Evidential basis for community response to land transport noise

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Primary Objective

Undertake a New Zealand community response study to determine the noise dose-response relationship based on a comparison of short-term changes in noise compared with existing steady-state conditions.

In doing so, the study aimed to establish:

- the current state of thinking for community response surveys by means of a literature review
- a noise dose-response relationship for three study areas
 - (existing road, new or altered road and new or altered rail)
- the difference between existing and new exposure to road (and rail) noise, ie short-term effects.



Research Methodology

Identify suitable study areas:

existing road, new or altered road and new or altered rail

Calculate road and rail noise levels at residential dwellings

Community noise survey – respondent based questionnaire

% HA assessment

Meta-analysis comparison with literature

Non-acoustic analysis



Study Areas

Identify suitable study areas:

- one new or altered road study area
- one existing road study area
- one existing rail study area

Revised Scope:

- one road study area prior to project opening
- one existing road study area
- one existing rail study area



Existing Road

Auckland Southern Motorway

- Papakura to CBD
- 25,681 homes within 500m
- 95,000 AADT



Rail

Section of line	Total number of trains per day	Freight percentage of rail traffic
Puhinui — Papakura	149	9%
Papakura – Pukekohe	64	28%

Section of line	Number of receivers within 150m	~ percentage of residential receivers
Puhinui – Papakura	2,160	40–50%
Papakura – Pukekohe	861	90–100%





Christchurch Northern Arterial

- 7 km of new motorway
- Sparse population
- 371 homes within 200m
- Completion 2019



Waikato Expressway

- 16 km of new roads
- Sparsely populated rural land
- 267 homes within 200m
- Completion 2016



AECON

Wellington Northern Corridor – Mackays to Peka Peka

- 18 km of new roads
- 795 homes within 200m
- Completion 2017



AECON

Auckland – Waterview Connection

- 5 km of new motorway
- 2.4 km within tunnel
- 808 homes within 200m
- Completion 2017



Questionnaire

Introduction

Demographic details

Source of noise and disturbance

five-point scale

Impact of noise from road traffic

ISO 11 point scale and times of day when at home

Impact of noise from rail traffic

ISO 11 point scale and times of day when at home

Transport usage – forms of transport the respondent uses

Recruiting for second household interview

Closing questions – opportunity to make comments



Annoyance Questions

Sources of annoying noise

10. I'm now going to ask you some questions about different sources of noise, which might or might not annoy you when you are at home.

Thinking about the last 12 months or so, when you are at home, about how much does noise from ... [RD. insert first option] bother, disturb or annoy you? Please answer using a scale from not at all, slightly, moderately, very, or extremely?

And what about? Note to interviewer Read each noise source

		Slightly		E	xtremely	DK	Not a all
a.	Aircraft	1	2	3	4	98	99
b.	Alarms or sirens						
c.	Animals	1	2	3	4	98	99
d.	Building and construction	1	2	3	4	98	99
e.	Local businesses, factories or industry	1	2	3	4	98	99
f.	Pubs and nightclubs	1	2	3	4	98	99
g.	Neighbours, including their children	1	2	3	4	98	99
h.	Road traffic	1	2	3	4	98	99
i.	Road works	1	2	3	4	98	99
j.	Trains	1	2	3	4	98	99

Impact of noise from road traffic

12. Thinking in particular about noise from road traffic.

On a scale from 0-10, where 0='not at all annoyed' and 10='extremely annoyed', what number from zero to 10 best shows how much you are bothered, disturbed or annoyed by noise from **road traffic**?

