .....                      (print name of witness)</p>	<p>.....                      (signature)</p>

99999

<b>Signature of the Property Owner/s</b>	
<p><b>Signed</b> by the Property Owner/s                      this _____ day of 20____                      in the presence of:                      .....                      (signature of witness)                      .....                      (print name of witness)</p>	<p>.....                      (signature)                      .....                      (full name)                      .....                      (signature)                      .....                      (full name)</p>

<b>Signature of the Property Owner (Company)</b>	
<p><b>Signed</b> by <b>[Insert name of Company and ABN]</b> by authorised officers in accordance with the Corporations Act 2001                      this _____ day of 20____                      in the presence of:                      .....                      (signature of witness)                      .....                      (print name of witness)</p>	<p>.....                      (Director)                      .....                      (full name)                      .....                      (Director/Secretary)                      .....                      (full name)</p>

## **Appendix 11: Typical noise barrier types**

### **1 Selection of noise fence type**

Noise fences are required to have a minimum height of 1.8 m. Available noise barriers include:

- Standard Noise Fences
- Purpose Designed Noise Fences
- Landscaped earth mounds.

Figure 1 provides illustrations of typical types of noise barriers.

**Figure 1 - Types of noise barriers**



Standard Noise Fence



Purpose Designed Noise Fence



Standard Noise Fence with Landscaping



Purpose Designed Noise Fence



Landscaped Earth mound



## 2 Standard noise fences

Materials for standard noise fences include the following:

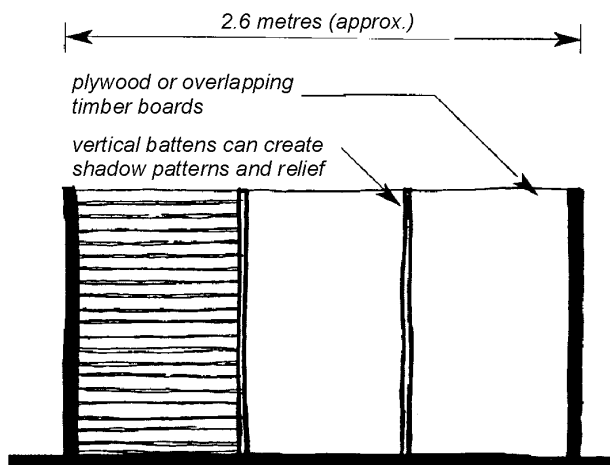
- timber (palings, planks or plywood sheets)
- reinforced and prestressed concrete (in-situ or pre-cast panels)
- steel panels (reflective or absorptive)
- aluminium (reflective or absorptive)
- masonry (stone or concrete blocks)
- transparent (toughened safety glass or acrylic).

Timber, concrete and steel fences should only be used at sites where there is sufficient space for screen planting.

Figure 2 (a) illustrates a typical elevation of a timber standard noise fence.

Standard noise fences used without appropriate landscape treatment can produce an undesirable visual effect. They also provide greater exposure for vandalism and defacement of the noise fence surface. Figure 2(b) illustrates how a visually stark appearance may result.

**Figure 2 (a) - Typical elevation of timber noise fence**



**Figure 2 (b) - Use of standard noise fence with narrow setback creates undesirable visual effect**



Vegetation plays an important role in screening noise fences and earth mounds. Species selection becomes critical for the short and long term success of the planting design. Long lived solutions are preferred over temporary solutions. Further information on plant species selection can be found in the Transport and Main Roads *Road Landscape Manual*. A suitably qualified and experienced landscape architect should be consulted when determining the type of screening material to be used.

Where possible, landscape treatments should be provided with standard noise fences.

### **3 Purpose designed noise fences**

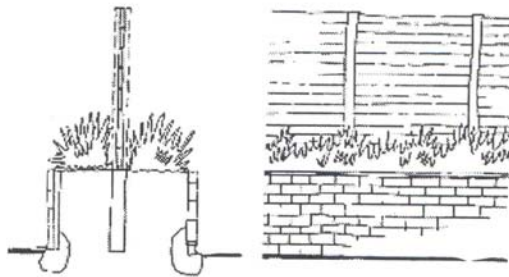
Purpose designed fences should be considered in cases where there is insufficient room for landscape treatment. Purpose designed noise fences should be visually responsive to the site and, regardless of being more expensive than standard noise fences, should be used in prominent locations. Examples of possible purpose designed noise fence treatments are shown in Figure 3.

Purpose designed noise fences may include the following features:

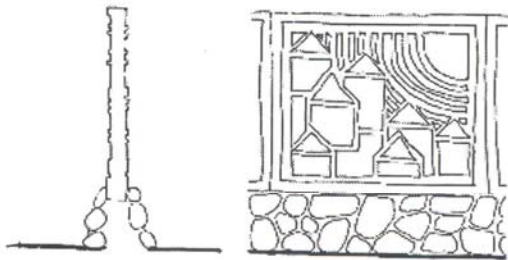
- use of integrated planting within or adjoining the noise fence
- incorporation of sculptural relief, particularly in low speed environments
- reflection of urban character by way of urban forms, patterns and materials
- mixing and variation of materials within the noise fence (e.g. timber, steel and concrete)
- use of transparent material panels where views are of significance.

Technical advice on these issues should be sought from a suitably qualified landscape architect to ensure the best possible integration with the road landscape.

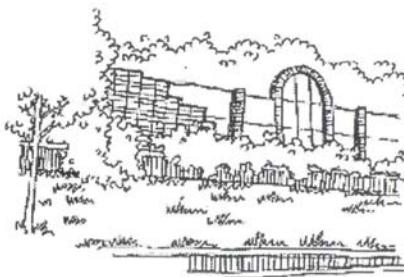
**Figure 3 - Alternative purpose designed noise fences**



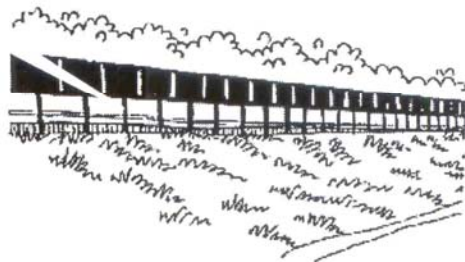
*Integrated planting for low speed environment*



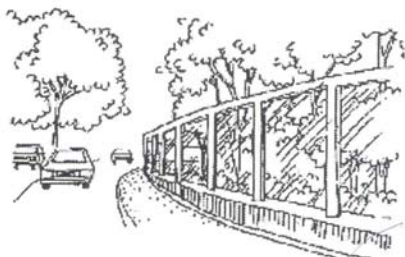
*Sculptural relief for low speed environment*



*Barrier reflecting urban character*



*Variation in materials for high speed environment*



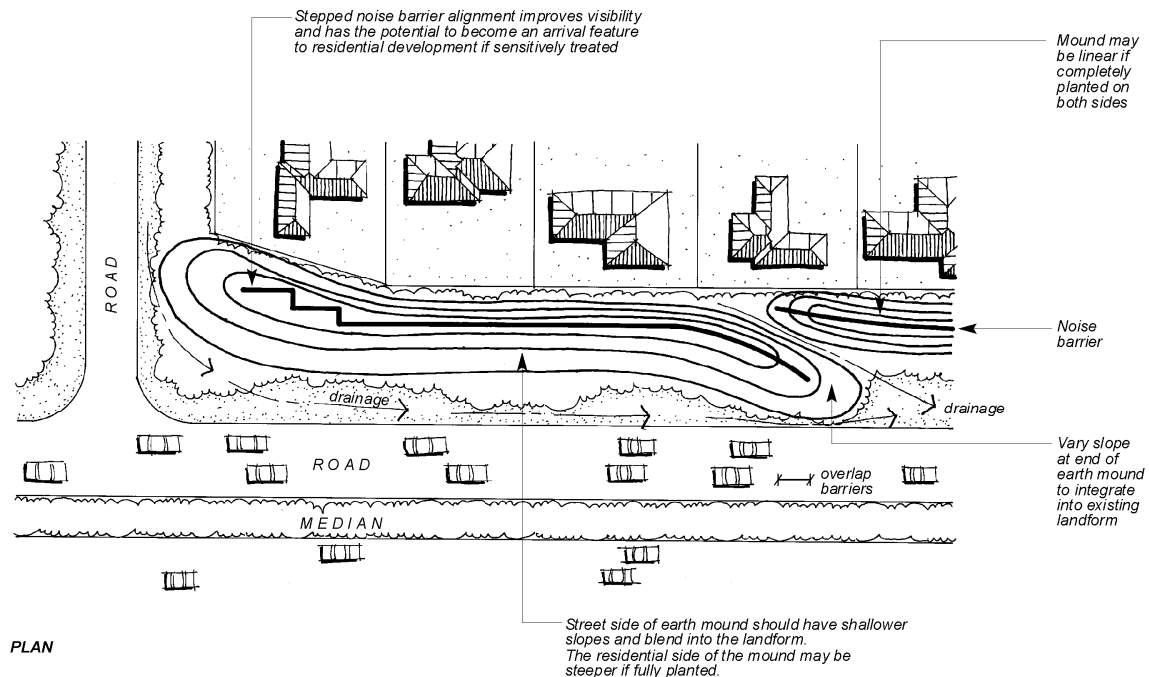
*Transparent material to maintain desirable views*

## 4 Earth mounds

Developing earth mounds as noise fences requires the manipulation of landforms and soil stabilisation. This involves careful consideration of the surrounding grading, type and source of material, and drainage conditions. Proposed earth mounds should blend into the existing or intended landscape as much as possible (refer to Figure 4). Ground covers, shrubs, trees and chip mulch are preferred over grass as less maintenance is required after establishment. Suitably qualified landscape architects may provide guidance on these issues.

Figure 4 illustrates the preferred earth mound arrangements.

**Figure 4 – Preferred earth mound arrangements**



Earth mounds require a significant area of land depending upon their intended height. For example, the minimum width for a 2.0 m high earth mound is 10.0 metres based on a 1 on 2 batter slope and a 2.0 m minimum top width. Where possible, a shallower batter slope of 1 on 3 is recommended for ease of maintenance and landscaping purposes.

Where space is limited, noise fences can be used with earth mounds. Earth mounds shall be designed and constructed in accordance with departmental Standard Specification MRTS04 *General Earthworks*. Landscaping shall comply with departmental Standard Specification MRTS16 *General Requirements, Landscape and Revegetation Works*.

A topsoil medium conducive to the healthy growth of plant material should be used in the top 100 mm where planting is proposed.

**Appendix 12: Community engagement templates for proposed noise barriers**

**A. Information Letter About Proposed Noise Barriers**

**EXAMPLE ONLY**

[date]

[Title] [Last Name]

[Relevant Local, State, Federal Politicians]

[Address]

Dear [Title] [Last Name]

Noise Barrier Modifications – [Road] [Road] to [Road]

The Department of Transport and Main Roads has received a number of complaints regarding the height of the existing barriers along [Road] between [Road] and [Road]. In response, acoustic consultants have been commissioned by the Department to assess the performance of the existing barriers against the department's noise criterion level of 68 dB(A) L<sub>10</sub> (18 hour). The consultant's report indicates that some of the existing barriers are not achieving the criterion level at two storey residences.

The department proposes modifying the existing barriers in order to achieve the criterion level. This would require replacing some sections of existing barriers with higher barriers. See the map of the proposal attached. The new barriers would be erected in the same position as the existing barriers.

As part of this project, Transport and Main Roads will consult with owners of properties that abut this section of the road. The proposed format of this consultation is to be a mail-out to the owners (see attached example). In the case of people who own property where noise barriers are proposed to be installed, feedback will be actively sought on the proposal. In the case of other property owners along [Road], the main purpose is to keep them informed, as they will not be directly affected by the proposal.

If you require any further information, please contact [Name] in the [Region] office, on [Phone No.] It is intended to commence the mail-out on [date]

Yours faithfully

[Name]

Regional Director

([Region] Region)

Enc (3)

[Date]

[Title] [Last Name]

[Address]

Dear [Title] [Last Name]

Noise Barrier Modifications – [Road] ([Road] to [Road])

The Department of Transport and Main Roads has received a number of complaints regarding the road noise along [Road]. In response, acoustic consultants have been commissioned to assess the performance of the existing barriers against the department's noise criterion level of 68 decibels (L10 (18h)). The consultant's report indicates that in some places ([Road] to [Road]) the existing barriers are not achieving the criterion level at 2-storey residences, and in other places ([Road] to [Road]) some additional barriers are needed.

It is proposed to modify the existing barriers in order to lower the noise levels equal to or below 68 decibels. This would require replacing some sections of existing barriers with higher barriers and adding in some extra sections of barrier. The new barriers would be erected in the same position as the existing barriers.

However, higher noise barriers may impact on amenities like views and breezes, so your opinions are sought on the proposal before proceeding further. A schematic plan is enclosed showing where the noise barriers are proposed to be modified.

Your views are important to us. Please complete the attached form and return it in the enclosed 'reply paid' envelope by [date]. A postage stamp is not required. If no reply either way is received, it will be assumed that you have no strong feeling although a response would be appreciated in order to fully determine the community's opinions.

If you are not in favour of the proposal to modify the existing barriers, you may wish to raise your concerns or requirements in comments area of the form.

After consulting further with you, if your feelings or views are still not satisfied you will be invited to discuss the matter until you reach an understanding with us.

When consultation is completed you will be informed of Transport and Main Roads decision, and the next step in process will be to complete the design, call tenders, and commence construction.

If you have any questions please contact [Name], in the [Region] office, on [Phone No.]

