Annexure 1: Glossary

Appendix E of the AEE	Assessment of Construction Noise and Vibration Effects report Construction Noise Markups
Appendix F of the AEE	Assessment of Operational Noise and Vibration Effects report Construction Vibration Risk Zone Maps
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
AUP	Auckland Unitary Plan
BPO	Best Practicable Option
CNVMP	Construction noise and vibration management plan
Decibel or dB	The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure
EIC	Evidence-in-chief
$L_{Aeq(t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.
NCI Project	Northern Corridor Improvements Project
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period
Noise	A sound that is unwanted by, or distracting to, the receiver.
PPFs	Protected Premises and Facilities
Styles Review Report	Northern Corridor Improvements Review of Noise and Vibration Effects, Construction and Operational Phases (2 June 2017)
SUP	Shared Use Path

Annexure 2: Relevant provisions

Auckland Unitary Plan: District Plan

Objectives

E25.2.4 - Construction activities that cannot meet noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects.

E25.2.1 - People are protected from unreasonable levels of noise and vibration.

E25.2.2 - The amenity values of residential zones are protected from unreasonable noise and vibration, particularly at night.

E25.2.3 - Existing and authorised activities and infrastructure, which by their nature produce high levels of noise, are appropriately protected from reverse sensitivity effects where it is reasonable to do so.

Policies

E25.3.1 - Set appropriate noise and vibration standards to reflect each zone's function and permitted activities, while ensuring that the potential adverse effects of noise and vibration are avoided, remedied or mitigated.

E25.3.2 - Minimise, where practicable, noise and vibration at its source or on the site from which it is generated to mitigate adverse effects on adjacent sites.

E25.3.5 - Prevent significant noise-generating activities other than roads and railway lines from establishing in or immediately adjoining residential zones.

E25.3.7 - Require activities to be appropriately located and/or designed to avoid where practicable or otherwise remedy or mitigate reverse sensitivity effects on:

(a) existing or authorised infrastructure;

(b) adjacent Business – Light Industry Zone and Business – Heavy Industry Zone;

(c) existing lawfully established rural production activities;

(d) major recreation facilities;

(e) existing lawfully established commercial activities within Business – City Centre Zone, Business – Metropolitan Centre Zone, Business – Town Centre Zone, Business – Local Centre Zone, Business – Neighbourhood Centre Zone, Business – Mixed Use Zone; or

(f) regionally significant mineral extraction activities.

E25.3.10 - Avoid, remedy or mitigate the adverse effects of noise and vibration from construction, maintenance and demolition activities while having regard to:

(a) the sensitivity of the receiving environment; and

(b) the proposed duration and hours of operation of the activity; and

(c) the practicability of complying with permitted noise and vibration

Annexure 3: Conditions as at 15 June (appended to rebuttal evidence of Messrs Burn and McGahan)

Designation conditions

Traffic noise (operation) ~~(ON)~~

ON.1 For the purposes of conditions ON.2 to ON.14:

a. BPO – means the Best Practicable Option;

b. Building-Modification Mitigation – has the same meaning as in NZS 6806:2010 *Acoustics – Road-traffic noise – New and altered roads*;

c. Habitable Space – has the same meaning as in NZS 6806;

d. Noise Assessment – Means the *Traffic Noise and Vibration Assessment Report* submitted with the NoR;

e. Noise Criteria Categories – means the groups of preference for sound levels established in accordance with NZS 6806 when determining the BPO for noise mitigation (i.e. Categories A, B and C);

f. NZS 6806 – means New Zealand Standard NZS 6806:2010 *Acoustics – Road-traffic noise – New and altered roads*;

g. P40 – means the NZ Transport Agency's NZTA *P40:2014 Specification for noise mitigation*;

h. PPFs – means only the premises and facilities identified in green, orange or red in the Noise Assessment; and

i. Structural Mitigation – has the same meaning as in NZS 6806.

Structural mitigation

ON.2 The road-traffic noise mitigation measures identified as the 'Preferred Traffic Noise Mitigation' in Chapter 6 of the *Noise Assessment* must be implemented to achieve the Noise Criteria Categories indicated in the *Noise Assessment* ('**Identified Categories**'), where practicable and subject to conditions ON.3 to ON.14.

ON.3 Prior to construction of the Project, a suitably qualified acoustics specialist must undertake the detailed design of the Structural Mitigation measures in the Noise

Assessment (the 'Detailed Mitigation Options'), which, subject to Condition ON.4, must include at least:

a. Noise barriers with location, length and height in general accordance with the Noise Assessment; and

b. Low-noise road surfaces with location in general accordance with the Noise Assessment.

