



# Airport wide Construction Noise Management Plan

**Prepared for**

Wellington International Airport Limited

**Prepared by**

Tonkin & Taylor Ltd

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## 1 Introduction

Wellington International Airport Ltd (WIAL) is committed to managing noise and vibration caused by airport related construction and maintenance works<sup>1</sup> such that it remains reasonable at neighbouring noise sensitive properties. This updated<sup>2</sup> Construction Noise and Vibration Management Plan (CNVMP) formalises this commitment and provides the necessary guidance and methods to manage noise from airport-wide construction works. This airport-wide CNVMP is an integral part of the Airport Noise Management Plan (ANMP).

This CNVMP is a requirement of the Main Site Area Designation<sup>3</sup> (see Section 4). Condition 35 requires WIAL to:

- prepare and implement a CNVMP
- comply, where practicable with the requirements of New Zealand Standard 6803:1999 *Acoustics - Construction Noise*
- implement the best practicable option for reducing noise to a reasonable level if the noise cannot comply with the noise limits of NZS 6803:1999 and that the duration for each activity shall be identified

Condition 36 requires WIAL to identify the specific management and mitigation required for any night-time construction activity, including:

- measures for consultation with the potentially affected community
- procedures for notification prior to night works
- maximum duration and frequency of night works
- processes for minimising the need for night-time construction works

The objectives of this CNVMP are:

- Establish an airport-wide approach to construction noise management
- Identify appropriate noise limits and performance standards which balance residential noise amenity and the need to undertake works efficiently
- Develop and implement procedures and strategies to reduce noise impacts on the local community
- Develop an engagement procedure that will be undertaken with affected communities
- Provide a framework for project-specific noise management plans for ‘significant’<sup>4</sup> construction works/projects
- Monitor and report on the effectiveness of the mitigation measures implemented in the CNVMP

Although this CNVMP focuses on noise management, vibration from construction activities also needs to be appropriately managed to minimise disturbance to buildings and their occupiers. The spatial separation between on-airport work sites and off-airport vibration sensitive sites will often negate the need to assess and manage vibration.

Management of noise other than construction works is documented in the ANMP.

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<sup>1</sup> Maintenance includes any construction works occur on existing airport infrastructure such as buildings, pavement surfaces, seawall defences, etc.

<sup>2</sup> Initial CNVMP – AECOM 11 August 2017

<sup>3</sup> Environment Court, Decision No. [2022] NZEnvC 106, Airport Purposes Designation – Main Site Area (MSA) – Consent Order, 21 June 2022

<sup>4</sup> For example, works close to residential neighbours (<50 m).

This CNVMP has been reviewed by Wellington Airport's Air Noise Management Committee (ANMC) and Wellington City Council (WCC).

A glossary of terms is included in Appendix A.

## 2 Airport wide construction activities

WIAL regularly undertakes construction works within the airport precinct<sup>5</sup> shown in Figure 2.1, including:

- Pavement construction and resurfacing
- General maintenance works to the runway/taxiway infrastructure, which includes vertical structures and ground level (and below) works
- Capital work projects such as new/replacement buildings
- Airfield Ground Lighting (AGL) installation and maintenance
- Work on marine defence systems including seawalls and structures

WIAL has extensive experience of undertaking these construction works and is mindful of the close proximity of its neighbours (residents and other noise sensitive properties) to the airport boundary. Figure 2.1 shows the residential areas near the airport - Miramar to the north east, Strathmore Park to the South East, and Rongotai to the west.

Construction works can include scheduled and unscheduled works:

- Scheduled works include planned pavement upgrades to aircraft operating areas, pavements such as runway overlays and taxiway and apron resurfacing, upgrading building structures and internal access roads, or constructing new infrastructure, including buildings.
- Unscheduled works will generally include non-critical maintenance and repairs of aircraft operating areas and other facilities within the airport boundary

Where practicable, noisy works are to be undertaken during standard daytime hours of 7:30 am to 6 pm. However, maintenance of aircraft operating areas including runways, taxiways and aprons may often necessitate certain activities taking place at night during the curfew period (1 am to 6 am). WIAL will implement the Best Practicable Option (BPO) to minimise the impact of noisy works at night including the time, duration and frequency of occurrence. Further details are provided later in this CNVMP, including the scheduling of night works<sup>6</sup>.

The requirements of this CNVMP do not restrict the delivery of emergency<sup>7</sup> construction works at Wellington Airport. Emergency works<sup>8</sup> may include critical pavement repairs and works associated with critical infrastructure such as utilities and Airfield Ground Lighting (AGL) or navigational aids. The delivery of emergency works must consider methods to manage noise effects. Any emergency works carried out that involve noisy works shall be notified to the Airport Planning Manager<sup>9</sup> within 24 hours and records kept.

This CNVMP has been produced in accordance with best practice as detailed in NZS 6803:1999 (see Section 6).

<sup>5</sup> Development of the East Side Area is excluded from this Main Site Area (MSA) CNVMP – see ESA designation conditions.

<sup>6</sup> WIAL's construction working week currently runs from Sunday night (Monday morning) to Thursday night (Friday morning).

<sup>7</sup> Resource Management Act 1991 – s330 Emergency works – to take preventative or remedial works.

<sup>8</sup> Emergency works relate to works required for the continued safe operation of the airport, which includes aircraft operating areas and safety critical infrastructure. It does not relate to the same definition of emergency in the ANMP which relates to aircraft operations.

<sup>9</sup> [airnoise@wellingtonairport.co.nz](mailto:airnoise@wellingtonairport.co.nz)



Figure 2.1: Airport layout (source WIAL)

### 3 Approach to construction noise and vibration management

The effects of construction noise and vibration can be mitigated using both management and engineering controls. Mitigation measures should be planned and implemented for all projects in a structured hierarchy depending on the extent of the likely noise effects.