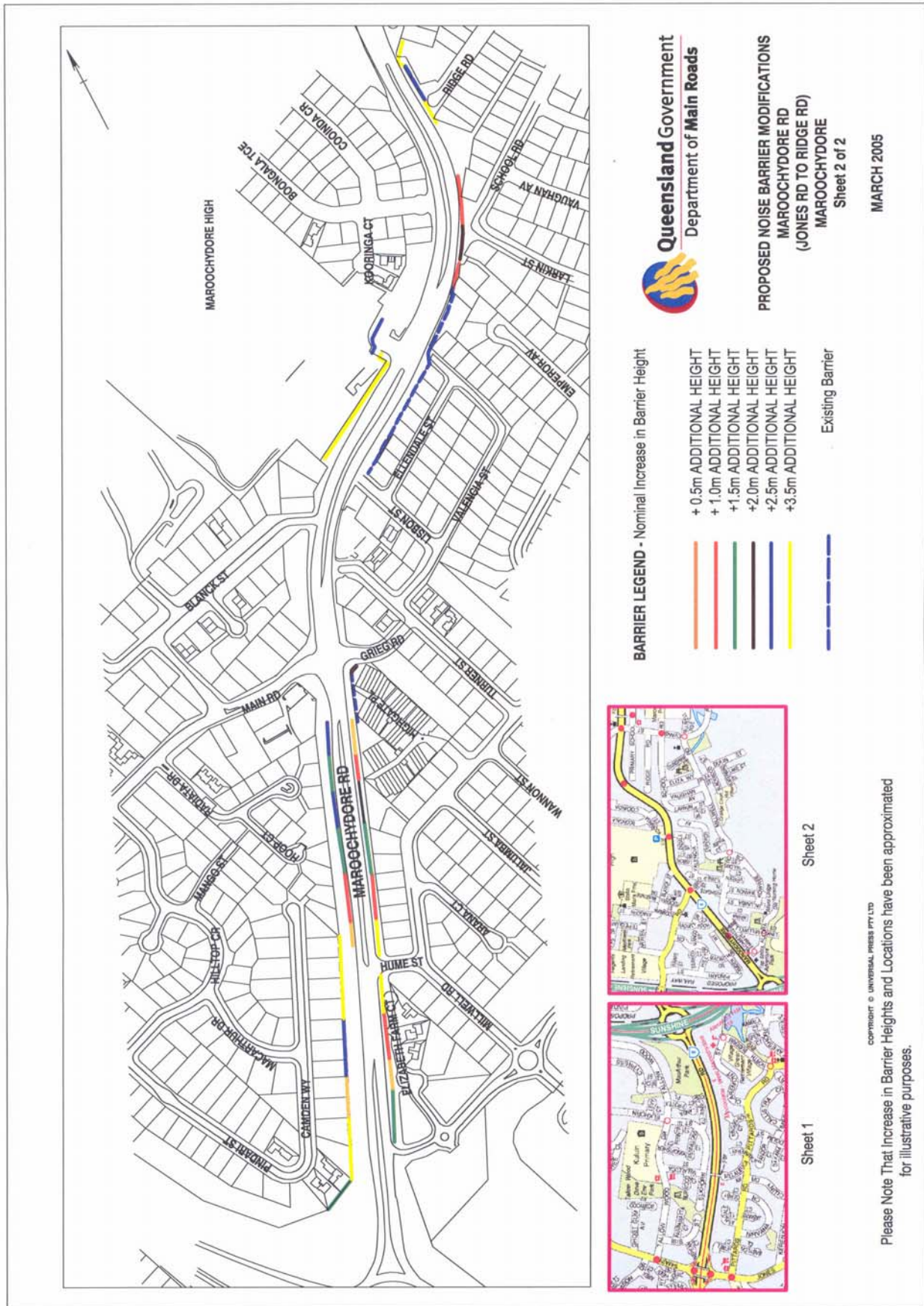
Yours faithfully

[Name]

Regional Director

[Region]

**EXAMPLE ONLY**



**EXAMPLE ONLY**

**[ROAD] ROAD**

**[ROAD] TO [ROAD]**

- I am in favour of the proposed noise barriers being modified (increased in height)
- I am not in favour of the proposed noise barriers being modified (increased in height)
- I have no strong feeling either way

(Please tick one box only)

My comments are as follows:

.....

.....

.....

.....

.....

.....

Yours faithfully

\_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_

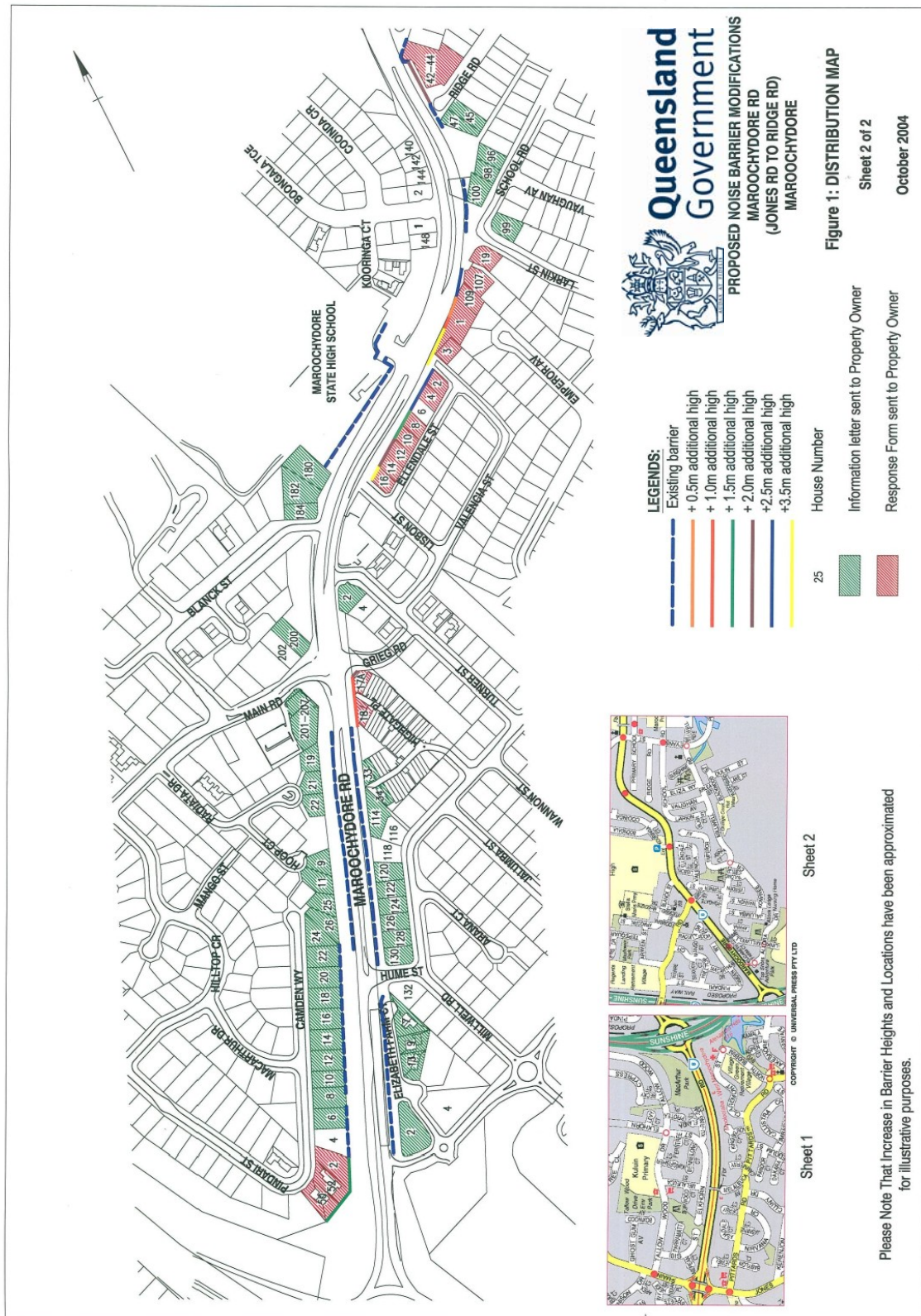
Date \_\_\_\_\_

This information being collected on this form is for the purpose of determining requests for proposed noise barriers. This information you provide is accessible to authorized departmental officers, and from time to time may be used by contractors/consultants undertaking consultation activities. Your personal details will not be disclosed to a third party without your consent unless required to do so by law.





EXAMPLE ONLY



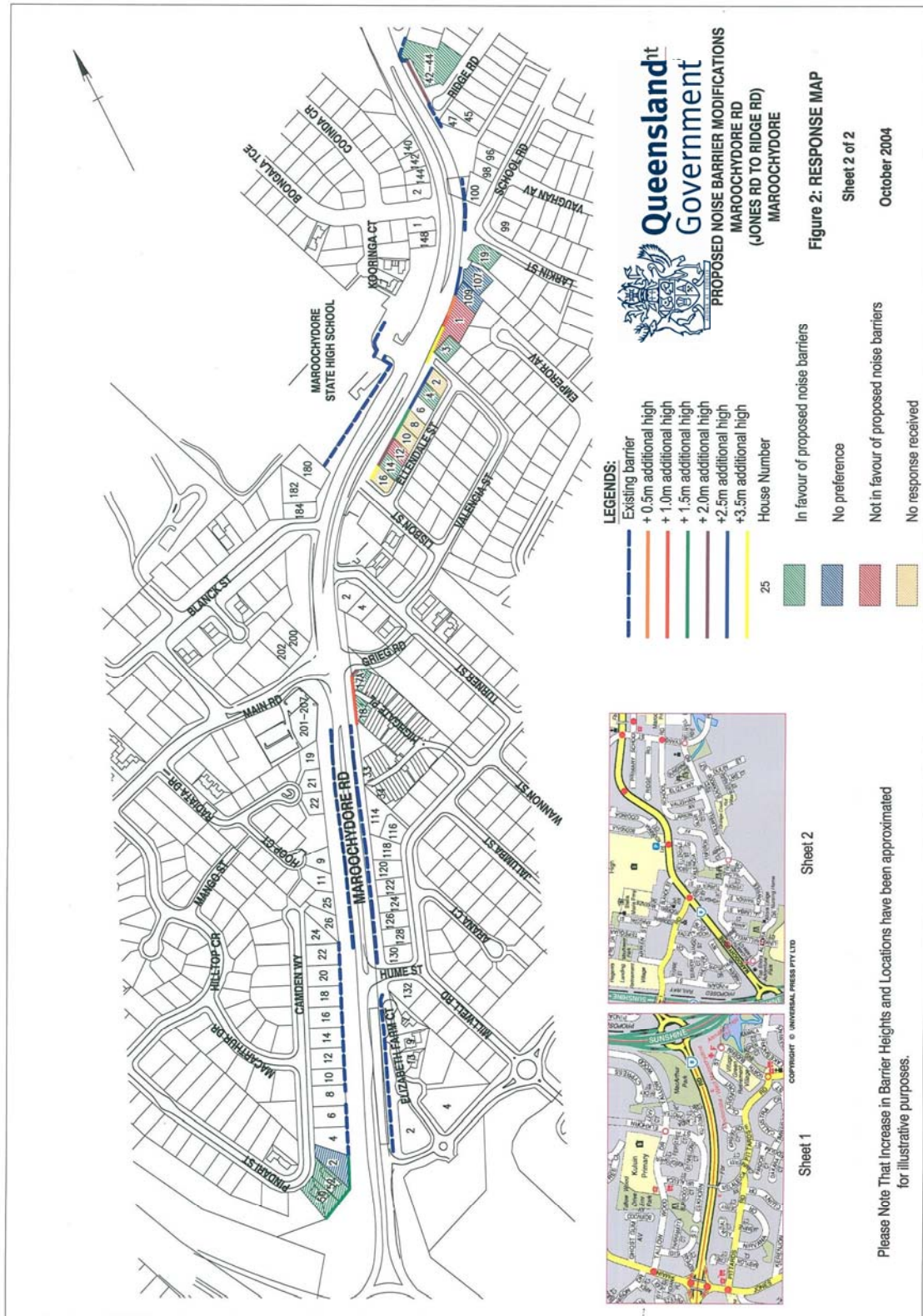
**C. Departmental Analysis Of Resident’s Response**

**EXAMPLE ONLY**

**Table**

Street Address	Owners	Response	Comment 1	Comment 2	Comment 3	Respondent	Lot	Plan
		No preference	Why aren't the barriers located at the footpath, rather than the property boundary					
		In favour	Pleased this is finally happening after complaining over years	Disappointed when earth mound removed and not replaced by barriers				
		In favour	Noise Barrier should be higher for security purposes					
		Concern	Will domestic pets be secure in backyards during construction					
		In favour	Hope barrier will also increase security of backyard and reduce road dust entering house	Hope barrier will stop people throwing things into our pool.				

EXAMPLE ONLY



#### **D. Follow Up Letter To Residents Who Have Not Responded**

##### **EXAMPLE ONLY**

[date]

[Title] [Last Name]

[Address]

Dear [Title] [Last Name]

#### **Noise Barrier Modifications – [Road] Road ([Road] to [Road])**

The Department of Transport and Main Roads is continuing with the public consultation process for the proposed provision of traffic noise barriers along [Road] between [Road] and [Road].

It is proposed to modify the existing barriers in order to lower the noise levels equal to or below 68 dB(A) L10 (18 h). This would require replacing some sections of existing barriers with higher barriers. The new barriers would be erected in the same position as the existing barriers.

In early [date] of this year, I arranged for the distribution of an information brochure. Our records indicate that your household received a copy of the brochure.

Attached to the brochure was a pro-forma, which allowed residents to register their opinion in favour of or not in favour of the departments' proposal.

More than [No.] responses were received and these have now been analysed. However, as there has been significant comment both in favour of and not in favour of the proposal, it is important that responses be received from all households, and in particular those nearest to [Road] Road.

It would appear that a response was not received from your household. Given the proximity of your home to the roadway, I would value your opinion.

