

Before the Board of Inquiry
Waterview Connection Project

in the matter of: the Resource Management Act 1991

and:

in the matter of: a Board of Inquiry appointed under s 149J of the Resource Management Act 1991 to decide notices of requirement and resource consent applications by the NZ Transport Agency for the Waterview Connection Project

Second Expert Caucusing Joint Report to the Board of Inquiry – Noise
(construction and operational)

Dated: 17 March 2011

SECOND EXPERT CAUCUSING JOINT REPORT TO THE BOARD OF INQUIRY

INTRODUCTION

- 1 This joint signed report is written in response to the Board of Inquiry's Minute and Directions dated 23 December 2010. The Directions require the experts, following caucusing, to provide a report that includes:
 - 1.1 Areas that have been resolved and how (e.g. by agreement about conditions)
 - 1.2 Areas that are not resolved, and succinctly why.
- 2 This report relates to the caucusing topic of **operational and construction noise**.
- 3 A caucusing meeting was held on **16 March 2011**.
- 4 Attendees at the meeting were:
 - 4.1 Siiri Wilkening (Noise, for the NZTA)
 - 4.2 Malcolm Hunt (Noise and vibration, appointed by the Board of Inquiry, and author of the EPA s42A report)
 - 4.3 Nevil Hegley (Noise, for Auckland Council and Transport).
- 5 We agreed that there were no remaining areas of disagreement.
- 6 We agreed to respond to the Board's concerns relating to the use of "where practicable" within noise and vibration conditions.
- 7 Following caucusing of the noise experts, a combined meeting with the planning expert caucusing was held and amendments to noise and vibration conditions discussed and agreed.

CONSTRUCTION NOISE

- 8 In response to the Board's concerns relating to the use of "where practicable", we proposed to remove these words from draft construction noise condition CNV.2 without compromising the intention of the condition to allow potential exceedance of the criteria.
- 9 We discussed several changes to wording, specifically focussing on CNV.1, CNV.2 and CNV. 13. These changes were discussed with the Planning Caucusing group and agreement reached about amendments to these conditions. A full set of amended Construction Noise conditions is attached in **Annexure A** of this Joint Statement.
- 10 Reasons for the agreed amendments were:
 - 10.1 To clarify the wording of the conditions to reflect the process set out in the Flow Chart attached in Annexure C of Siiri Wilkening's supplementary evidence;

- 10.2 To reduce reliance of the assessment of construction noise effects on practicability, i.e. improving certainty about processes and outcomes;
- 10.3 To reflect the processes set out in the Construction Noise and Vibration Management Plan more clearly in the conditions;
- 10.4 To allow for Auckland Council to nominate if they wish to receive any Site Specific Noise Management Plan. This allows for Council to receive all SSNMPs if necessary, however the amended provisions also allow for unnecessary paperwork to be avoided by Council, if appropriate.


OPERATIONAL NOISE

- 11 In response to Member Dunlop's concerns relating to internal operational noise levels, we discussed operational (traffic) noise effects.
- 12 We confirmed our support for the application of the concepts and criteria as set out in NZS6806:2010 "Acoustics – Road-traffic noise – New and altered roads", for all noise sensitive locations along the Waterview Project alignment.
- 13 We arrived at this conclusion because of the following reasons:
 - 13.1 Worldwide, road traffic noise is treated differently to industrial and other noise sources. A higher level of road traffic noise is accepted by the community than noise from other sources. This is because road traffic noise generally causes less annoyance to residents. This is supported by research, e.g. the Schultz curve.
 - 13.2 The World Health Organisation guidelines for internal and external noise levels are rarely achieved anywhere in the world next to busy roads.
 - 13.3 In New Zealand, noise from new and altered roads is assessed in accordance with NZS6806:2010. This Standard reflects, and is based on, the information set out in Paragraphs [13.1] and [13.2] above.
 - 13.4 NZS6806 assessments embody the requirements of the RMA, including the concept of the Best Practicable Option, weighing options and being assessed by a wide team of experts.
 - 13.5 The following sections of NZS6806:2010 describe the concepts on which the assessments are based:
 - "3.3.2
The noise criteria contain in section 6 of this Standard are designed to set reasonable criteria for the road-traffic noise from new or altered roads taking into account health issues associated with noise, the effects of relative changes in noise levels on people and communities, and the potential benefits of new and altered roads to people and communities."
 - "4.7.2
The noise criteria in this Standard have been selected to limit adverse effects on people of road-traffic noise above a reasonable level and health


criteria, recognising as does WHO that the evaluation of control options must take into account technical, financial, social, health, and environmental factors."