ON.4 If it is not practicable to implement a particular Structural Mitigation measure in the location or the length or height included in the Noise Assessment, a changed design can be included in the Detailed Mitigation Options if either:

a. ŧThe changed design would result in the same Identified Category at all PPFs, and a suitably qualified person certifies to the Council (Team Leader Northern Monitoring) that the changed Structural Mitigation would be consistent with adopting the BPO in accordance with NZS 6806; or

b. ŧThe changed design would result in the Identified Category changing to a less stringent Category, e.g. from Category A to B or Category B to C at any PPF, and the Council (Team Leader Northern Monitoring) confirms that the changed Structural Mitigation would be consistent with adopting the BPO in accordance with NZS 6806.

ON.5 Prior to construction of the Project, a **Noise Mitigation Plan** prepared in accordance with NZ Transport Agency's *P40 Specification for Noise Mitigation 2014* must be provided to the Council (Team Leader Northern Monitoring).

The purpose of the Noise Mitigation Plan is to confirm that the Detailed Mitigation Options meet the requirements of ON.2-ON.4. The Noise Mitigation Plan shall include confirmation that consultation has been undertaken with affected property owners for site specific design requirements and the implementation programme.

ON.6 The Detailed Mitigation Options must be implemented prior to completion of construction of the Project.

ON.7 Within twelve months of completion of construction of the Project, a post-construction review report written in accordance with NZ Transport Agency *P40 Specification for Noise Mitigation 2014* must be provided to the Council (Team Leader Northern Monitoring).

The review shall include field measurements at a minimum of six representative PPFs within the Project. Monitoring shall be in accordance with the requirements of NZS 6806:2010 "Acoustics – Road-traffic noise – New and altered roads".

ON.8 The Detailed Mitigation Options must be maintained so they retain their noise reduction performance as far as practicable.

Building-Modification Mitigation

ON.9 Prior to construction of the NCI Project, a suitably qualified acoustics specialist must identify those PPFs which, following implementation of all the Detailed Mitigation Options, will receive noise levels above Noise Criteria Category B and where Building-Modification Mitigation might be required to achieve 40 dB $L_{Aeq(24h)}$ inside habitable spaces ('**Category C Buildings**').

ON.10 Prior to construction of the NCI Project in the vicinity of each Category C Building, the Requiring Authority must write to the owner of the Category C Building requesting entry to assess the noise reduction performance of the existing building envelope. If the building owner agrees to entry within twelve months of the date of the Requiring Authority's letter, the Requiring Authority must instruct a suitably qualified acoustics specialist to visit the building and assess the noise reduction performance of the existing building envelope.

ON.11 For each Category C Building identified, the Requiring Authority is deemed to have complied with condition ON.10 if:

a. The Requiring Authority's acoustics specialist has visited the building; or

b. The building owner agreed to entry, but the Requiring Authority could not gain entry for some reason (such as entry denied by a tenant); or

c. The building owner did not agree to entry within twelve months of the date of the Requiring Authority's letter sent in accordance with condition ON.10 (including where the owner did not respond within that period); or

d. The building owner cannot, after reasonable enquiry, be found prior to completion of construction of the NCI Project.

If any of (b) to (d) above apply to a Category C Building, the Requiring Authority is not required to implement Building-Modification Mitigation to that building.

ON.12 Subject to condition ON.11, within six months of the assessment required by condition ON.10, the Requiring Authority must write to the owner of each Category C Building advising:

a. If Building-Modification Mitigation is required to achieve 40 dB $L_{Aeq(24h)}$ inside habitable spaces; and

b. The proposal for Building-Modification Mitigation to the building, if required; and

c. That the owner has three months to decide whether to accept Building-Modification Mitigation to the building and to advise which option for Building-Modification Mitigation the owner prefers, if the Requiring Authority has advised that more than one option is available.

ON.13 Once an agreement on Building-Modification Mitigation is reached between the Requiring Authority and the owner of a Category C Building, the mitigation must be implemented, including any third party authorisations required, in a reasonable and practical timeframe agreed between the Requiring Authority and the owner.

ON.14 Subject to condition ON.11, where Building-Modification Mitigation is required, the Requiring Authority is deemed to have complied with condition ON.13 if:

a. The Requiring Authority has completed Building-Modification Mitigation to the building; or

b. An alternative agreement for mitigation is reached between the Requiring Authority and the building owner; or

c. The building owner did not accept the Requiring Authority's offer to implement Building-Modification Mitigation within three months of the date of the Requiring Authority's letter sent in accordance with condition ON.12 (including where the owner did not respond within that period); or

d. The building owner cannot, after reasonable enquiry, be found prior to completion of construction of the NCI Project.