- 00 Not at all annoyed 11 22 33 44 55 – Midpoint 66 77 88 99 10 ...10 – Extremely annoyed 98 ...Don't know
- 13. In what ways does noise from road traffic bother or annoy you? PROBE FOR CLEAR ANSWER
 - 96 ... Answer Specify 98 ... Don't know

14. So we can understand when you might be affected by noise from **road traffic** while you are at home, thinking about the **days of a typical week**, can you tell me whether you are likely to be home or in the immediate neighbourhood close to your home for each of the following times? **Read**

- 1.....Between 7am and 11am in the morning
- 2Between 11am and 3pm
- 3Between 3pm and 7pm in the afternoon and the early part of the evening
- 4Between 7pm and 11pm
- 5Between 11pm and 3am late at night and early in the morning
- 6 Between 3am and 7am
- 98 ... Don't know **Do not read**
- 99 ... Refused **Do not read**

15. And what about the **days of a typical weekend**? Can you tell me whether you are likely to be home or close to your home for each of the following times? **Read CODE MANY**

- 1Between 7am and 11am in the morning
- 2Between 11am and 3pm
- 3 Between 3pm and 7pm in the afternoon and the early part of the evening
- 4Between 7pm and 11pm
- 5.....Between 11pm and 3am late at night and early in the morning
- 6 Between 3am and 7am
- 98 ... Don't know **Do not read**
- 99 ... Refused ** Do not read**

16. If Q8 = 1 skip to Q26 else ask In general, would you say the other people who live in your home find noise from road traffic they hear while they are at home more or less annoying than you do, or about the same?

- 1 More annoying
- 2 Less annoying
- 3 About the same
- 98 ... Don't know





Demographics



Demographics



Reported Annoyance – SH1

Source of noise (n=400)	Proportion of respondents bothered, annoyed or disturbed by noise source (%)			
	Slightly to extremely	Moderately to extremely	Very to extremely	
Aircraft	45	21	6	
Alarms or sirens	49	21	7	
Animals	42	19	6	
Buildings and construction	29	14	4	
Local businesses, factories or industry	13	7	4	
Pubs and nightclubs	5	3	1	
Neighbours, including their children	39	19	8	
Road traffic	69	46	24	
Road works	41	20	6	
Trains	19	6	1	

Reported Annoyance – Study Area

Source of noise	Proportion of respondents 'very' to 'extremely' bothered, annoyed or disturbed by noise source (%)			
	Rail	SH1	Waterview	
Aircraft	21	6	9	
Alarms or sirens	22	7	25	
Animals	15	6	13	
Buildings and construction	10	4	25	
Local businesses, factories or industry	9	4	3	
Pubs and nightclubs	4	1	4	
Neighbours, including their children	21	8	25	
Road traffic	30	24	37	
Road works	14	6	25	
Trains	19	1	5	

SH 1 (road traffic) - percentage highly annoyed (%HA) as a function of L_{dn}



AECOM

Rail study area (rail traffic) - percentage highly annoyed (%HA) as a function of L_{dn}

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Waterview (road traffic) - percentage highly annoyed (%HA) as a function of L_{dn}



AECOM

	Study area	L _{Aeq(24h)} /dB	L _{dn} /dB	Miedema and Vos
>0 %HA	Rail	37	40	42
	SH 1	40	42	42
	Waterview	38	39	42
	Rail	62	63	76
>20 %HA	SH 1	59	60	65
	Waterview	58	59	65

Category	Rail	SH1	Waterview
General traffic noise	3	28	5
Specific traffic noise	23	35	13
Driver behaviour	66	47	47
Heavy goods vehicles (HGVs)	16	15	13
Motorbikes	8	5	4
Police/ambulance sirens	6	6	3
Trains	3	1	0
Other noise sources	2	0	0
Non-noise issues	12	15	6
Lifestyle impact	19	66	32
Total responses to question	59 (24%)	92 (23%)	51 (32%)

Category	Rail	SH1	Waterview
Aircraft noise	12	7	2
Industrial noise	3	2	3
Community noise	9	17	11
Traffic noise	0	11	1
Driver behaviour	6	10	4
Construction/roadworks	3	3	7
HGVs	5	5	2
Police helicopter/sirens	6	8	2
Other noise	2	1	0
Vibration	2	2	2
Lifestyle impact	6	7	3
Suggestions for improvements	7	16	1
Non-noise issues	4	4	4
Survey (positive/negative)	4/2	2/0	3/1
Total	71 (29%)	93 (23%)	35 (22%)

Questions