Each project, whether carried out under this CNVMP or a project specific CNVMP, should address the following questions (hierarchy of controls):

- 1 Is there anything preventing the works being done during normal construction work hours (7.30 am to 6 pm Monday – Saturday)?
- 2 Is it imperative that night-time works are undertaken, or can works be rescheduled to daytime?
- 3 Can the works be sequenced to avoid sensitive times for neighbouring residents/businesses?
- 4 Scheduling the noisiest work at the beginning of the shift. For example, performing concrete cutting during the day and then breaking and resurfacing at night, where practicable.
- 5 Minimising the number of consecutive nights that noisy works are to take place and not working Friday or Saturday nights, where practicable. The general shift pattern is Sunday-Thursday nights.
- 6 Use of broad band reversing alarms rather than tonal alarms for all moving plant within the construction site.
- 7 Use of quietest equipment and methodology available to minimise noise. This may include a balance between the overall noise level and the duration of noise. In some situations it may be preferable to undertake short term noisy works rather than having lower noise levels which may occur for a significant period of time.
- 8 Use of temporary construction noise barriers or mobile screens to provide effective acoustic shielding of the equipment/activity. Use of screens may be limited depending upon wind conditions and stability of these structures. Use of mobile screens will not be practicable when conducting milling or paving over large areas.
- 9 Use of multiple items of plant to shorten the construction period, e.g. two items of plant may halve the duration of the activity but at most only lead to a ‘just’ perceptible (3 dB) increase in noise level.
- 10 Use of equipment and construction techniques in accordance with manufacturer’s instructions / site protocols (method statements).

WIAL and its contractors will also consider these controls when planning and undertaking maintenance of the airport’s pavement infrastructure. As these maintenance works can include scheduled and unscheduled activities, this CNVMP addresses these works as a separate section to this management plan to reflect their routine/repetitive nature.

A key requirement of this CNVMP is to provide information to the local community to raise awareness of planned construction works at Wellington Airport, either via WIAL’s website<sup>10</sup> or via letterdrops for significant projects (as required by their own individual CNVMPs). Further information is provided in Section 7.

There is a duty on all persons carrying out construction activities to adopt the BPO to ensure noise does not exceed a reasonable level. This underpins WIAL’s approach to all construction projects. Accordingly, all projects which fall within the framework of this CNVMP should record in the project’s construction methodology how the BPO has been adopted (with reference to the 10 questions listed above and the communication strategy).

<sup>10</sup> <https://www.wellingtonairport.co.nz/noise/construction-noise/>



## 4 Standards

### 4.1 Noise

Designation condition 32 requires WIAL to prepare an ANMP and condition 33 requires that the ANMP includes an airport wide CNVMP.

Designation condition 35 requires that:

*'35. Construction noise from all construction work within the designation shall be managed so that it complies where practicable with the requirements of New Zealand Standard 6803:1999 Acoustics Construction Noise. In managing construction noise, the Requiring Authority shall prepare and implement a Construction Noise Management Plan (CNVMP) based on the Airport Wide Construction Noise Management Plan. The CNVMP shall be prepared in accordance with the guidance provided by the ANMP. Any construction activity or work that cannot comply with the recommended limits of New Zealand Standard 6803:1999 Acoustics Construction Noise shall be identified and the duration for each activity shall be specified. The best practicable option for reducing noise to a reasonable level shall be adopted for these construction activities.'*

and condition 36:

*36. The CNVMP shall include the process for identifying the specific management and mitigation required for any night-time construction activity, including measures for consultation with the potentially affected community, procedures for notification prior to night works, maximum duration and frequency of night works, and processes for minimising the need for night-time construction works.*

The Foreword of NZS 6803:1999 notes that:

*'the generally acceptable level of intrusive noise in the community is assessed under the provisions of NZS 6802:1999 [current version 2008]. However, construction noise is outside the scope of NZS 6802:1999 because it usually cannot be kept within the specified limits. Although this may mean that the noise is undesirable, it is not necessarily unreasonable when all the relevant factors are taken into consideration. Construction noise is an inherent part of the progress of society.'* table and requirements

NZS 6803:1999 includes guidance on recommended noise limits, which depend on the time of day and the duration of construction noise. Table 4.1 and Table 4.2 provide the relevant NZS 6803:1999 noise limits depending upon the duration of noise:

- 'Short-term' means construction work at any one location for up to 14 calendar days
- 'Typical duration' means construction work at any one location for more than 14 calendar days but less than 20 weeks; and
- 'Long-term mean's construction work at any one location with a duration exceeding 20 weeks.

In most cases, construction noise limits are less restrictive than operational noise limits, on the basis that the effects of construction activities are of limited duration.

The Standard's noise limits apply at 1 m from external façades of occupied buildings. Noise is typically assessed over a representative 15-minute period of construction activity. A representative period of activity considers the number of construction plant present, how long they operate for and how the noise varies over the 15-minute period; i.e., whether constant or fluctuating.

NZS 6803:1999 recognises that there may be situations when the recommended noise limits may be exceeded. In these situations, NZS 6803:1999 states that BPO for noise avoidance or mitigation must

be implemented. NZS 6803:1999 includes a detailed section on managing construction noise including the preparation of CNVMPs. Section 8 of the Standard sets out a range of noise management measures, which includes:

- Noise management planning – via good project management to minimise noise problems arising;
- Noise reduction at source – including choice of machinery, noise enclosures and screens;
- Community relations – consultation and co-operation between the contractor and neighbours; and
- Site factors – such as the existing noise environment, distance between the activity and neighbours, sensitivity of the neighbours (residential / commercial), and duration and hours of working, etc.

If the relevant noise limits of NZS 6803:1999 are met then construction noise can be considered reasonable. In situations when the limits are exceeded and BPO has been adopted and community engagement has taken place to raise awareness, then the resulting noise effects can also be considered reasonable.