I have attached a map of the proposed works, a response form and a pre-addressed envelope for the return of your comments. No postage stamp is required.

I would appreciate your reply by [date]. If you have any questions regarding any issue please contact [Name], in the [Region] office, on [Phone No.].

Yours sincerely

[Name]

Regional Director

[Region]

**E. Letter to Residents About Outcome of Consultation**

**EXAMPLE ONLY**

[Date]

[Title] [Last Name]

[Address]

Dear [Title] [Last Name]

**Consultation about Proposed Noise Barrier Modifications – [Road] Road ([Road] to [Road])**

The Department of Transport and Main Roads wrote to you on [date], seeking your views about the proposal to modify the existing noise barriers along [Road] Road between [Road] and [Road].

The consultation process showed that the majority of people are in favour of the proposed noise barriers.

In addition, a number of concerns about the noise barriers were raised during consultation. These issues are listed in the table below, together with the action that will be taken to address them.

Concern	Action
Rusty appearance of noise barrier not acceptable for private properties	The side of the noise barrier facing private properties will be painted a green colour (Colorbond "Rivergum" or equivalent) to complement any existing vegetation.
Noise barrier should be higher for security purposes	The height of the noise barriers will be increased to a [height] between [Road] Road and [Road] Road. [height] was the barrier height determined for properties near [Road/Street].
Will domestic pets be secure in backyards during construction	Temporary security fencing will be used during construction to secure and separate private properties from the construction area.
Why aren't the barriers located at the footpath, rather than the property boundary	Locating the noise barrier on the property boundary eliminates potential security and maintenance problems that could otherwise occur from having a secluded corridor at the rear of properties. It is also good practice to locate the noise barrier as close to the property boundary as possible, to maximise the effectiveness of the noise barrier on the residence. Therefore, the noise barriers will be installed on the property boundaries.

Plans for the noise barriers have now been further developed to incorporate the actions listed above. The department will now seek tenders for construction of the barriers. Refer to the attached Plan.

If you have any further questions about the noise barriers, or the road upgrade project in general, please contact [Name], at the [Region] office, on [Phone No.].

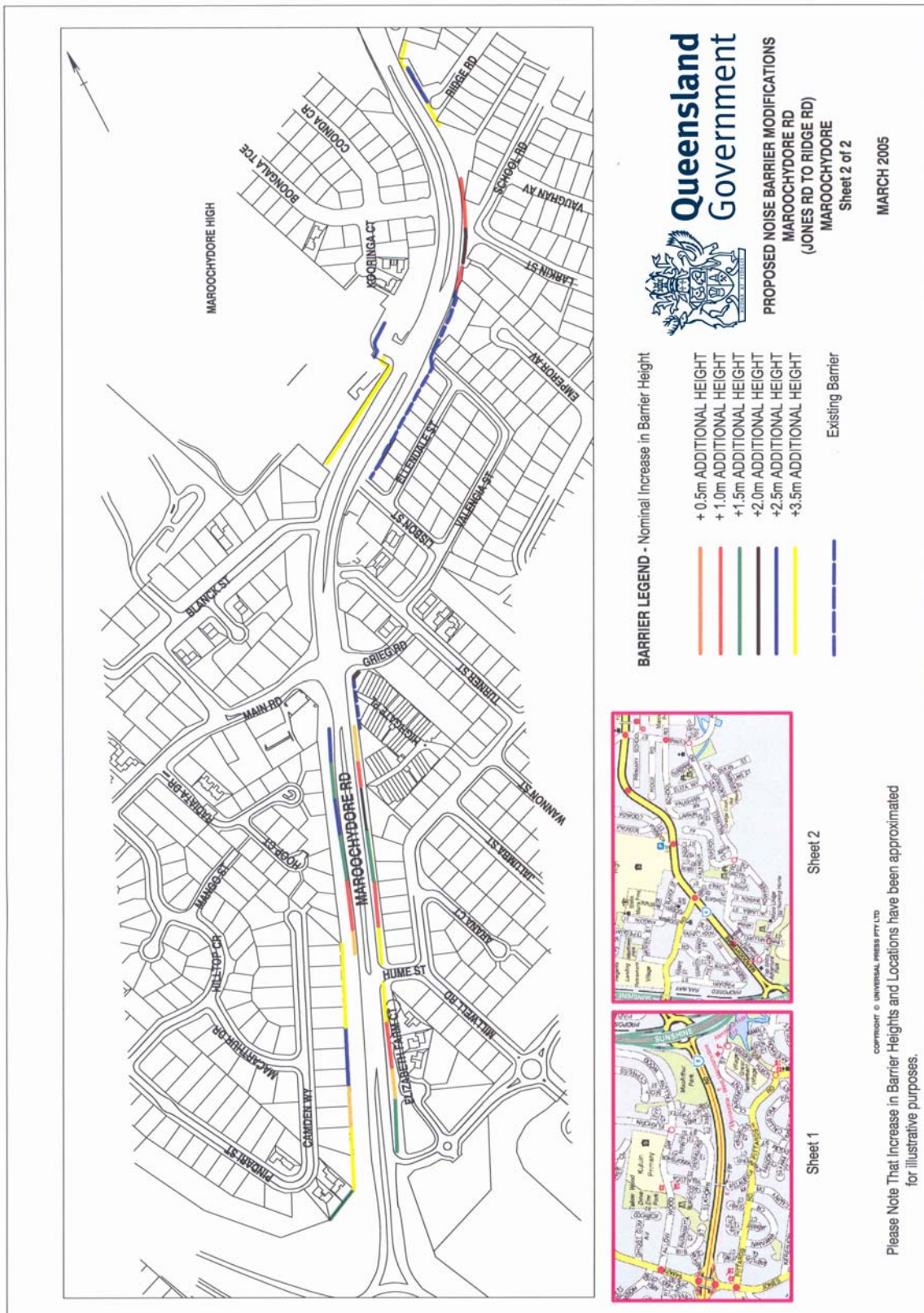
Yours sincerely

[Name]

Regional Director

[Region]

**EXAMPLE ONLY**



## **Appendix 13: Noise barrier design methodology for wind loads and boulder retaining walls**

### **A. Noise Barrier Design Methodology for Wind Loads**

#### **1 General**

The aim of this document is to explain the relationship of AS/NZS 1170.2 and the wind speed in MRS15. Noise barriers are an option considered for reduction of road traffic noise levels at noise impacted properties in accordance with the department's Transport Noise Management: Code of Practice, Volume 1. Noise barriers are a potential source of wind borne debris to road users and adjacent buildings. The Department has a duty of care to ensure that noise barriers are not the first structure to fail and become:

- air borne debris that threatens life and damages adjacent housing and other property.
- a hazard to motorists, or causes blockage to highways that have an urgent post-disaster function.

Noise barriers must therefore be designed for at least the design wind speed for the adjacent buildings.

#### **2 Buildings in the vicinity of noise barriers**

Buildings shielded by noise barriers can include the following but not limited to:

- single houses
- multiple dwellings including blocks of units
- educational facilities
- medical facilities
- day care centres.

#### **3 Importance levels of buildings in the vicinity of noise barriers**

The importance level of buildings adjacent to noise barriers ranges from Importance Level 2 for single houses to Level 3 for multiple residency, day care centres and halls (AS 1170.0). Noise barriers must be designed for Level 3 to cover the range of importance levels of buildings in the vicinity of the noise barriers.

At the development stage, the exact nature of buildings in the vicinity of the noise barrier may not have been determined, or may change later. Hence, any reduction in Importance Level will not be allowed to reduce barrier design wind speed.

#### **4 Design life of noise barriers**

MRS15 specifies a 40 year minimum design life. Therefore the 50 year value in the appropriate tables of AS/NZS 11.70.2 is applicable (refer to Table F2 and Table 3.3 of AS 1170.0).

Annual probability of exceedence for design wind speed for noise barriers will be:

- Ultimate wind: V1000
- Permissible wind: V100
- Serviceability wind: V20.

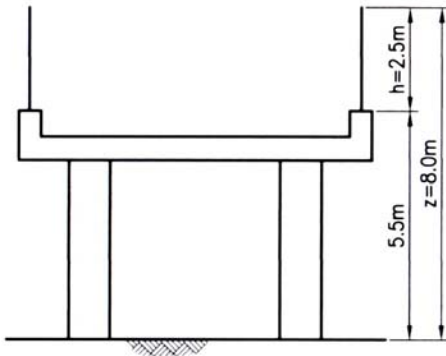


## 5 Case studies

The following case studies illustrate the issues that a designer should consider in various typical design situations.

### Noise Barrier on an Elevated Structure

This case considers a noise barrier on the side of a high bridge or viaduct. It is assumed that the terrain is generally flat, the barrier is 2.5 m high and the edge of the kerb that the barrier is on is 5.5 m above the ground.



$M_t = 1.0$  (from AS/NZS 1170.2:2002 Clause 4.4 assuming the upwind slope is less than 0.05)

$h = 2.5 \text{ m}$  = height of noise barrier

Terrain Category = 2.5 (open terrain – AS/NZS 1170.2:2002 Cl 4.2.1)

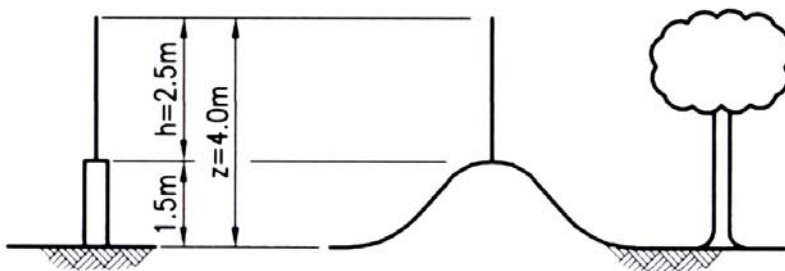
$z = \text{height visible to the wind} = h + \text{height of structure} = 2.5 \text{ m} + 5.5 \text{ m} = 8.0 \text{ m}$

$M_z.\text{cat} = 0.92$  (interpolating from AS/NZS 1170.2:2002 Table 4.1 (A))

Determine the design wind speed in accordance with Section 2 of AS 1170.2

### Noise Barrier on Noise Mound

This case is common where the 2.5 m high noise barrier is on a small 'noise mound' or on the side of a small road embankment that is 1.5 m high.



$M_t = 1.0$  (from AS/NZS 1170.2:2002 Clause 4.4)

$h = \text{height of noise barrier (as defined in AS/NZS 1170.2 D1)} = 2.5 \text{ m}$

Terrain Category = 3 (urban area – AS/NZS 1170.2:2002 Clause 4.2)

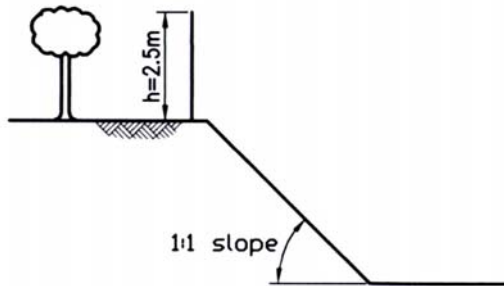
$z = \text{height visible to the wind} = h + \text{height of noise mound} = 2.5 \text{ m} + 1.5 \text{ m} = 4.0 \text{ m}$

$M_z.\text{cat} = 0.83$  (from AS/NZS 1170.2 Table 4.1 (A))

Determine the design wind speed in accordance with Section 2 of AS 1170.2.

### Noise barrier on Dominant Topographical Feature

In this situation the topographical feature is dominant and significant compared to the surrounding houses and trees. Such features are hills, mountains and cliffs, or man made features.



Refer AS/NZS 1170.2 Supp1:2002 Clause C4.4 for a thorough worked example of how to determine  $M_h$  and  $M_t$ . Where the topographical effect dominates, the effect of the hill is taken into account by the  $M_t$  rather than the  $z$  as in the previous examples. Situations where significant topography needs to be considered are rare. In noise barrier designs, the topography is most likely flat (i.e.  $M_t = 1.0$ ).

## B. Design of Boulder Retaining Walls

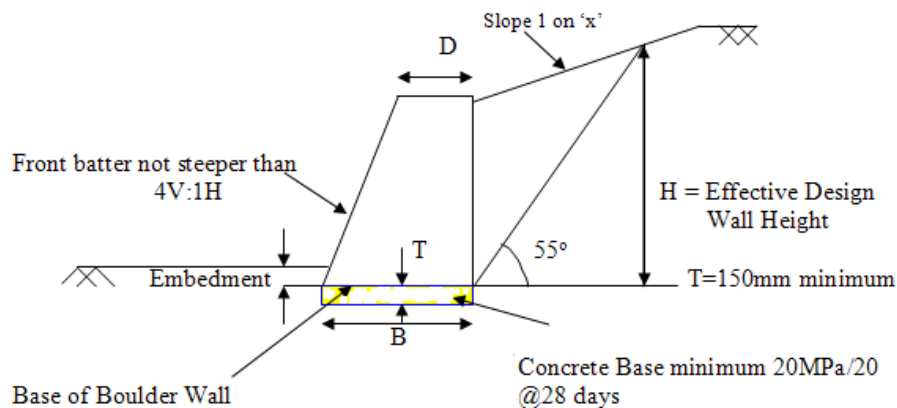
### 1 General

Various types of earth retaining structures (boulder walls inclusive) abutting the road network have become a common feature. Proprietary wall systems, such as reinforced soil structures, are subject to rigorous design checks and are under the jurisdiction of design codes.

Traditionally, boulder wall designs and their construction control have been very ad hoc, more experience based, but then their heights have been relatively low, say 1 to 2m. In recent times the heights of these walls have increased to levels where they tend to compete with low height engineered wall systems. Also, boulder walls have traditionally been constructed of rounded or semi-rounded rocks of varying sizes.