- 13.6 We note that only a small number of buildings (14 of the 521 buildings assessed) have been identified that may potentially receive noise levels above reasonable external levels (i.e. dwellings in Category C, marked red on the noise level figures in Appendix F of Technical Report G.12). These include dwellings on the southern end of Alwyn Ave (Sector 1), dwellings in Great North Road north of SH16 (Sector 6) and buildings at Unitec.
- 13.7 Category C buildings may require mitigation to ensure indoor future traffic noise levels do not exceed $L_{Aeq(24hr)}$ 40 dB. In accordance with NZS6806:2010, achieving the external noise criteria of Categories A and B provides a better traffic noise outcome for residents than the internal criterion for Category C buildings.
- 13.8 For dwellings in Sectors 1 to 7, along SH16 and Great North Road, the mitigation identified to be the BPO will result in betterment for the most affected dwellings. This means that these dwellings are predicted to receive noise levels for the design year (2026), which are lower than current (2010) noise levels.
- 13.9 We consider that by achieving the noise criteria of Categories A and B externally, internal noise levels are sufficiently controlled to reasonable levels of traffic noise. Where the external noise criteria of Categories A and B cannot be achieved, the internal noise criterion of Category C will be applied as required by NZS6806:2010.
- 13.10 We did not amend the recommended operational noise conditions as the approach of NZS6806:2010 and the wording of the operational noise conditions were considered adequate to avoid unreasonable future traffic noise effects, including effects within dwellings and noise sensitive buildings.

Dated: 17 March 2011


Siiri Wilkening (Noise, for the NZTA)


Nevil Hegley (Noise, for the Auckland Council and Transport)


Malcolm Hunt (Noise and Vibration, for the Board of Inquiry)

ANNEXURE A

Note: Agreed changes made during the Planning Caucusing on the 8th March 2011 are shown as red underlined, agreed changes made during the Noise and Planning Caucusing on the 16th March 2011 are shown as green underlined.

PROPOSED NOISE AND VIBRATION (CNV) CONDITIONS – CONSTRUCTION

CNV.1	<p>The NZTA shall finalise and implement through the CEMP, a Construction Noise and Vibration Management Plan (CNVMP) throughout the entire construction period of the Project.</p> <p>The CNVMP shall describe the measures adopted to, as far as practicable, meet:</p> <p>(a) the noise criteria set out in Conditions CNV.2 and 3 below; and</p> <p>(b) the vibration criteria set out in Condition CNV.4 below; <u>or</u></p> <p>(c) <u>where (a) or (b) cannot be met, the process that will be followed to appropriately mitigate noise and vibration effects including methods that may be applied outside the designation.</u></p> <p>The CNVMP shall be provided to the Auckland Council at least 20 working days prior to construction activities being undertaken for review and certification that the CNVMP, as a minimum, addresses the following:</p> <p>(i) Construction noise and vibration criteria (Conditions CNV.2, CNV.3, and CNV.4);</p> <p>(ii) Hours of operation, including times and days when noisy and/or vibration inducing construction activities would occur;</p> <p>(iii) Machinery and equipment to be used;</p> <p>(iv) Vibration testing of equipment to confirm safe distances to buildings prior to construction;</p> <p>(v) Preparation of building condition surveys of critical dwellings prior to, during and after completion of construction works;</p> <p>(vi) Roles and responsibilities of personnel on site;</p> <p>(vii) Construction operator training procedures;</p> <p>(viii) Methods for monitoring and reporting on construction noise and vibration;</p> <p>(ix) A hierarchy of mitigation options that will be assessed for the Project noise mitigation, including alternative strategies where full compliance with the relevant noise and/or vibration criteria cannot be achieved;</p> <p>(x) Management schedules containing site specific information;</p> <p>(xi) Measures for liaising with and notifying potentially affected receivers of proposed construction activities and the potential for noise and vibration effects, specifically:</p> <ul style="list-style-type: none"> • PPFs located within 35 metres of underground excavation works along the tunnel alignment shall receive prior notification no greater than 7 days (and not less than 24 hours) prior to the commencement of works.
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PROPOSED NOISE AND VIBRATION (CNV) CONDITIONS – CONSTRUCTION