**Table 4.1: Construction noise limits for residential dwellings - NZS 6803 Table 2**

Time of week	Time period	Duration of work					
		Typical duration dB		Short-term duration dB		Long-term duration dB	
		L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>Aeq</sub>	L <sub>Amax</sub>
Weekdays	6:30 am – 7:30 am	60	75	65	75	55	75
	7:30 am – 6:00 pm	75	90	80	95	70	85
	6:00 pm – 8:00 pm	70	85	75	90	65	80
	8:00 pm – 6:30 am	45	75	45	75	45	75
Saturdays	6:30 am – 7:30 am	45	75	45	75	45	75
	7:30 am – 6:00 pm	75	90	80	95	70	85
	6:00 pm – 8:00 pm	45	75	45	75	45	75
	8:00 pm – 6:30 am	45	75	45	75	45	75
Sundays and public holidays	6:30 am – 7:30 am	45	75	45	75	45	75
	7:30 am – 6:00 pm	55	85	55	85	55	85
	6:00 pm – 8:00 pm	45	75	45	75	45	75
	8:00 pm – 6:30 am	45	75	45	75	45	75

**Table 4.2: Construction noise limits for commercial and industrial buildings - NZS 6803 Table 3**

Time period	Typical duration dB	Short-term duration dB	Long-term duration dB
	L <sub>Aeq</sub>	L <sub>Aeq</sub>	L <sub>Aeq</sub>
7:30 am – 6:00 pm	75	80	70
6:00 pm – 7:30 am	80	85	75

## 4.2 Vibration

There is no New Zealand standard for vibration, however the German Industrial Standard is typically referenced for vibration limits to avoid cosmetic damage to buildings and the British Standard for human perception of vibration within buildings:

- DIN 4150-3:2016-12 *Vibration in buildings – Part 3 - Effects on structures* (DIN 4150-3)
- BS 5228-2:2009 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (BS 5228-2).

## 4.3 DIN 4150-3:2016

DIN 4150:2016-12 is an internationally recognised standard used to assess the effects of vibration on structures. The Standard is commonly used across New Zealand as there are no vibration standards specific to New Zealand. The DIN 4150-3 criteria to evaluate the effects of short-term vibration on structures are shown in Table 4.3 and summarised in Figure 4.1. Short-term vibration is vibration that does not occur often enough to cause structural fatigue, and which does not induce resonance in a building structure.

The table and figure show the recommended vibration limits in terms of Peak Particle Velocity (PPV) as this is directly related to strain, and hence potential for damage to structures. They are lowest in the frequency range of 1-10 Hz, which is the normal range of natural frequency of most structures. The limits increase at higher frequencies where the potential harmonic effects are reduced. The guideline values for PPV are at the foundation and in the plane of the highest floor of various types of building.

**Table 4.3: DIN 4150-3:2016 guidelines for evaluating the effects of short-term vibration on structures**

Line	Type of structure	Vibration at the foundation at a frequency of			Vibration at horizontal plane of the highest floor
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All frequencies
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or occupancy	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

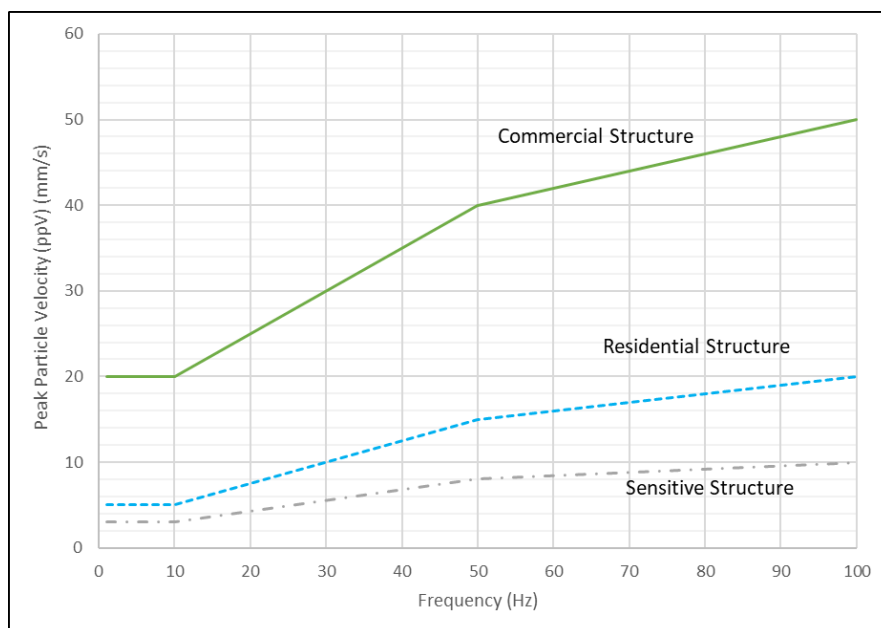


Figure 4.1: DIN 4150-3:2016 Short-term standard baseline curves.

#### 4.4 BS 5228-2: 2009

Human perception and response to vibration varies depending upon the sensitivity of the individual, the tasks being performed, the magnitude, frequency and duration of the vibration, whether the vibration is expected, and whether there is concern that structural damage may occur.

Low levels of vibration can cause fixtures and fittings, such as door and windows, to rattle and the noise that is sometimes generated by the 'rattling' can draw an individual's attention to the original source of the vibration. Humans perceive vibration at much lower magnitudes than the levels of vibration that are likely to cause building damage and as such homeowners are likely to complain about vibration significantly below the levels likely to result in cosmetic damage of buildings.

Within New Zealand there are no national vibration standards for the effects on human exposure within buildings, however, it is accepted practice to apply the guidance from BS 5228-2:2009<sup>11</sup>. BS 5228-2:2009 discusses vibration levels at which adverse comment is likely from building occupants. The guidance values of Table B.1 of BS 5228-2 are provided in Table 4.4.

**Table 4.4: Guidance on effects of vibration levels - BS 5228-2:2009**

Vibration level (PPV)	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

<sup>11</sup> The previous version of this standard is referenced extensively throughout NZS 6803:1999 as a method for predicting the noise levels from specific construction activities. The current version is considered appropriate.

As stated in the Introduction, vibration from construction works is unlikely to be significant when experienced at sites outside the airport boundary. Works that generate ground vibration, such as vibratory compaction or driven piling, within 30 m of a sensitive site may require vibration management and therefore a screening exercise will be undertaken to identify whether vibration producing activities are within 30 m of a vibration sensitive receiver, regardless of whether it is occupied or unoccupied.