In this upper range of heights, they could pose a significant public safety risk. Unlike their counterparts, boulder systems by virtue of their more rounded large sizes would have the tendency to roll longer distances in the event of failure and thereby increase the risk to the road user. Therefore, there is no justification to continue to use ad hoc methodologies for their specification, design and construction. At the least, boulder wall systems should be subjected to requirements comparable to those in force for more engineered systems. As they (boulder walls) are currently not contained in design codes, in order to ensure public safety, it is required that they should be engineered construction and consequently would be designed to similar requirements of MRS06 *Reinforced Soil Structures Walls*. Hence there is a need to have systems developed by the Department. The typical wall system is shown on Figure 1.

**Figure 1 - Typical Wall Section**



In the absence of specific design codes covering boulder retaining walls, the Department, in general, would not consider wall heights in excess of 4.0 m for boulder walls for the present.

This guide provides various geotechnical issues, which must be complied with in order to achieve a reliable and safe design for boulder walls in excess of 1.5 m in height.

This guide only addresses the geotechnical issues and additional items would need to be introduced to make it a general job specification.

## 2 Materials

### 2.1 Rock Boulders

**General:** Rock shall be sound igneous, metamorphic or approved sedimentary rock (as per MRS05) that meets the minimum requirements of Table 1. Rock shall be fresh or slightly weathered and not rounded.

**Source of Boulders:** For the selected source of boulders e.g. quarry, the contractor shall develop a methodology outlining the quality assurance procedures that would be adopted to manage the production of rock boulders meeting the stipulated requirements described in this document.

#### Shape/Size:

- nearly cubic rock where possible
- boulders with a ratio of maximum to minimum dimension of not greater than 3
- at least two split faces
- the minimum dimension of a boulder shall be 0.5 m.

**Table 1 - Properties of rock boulders**

Property	Test Method	Limit	Test Results
Density (APD)	Q 109	2.5 t/m <sup>3</sup> minimum	
Rock Material Strength as Is (50)	Q187	2.5 MPa minimum	
Los Angeles Value	Q206	12% maximum	
Sodium Sulphate Soundness (5 cycles)	Q209	5% maximum	
Water Absorption	Q214A/B	1% maximum	

### 2.2 Backfill

- friction angle (test method ASTM D3080)
- selected backfill (peak friction angle) = xxx deg (note: the maximum value adopted in the design shall be 40°)
- cohesion to be assumed zero
- grading (Test method Q103A)
- unit weight: a nominal allowance for saturated backfill ( $\gamma_{\text{sat}}$  of backfill = 20kN/m<sup>3</sup>) to account for situations, which might arise as a result of poor drainage, shall be considered.

### 2.3 Drainage blanket

A drainage blanket of minimum width 300 mm shall be placed behind the boulder wall to act as permanent drainage to the adjacent fill material. Material in the drainage blanket shall be sound, durable, fresh, angular and semi-rounded or rounded stone. The rock size shall comply with the following size limitations in Table 2.

**Table 2 - Grading requirements for drainage blanket**

Stone Size (mm)	Percent Finer	Test Results
150	100	

Stone Size (mm)	Percent Finer	Test Results
75	90-100	
50	30-60	
26.5	0-5	
19	0-2	

The separator/geosynthetic filter to be used at the drainage blanket/backfill interface shall conform to MRS27.

#### **2.4 Packing stones in boulder walls**

Packing stones or rock wedges may be needed to bed boulder wall rocks tightly or to level boulders for subsequent courses. This material shall meet the specification for Drainage Blanket.

#### **2.5 Foundation**

- effective cohesion intercept (Q177) = xxx kPa
- effective angle of shearing resistance (Q177) = xxx deg
- undrained strength = xxx kPa.

Select granular fill shall be used to replace unsuitable material under the boulder wall footing if intersected below footing level. The select granular fill shall comply with the following:

- maximum size: 100 mm
- soaked CBR: 15%.

### **3 Design**

#### **3.1 Design life**

The design life of the wall shall be 100 years minimum.

#### **3.2 Applied loads**

Design live loading as a result of road traffic shall be in accordance with Australian Bridge Design Code and relevant loading statements on the drawings. The minimum design vertical live load shall be 10 kPa unless noted otherwise. Vertical and lateral loads from earthworks (or other effects) on or adjacent to the boulder wall shall be included in the design.

Traffic impact and safety barrier loads and other superimposed structural loads (e.g. noise barriers) shall be taken into account in the design of the wall.

Compaction induced stresses as discussed under Section 5.3 shall also be taken into consideration.

#### **3.3 Minimum wall dimensions**

Minimum wall dimensions shall be as per Table 3 below.

**Table 3 - Wall geometry**

Effective Design Wall Height, H (m)	Minimum Wall Base Dimension, B (m)	Minimum Width of Top of Wall, D (m)
1.5	1.40	0.500
2.0	1.50	0.500

Effective Design Wall Height, H (m)	Minimum Wall Base Dimension, B (m)	Minimum Width of Top of Wall, D (m)
2.5	B/H=0.7	0.750
3.0	B/H=0.7	1.000
3.5	B/H=0.7	1.000
4.0	B/H=0.7	1.000

Note: for the definition of effective design wall height, H, refer the typical wall section (Figure 1) provided at the beginning of this document.

A minimum foundation embedment of 0.5m of the boulder wall into natural ground shall be provided. Front batter of wall shall not be steeper than 4V:1H.

### Geometry Checklist

- effective height of wall
- base dimension
- top width
- embedment
- front batter of wall.

### 3.4 Stability

The stability of the wall should be checked against the following criteria amongst others as may be warranted depending on particular requirements. Wall friction shall be ignored.

- sliding (effective cohesion to be assumed zero. Both total and effective stress calculations for sliding to be carried out). Passive resistance in front of the wall shall be ignored.
- overturning (shall meet the requirements of the middle-third rule of structural mechanics)
- bearing failure (total stress calculations to be carried out)
- global failure (both total and effective stress calculations to be carried out).

The friction angle of rockfill shall be limited to a maximum of 36°. Factor of safety should conform to Table 4.

**Table 4 - Factor of safety**

Mode of Failure	Required Minimum FOS
Sliding	2.0
Overturning	2.0
Bearing	2.5
Global	1.5

## 4 Report

A design report and drawings shall be certified by RPEQ geotechnical engineer and all shall be submitted to the Department for approval.

The following information shall be reported:

- source of boulders and methodology for production control
- properties of the boulders
- properties of the backfill material
- foundation conditions
- wall dimensions
- design calculations.

The following information shall be included on the drawings:

- a plan showing the location of the wall along with adjoining structures e.g. buildings
- wall elevation (vertical joints shall be staggered)
- wall cross sections (showing the thickness of the courses) at every change of wall height > 0.5 m and /or B/H ratio
- drainage details. Provide a full height 300 mm minimum thickness granular drainage blanket (see Section 13 (b).2.3) behind the boulders. Continuous geosynthetic filter fabric complying with MRS27 shall be provided at the drainage blanket/backfill interface.
- the allowable bearing pressures to be stipulated.

## **5 Construction**

The certified (RPEQ) Design Report and Drawings shall be submitted to the Department for acceptance prior to the commencement of construction.

### **5.1 Foundation construction**

The foundation of the boulder walls shall be inspected by the contractor's RPEQ geotechnical engineer to ensure that the allowable bearing capacity of the exposed foundation meets the design requirements. Where the exposed foundations have an allowable bearing capacity less than the design allowable bearing capacity, the weak material shall be excavated and replaced with select granular materials to the extent necessary to provide the required foundation at the base of the boulder wall.

### **5.2 Boulder wall placement**

Boulders shall be placed so that they interlock with each other. This shall be achieved by the following measures:

- The first row of boulders shall be placed on a blinding layer of 150 mm minimum thickness of 20 MPa/20 concrete or better. The boulders within the depth of embedment must be set in concrete.
- All boulders shall be placed with the minimum dimension vertical.
- Not more than two boulders should be placed along the width of wall at any elevation.
- Vertical joints between adjacent boulders, in the longitudinal direction of the wall, shall be staggered between successive courses by a distance not less than 300 mm.
- Vertical joints between adjacent boulders, in the cross-section of the wall, shall be staggered between successive courses by a distance not less than 300 mm.

- Placement of the boulders shall be progressive along the wall length so as to minimise voids. Packing stone may be used to correct uneven surfaces and to prevent rocking.
- The extent of contact at any interface between boulders of the adjacent courses in a cross-section shall be not less than 75% of the width of the particular interface in the cross-section.
- Adjacent boulders shall touch.

The face of the wall shall have a uniform appearance for the full visible height by suitable selection from a stockpile. Boulders of similar exposed end dimensions shall be placed as uniformly as practicable along the length and height of the wall.

Placement of boulders shall be subject to daily inspections by the contractor's RPEQ geotechnical engineer.

### **5.3 Backfill compaction**

Compaction of backfill adjacent to the boulder wall/drainage blanket shall conform to the requirements of Section 15 of MRS04 with the exception that the compaction of the backfill shall be carried out with no relaxation of compaction requirements adjacent to the wall. The wall shall be designed to accommodate this compaction induced thrust as stated in Section 3.1.

### **5.4 Tolerances and level control**

The horizontal tolerance for the front face of the wall shall be constructed to within +150 mm from the sloping face defined on the drawings. The thickness of the wall at any cross-section should not be less than that shown on the drawings.

It is the responsibility of the contractor to set out the wall alignment and shape. The contractor shall provide the equipment or tools for the control of the lines and levels (templates, string lines etc.) and this equipment shall remain on site.

### **5.5 Concrete slurry fill**

The voids between the boulders shall be filled with slurry concrete (slump greater than 100 mm) to the level of the adjacent ground where shown on the drawings.

### **5.6 Seepage drains**

Seepage drains using slotted PVC (min. 100 mm dia.) shall be placed at not more than 5 m centres to link the drainage blanket through the boulder wall to an outlet at the face of the wall.

Backfill around the PVC drain shall be screened gravel of 20 mm nominal size and shall completely surround the pipe with a geotextile (as per MRS03) forming the interface with the backfill.

The boulder course above the pipe shall span over the pipe between adjacent boulders.

### **5.7 Surface runoff behind the wall**

Positive measures shall be taken to discharge the surface runoff and must not be allowed to infiltrate into the backfill.

### **5.8 Certification at completion of construction**

The contractor shall submit a report certified by the contractor's RPEQ geotechnical engineer who carried out the design of the wall and supervised the construction, that the wall has been duly constructed as per these specifications and meets all the design requirements including the foundation bearing requirements.



### **Appendix 14: Requirements for road traffic noise assessment report for DA**

A Noise Assessment Report prepared to support a development application referred to the State should adequately document and present all the data inputs, assumptions and assessment results, and noise attenuation strategies/options considered as part of the assessment. In order to limit the expense of preparing reports, a Noise Assessment Report has been split into two parts:

- Noise Assessment Report Part A is to present the noise assessment findings. The findings and conclusion of Part A will determine whether noise attenuation measures will be required for the development; and
- Noise Assessment Report Part B is to detail the noise attenuation measures required as per the results of Part A and will only need to be provided when measured noise levels exceed the relevant noise criteria.

Where it is obvious that a development will require noise attenuation measures, it is suggested a full Noise Assessment Report (i.e. Part A and Part B) be prepared at the same time. Matters that the Noise Assessment Report should consider are outlined as follows.

#### **Noise Assessment Report Part A – Review of Noise Impacts**

##### **Development details**

The following information is to be provided:

- description of the subject site including real property description/s and a locality plan
- description of the proposed development including building and open space layout plans, noise sensitive areas and uses, the setback distances for building facades (noise sensitive locations), proposed lot numbers (if applicable)
- drawings showing site contours and earthworks (cut and fill) information to clarify the existing topography and proposed finished levels, and
- drawings showing cross-sections through the transport corridor (showing levels of transport infrastructure, any embankments or physical obstructions), any existing noise attenuation measures, the proposed development including ground level and levels for each storey.

##### **Noise measurement**

- Overview of the noise measurement methodology:
  - for State-controlled roads - Noise measurements and monitoring should be conducted on a typical working day. Measurements taken during school holidays or on the weekend will need to be justified with vehicle classification count data recorded on the day of the noise measurement for the nearby transport corridor; and
  - for railways – Noise measurements and monitoring should be conducted over a two day period, preferably on highest trafficked days. Timetable information for freight trains and passenger rail can be obtained from the relevant railway manager. Noise measurements must be in accordance with *Queensland Rail's Code of Practice - Railway Noise Management* (version 2, November 2007) (1 metre from the proposed facade of the new sensitive place) (available at:  
<http://www.queenslandrail.com.au/AboutUs/ReleaseOfInformation/Pages/OurPolicies.asp>

x), Australian Standard 1055.1 - 1997 (Acoustics – Description and measurement of environmental noise) and Australian Standard IEC 61672.1 - 2004 (Electroacoustics – Sound level meters Part 1: Specifications). Please note measurement of the single event maximum sound pressure level requires an arithmetic average of maximum levels from the highest 15 events over a 24 hour period. Where there are less than 15 events in a 24 hour period, the monitoring period should be extended until a minimum of 15 events is reached;

- summary of the noise measurement results including a layout plan depicting the site locations and positions of the noise measurements conducted for the assessment, the time of day and weekday the measurements took place
- measurement data sheets and site attendance records/site notes taken by the consultant measuring noise at each measurement site
  - all results of measurements, calculations and predictions are to be presented in a tabular format
- tabulation of calculated noise levels for all noise sensitive receptors (without noise attenuation treatments), and
- noise contours or plans showing specific areas where noise criteria are exceeded:
  - the noise level exposures can be produced as noise level contours or presented in a format depicting areas where the specified noise criteria are exceeded or where the noise levels of noise sensitive receptors fall within a certain noise level range. Which format to adopt will depend on the number of factors/options/criteria considered in the noise assessment and the type of development proposal being assessed, and
  - when presenting noise contours, the figure should make clear whether the noise levels are façade corrected or free field based on a grid assessment. This assessment will determine the relative accuracy of the contours compared with the facade calculations and the receptor height assumed. The maximum grid spacing shall be a 10 metre by 10 metre square depending on the accuracy required. Reference to grid spacing assessment is to be noted in the title block for each figure.