	<ul style="list-style-type: none"> • Methods for ensuring affected residents are notified of scheduled night-time works (i.e. any works during the hours of 20:00 to 06:30) at least 5 days prior to the commencement of any such work. • Maps showing PPFs to be notified shall be included within the CNVMP. <p>(xii) Methods for receiving and handling complaints about construction noise and vibration;</p> <p>(xiii) Measures for preventing the occurrence of rogue fly rock, including management of charge weights and face loading procedures, stemming of charge holes and profiling of the face to maintain minimum burden (face cover);</p> <p>(xiv) Investigations of the practicability of implementing Building Modification mitigation, as required in accordance with Conditions ON.6 and ON.11 , prior to commencement of construction within 100m of the relevant PPFs; and</p> <p>(xv) <u>The process for developing Site Specific Noise Management Plans (SSNMP), including templates and a certification process for Auckland Council (in accordance with Condition CNVMP.12,13) to confirm the process of SSNMP review of noise mitigation options where the modelled/predicted levels or subsequent actual levels exceed the criteria in Conditions CNV.2 and/or CNV.4.</u></p>
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PROPOSED NOISE AND VIBRATION (CNV) CONDITIONS – CONSTRUCTION

CNV.2

Except where certified by the Council through the SSNMP (in accordance with Condition CNV.13), construction noise (excluding noise from blasting Monday to Saturday inclusive) shall be measured and assessed in accordance with NZS 6803:1999 “Acoustics – Construction Noise” and shall, ~~as far as practicable,~~ comply with the following criteria:

Note: In Condition CNV.2 (T) means a duration between 15 minutes and 60 minutes, in accordance with NZS6803:1999.

(a) Project Construction Noise Criteria: Residential Receivers

Time of week	Time period	Project Construction Noise Criteria (Long Term Construction) dB		
		Sectors 1 to 7	Sectors 8 and 9	All Sectors
		LAeq(T)	LAeq(T)	LAFmax
Monday – Saturday	0630–0730	60	45	75
	0730–1800	70	70	85
	1800–2000	65	65	80
	2000–0630	60	45	75
Sundays and Public Holidays	0630–0730	45	45	75
	0730–1800	60	45	85
	1800–2000	45	45	75
	2000–0630	45	45	75

(b) Project Construction Noise Criteria: Commercial and Industrial Receivers

Time period	Project Construction Noise Criteria (Long Term Construction) dB
	LAeq(T)
0730–1800	70
1800–0730	75

CNV.2 cont.

(c) Project Construction Noise Criteria: Internal Structure-borne Noise from

PROPOSED NOISE AND VIBRATION (CNV) CONDITIONS – CONSTRUCTION

tunnelling for Residential Receivers		
Time period	Project Construction Noise Criteria Inside	
0600–2200	35 dB $L_{Aeq(T)}$	All habitable rooms
2200–0600	30 dB $L_{Aeq(T)}$	Bedrooms

(d) Project Construction Noise Criteria: Internal noise for Licensed Educational Facilities

Time period (School Days)	Project Construction Noise Criteria Inside	
Teaching Hours	45 dB $L_{Aeq(T)}$ or existing, whichever is the higher	Classrooms, library, offices, teaching, laboratories, manual arts, workshops
Teaching Hours	40 dB $L_{Aeq(T)}$ or existing, whichever is the higher	School hall, lecture theatres