A separation distance of 30 m is sufficiently conservative that structural effects are highly unlikely from typical construction techniques (DIN 4150-3) but at a distance at which human perception may occur (BS 5228-2). When impact/vibratory piling, percussive concrete breaking or vibratory compaction activities take place within 20 m of an occupied building there is likely to be adverse effects for the building occupier (i.e. annoyance).

## 5 Noise management

### 5.1 Project risk rating

All construction activities at Wellington Airport have the potential to generate noise and potentially result in a disturbance to residents and other noise sensitive occupied properties. A noise risk assessment is required to ensure there is a comprehensive assessment of potential adverse effects. Each project will need to be ranked according to the noise risk as follows:

- **Low** – predicted noise levels are not considered to be significant and are below the relevant performance noise standard(s) of NZS 6803:1999
- **High** – predicted noise levels without mitigation are likely to meet or exceed the performance noise standard(s) of NZS 6803:1999.

To make this assessment, each project will need to be screened against the performance standards using a simple setback distance approach (see below and Appendix B). The setback distances for routine airport maintenance works, as discussed in Section 6, are provided in Appendix C.

Two tables are provided at Appendix B. The first table provides unmitigated sound levels at 10 m from typical construction plant that may operate at Wellington Airport. Calculated setback distances in metres are provided for each item of plant to achieve the different NZS 6803:1999 performance standards (day of week and time of day). The second table provides similar information but includes an 8 dB reduction<sup>12</sup> for situations when either a proprietary noise barrier/screen has been used or there is no line of sight from the activity to the receiving location; i.e. from carpark or terminal buildings, or local topography. The contractor will determine the closest distance from the work site to the nearest off-site noise sensitive receiver and select the most appropriate items of plant. This will then help to inform the risk assessment.

The overall noise risk for a project should be determined based on the highest risk type of construction activity. If applicable, the cumulative effects of multiple projects / work sites should also be considered. The risk rating should also consider the duration of the works, a single night will be less disturbing than works which span consecutive nights, and the character of the noise, i.e. whether it is likely to attract attention due to the presence of tonality or impulsivity.

If a project is deemed high risk and involves multiple activities<sup>13</sup> taking place for more than 14 calendar days<sup>14</sup>, then a project specific CNVMP should be produced.

Risk screening assessment	Risk rating
Activities are outside the minimum setback distances and noise is below the relevant performance standard	LOW
Activities are within the minimum setback distances and noise is above the relevant performance standard	HIGH
Night works which span consecutive nights (at least 3) and are required within 100 m of residential (or other sensitive land use) neighbours of the Airport.	HIGH
Night works which may have noticeable audible characteristics but may marginally fall outside the minimum setback distance – examples including pavement grooving or use of impact tools.	HIGH
Works involving impact/vibratory piling, percussive concrete breaking or vibratory compaction within 20 m of a residential/commercial or industrial building.	HIGH

<sup>12</sup> 8 dB is a typical level of reduction if there is no line of sight between the noise source and the receiving location. If there is partial line of sight then a lower level of reduction such as 3-5 dB is likely.

<sup>13</sup> Different plant, different locations and different noise characteristics.

<sup>14</sup> To be consistent with the typical and long-term project durations of NS 6803:1999.

## 5.2 Project-specific CNVMPs

If warranted by the risk screening exercise, the appointed contractor shall prepare and implement a project specific CNVMP throughout the entire construction period of the project. The CNVMP must describe the measures adopted to seek to meet the NZS 6803:1999 noise limits, where practicable, and the vibration standards of DIN 4150-3. Where it is not practicable to achieve these performance standards, alternative strategies should be described to address the effects of noise and vibration.

The CNVMP shall be provided to WIAL for approval prior to commencement of the construction project. The CNVMP shall, as a minimum, address the following:

- Description of the works, anticipated equipment/processes and their scheduled durations.
- Hours of operation, including times and days when construction activities causing noise will occur.
- The applicable construction noise/vibration performance standards for the project.
- Identification of affected dwellings and other sensitive locations where noise/vibration limits apply.
- Mitigation options, including alternative strategies where full compliance with the relevant limits cannot be achieved.
- Construction equipment operator training procedures and expected construction site behaviours.
- Methods and frequency for monitoring and reporting on construction noise/vibration.
- Procedures for maintaining contact with stakeholders, notifying of proposed construction activities and handling noise/vibration complaints.

Where vibration risk is identified, the project CNVMP shall also include the following:

- The construction vibration limits for the project.
- Identification of affected dwellings and other sensitive locations where vibration limits apply.
- Methods required to mitigate adverse construction vibration.

## 5.3 General noise and vibration management – airport-wide works

Complaints can arise whether or not noise/vibration complies with the relevant limits. To avoid complaints, general mitigation and management measures include, but are not limited to, the following good practice (most of these requirements equally apply to vibration management, e.g. maintenance and operator best practice):

- 1 Avoid unnecessary noise, such as shouting, the use of horns, loud site radios, rough handling of material and equipment, and banging or shaking excavator buckets.
- 2 Locate equipment at a distance greater than the minimum set back distances where practicable.
- 3 Orient machinery to maximise the distance between the engine exhaust and the nearest sensitive building façade (e.g. excavators).
- 4 Selection of equipment and methodologies to restrict noise and vibration.
- 5 Utilise noise barriers and/or enclosures where appropriate.
- 6 Liaising with neighbours so they can work around specific activities.
- 7 Trucks should enter site without engine brakes and leave site with smooth acceleration and low engine revs.
- 8 When arriving at work, drive slowly on site and keep engine revs to a minimum. Keep stereos off and do not slam vehicle doors.