### **Acoustic assessment**

For acoustic assessment:

- description of the investigation process in determining the noise exceedance:
  - careful interrogation of noise level contours needs to be undertaken in conjunction with the tabulated noise levels in order to clearly identify whether any of the criteria levels are exceeded
- documentation of all noise model input data and assessment criteria adopted. The source and date of collection of all data used should be clearly documented. Data more than 12 months old cannot be used in the acoustical assessment
- all acoustical assessments undertaken as part of the Noise Assessment Report must take the following into account:
  - for reconfiguration proposals, or a section 242 preliminary approval for a material change of use affecting a local planning instrument, the assumed location of residential building

facades is to be the minimum setback distance required under the Queensland Development Code or as varied by the relevant local government planning scheme for detached and duplex housing. For other noise sensitive developments, the assumed facade location is to be as per the relevant planning scheme. In these situations, a 'facade correction' of 2.5 dB(A) should be added to the free field measurement of 1 metre from the assumed facade to determine the facade corrected noise level, and

- the receptor height used in the acoustical assessment should be 1.5 metres above the finished floor level/s. In the case of multi-level buildings, all floor levels are to be assessed. For residential reconfigurations, where the finished floor level is not known, the receptor heights should be assumed at 1.8 metres and 4.6 metres above an assumed building pad level, for the ground and first floors (first and second storey) respectively. It is essential that both low and high-set residential buildings be considered in the assessment.
- in addition, for State-controlled roads, the acoustical assessment undertaken as part of the Noise Assessment Report must take the following into account:
  - traffic noise model input data including, road levels on Australian Height Datum (AHD), pavement surface type and average annual daily traffic (AADT), percentage of commercial vehicles, vehicle speed and growth rate for the base year and the ten year traffic horizon from the estimated time of completion of the development. For a material change of use of premises, completion is from when a final inspection certificate or certificate of classification is obtained, or from when the use commences, whichever occurs first, and
- in addition for railways, the acoustical assessment undertaken as part of the Noise Assessment Report must take the following into account:
  - the running of freight and passenger trains hauled by diesel locomotives as well as electric passenger unit trains
  - diesel powered track maintenance machinery, including equipment with audible reversing alarms and significant vibration generation, and
  - projected increases in railway traffic, including future tracks and platforms, for up to 10 years from the estimated time of completion of the development. For reconfiguring a lot, completion is when the local government approves the plan of survey. For a material change of use of premises, completion is from when a final inspection certificate or certificate of classification is obtained, or from when the use commences, whichever occurs first.

### **Recommendation**

The Noise Assessment Report Part A must clearly articulate whether noise generated from the transport corridor exceeds the relevant noise criteria. If levels are exceeded, the Report must recommend that attenuation measures are to be provided by the development.

### **Certification**

The Noise Assessment Report Part A is to be prepared by a qualified acoustic consultant and certified by a Registered Professional Engineer of Queensland (RPEQ).

### **Attachments**

Attachments to include where applicable are:

- all field measurement results
- all input and output data and analysis including modelling data files in electronic format
- supplementary reports and references, and
- any other explanatory and general notes.

## Noise Assessment Report Part B – Noise

### Attenuation measures

If the Noise Assessment Report Part A recommends that noise attenuation measures are necessary, these measures should be presented as per the requirements of Part B.

### Attenuation

Part B should provide full details of the preferred noise attenuation strategies and clearly demonstrate that the proposed measures will reduce noise to acceptable levels including:

- description of the investigation process in determining the preferred noise attenuation strategies/options
- description and layout plans of all existing and recommended noise attenuation treatment/options, including the length, height and location of proposed noise barriers
- layout plans showing the length, height and location of all existing and recommended noise attenuation treatment options. These should include:
  - the maximum height above proposed finished ground levels in Reduced Levels (RLs) on AHD of any proposed noise attenuation structures, which are required to meet the department's noise criteria
  - the maximum height above proposed finished ground levels in RLs on AHD of any proposed noise attenuation structures, which are required to meet the department's noise criteria for the ground level (first storey) of any noise sensitive receiver (if different from above)
  - the maximum height above proposed finished ground levels in RLs on AHD of any proposed noise attenuation structures which are required to meet the department's noise criteria for the first floor level (second storey) of any noise sensitive receiver
  - if the proposed noise attenuating structure(s) include/s an earth mound/s, the footprint extent of any earth mound/s, and
  - the layout of the proposed development.
- supporting analysis, calculations and model outputs substantiating the ability of the proposed treatments to attenuate noise to acceptable levels
- (recommended): A map which shows Queensland Development Code Mandatory Part 4.4 - Buildings in Transport Noise Corridors (QDC MP4.4) noise categories that would apply to the site as a result of any proposed noise barriers. This will inform subsequent development applications for building works over the land. The map should show the contours aligned to the relevant noise category levels identified in Schedule 3 of QDC MP4.4 for State-controlled roads [58 dB(A), 63 dB(A), 68 dB(A) and 73 dB(A)] or railways [70 dB(A), 75 dB(A), 80 dB(A) and 85 dB(A)] as applicable.

Where development is impacted by noise from a State-controlled road, it should be noted that the State considers that noise barriers such as noise fences and/or earth mounds are the primary forms of noise attenuation treatment. Noise attenuation treatments should comply with the Department of Transport and Main Roads standards, which are available at: <http://www.tmr.qld.gov.au/Business-industry/Technicalstandards-publications.aspx>, namely:

- Road Traffic Noise Management: Code of Practice;
- Standard Drawings Road Manual – Part 13, Noise Barriers:
  - 1605 – steel post – Timber planks
  - 1606 – steel posts – Plywood panels
  - 1607 – universal beam posts – Plywood panels
  - 1608 – universal beam posts – Concrete panels – Steel panels
  - Standard Specifications and associated Technical Standards
  - MRS04 & MRTS04 – General Earthworks
  - MRS15 & MRTS15 – Noise Fences (SCR and Busways)
  - MCE-SR-014 – Design of Noise Barriers Adjacent to Railways (Railways)
  - MRS16 & MRTS16 – General Requirements Landscape and Revegetation Works
  - MRS16B & MRTS16B – Vegetation Ground Works
  - MRS16C & MRTS16C – Vegetation Works
  - MRS16D & MRTS16D – Hardscape Works
  - MRS16E & MRTS 16E – Establishment and Monitoring Works
- *Road Landscape Manual*;
- noise barriers constructed of treated timber palings, posts and rails must be in accordance with Standard Specification MRS15 and Technical Standard MRTS15; and
- in addition to these requirements, for developments where road traffic noise is being assessed, address the requirements detailed in Chapter 4 of the *Road Traffic Noise Management: Code of Practice*.

Where development is impacted by noise from a railway, noise attenuation treatments should comply with the Department of Transport and Main Roads standards which are available at: <http://www.tmr.qld.gov.au/BusinessIndustry/Technical-standards-publications.aspx>, namely, the *Guide for Development in a Railway Environment* and Queensland Rail Technical Requirement CIVIL-SR-014 – *Design of noise barriers adjacent to railways*.

It should be noted that the *Queensland Development Code Mandatory Part 4.4 - Buildings in Transport Noise Corridors* (QDC MP4.4) addresses State-controlled road and railway noise for residential development within Transport Noise Corridors (TNC) for habitable rooms of Class 1, 2, 3 and 4 buildings at the building works stage. QDC MP4.4 is only considered an acceptable means of achieving the State's internal criteria. The primary concern of the State in relation to noise impacting on residential development relates to noise levels at building facades and in private open space, outdoor education and passive recreation areas.

### **Recommendations and conclusions**

The Noise Assessment Report Part B must clearly demonstrate and subsequently recommend that the development provide noise attenuation measures to ensure noise generated from the transport corridor meets acceptable noise criteria.

### **Certification**

The Noise Assessment Report Part B is to be prepared by an appropriately qualified acoustic consultant and certified by a Registered Professional Engineer of Queensland (RPEQ).

### **Attachments**

Attachments to include where applicable:

- all input and output data and analysis including modelling data files in electronic format
- supplementary reports and references, and
- any other explanatory and general notes.

**Appendix 15: Example report for road traffic noise assessment for DA**

**Road Traffic Noise Assessment Report**

**Development Application**

**FORM1**

Development Address:	_____
Real Property Description:	_____
Company:	_____
Report Reference Number:	_____
Revision Number:	_____
Report Date:	_____
Author:	_____
Signature and Date:	_____
Reviewed By:	_____
Signature and Date:	_____

Note: Provision of all information required in this Form does not imply departmental acceptance of the report or the road traffic noise attenuation strategies presented. The acoustical consultant should be responsible for presenting any additional information that may be required to present the methodology and conclusions of the assessment.

**Introduction and Brief Description of the Proposed Development**

A description of the development (type, purpose, function etc) and the noise sensitive locations (existing and proposed)

--

**Road Noise Traffic Assessment Primary Criteria for this Development**

Tick the criteria which are applicable to this development. Refer to the Department's Policy Position Statement, Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure.



Applicable	Development Category	Location within Development	Primary Criteria
<input type="checkbox"/>   <input type="checkbox"/>	1 Detached Residential	All Facades (Habitable Rooms, Ground Floor and Upper Floor(s))	60 dB(A) L <sub>10</sub> (18hour) facade corrected or less at all façades; (Measured L <sub>90</sub> (8h) free field between 10pm and 6am ≤ 40 dB(A)). 63 dB(A) L <sub>10</sub> (18h) façade corrected or less at all façades; (Measured L <sub>90</sub> (8h) between 10pm and 6am > 40 dB(A)).
		Private Open Space	57 dB(A) L <sub>10</sub> (18h) free field or less at any designated external private open space area within the design of the dwelling and / or lot (Measured L <sub>90</sub> (18h) free field between 6am and 12 midnight ≤ 45 dB(A)). 60 dB(A) L <sub>10</sub> (18h) free field or less at any designated external private open space area within the design of the dwelling and / or lot (Measured L <sub>90</sub> (18h) free field between 6am and 12 midnight >45 dB(A)).
<input type="checkbox"/>   <input type="checkbox"/>  <input type="checkbox"/>	2 Attached Residential	All Facades (Habitable Rooms, Ground Floor and Upper Floor/s)	60 dB(A) L <sub>10</sub> (18hour) facade corrected or less at all façades; (Measured L <sub>90</sub> (8h) free field between 10pm and 6am ≤ 40 dB(A)). 63 dB(A) L <sub>10</sub> (18h) façade corrected or less at all façades; (Measured L <sub>90</sub> (8h) free field between 10pm and 6am >40 dB(A)).
		Private Open Space	57 dB(A) L <sub>10</sub> (18h) free field or less at any designated external private open space area within the design of the dwelling and / or lot (Measured L <sub>90</sub> (18h) free field between 6am and 12 midnight ≤ 45 dB(A)). 60 dB(A) L <sub>10</sub> (18h) free field or less at any designated external private open space area within the design of the dwelling and / or lot (Measured L <sub>90</sub> (18h) free field between 6am and 12 midnight >45 dB(A)).
		Passive Recreational Areas	63 dB(A) L <sub>10</sub> (12h) free field or less, taking into consideration the full circumstances surrounding the provision and future use of the outdoor communal open space areas. Refer to Section 3.5 of the CoP.
<input type="checkbox"/>	3 Educational Establishments, Community Uses and Health Buildings	All facades of internal spaces sensitive to road traffic noise	58 dB(A) L <sub>10</sub> (1h) facade corrected or less at all impacted façades (maximum hour during normal operating hours of the building).
<input type="checkbox"/>	4 Outdoor Educational and Passive Recreational Areas (including parks)	Outdoors	63 dB(A) L <sub>10</sub> (12h) free field or less, taking into consideration the full circumstances surrounding the provision and future use of the outdoor area). Refer to Section 3.5 of the CoP.
<input type="checkbox"/>	5. Offices and Mixed Use (Other than residential)	All facades of internal spaces sensitive to road traffic noise	58 dB(A) L <sub>10</sub> (1h) facade corrected or less at all impacted façades (maximum hour during normal operating hours of the building).

### Measurements

Measurement description includes details such as – location, comments, date, time, microphone height and location shown in a suitable drawing. Measurements of road traffic noise shall be conducted in accordance with AS 2702 and Chapter 4 of this Volume of the CoP. As a minimum, measurements of at least 2 x 24 hours duration shall be conducted on the site on a typical business day. Longer duration measurements may be necessary. Measurements may be conducted in free field conditions. Measurements may be conducted during school holidays if the traffic data are similar to those on typical business days or are known for the days the noise measurements were undertaken. The location of the measurement or measurements shall be clearly annotated on an appropriate drawing which can be either the locality plan or another scaled survey drawing.

Location	Instrument	Serial #	Pre-Calibration	Post-Calibration	Measurement Description
1					
2					
3					
4					
-	Calibrator				

### Meteorological Conditions during the Measurement Survey

Provide a description of the meteorological conditions during the measurement period(s) and the source of the meteorological data (e.g. portable weather stations, observations, etc.)

### Measured Noise Levels

Add more rows as necessary.

Location	Free Field (FF) or Façade Corrected (FC)	L <sub>A10</sub> (18h) 6am – 12 midnight	L <sub>A90</sub> (8h) 10pm – 6am	L <sub>A90</sub> (18h) 6am – 12 midnight	L <sub>A10</sub> (1h) max during normal opening hours	L <sub>A10</sub> (12h) 6am – 6pm	L <sub>Aeq</sub> (1h)day maximum hour 6am – 10pm	L <sub>Aeq</sub> (1h) night maximum hour 10pm – 6am
1								
2								
3								
4								

**Calculation Framework**

The methodology used for the calculations e.g. Commercial software and version, other methods of calculation.