Note: In Condition CNV2(d) "Teaching hours" means:

Primary schools and Kindergartens: 9am to 3pm

Unitec: 8am to 9pm

PROPOSED NOISE AND VIBRATION (CNV) CONDITIONS – CONSTRUCTION

CNV.3	Project Construction Noise Criteria: Airblast (excluding Sundays)		
	Category	Type of Blasting Operations	Peak Sound Pressure Level (L_{zpeak} dB)
	Human Comfort Limits		
	Sensitive Site	Operations lasting longer than 12 months or more than 20 Blasts	115 dB for 95% blasts per year. 120 dB maximum unless agreement is reached with occupier that a higher limit may apply
	Sensitive Site	Operations lasting less than 12 months or less than 20 Blasts	120 dB for 95% blasts per year. 125 dB maximum unless agreement is reached with occupier that a higher limit may apply
	Occupied non-sensitive sites such as factories and commercial premises	All blasting	125 dB maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacturer's specifications of levels that can be shown to adversely affect the equipment operation
	Damage Control Limits		
	Structures that include masonry, plaster and plasterboard in their construction and also unoccupied structures of reinforced concrete or steel construction	All Blasting	133 dB unless agreement is reached with owner that a higher limit may apply.
	Service structures such as pipelines, powerlines and cables located above ground	All Blasting	Limit to be determined by structural design methodology

PROPOSED NOISE AND VIBRATION (CNV) CONDITIONS – CONSTRUCTION

CNV.4	<p><u>Except where certified by the Council through the SSNMP (in accordance with Condition CNV.13),</u> construction vibration received by any building shall be measured and assessed in accordance with the German Standard DIN 4150-3:1999 “Structural vibration – Part 3: Effects of vibration on structures”, and shall, as far as practicable, comply with the criteria set out as follows:</p> <table border="1"> <thead> <tr> <th rowspan="3">Type of structure</th> <th colspan="3">Short-term vibration</th> <th rowspan="3">PPV at horizontal plane of highest floor (mm/s)</th> <th rowspan="3">Long-term vibration</th> </tr> <tr> <th colspan="3">PPV at the foundation at a frequency of</th> <th rowspan="2">PPV at horizontal plane of highest floor (mm/s)</th> </tr> <tr> <th>1 – 10Hz (mm/s)</th> <th>1 – 50 Hz (mm/s)</th> <th>50 – 100 Hz (mm/s)</th> </tr> </thead> <tbody> <tr> <td>Commercial/Industrial</td> <td>20</td> <td>20 – 40</td> <td>40 – 50</td> <td>40</td> <td>10</td> </tr> <tr> <td>Residential/School</td> <td>5</td> <td>5 – 15</td> <td>15 – 20</td> <td>15</td> <td>5</td> </tr> <tr> <td>Historic or sensitive structures</td> <td>3</td> <td>3 – 8</td> <td>8 – 10</td> <td>8</td> <td>2.5</td> </tr> </tbody> </table>	Type of structure	Short-term vibration			PPV at horizontal plane of highest floor (mm/s)	Long-term vibration	PPV at the foundation at a frequency of			PPV at horizontal plane of highest floor (mm/s)	1 – 10Hz (mm/s)	1 – 50 Hz (mm/s)	50 – 100 Hz (mm/s)	Commercial/Industrial	20	20 – 40	40 – 50	40	10	Residential/School	5	5 – 15	15 – 20	15	5	Historic or sensitive structures	3	3 – 8	8 – 10	8	2.5
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CNV.5	<p>Notwithstanding Condition CNV.3 above,</p> <p>(a) Blasting activities shall be conducted so that 95% of the blasts undertaken (measured over any twenty blasts on the foundation of any building outside the designation boundary) shall produce peak particle velocities not exceeding 5mm/s and 100% of the blasts undertaken shall produce peak particle velocities not exceeding 10mm/s irrespective of the frequency of the blast measured.</p> <p>(b) Construction activities, which occur within Sectors 1, 6, 8 and 9 which are identified in Technical Report no. G.19 Assessment of Vibration Effects, as being at a ‘High Risk’ of exceeding the DIN 4150-3:1999 criteria (being excavation, piling, compaction and drilling) shall be conducted so that 95% of the activities undertaken (measured over at least 20 representative samples of the relevant activity on any residential building) shall produce peak particle velocities not exceeding the relevant criterion in DIN 4150-3:1999 and 100% of the activities undertaken shall not exceed 10mm/s irrespective of the frequency of the activity measured.</p>																															
CNV.6	<p>Blasting shall be undertaken between 09:00h and 17:00h, Monday to Saturday, except that blasting may be undertaken between 09:00h and 17:00h on Sundays where:</p> <p>(a) The blasting is at least 50m inside the Sector 8 tunnel;</p> <p>(b) The blasting produces peak particle velocities at any residential building not exceeding 0.5mm/s; and</p> <p>(c) The Project construction noise criteria set out in Condition CNV.2(a)–(d) for Sundays are complied with.</p>																															