- 9 Equipment and vehicles should not be left running when not in use.
- 10 Limit vehicle horns to emergency purposes only.
- 11 Where possible, avoid reversing beepers on trucks, opting for flashing lights, broadband alarms or rear sensors where practicable. This is particularly important for any night works to minimise tonal noise.
- 12 All equipment is to be well maintained - simple maintenance can reduce noise levels by as much as 50 %. For example, preventing tracked vehicles from 'squealing' will help to minimise disturbance.
- 13 Do not slam tailgates of vehicles.
- 14 Do not drag materials on the ground. Place them down when you arrive at the work area.
- 15 When loading and unloading trucks do not drop material from a height. Load softer material at the bottom.
- 16 It is essential that good relationships are maintained with local residents. Any queries from members of the public shall be responded to politely and referred to Wellington Airport's point of contact. Staff shall assist the public to contact this person. Staff shall not enter into a debate or argue with members of the public.
- 17 No potentially noisy work will be conducted until all staff involved in the task understands the required noise controls for that task.

### 5.3.1 Staff training

All site personnel will be made aware of the need to control noise from site activities and any specific noise or vibration mitigation relating to site activities. This can be included in the site induction or toolbox talks. In particular, attention shall be given to the following matters:

- Activities with the potential to generate high levels of noise and/or vibration
- Noise and vibration mitigation and management procedures
- The sensitivity of local properties and any operational requirements and constraints identified through communication and consultation.

### 5.3.2 Noise Barriers

If noise barriers are considered practicable, panels should be positioned as close as possible to the construction activity to block line-of-sight between the activity and noise sensitive receivers. Additional local barriers may be necessary near the activity to ensure effective mitigation. The panels should be a minimum height of 1.8 m, and higher if practicable to block line-of-sight<sup>15</sup>. The panels must be abutted or overlapped to provide a continuous screen without gaps at the bottom or sides of the panels.

Examples of temporary noise barriers include the following proprietary 'noise curtains':

- Echo Barrier Temporary Acoustic Noise Barrier (<http://www.supplyforce.co.nz/>)
- Duraflex 'Noise Control Barrier – Performance Series' ([www.duraflex.co.nz](http://www.duraflex.co.nz))
- Soundex 'Acoustic Curtain – Performance Series' (NZ)
- Flexshield 'Sonic Curtain with 4 kg/m<sup>2</sup> mass loaded vinyl backing' (NZ)

Movable screens may be more practicable for pavement works.

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<sup>15</sup> Temporary barriers greater than 2 m are generally impracticable to construct due to wind loading constraints within the aircraft operating areas of the airport.



If there is no line of sight between the source of the noise and receiving location then the mitigated setback distances of Appendix B and Appendix C can be used.

## **5.4 Noise and vibration monitoring**

### **5.4.1 Noise monitoring**

Noise monitoring may be undertaken at locations representative of the nearest noise sensitive properties as follows:

- In response to a reasonable noise complaint
- At the start of any night works to demonstrate BPO is being implemented
- As required by the contractor's site manager / WIAL Airport Planning Manager.

Noise monitoring will be in accordance with the requirements of NZS 6803:1999, measured at 1 m from the façade of the most affected building or representative proxy location. The LAeq and LMax levels will be recorded over a representative period as a minimum.

### **5.4.2 Vibration monitoring**

Vibration monitoring is not considered necessary due to the separation distances between vibratory works and sensitive properties. If reasonable complaints are received, then monitoring can be undertaken as part of the response if deemed appropriate.

All monitoring will be undertaken by a suitably qualified and experienced individual.

## 6 Routine airport maintenance works

### 6.1 Work types

Regular maintenance works include pavement construction and resurfacing and maintenance of runway and taxiway infrastructure. Depending upon their location, i.e. within active operating areas of the airport, works may need to be undertaken at night during the flight curfew.

Works can include localised repair of surfaces, which can typically be undertaken in one shift, to replacement of larger areas of pavement, which may last a number of days or weeks depending upon the scale of the works and the ability to schedule works around aircraft operations.

To facilitate these routine works, a similar risk based approach as per Section 5.1 of this CNVMP has been adopted. This approach is derived from activity noise levels rather than from individual items of plant.

### 6.2 Risk management

As this work is routine and repetitive in nature, rather than preparing specific CNVMPs for each work package, maintenance works are managed as part of this airport-wide CNVMP. For works which involve extensive work across large areas of the airport, e.g. runway / taxiway rehabilitation works, then a project specific CNVMP will be prepared.

For the purposes of this airport-wide CNVMP, pavement maintenance works will typically include:

- Breakout of existing surface
- Excavation and preparation of the subbase
- Milling of the existing surface for larger areas
- Paving of the new surface
- Line markings if needed and final cleaning.

For each activity, different plant will be used. For some works, such as saw cutting and use of breakers, localised noise screens can be used or there may be screening from building structures. For larger items of plant or for mobile activities, such as milling and paving, barriers will not be practicable.

Appendix C provides a breakdown of the noise levels for the activities outlined above for unmitigated and mitigated scenarios. This data is summarised in Table 6.1 and Table 6.2 for unmitigated and mitigated noise sources respectively. The mitigated data should be used when there is a commitment that localised noise screens can be used or there is no line of sight between the work site and noise sensitive properties.

The distances quoted are based on indicative plant that would operate either at the same time, e.g. paving and rolling plant, or noise dominant plant which would operate in isolation, e.g. saw cutting. The set back distances can be used to determine whether notification is needed to potentially affected properties<sup>16</sup>. For the majority of works, notification is likely for works taking place on:

- Weekdays from 8:00 pm to 6:30 am
- Saturdays from 6:00 pm to 6:30 am
- all day Sundays and public holidays

<sup>16</sup> Notification will normally be undertaken for those occupied properties that are within the setback distances as determined by GIS / online mapping services. The Airport Planning Manager may extend the area of notification to include additional properties that adjoin these buffer areas, for example to include a row of buildings on the same street.

WIAL's construction working week currently runs from Sunday night (Monday morning) to Thursday night (Friday morning). Night-time working on Friday and Saturday night may occur in response to unscheduled/emergency works that require urgent remediation.

The lower daytime and evening noise thresholds of NZS 6803:1999 on Saturdays and Sundays ignore that aircraft operations will likely mask daytime maintenance works. If properties are within the 'after 8pm' set back distances (as highlighted in the tables) then engagement with affected property occupiers should be undertaken.