--

**Calculation and Prediction Road Data**

If additional segments/data requires reporting add it in the “Additional Notes” section below or as an attachment to this form.

	Road/Segment 1	Road/Segment 2	Road/Segment 3	Road/Segment 4
Segment Name				
<b>Existing Variables</b>				
AADT				
18 hour vehicles				
% Commercial Vehicles				
Pavement Surface Type				
Speed				
Gradient				
<b>Future Variables</b>				
Growth Rate				
AADT				
18 hour vehicles				
% Commercial Vehicles				
Pavement Surface Type				
Speed				
Gradient				

**Additional Notes**

--

**Model Verification**

Results of the road traffic noise model verification addressing all road traffic noise sources (i.e. all relevant State-controlled and local government roads). This should include a tabulation and

description of the comparison of the road traffic noise levels. A model verification shall be developed for all assessments. A calculation of the noise level shall be undertaken for the same conditions when the measurement was undertaken for comparison with the measured level. If the calculated and the measured noise levels are within  $\pm 2$  dB(A), the model is considered to be verified. When the tolerance is greater than  $\pm 2$  dB(A), all input data shall be scrutinised for errors. When the calculated level is greater than the measured level by no more than 2 dB(A), the input data shall be retained and used for 10 year traffic noise predictions. When the calculated level is lower than the measured level but within the 2 dB(A) tolerance, the model shall be manually corrected by a calibration factor to equal the measured level.

Location	Measured	Calculated	Comments
1			
2			
3			
4			

### Road Traffic Noise Attenuation Strategy

Road traffic noise level calculations and predictions for the base and ten year horizon respectively for all sensitive receptors, with and without any proposed traffic noise attenuation for contributions from State-controlled roads only. Service roads shall be considered where the road traffic noise will impact upon a development.

Note: Additional information may be required by local government to satisfy local government requirements Note: Fences that are not constructed in accordance with departmental specification MRTS15 shall not be included in noise calculations and predictions.

The acoustical consultants shall provide the following in addition to the above:

- What height noise barrier is required to satisfy departmental criteria for all receptor levels, and
- What height noise barrier is required to satisfy departmental criteria for the ground floor receptors only, or
- What height noise attenuating structure is required to meet part of the site specific criterion levels.

Proposed Strategy	Description of the proposed Strategy for Road Traffic Noise Attenuation for this development and justification for its proposal. Identify the Strategy Component or combination of Strategy Components listed in Table 6.5 of Chapter 6 of the Code of Practice.	Secondary Criteria Applicable (Tick if Yes)
A	e.g. – no noise attenuation treatments	<input type="checkbox"/>
B	e.g. – 3.0 meter high noise fence as per Figure x.	<input type="checkbox"/>

### **Noise Fences and Landscaped Earth Mounds**

All noise barrier proposals shall be demonstrated in a suitable “Noise Barrier Specification” drawing showing the:

- Location – a plan view of any proposed noise barrier indicating the extents and relationship to other structures such as proposed retaining walls or buildings, road edges, safety barriers, embankments or earth mounds (footprints of any proposed earth mound are to be shown including a 2.0 metre minimum wide flat surface at the top of the earth mound etc.
- Height - top edge level and base edge level using AHD as the reference datum.
- Height above ground level – the height above ground level for each component of the noise attenuating structure is required, for example, if the whole noise barrier consists of a 2.0 metre earth mound (above localised ground level) and a 3.0 metre high noise fence, then the fence is 3.0 metres above ground level but the whole noise barrier is 5.0 metres above the localised ground level.

### **Recommendations and Conclusions**

### **Attachments**

List all the attachments to this document and their purpose, for example:

- Architectural drawings (if any) as used for the acoustical assessment in A3 size format. These drawings are to indicate the proposed floor plan showing rooms with types of activity or occupancy.
- Survey drawings and sub-divisional layout showing the topographical information and proposed building pad levels as used for the acoustical assessment in A3 size format.
- A drawing showing the locations and height of all intervening buildings and existing noise barriers.
- Where it assists, the acoustical consultants or developers are encouraged to supply photographs of the site (in colour).

### **Road Traffic Noise Calculations - General Notes**

The road traffic noise model should only include road traffic located on State-controlled roads. Where a local road is a significant contributor to the noise environment, this should be indicated in the report (the verification model is likely to highlight this issue when present and should include the local road input to the verification process).

In the case of Reconfiguration of a Lot, the noise calculations and predictions should be conducted to all proposed lots (ground and upper floors) and all existing dwellings on any of the sub-divided lots.

A noise attenuating structure is an existing or proposed structure which provides a reduction to road traffic noise. The structure is to be permanent. Standard boundary fences are not permanent structures.

The acoustical report shall as a minimum, present calculated and predicted noise levels with and without any proposed noise attenuating structure. Also, the ultimate noise levels shall be predicted without any intervening fences that provide shielding for the model verification and that are not designed in accordance with departmental Specification MRTS15 *Noise Fences*.

All noise attenuating structures required to meet departmental criteria are required to be designed and constructed to several departmental specifications. The actual specifications which the design and construction must adhere to, depends on the type of noise attenuating structure being proposed.

It is not sufficient to merely state the required construction categories defined in AS 3671 in the acoustical report. The acoustical consultant shall provide guidance to the developer with respect to each building element necessary to achieve the required RW ratings.

The receptor height used in the acoustical assessment shall be 1.5 m above the finished floor level/s (FFL). In the case of multi-level buildings, all floor levels are to be assessed. For residential subdivisions, where the FFL is not known, the receptor heights shall be assumed at 1.8 m and 4.6 m above an assumed building pad level, for the ground and upper floors respectively. It is essential that both low and high set dwellings be considered in the assessment

Date of Assessment – 10 years from the date of expected completion of the subdivisional or dwelling construction, if different to the original development application report, traffic volumes will need to be upgraded accordingly.

#### **Checklist**

- A description of the development and the noise sensitive locations.
- A locality plan and real property descriptions.
- Architectural drawings (if any) as used for the acoustical assessment in A3 size format.
- Survey drawings and sub-divisional layout showing the topographical information as used for the acoustical assessment in A3 size format.
- Results of the on-site noise measurements and the relevant site specific traffic noise criteria for the development.
- A drawing showing the locations of the measurements and height of all intervening buildings and existing noise barriers (note: fences that are not designed in accordance with MRTS15 are not to be included in noise predictions).
- All traffic noise model input data, such as:
  - road level in AHD, pavement surface type, AADT, percentage of commercial vehicles, vehicle speed and growth rate for the base year and the ten year horizon, and
  - assumed building pad levels and/or finished floor levels in AHD and the modelled receptor heights, receptor locations and distances.
- Results of the road traffic noise model verification addressing all road traffic noise sources (i.e. all relevant State-controlled and local government roads). This should include a tabulation and description of the comparison of the road traffic noise levels.
- Road traffic noise level calculations and predictions for the base and ten year horizon respectively for all sensitive locations, with and without any proposed road traffic noise

attenuation for contributions from State-controlled roads only (Note: additional information may be required by local governments to satisfy local government requirements).

- A suitable drawing showing the location and extents of any proposed noise attenuating structures, including:
  - top edge and base level including height above ground of any proposed noise attenuating structure/s in AHD for all receptor levels;
  - top edge and base level including height above ground of a noise attenuating structure/s in AHD which would be required to meet departmental criteria for the ground floor level of any noise sensitive receptors and
  - If the proposed noise attenuating structure/s includes an earth mound, provide the footprint extents of any earth mounds.
- A list of all lots or habitable rooms that require architectural treatment or a list of habitable rooms exceeding the relevant façade criterion level.
- Proposed lot numbers.

Schedule of Predicted Noise Levels and Required Building Treatments - 10 Year Horizon — Prediction Year

A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R
Building/lot/Unit Number	Building Pad Level (AHD)	Floor Level (ground, first, etc.)	Elevation of Finished Floor Level (AHD)	Habitable Room	Predicted External Noise Level, $L_{A10}(18h)$ façade corrected or $L_{A10}(1h)$ façade corrected without Barrier (max hour during normal opening hours)	Predicted External Noise Level, $L_{A10}(18h)$ façade corrected or $L_{A10}(1h)$ and $L_{Aeq}(1h)$ façade corrected with Barrier (max hour during normal opening hours)	External Criterion Level Exceeded (Y/N)	Predicted External Noise Level façade corrected for determination of TNR.	Internal Criterion Level	Assumed RT60 (seconds)	Building Element	Area of Building Element	Required Minimum Rw	Windows and Doors to remain closed? (Y/N)	Method of Ventilation Required or Permitted? (Artificial/Natural)	Recommended Required Minimum Construction



**Appendix 16: Building construction certification - acoustics**

**Road Noise Traffic Attenuation Report**

**Building Construction Certification - Acoustics**

**FORM A**

Development Address:

Real Property Description:

Acoustic Company:

Report Reference Number:

Revision Number:

Assessment Date:

Note: Appropriate completion of this certificate and submitted to the department ensures that each habitable room within the property is provided the required building envelope construction to meet specified internal noise levels. This compliance is only applicable for the design and construction of the dwelling at the time of the inspection by the signatory below. This certificate is required to be executed by a Registered Professional Engineer of Queensland (RPEQ).

I have inspected the construction of the dwellings located at (address) and I confirm that the construction of each dwelling provides satisfactory road traffic noise attenuation in order to meet the internal noise levels stated in the Department of Transport and Main Roads Policy Position Statement, Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure for all habitable rooms where any façade has an external level greater than the departmental Primary Criterion of xxx dB(A)  $L_{A10}(xxx\text{ h})$  façade corrected.

I confirm that these constructions satisfy, in part or in full, the departmental Conditions of Development dated xx/xx/xxxx for this property.

Author:

RPEQ Number:

Signature and Date:

**Road Noise Traffic Attenuation Report**

**Queensland Development Code Certification - Acoustics**

**FORM B**

Development Address:

Real Property Description:

Acoustic Company:

Report Reference Number:

Revision Number:

Assessment Date:

Note: Appropriate completion of this certificate and submitted to the department ensures that each habitable room within the property is provided the required building envelope construction to meet specified internal noise levels. This compliance is only applicable for the design and construction of the dwelling at the time of the inspection by the signatory below. This certificate is required to be executed by a Registered Professional Engineer of Queensland (RPEQ).

I have inspected the construction of the dwellings located at (address) and I confirm that the construction of each dwelling provides satisfactory road traffic noise attenuation in order to comply with the minimum transport noise reduction levels specified in the Queensland Development Code, MP4.4 Buildings in Transport Noise Corridors, for all habitable rooms.

I confirm that these constructions satisfy the requirements of the Queensland Development Code for this property.

Author:

RPEQ Number:

Signature and Date:

## **Appendix 17: Process for tracking road traffic noise issues**

### **1 Introduction**

This document provides an overview of processes, issues and proposed outcomes for monitoring and reporting road traffic noise issues. It has been developed primarily to address performance indicators for noise requirements set out in the Department's Environmental Policy and Strategy.

This document also provides information which is operationally useful, and may meet other reporting requirements.

### **2 Definitions**

#### **Noise**

Unwanted sound transmitted through air or another medium (Sound is defined as any pressure variation in air, water or some other medium).

#### **Road traffic noise**

Noise generated by traffic during the normal operation of a road.

#### **Noise complaint**

A written or verbal expression of discontent from a member of the public, or a person acting on their behalf, about noise generated by traffic on a road under the Department's jurisdiction.

#### **Noise affected property**

An existing property that the Department has identified as being exposed to noise generated by traffic on a road under the Department's jurisdiction, where the TMR noise criteria has been exceeded (refer below to Noise Criteria).

#### **Property**

A property is defined as a single land entity. Examples include single buildings, individual units e.g. strata titled properties and facilities such as schools, hospitals, parks etc.

#### **Noise criteria**

Criteria documented in the current edition of the departmental *Transport Noise Management: Code of Practice Volume 1 – Road Traffic Noise*.

#### **Road traffic noise assessments**

A road traffic noise assessment determines the impact of road traffic noise and appropriate attenuation treatments. This includes guidance on the integration of noise attenuation treatments within the road environment. A Road Traffic Noise Assessment may be prepared for a section of road or an individual site.

### **3 Departmental noise issues**

Generally, the Department is responsible for two types of noise issues:

- Road traffic noise (operational activities)
- Noise from construction/maintenance activities.

Noise issues relating to construction and maintenance activities are managed by the project manager and the contractor undertaking the work. They are not considered as part of the processes detailed in this document.

### **3.1 Road traffic noise**

The Department considers road traffic noise issues according to the departmental document *Transport Noise Management: Code of Practice Volume 1 – Road Traffic Noise (CoP)*. The purpose of the CoP is to provide guidance and instruction for assessing and managing the impact of road traffic noise. The specific objectives of the CoP are to:

- provide advice on the appropriate criteria to be used when assessing road traffic noise
- establish consistent methodologies for assessing the impact of road traffic noise including establishing priorities for noise attenuation treatments
- provide guidance on an integrated design process for the inclusion of noise attenuation treatments into the road environment. This ensures that the social, economic, visual, safety, community and environmental factors are not compromised.

Noise is regulated by the *Environmental Protection Act 1994* and the *Environmental Protection (Noise) Policy 2008 [EPP (Noise)]*. This Policy states acoustic quality objectives for Queensland's acoustic environment. These objectives are long-term goals for obtaining a good standard of amenity regarding environmental noise. These objectives do not apply to the environmental nuisance provisions of a noise from the ordinary use of a public road (refer *Environmental Protection Act 1994*).