PROPOSED NOISE AND VIBRATION (CNV) CONDITIONS – CONSTRUCTION

CNV.7	Where practicable, permanent (traffic) noise barriers, required in any Sector as Detailed Mitigation Options for operational noise following completion of the Project (in accordance with Conditions ON.3 to ON.5) shall be erected prior to noise generating construction works. Where this is not practicable, temporary noise mitigation measures shall be implemented in accordance with the CNVMP.
CNV.8	Pile driving or pile removal shall not be undertaken at night (i.e. during the hours of 20:00 – 06:30).
CNV.9	The concrete batch plants shall be fully enclosed.
CNV.10	<p>If noise and vibration monitoring, as required by Conditions CNV.2 and CNV.4 and the CNVMP, indicates that temporary relocation is required for residents at 1510 Great North Road during construction, then at least 1 months notice shall be given to the leaseholder at 1510 Great North Road to confirm relocation requirements.</p> <p><u>If noise and vibration monitoring of the tunnelling works for the Project (in accordance with CNV.1), indicates that the noise or vibration criteria of Conditions CNV.2(c) or CNV.4 will potentially be exceeded and that temporary relocation will be offered for residents at 1510 Great North Road, then relocation (and temporary transportation) shall be arranged with the leaseholder at 1510 Great North Road for tenants (with at least 1 months notice to the leaseholder prior to relocation). Any accepted offer of relocation is to be in place prior to tunnelling works within 50m of the building at 1510 Great North Road.</u></p>
<u>CNV.11</u>	<p><u>For all other properties, if noise and vibration monitoring of the tunnelling works for the Project (in accordance with CNV.1), indicates that the noise or vibration criteria of Conditions CNV.2(c) or CNV.4 will potentially be exceeded, then the process set out in the CNVMP will be undertaken including Site Specific Noise Management Plans. Where relocation for residents is proposed, notification of such relocation with residents and property owners will be undertaken in accordance with the processes contained in the CNVMP.</u></p>
<u>CNV.12</u>	Any relocation required by CNV.10 shall not take place at least 10 working days prior to or during Unitec Examinations <u>and shall not commence over exam periods.</u>
<u>CNV.13</u>	<p>The SSNMPs (required by Condition CNV.1(xv)) above, shall be submitted to the Council Noise Officer and Council Compliance Officer for review and certification at least 5-7 working days prior to the proposed works commencing. <u>A decision Certification or otherwise</u> will be provided by the Council within 35 working days of receipt of the SSNMP. Works will not commence until certification is received from Auckland Council. <u>The Council may, at its discretion, waive the requirement for SSNMPs to be submitted to the Council where an SSNMP is required.</u></p> <p><u>Advice note: It is accepted that the criteria of CNV.2 and CNV.4 may not be met at all times, but that the NZTA will take all practical steps to achieve compliance, taking into account the hierarchy of mitigation options outlined in Condition CNV.1 (ix).</u></p>