Resource consent conditions

Construction Noise and Vibration (CNV)

CNV.1 A ~~Construction Noise and Vibration Management Plan (~~CNVMP~~)~~ shall be prepared by an appropriately qualified person, and shall be submitted as part of the CEMP.

CNV.2 The purpose of the CNVMP is to provide a framework for the development and implementation of measures to avoid, remedy or mitigate adverse construction noise and vibration effects, and to minimise any exceedance of the criteria set out in Conditions CNV.5 and CNV.6.

CNV.3 The CNVMP shall be prepared in accordance with the Noise Management Plan requirements of Annex E2 of *New Zealand Standard NZS 6803:1999 'Acoustics – Construction Noise'* (NZS 6803:1999) and shall describe the measures adopted to, as far as practicable, meet the criteria in conditions CNV.5 and CNV.6. The CNVMP shall also be prepared in accordance with the NZ Transport Agency's *State highway construction and maintenance noise and vibration guide* (version 1.0, 2013).

CNV.4 The CNVMP shall identify which mitigation measures required by conditions ON.1 to ON.14 imposed on the designations for the NCI Project would also attenuate construction noise. Where practicable, those measures shall be implemented prior to commencing major construction works that generate noise in the vicinity.

CNV.5 Noise arising from construction activities on land shall be measured and assessed in accordance with NZS 6803:1999 Acoustics - Construction Noise and shall comply, as far as practicable, with the noise limits set out Table CNV1:

Table CNV1: Construction noise limits

Day	Time	$L_{Aeq(15min)}$	L_{AFmax}
Residential buildings			
Weekdays	0630h - 0730h	55 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	65 dB	80 dB
	2000h - 0630h	45 dB	75 dB
Saturdays	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB

Sundays and Public Holidays	0630h - 0730h 0730h - 1800h 1800h - 2000h 2000h - 0630h	45 dB 55 dB 45 dB 45 dB	75 dB 85 dB 75 dB 75 dB
Commercial and industrial receivers			
All	0730h – 1800h 1800h – 0730h	70dB 75dB	

Advice Note:

There may be occasions when it is not practicable for construction activity to achieve the guideline criteria in the standard. In such circumstances, mitigation that is consistent with the best practicable option shall be adopted in accordance with CNV.7~~6~~.

Table CNV2: Construction vibration criteria

CNV.6 Construction vibration shall be measured in accordance with ISO 4866:2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures, and shall, as far as practicable, comply with the Category A construction vibration criteria in Table CNV2 or for pipework, the construction vibration criteria in Table CNV3.

Receiver	Details	Category A	Category B
Occupied PPFs*	Night-time 2000h - 0630h	0.3mm/s ppv	1mm/s ppv
	Daytime 0630h - 2000h	1mm/s ppv	5mm/s ppv
Other occupied buildings	Daytime 0630h - 2000h	2mm/s ppv	5mm/s ppv
All other buildings	Vibration - transient	5mm/s ppv	BS 5228-2** Table B2
	Vibration - continuous		BS 5228-2** 50% of table B2 values

** For vibration, protected premises and facilities (PPFs) are dwellings, educational facilities, boarding houses, homes for the elderly and retirement villages, marae, hospitals that contain in-house patient facilities and buildings used as temporary accommodation (e.g. motels and hotels).*

*** BS 5228-2:2009 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'*

a. If measured or predicted vibration from construction activities exceeds the Category A criteria, a suitably qualified person must assess and manage construction vibration during those activities.

b. If measured or predicted vibration from construction activities exceeds the Category B criteria, those activities may only proceed if vibration effects on affected buildings are assessed, monitored and mitigated by a suitably qualified person.

Table CNV3: Construction vibration criteria (pipework) (from DIN 4150-3:1999)

Line	Pipe material	Guideline values for PPV measured on the pipe, in mm/s
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

CNV.7 If measured or predicted noise and vibration from a construction activity exceeds the criteria in conditions CNV.5 or CNV.6, a Schedule to the CNVMP for that activity shall be prepared in accordance with the NZ Transport Agency's *State highway construction and maintenance noise and vibration guide* (version 1.0, 2013). The Schedule shall, where practicable, be provided to the Council (Team Leader Northern Monitoring) for certification at least five working days in advance of the activity commencing. Where no response is received from the Council within three working days, the Schedule shall be deemed to have been certified and work may commence. The Schedule shall provide details of the best practicable option for noise mitigation to be implemented for the construction activity.

CNV.8 If any vibration-induced damage is shown to have occurred as a result of the NCI Project construction activities, any such damage shall be remedied by the Consent Holder.