**Table 6.1: Maintenance activity sound levels and set back distances – not mitigated**

Activity	Lp @ 10m dB	Set back distance to NZS 6803 threshold (LAeq) / m						
		80 dB	75 dB	70 dB	65 dB	60 dB	55 dB	45 dB
Sawcut/Breakout Removal	87	20	25	40	65	100	160	400
Excavation & Prep	76	5	10	20	25	35	60	145
Milling	83	15	25	25	40	65	105	265
Paving	81	10	20	20	35	55	85	220
Line marking	77	5	15	25	25	40	65	160

**Table 6.2: Maintenance activity sound levels and set back distances – mitigated (where practicable)**

Activity	Lp @ 10m dB	Set back distance to NZS 6803 threshold (LAeq) / m						
		80 dB	75 dB	70 dB	65 dB	60 dB	55 dB	45 dB
Sawcut/Breakout Removal	79	10	15	20	30	50	75	190
Excavation & Prep	74	5	10	15	20	30	50	120
Milling	83	15	25	25	40	65	105	265
Paving	81	10	20	20	35	55	85	220
Line marking	77	5	15	25	25	40	65	160

As mentioned previously, maintenance may involve unscheduled (and emergency) works which, due to operational needs, may have to be undertaken at short notice. In these situations WIAL will endeavour to contact homeowners prior to works. The most practicable method in these situations is to provide timely notification via electronic means either by email or via WIAL's website.

The next section outlines WIAL's approach to engagement / notification. Community engagement should be a priority for all works which fall within the scope of this CNVMP; providing advanced notice of works and the adoption of BPO will likely result in minimal disturbance effects.

## 7 Community engagement and complaints

### 7.1 Engagement

Effective stakeholder engagement is a critical part of managing construction noise/vibration. Stakeholder engagement can have a greater bearing on acceptance of the works and complaints than the actual noise levels. Neighbours who understand what, when and why the works are happening are often able to adjust their activities accordingly and are generally more tolerant of construction activities.

Stakeholder engagement for construction noise should be integrated with the wider project requirements. Engagement measures include:

- Updating the WIAL website<sup>17</sup> with a list of works both current and planned.
- Prior notification of the high risk works via directed email/letterbox drops or supplemented by other means (news article, website etc) to affected neighbours. The email/letterbox drop will provide contact details and will detail the overall nature and expected duration of the works.

In general, neighbours should be informed at least one week before construction work starts and any local issues/requirements should be identified. For larger projects, stakeholder engagement should commence during the planning and mobilisation phases.

Information provided should include:

- Reason for the works
- Reason for the construction methodology proposed
- Overall timeframe and timing of specific noisy or vibration producing activities
- Reason for any night or weekend works
- Expected noise and/or vibration effects
- Point of contact including name and the air noise phone number - 0508 AIRNOISE (0508 247 664).

Occasionally works may need to be undertaken for emergency repairs/maintenance. In these situations WIAL will use best endeavours to provide advanced warning if works are to occur at night. In this situation, electronic means of notification is appropriate.

### 7.2 Complaints

This section should be read in conjunction with Section 7 of the ANMP.

The following procedure shall be followed for all noise complaints received:

- All queries/complaints should be directed to the Airport Noise Team via email: [airnoise@wellingtonairport.co.nz](mailto:airnoise@wellingtonairport.co.nz) or via the website noise enquiry form: ([www.wellingtonairport.co.nz/noise/construction-noise/](http://www.wellingtonairport.co.nz/noise/construction-noise/)) or by phoning Wellington Airport on 04 385 5100
- As soon as the complaint is received it will be recorded on the complaints register as per Section 7 of the ANMP to detail:
  - Time and date the complaint was received and who received it;
  - Time and date of the activity subject to the complaint (estimated where not known);

<sup>17</sup> <https://www.wellingtonairport.co.nz/noise/construction-noise/>

- The name, address and contact details of the complainant (unless they elect not to provide);
- The complainant’s description of the activity and its resulting effects;
- Any relief sought by the complainant (e.g. scheduling of the activity).
- An initial response will be made and recorded within one working day. Depending on the nature of the complaint the initial response could be to determine if the complaint is justified and reasonable. If justified then immediately cease the activity pending investigation or to replace an item of equipment. However, in some cases, it might not be practicable to provide immediate relief.
- Where the initial response does not address the complaint, further investigation, corrective action and follow-up monitoring shall be undertaken as appropriate. The complainant will be informed of actions taken; and
- All actions will be recorded on the project complaints register.

If complaints are made during construction about vibration, or if monitoring determines it necessary, then building condition surveys may need to be undertaken.

Full details of each complaint will be provided to WCC Noise Team (noiseteam@wcc.govt.nz) within one working day of receiving a complaint, and be included as an agenda item for each ANMC meeting to discuss any corrective actions if the complaint is deemed justified.

### 7.3 Responsibilities

WIAL, in conjunction with its contractors, will be responsible for ensuring that the relevant management plan(s) are correctly implemented. They will review all documentation relating to construction noise and vibration before it is issued.

The contractor for each project shall carry out a screening exercise using this CNVMP to determine if the works are considered high risk. If required the contractor will then:

- Prepare and implement a project specific CNVMP.
- Engage an acoustic specialist if complex noise calculations are required.
- Monitor at the beginning of the project and when methodology or plant changes.<sup>18</sup>
- Liaison with the WIAL project manager on any complaints received and undertake investigation and reporting on complaints as required by the WIAL Project Manager/ Airport Planner.
- Ensure all staff including subcontractors participate in an induction training session on the CNVMP, including:
  - team roles and responsibilities for management of noise matters
  - noise mitigation and management procedures
  - sensitivity of neighbouring properties to noise and any operational requirements or constraints identified through communication and consultation
  - complaints management procedure.

Awareness of current noise matters on, or near active worksites, will be addressed during site meetings and/or toolbox training sessions.

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<sup>18</sup> Monitoring at the start of works helps to confirm the noise levels stated in the project’s CNVMP – if there are notable difference (typically greater than 2 dB) then the CNVMP may require updating. Further monitoring may be required if there is a subsequent change in work practices or the introduction of a noisier activity or item of equipment.