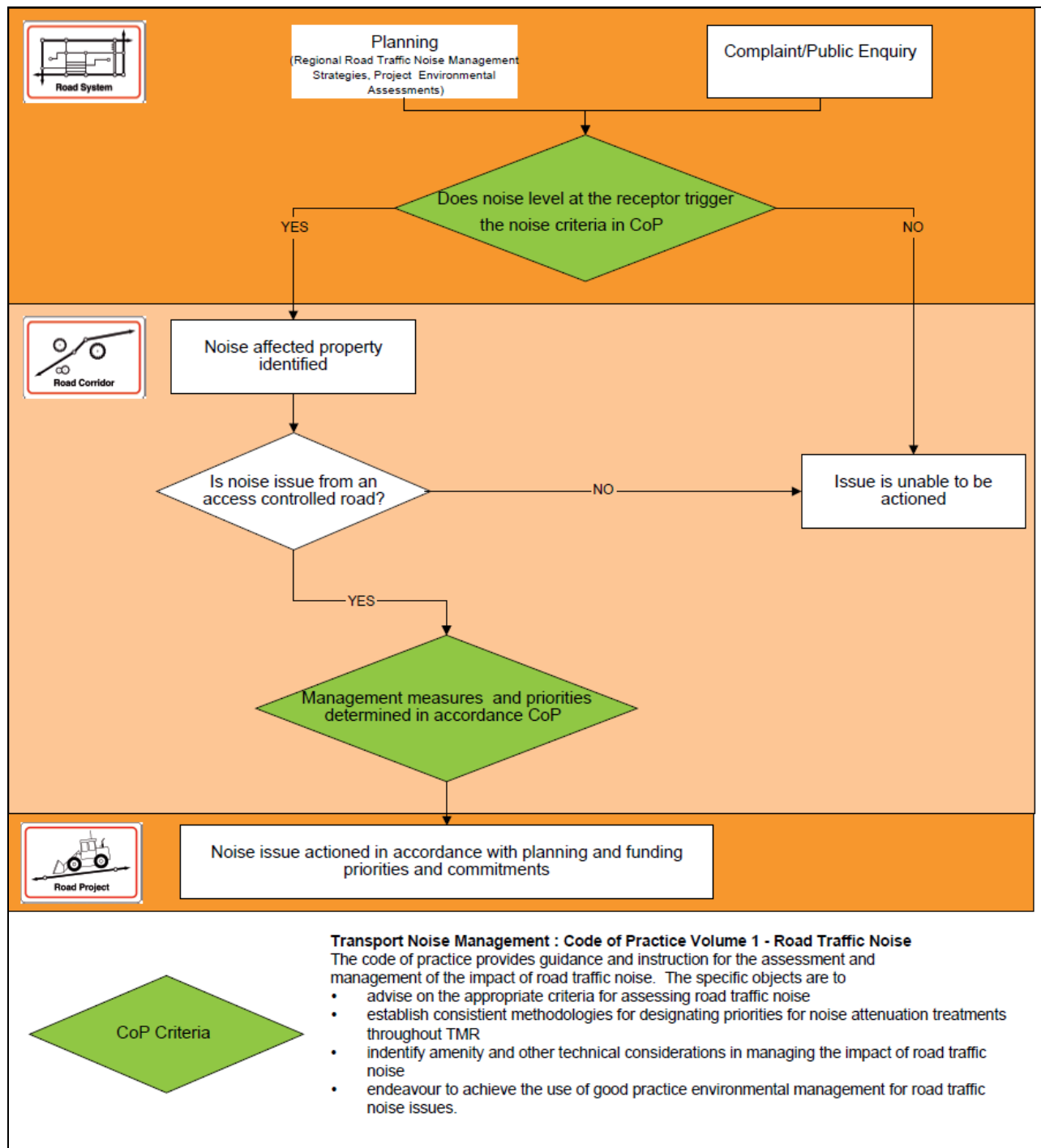
The Transport Infrastructure Act 1994 defines a public road as being a 'beneficial asset'. It recognises that "*although the operation or use of a beneficial asset may have significantly adverse effects on the environmental values, they are necessary for the community's environmental, social and economic wellbeing*".

The criteria do not presume to protect human environment values. This means that people living within an environment exposed to noise from a beneficial asset will be affected by that noise. The Department is a party to reducing any significant adverse environmental impacts from road traffic noise. It is only one of the many stakeholders responsible for managing the impact of road traffic noise.

## **4 Identifying noise impacted properties**

Road traffic noise issues can be identified through complaints, road planning activities and development applications. Developers are responsible for managing road traffic noise issues that are identified as part of the development application process under the *Sustainable Planning Act 2009*. These development issues are not considered as part of the departmental reporting processes. Figure 4 outlines the process used within the Department for identifying and managing road traffic noise issues.

**Figure 4 Process for identification and management noise affected properties**



## 5 Noise complaints

The Department is made aware of public concerns regarding road traffic noise through:

- Ministerials (generally complaints that have been made directly to the Minister's Office)
- Communication from local government (generally complaints that have been made directly to the local government and passed on to the Department)
- Communication from local politicians (local, state and federal)
- Community engagement during road planning activities

- Direct complaint (written, verbal) from individual resident/landowner to local regional office
- Email complaint via the Department's web site.

### **5.1 Using noise complaint data as a measure of noise issues**

To collect useful information, it is necessary to understand how the data is going to be used in relation to the performance measure. Simply counting the number of complaints in a particular area will not necessarily provide a good indication of the number of people exposed to road traffic noise levels above the departmental noise criteria. For example:

- The same person may complain a number of times.
- Many noise complaints are recorded as the result of communication from either the Minister or local government. These are generally recorded as one complaint but in effect could be the result of numerous complaints or even a petition signed by a large number of people.
- People could make a complaint because the noise level is a nuisance to them but the actual noise level could be below the departmental road traffic noise criteria.

The Department recognises that noise is becoming an increasingly important issue. As the general standard of living increases, so do expectations in terms of public amenity issues. It is likely that the number of noise complaints will continue to rise. This is irrespective of whether the actual level of noise from roads increases beyond the departmental criteria. Determining the need for an acoustical assessment or implementing any noise attenuation treatments should be based on scientific analysis – not based on complaints management.

### **5.2 Planning processes**

Road traffic noise issues are proactively identified as part of road planning processes. This is done generally during a road traffic noise assessment or a Regional Road Traffic Noise Management Strategy.

## **6 Data collection**

The following data collection methods are recommended to ensure that data is consistent, meaningful and not onerous to manage.

### **6.1 Noise complaints**

Noise complaints should be recorded by using a Region's complaint management database according to a corporately mandated complaints management system. Parameters recorded in this data base should be:

- name, address, date of complaint
- number of residents effected
- real property description
- purpose of facility (e.g. residential, school and hospital)
- details of the outcome of any investigation (i.e. what was the measured / modelled / predicted noise level(s)).

## **6.2 Recording road traffic noise issues identified through planning**

Data is usually collected on a project-by-project basis but not consolidated into a summary document. In areas where planning studies have identified noise levels above the departmental criteria, a database/spreadsheet should record expected noise levels and areas affected. Once the system is established, maintaining information will be relatively straight forward. Measurements will be added as they are obtained.

**Appendix 18: Example correspondence for complaints about road traffic noise**

**A. Inward and Outward Correspondence for Noise Barrier Request**

[Name]

[Address]

[Date]

[Name]

Minister for Transport and Main Roads

GPO Box 2644

BRISBANE

QLD 4001

Please find enclosed a copy of a petition' signed by 175 residents of [suburb] addressed in the first instance to the Queensland Department of Transport and Main Roads.

This year sections of the Bruce Highway, North of Brisbane, have been widened from four lanes to six lanes. A housing estate situated in [suburb] runs along a length of that highway just before the [street name] turnoff.

Since the opening of the last lane and the return of the speed limit to 100 km/h, the level of traffic noise has significantly increased to the point where residents in the area are no longer able to enjoy the outdoor life, which we as Australians should be able to enjoy and which many of us, until now, have enjoyed for many years. In fact, those like myself living in the close proximity of the fence line are not even able to open our windows during peak hour traffic times and that, I assure you, is not an exaggeration.

A wooden fence has been constructed along part of the highway. In another section there is simply a plastic mesh fence. Where there is a fence, it is 2.5 m high and 25 mm in thickness. I am sure there are engineering documents and experts that will argue that what has been constructed is of a recognised standard for a sound barrier, but I can assure you as a person living here and subjected to the noise, the fence is in no way effective. As well as that, the height of the fence means that you actually see the trucks passing.

I do see many examples of more appropriate sound barriers being constructed in other areas, for example at [Suburb], and question why the same has not been erected along this section of the Bruce Highway.



The traffic noise is not something that goes away day or night, although it does vary in its intensity, peak hours in the morning and at night are particularly horrendous. Semi trailers and trucks too use this route continually and frequently apply their air brakes as they pass by this residential area, elevating that noise level further. I acknowledge that there was a need for road expansion as the Pine Rivers population continues to grow. Travelling from [Suburb] to [Suburb] each day, I experience first hand the benefit. However, what was also needed was a bit more consideration and dollars put towards ensuring that at the same time the quality of life for residents in the area was not being destroyed. It is unacceptable the noise we now endure day in day out.

The petitioners are calling upon the Queensland Department of Transport and Main to construct a more suitable sound barrier along the highway leading up to the [Street Name] turnoff.

As the Minister for Transport and Main Roads I seek your support in this matter.

I have offered to host a visit by any interested party including the Department of Transport and Main Roads, local government alderman, the local state MP to the estate to experience first hand what we, as residents must now live with each day.

Yours sincerely

**[Name]**

**PETITION**

**To: THE QUEENSLAND DEPARTMENT OF TRANSPORT AND MAIN ROADS**

<p><b>Petition Contact Person:</b></p> <p><b>Telephone Number:</b></p> <p><b>Address:</b></p>
---

We, the undersigned residents of [Suburb], Pine Rivers, draw the attention of the Queensland Department of Transport and Main Roads to the following:

This year sections of the Bruce Highway, north of Brisbane, have been widened from 4 lanes to 6 lanes. A housing estate situated in [suburb] runs along a length of that highway just before the [Street Name] turnoff. As a result of this roadwork, the residents are now subject to an unacceptable level of road traffic noise throughout the day and night. Semi trailers and trucks use this route continually and frequently apply their air brakes when passing through the area. A wooden fence constructed along the highway is ineffective in combating the noise.

Therefore, your petitioners call upon the Queensland Department of Transport and Main Roads to construct a more suitable sound barrier along the highway leading up to the [Street Name] turnoff.

Sincerely,

**The Undersigned**

	Name	Signature	Address
1			

Our ref:

Your ref:

Accountable executive ED (SEQ)
Contact officer
Telephone
Finalised through
ECS reference
Ministerial reference

[Name}

[Address]

Dear [Name]

**Re: Request for a sound barrier on the Bruce Highway near [Street Name]**

Thank you for your letter of [Date] enclosing a petition to the Honourable [Name} MP, Minister for Transport and Main Roads about traffic noise associated with the widening of the Bruce Highway from four to six lanes and requesting installation of a sound barrier near [Street Name]. The Minister has asked that I respond on his behalf.

As part of the upgrade to this section of the Bruce Highway, the Department of Transport and Main Roads carried out a road traffic noise assessment. This measured existing road traffic noise levels and predicted increases in noise levels over a ten-year period based on forecast traffic growth. The assessment recommended noise-reducing treatment in the form of noise barriers and pavement surface type which were constructed as part of the upgrade to the project.

The Department designs noise barriers to reduce noise to specified levels, which are documented in the 'Road Traffic Noise Management: Code of Practice'. In the case of the Bruce Highway, where there is a major upgrade to an existing road, barriers have been designed to reduce noise levels to 68 decibels or lower.

The reduction of noise levels to 68 decibels or lower does not represent a complete elimination of road traffic noise. It is a compromise between a level of traffic noise that may be achieved, its cost effectiveness technical feasibility, visual amenity and funding levels associated with noise reducing treatments such as noise barriers.

The noise barriers adjacent to your property are constructed of a plywood material, which is compliant with departmental specifications for the supply and construction of noise barriers. The ones you refer to at Aspley are 'absorptive' barriers, designed to absorb road traffic noise. The plywood barriers used on the Bruce Highway are known as 'reflective' barriers. Although different materials have been used, both types of barriers have been designed and built to departmental standards to achieve the departmental criteria.

The barriers are designed to reduce noise generated by road traffic. The height is designed to intercept noise travelling from the road towards each noise-sensitive receptor, such as your house. This may mean in some instances, the tops of heavy vehicles are visible above the barrier.

The Minister has noted your concerns about the noise generated by heavy vehicle engine brakes. Noise barriers are not capable of addressing this specific type of low-frequency noise. However, the Department has initiated a driver education and awareness campaign, with the support of the trucking industry. An educational brochure addressing the issue has been distributed to trucking industry representatives and I enclosed a copy for your information. Signs asking truck drivers to limit the use of engine brakes are installed at strategic entry points around Brisbane.

The Department is currently preparing to undertake post-construction noise monitoring at a number of locations where barriers are installed. Noise monitoring cannot commence until traffic flows return to normal, after the school holiday period. Following collection of this quantitative data, the Department will be in a better position to respond to your concerns about the effectiveness of the barriers. Accordingly, I have arranged for [Name] Regional Director (Metropolitan) to advise you of the results of the noise monitoring when it is completed, in [Date].

In the meantime, if you require any further information, please contact, [Name] Senior Environmental Officer in Metropolitan Region on [Phone No.]. [Name] will be pleased to assist.