## 7.4 WIAL Project Manager / Airport Planning Manager

The WIAL Project Manager / Airport Planning Manager will:

- Identify and communicate across project teams actual/potential concurrent projects.
- Provide notification to WCC Noise Team for any night-time works, weekdays from 8:00 pm to 6:30 am, Saturdays from 6:00 pm to 6:30 am and all day Sundays and public holidays. The notification will include the general nature and scale of the works, what activities are being undertaken, the location and proximity to the closest noise sensitive sites.
- Undertake consultation with the community, particularly potentially affected residents and businesses prior to works being undertaken.
- Direct the contractor to undertake investigations, monitoring and methodology changes if required in light of monitoring results of complaints.


## 8 Applicability

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This report has been prepared in accordance with our scope of works dated 27 October 2022 and for the exclusive use of our client Wellington International Airport Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd  
Environmental and Engineering Consultants

Report prepared by:



Darran Humpheson  
Technical Director, Acoustics

Authorised for Tonkin & Taylor Ltd by:



Chris Hillman  
Project Director

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## Appendix A Glossary

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Term	Definition
dB	A unit of measurement on a logarithmic scale which describes the magnitude of sound pressure with respect to a reference value (20 $\mu$ Pa)
$L_{Aeq(t)}$	The A-weighted time-average sound level over a period of time (t), measured in units of decibels (dB)
$L_{Amax}$	The maximum A-weighted sound pressure, measured in units of decibels (dB)
PPV	Peak particle velocity. This is the instantaneous maximum velocity reached by the vibrating surface as it oscillates about its normal position
Noise	Unwanted sound

Every 10 dB increase in sound level doubles the perceived noise level. A sound of 70 dB is twice as loud as a sound level of 60 dB and a sound level of 80 dB is four times louder than a sound level of 60 dB. An increase or decrease in sound level of 3 dB or more is perceptible. A change in sound level of less than 3 dB is not usually discernible.

As sound level is measured on a logarithmic scale, the following table provides examples of typical sources of noise.

Decibel (dB)	Example
0	Hearing threshold
20	Still night-time
30	Library
40	Typical office room with no talking
50	Heat pump running in living room
60	Conversational speech
70	10 m from edge of busy urban road
80	10 m from large diesel truck
90	Lawn mower - petrol
100	Riding a motorcycle at 80 kph
110	Rock band at a concert
120	Emergency vehicle siren
140	Threshold of permanent hearing damage



## Appendix B Construction activities

These tables provide an inventory of activities/plant, sound power and sound pressure level and the distance at which the NZS 6803:1999 noise thresholds are met.

**Appendix B Table 1: Equipment sound levels and set back distances – not mitigated**

Plant	Lw	Lp @ 10m	Set back distance to NZS 6803 threshold (LAeq) / m						
			80 dB	75 dB	70 dB	65 dB	60 dB	55 dB	45 dB
2.5m Rotomill	111	<b>83</b>	15	15	30	45	70	110	275
Bobcat	104	<b>76</b>	5	10	20	25	35	60	145
Compressor	101	<b>73</b>	5	10	15	15	30	45	110
Concrete pump	103	<b>75</b>	5	10	20	20	35	50	130
Crane 25T	99	<b>71</b>	5	5	10	20	25	35	90
Dozer D61 18t	118	<b>90</b>	20	35	50	85	130	210	525
Drill Rig	111	<b>83</b>	15	15	30	45	70	110	275
Drop hammer 16T	124	<b>96</b>	35	60	90	145	230	365	910
Dumper 30T	108	<b>80</b>	10	20	20	35	50	85	210
Emulsion sprayer	97	<b>69</b>	5	5	10	15	20	30	75
Excavator 10T	94	<b>66</b>	0	5	5	10	20	25	60
Excavator 12T	94	<b>66</b>	0	5	5	10	20	25	60
Excavator 13T	94	<b>66</b>	0	5	5	10	20	25	60
Excavator 15t	96	<b>68</b>	5	5	10	15	15	30	70
Excavator 23t	102	<b>74</b>	5	10	15	20	30	50	120
Excavator 40T	115	<b>87</b>	20	25	40	65	100	160	400
Excavator 6t	92	<b>64</b>	0	5	5	10	15	20	50
Excavator Long Reach	115	<b>87</b>	20	25	40	65	100	160	400
Grader 110kW	110	<b>82</b>	15	20	25	40	65	100	250
Grader 13T	110	<b>82</b>	15	20	25	40	65	100	250
Impact wrench	104	<b>76</b>	5	10	20	25	35	60	145
Jackhammer	108	<b>80</b>	10	20	20	35	50	85	210
Line marking plant	104	<b>76</b>	5	10	20	25	35	60	145
Loader 10T	104	<b>76</b>	5	10	20	25	35	60	145
Loader 25T	112	<b>84</b>	15	20	30	50	75	120	300
Loader 5T	96	<b>68</b>	5	5	10	15	15	30	70
Paver	104	<b>76</b>	5	10	20	25	35	60	145
Road sweeper	98	<b>70</b>	5	5	10	20	20	35	85
Roller 12T Smooth	110	<b>82</b>	15	20	25	40	65	100	250
Saw cutter	121	<b>93</b>	30	45	70	110	175	275	690
Suction sweeper	105	<b>77</b>	5	15	20	25	40	65	160
Trench rammer	106	<b>78</b>	10	15	15	30	45	70	175

Truck 6-Wheeler	106	<b>78</b>	10	15	15	30	45	70	175
Trucks	99	<b>71</b>	5	5	10	20	25	35	90
Ute	98	<b>70</b>	5	5	10	20	20	35	85
Vac Truck	100	<b>72</b>	5	5	15	20	25	40	100
Vibratory plate	108	<b>80</b>	10	20	20	35	50	85	210
Vibro 5T	115	<b>87</b>	20	25	40	65	100	160	400
Water Cart	94	<b>66</b>	0	5	5	10	20	25	60
Water Pump	92	<b>64</b>	0	5	5	10	15	20	50
Water tanker	98	<b>70</b>	5	5	10	20	20	35	85
Welder	90	<b>62</b>	0	0	5	5	15	20	40