Yours sincerely

[Name]

**Senior Advisor**

## B. Example Response – Traffic Noise Assessment Is Planned

[Date]

[Name]

[Address]

Dear [Name]

Thank you for writing to the Department of Transport and Main Roads Metropolitan Region about your request for noise reducing infrastructure to be constructed at the end of [Street] [Suburb]. Thank you also for meeting with departmental officers. [Name] and [Name] on [Date] to discuss your concerns.

As agreed, the Department has carried out a noise measurement at [Street] [Suburb]. The measurement results indicated that noise levels exceed the department's criterion level for consideration of noise reducing treatments. The Main Roads criterion level for consideration of noise reducing treatments is 68dB(A) L<sub>10</sub> (18 hour). This is measured as the top ten percent of noise levels for each hour, averaged over an eighteen-hour period from 6:00am to midnight. (The method for noise level measurements is in accordance with the AS 2702 -1984, Acoustics - Methods for the Measurement of Road Traffic Noise.

Although there are a number of areas where noise levels exceed departmental criteria, this has to be weighed up against the department's available funds for noise reducing treatments, which are very limited. As a result, works need to be prioritised in order of importance and urgency to ensure responsible allocation of funds. Factors that are considered in prioritising works are the magnitude of the noise levels, the presence of existing barriers, the number of properties affected and the technical feasibility of applying noise reducing treatments.

The next step is for the Department to organise a road traffic noise assessment for all properties affected in the [Street] [Suburb] area. The aim of a road traffic noise assessment is to determine the impact of road traffic noise and the appropriate noise reducing treatments that would be effective now, and in the future. A road traffic noise assessment is a much more detailed and comprehensive analysis of noise levels and is undertaken in accordance with the department's Manual, *Transport Noise Management: Volume 1 – Road Traffic Noise Code of Practice*.

The Department requires the calculation and prediction of road traffic noise to be conducted in accordance with the United Kingdom, Department of Transport (1988) procedure, Calculation of Road Traffic Noise (CoRTN 88).

The noise assessment will be carried out this financial year. It will assess options as to the most cost-effective means of reducing noise at affected properties. As mentioned earlier, funding availability for noise reducing measures is quite limited. The results of the noise assessment will be used to determine the priority of the works when the Department reviews its works program.

Metropolitan Region's Senior Environmental Officer, [Name] is available on [Phone No.] if you wish to seek further information or updates.

Yours sincerely

[Name]

**Regional Director (Metropolitan)**

### **C. Example Response – Funding Limitations Prevent Immediate Attenuation**

[Date]

[Name]

[Address]

Dear [Name]

Thank you for your enquiry regarding noise levels at your home, [Address].

The Department of Transport and Main Roads conducted a noise measurement at your home on [Date]. The measurement site was at the most exposed façade affected by noise generated by traffic on [Road]. The result of the noise measurement indicated that the noise level at your home is above the criterion level for the consideration of noise barriers.

The funding for noise barriers is extremely limited and consequently any expenditure must be strictly prioritised. Priorities are determined by considering whether there are existing noise barriers, the magnitude of the measured noise level, the number of properties affected by levels above the criterion level, the feasibility and practicality of constructing barriers and the relative increase (or expected increase) in noise levels over a period.

Although the noise level at your home is above the department's criterion level, there are currently other areas adjacent to State-controlled roads in the Metropolitan Region that are also experiencing noise levels in excess of the criteria. The Department progressively attends to each of these areas by carrying out more detailed noise assessments and considering a range of noise reducing treatments. Presently, there are other properties in Brisbane where noise levels are higher than those at [Address]. Consequently, there are no additional studies currently programmed to consider the noise reducing treatments in your area.

I regret that I am unable to be of more assistance at this stage. Please be assured that the Department will continue to seek additional funds for the construction of noise barriers. If you have any further queries, please contact [Name] on [Phone No.]

Yours sincerely

[Name]

**Regional Director (Metropolitan)**

#### **D. Example Letter – Measured Noise Level Below Criteria for Attenuation**

[Date]

[Name]

[Address]

Dear [Name]

Noise Measurement at [Address]

I am writing to you as a follow up to [Minister] letter of the [Date] to the [Local Member]. [Minister] was responding to issues raised by [Local Member] on your behalf. In this letter [Minister] gave an undertaking for the Department of Transport and Main Roads to carry out a noise measurement at your property. I am pleased to discuss the findings of this measurement.

The Department conducted a noise measurement at your home on the [Date]. The measurement site was at the most exposed facade affected by noise generated by traffic on the [Road]. The measurement was undertaken in accordance with the AS2702-1984, Acoustics - Methods for the Measurement of Road Traffic Noise and was conducted over two, twenty-four hour periods on typical weekdays, exclusive of public or school holidays.

The Department undertakes assessment in accordance with the department's Manual, Road Traffic Noise Management: Code of Practice. The Code of Practice specifies a noise level and other criteria that must be satisfied for Transport and Main Roads to consider the installation of noise barriers. For residential areas on existing roads, this level is 68dB(A). This level is based on what is known as the L<sub>10</sub> (18 hour) noise level. The L<sub>10</sub> (18 hour) is calculated by measuring the top ten percent of levels for each hour of recording, averaged over 18 hours of measurement from 6:00am to midnight on any normal working day.

Some people are more sensitive to noise than others. In situations where a particular level of noise will cause dissatisfaction to some residents, others in the same area may be quite satisfied. The 68 dB(A) is also a compromise between a level of traffic noise that may be achieved and its cost effectiveness, technical feasibility, visual amenity and funding levels associated with noise reducing treatments (i.e. noise barriers).

The highest measured noise level at your home was 59.1dB(A) L<sub>10</sub> (18 Hour). Assuming a 3.5% annual growth rate in traffic volumes, the noise level at your home can be expected to reach 60.6dB(A) L<sub>10</sub> (18 Hour) in [Year]. This level does not exceed the departmental criterion level and consequently the Department is unable to further consider noise-reducing treatments at this time.



Thank you for allowing us access to your home for these measurements. If you have any further queries, please contact [Name] on [Phone No.]

Yours sincerely

[Name]

**Regional Director (Metropolitan)**

**Appendix 19: Example correspondence for complaints about heavy vehicle noise**

**A. Example Inwards Letter – Increased Heavy Vehicle Traffic Noise Complaint**

Dear Sir/Madam,

Over the past six months, myself, my wife, and various other residents of [town] have been troubled by the increased amount of traffic, mostly heavy transport using the [Name] Highway 24/7, the noise pollution created by the heavy transport seems to be increasing week by week.

Not only the number of heavy transport is causing this pollution, but, the lack of thought by transport drivers, using engine brakes coming into the built up area, but, the noise from the exhaust systems of older machinery seems to be an unbridled, unregulated, unchecked source of pollution from noise, which has reached the point over the last few months, that one is unable to get a good night's sleep.

There are times, now that the multi tyred heavy machinery movers have been informed of the overpass over the railway line, when one is unable to hear his own television in the lounge room when these particular heavy transports are travelling through "Single lane" residential areas, using engine brakes, and with extremely noisy engine brakes as used in many of the "Semi-Trailerred" systems. There are also occasions, now that semi drivers seem to be using residential areas to park for their breaks from driving, leaving the trucks running etc to carry out their checks, which on occasions involve whacking the chains and dogs for chains, to check for tension, another source of noise pollution.

My question is:

- what are our rights as a small rural town regarding noise pollution?
- What are the rights of larger towns regarding the same noise pollution?
- Are our rights as citizens of Queensland being protected by the Department of Transport and Main Roads?
- Are the rights of rural towns being neglected regarding the noise and other forms of pollution from increased levels of general traffic, plus the increase number and occasions of neglectful/recalcitrant drivers taking no notice of the signage before entering rural communities?

Regards

**(NAME)**

**Date**

## **B. Example Outwards Letter – Increased Heavy Vehicle Traffic Noise Complaint**

[Date]

Our ref  
Enquiries

[Name]

[Address]

Dear [Name]

Thank you for using the Department of Transport and Main Roads (TMR) Online Enquiry form on [Date] about heavy vehicles using the [Name] Highway. Your Online Enquiry Contact Confirmation Number (CCN) is [xxxx].

As a decentralised state, Queensland depends on the road freight industry to carry the freight that our economy and community depends on. The [Name] Highway is one of the [Name] Region's major transport routes and while TMR aims to strike a balance on roads between the quality of life for residents and road safety, there is a need to undertake specific freight tasks.

TMR controls vehicle access to State-controlled roads on the basis of their dimensions and conformance to vehicle standards and weights. On the [Name] Highway, 25m B-doubles are permitted to use the road as-of-right and for [Name] Road, 25m B-doubles are permitting to use the road under permit.

TMR is aware of the issues of noise made by trucks, especially when using engine brakes. The use of engine braking is a significant safety feature for heavy vehicles, as it reduces brake wear, assists trucks to stop or reduce speed safely, and can prevent heat-induced brake failure. As you may be aware, 'Limit Compression Braking' signs are installed on the [Name] Highway on each approach to [Name] to discourage excessive or unnecessary use of engine braking on State-controlled roads through the town area. It is however acknowledged that the signage is advisory only and cannot be legally enforced as the engine brakes can be used for safety reasons.

For your information there are legislative standards that restrict heavy vehicle noise. They are found in the Transport Operations (Road Use Management - Vehicle Standards and Safety) Regulation 2010.

In addition to regular enforcement activity, TMR has a system in place that enables members of the public to report vehicles operating in a defective state, including excessively noisy vehicles. The

person reporting the vehicle is required to provide their name, address and telephone contact, along with the following details of the vehicle:

- registration plate number
- vehicle make
- location observed
- time and date observed
- nature of the defect.

This information can be reported to the Manager (Compliance) in the region where the vehicle was sighted. If you would like to report a vehicle, please contact the TMR office in [City] on [Phone Number].

TMR has also noted the anti-social behaviour described in your correspondence. If motorists are acting inappropriately in a public place, it is a matter for the Queensland Police Service and you may wish to raise your concerns with your local station.

I trust this information is of assistance.

Yours sincerely

[Name]

**Regional Director (Name)**

### **C. Example Outwards Letter – Response to Heavy Vehicle Noise Complaint**

[date]

[Name]

[Address]

Dear [Name]

Thank you for your email of [date] about truck engine braking noise on the Warrego Highway at Blacksoil.

Trials of the "Limit Engine Braking" signs in Queensland and New South Wales have shown limited success in limiting engine brake noise in the immediate vicinity of the signs. As the signs cannot be legally enforced, the Department of Transport and Main Roads Metropolitan Region developed a strategy based on an educational and awareness campaign.

The Department, with the support of the trucking industry, is progressing the campaign which is aimed at reaching a large percentage of truck drivers and raising community awareness.

Signs asking drivers to limit the use of engine brakes and reduce noise have been installed at key entry points around the city perimeter on the major truck access roads into the metropolitan urban area.

As part of this strategy, signs are not installed at locations in response to individual requests. It is considered that this may lead to proliferation of signs throughout the road network and a reduction in the effectiveness of these and other signs.

Based on this, the Department does not intend to install additional Reduce Noise / Engine Braking signs on the Warrego Highway.

Yours sincerely

[Name]

**Regional Director (Metropolitan)**

#### **D. Example Outwards Letter – Response to Heavy Vehicle Noise Complaint**

[date]

[Name]

[Address]

Dear [Name]

Thank you for your enquiry of [date] about truck exhaust brake noise on Samford Road.

The Department of Transport and Main Roads is aware of the issue of noise made by trucks, especially when using their engine brakes. In view of this, the department's Metropolitan Region has developed a strategy in an effort to address this issue.

The Department, with the support of the trucking industry, is progressing an education and awareness campaign. This is aimed at reaching a larger percentage of truck drivers and raising the community awareness in an effort to reduce truck noise in urban areas.

Signs asking truck drivers to limit using their engine brakes have been installed at key points around the city. An educational brochure addressing the issue has also been produced and distributed to the trucking industry. A copy has been attached for your information.

Based on this, the Department will not be installing "Please Limit Engine Braking" signs on Samford Road.

I also note your comment with regards to the speed of the trucks, you should contact the Queensland Police Service and advise them of this. If the trucks are speeding, enforcement will slow them down and the need to use their engine brakes will be reduced.

Yours sincerely

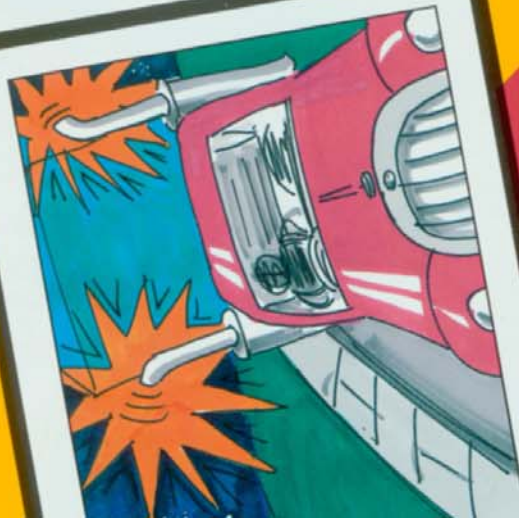
[Name]

**Regional Director (Metropolitan)**



### keep your surroundings quiet

Residents in urban communities in Queensland have expressed concern about heavy vehicle noise. These concerns frequently identify exhaust brake noise, as the cause of the disturbance, generally at night.



The number and size of trucks that enter residential areas are substantial, causing loud noise in these areas.

### braking through the barrier

There has been an increasing number of requests from the public to install Limit Compression Braking signs, both on State and Local Government roads.



Perimeter signs will be placed on the major truck access roads where they enter large residential areas, as part of an overall plan for reducing truck noise. Co-operation from the Transport industry to limit the use of compression braking in residential areas is encouraged.

### a quieter living environment

Make living near a road quieter. Watch the sign and the time and limit compression braking. A small effort by many will help to make the residential areas a more peaceful place.