**Appendix B Table 2: Equipment sound levels and set back distances – mitigated**

Plant	Lw	Lp @ 10m	Set back distance to NZS 6803 threshold (LAeq) / m						
			80 dB	75 dB	70 dB	65 dB	60 dB	55 dB	45 dB
2.5m Rotomill	111	<b>83</b>	5	10	20	20	35	50	130
Bobcat	104	<b>76</b>	5	5	10	15	15	30	70
Compressor	101	<b>73</b>	0	5	5	10	20	20	50
Concrete pump	103	<b>75</b>	0	5	5	15	20	25	65
Crane 25T	99	<b>71</b>	0	5	5	10	15	15	45
Dozer D61 18t	118	<b>90</b>	15	20	25	40	65	100	250
Drill Rig	111	<b>83</b>	5	10	20	20	35	50	130
Drop hammer 16T	124	<b>96</b>	15	30	45	70	110	175	435
Dumper 30T	108	<b>80</b>	5	5	15	20	25	40	100
Emulsion sprayer	97	<b>69</b>	0	0	5	5	10	20	35
Excavator 10T	94	<b>66</b>	0	0	5	5	10	15	30
Excavator 12T	94	<b>66</b>	0	0	5	5	10	15	30
Excavator 13T	94	<b>66</b>	0	0	5	5	10	15	30
Excavator 15t	96	<b>68</b>	0	0	5	5	10	20	35
Excavator 23t	102	<b>74</b>	0	5	5	10	20	25	60
Excavator 40T	115	<b>87</b>	10	15	20	30	50	75	190
Excavator 6t	92	<b>64</b>	0	0	0	5	5	10	25
Excavator Long Reach	115	<b>87</b>	10	15	20	30	50	75	190
Grader 110kW	110	<b>82</b>	5	10	15	20	30	50	120
Grader 13T	110	<b>82</b>	5	10	15	20	30	50	120
Impact wrench	104	<b>76</b>	5	5	10	15	15	30	70
Jackhammer	108	<b>80</b>	5	5	15	20	25	40	100
Line marking plant	104	<b>76</b>	5	5	10	15	15	30	70
Loader 10T	104	<b>76</b>	5	5	10	15	15	30	70
Loader 25T	112	<b>84</b>	5	10	20	25	35	60	145

Loader 5T	96	<b>68</b>	0	0	5	5	10	20	35
Paver	104	<b>76</b>	5	5	10	15	15	30	70
Road sweeper	98	<b>70</b>	0	0	5	5	15	20	40
Roller 12T Smooth	110	<b>82</b>	5	10	15	20	30	50	120
Saw cutter	121	<b>93</b>	20	20	35	50	85	130	330
Suction sweeper	105	<b>77</b>	5	5	10	15	20	30	75
Trench rammer	106	<b>78</b>	5	5	10	20	20	35	85
Truck 6-Wheeler	106	<b>78</b>	5	5	10	20	20	35	85
Trucks	99	<b>71</b>	0	5	5	10	15	15	45
Ute	98	<b>70</b>	0	0	5	5	15	20	40
Vac Truck	100	<b>72</b>	0	5	5	10	15	20	50
Vibratory plate	108	<b>80</b>	5	5	15	20	25	40	100
Vibro 5T	115	<b>87</b>	10	15	20	30	50	75	190
Water Cart	94	<b>66</b>	0	0	5	5	10	15	30
Water Pump	92	<b>64</b>	0	0	0	5	5	10	25
Water tanker	98	<b>70</b>	0	0	5	5	15	20	40
Welder	90	<b>62</b>	0	0	0	5	5	10	20

## Appendix C Maintenance works

Appendix C Table 1: Maintenance activity sound levels and set back distances – not mitigated

Activity	Lp @ 10m	Set back distance to NZS 6803 threshold (LAeq) / m						
		80 dB	75 dB	70 dB	65 dB	60 dB	55 dB	45 dB
<b>Sawcut/Breakout removal</b>	<b>87</b>	<b>20</b>	<b>35</b>	<b>55</b>	<b>85</b>	<b>130</b>	<b>210</b>	<b>525</b>
• Roadsaw for AC cutting	87	20	25	40	65	100	160	400
• Handsaw for concrete cutting	85	20	20	35	50	85	130	330
• Slurry vacuum	78	10	15	15	30	45	70	175
• 5T excavator rubber tracked	72	5	5	15	20	25	40	100
• Handheld breaker	80	10	20	20	35	50	85	210
• 4.5m <sup>3</sup> Tip Truck	70	5	5	10	20	20	35	85
<b>Excavation &amp; prep</b>	<b>76</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>30</b>	<b>50</b>	<b>80</b>	<b>200</b>
• 5T Excavator rubber tracked	72	5	5	15	20	25	40	100
• 4.5m <sup>3</sup> Tip Truck	68	5	5	10	15	15	30	70
• 450kg Reversible Plate	76	5	10	20	25	35	60	145
• 88kg Trench Rammer	74	5	10	15	20	30	50	120
<b>Milling</b>	<b>83</b>	<b>20</b>	<b>25</b>	<b>40</b>	<b>65</b>	<b>100</b>	<b>160</b>	<b>400</b>
• Rotomill - 1.3m 19 ton	82	15	20	25	40	65	100	250
• Bobcat with broom attachment	74	5	10	15	20	30	50	120
• Tipper trucks 7m <sup>3</sup>	68	5	5	10	15	15	30	70
• Concrete saw	85	20	20	35	50	85	130	330
<b>Paving</b>	<b>81</b>	<b>10</b>	<b>20</b>	<b>20</b>	<b>35</b>	<b>55</b>	<b>90</b>	<b>225</b>
• Paver 1.7m - 3.4m 14 ton	77	5	15	20	25	40	65	160
• Roller twin steel 10 ton	72	5	5	15	20	25	40	100
• Roller 5 ton	72	5	5	15	20	25	40	100
• PTR 12 ton	74	5	10	15	20	30	50	120
• Tipper trucks 7m <sup>3</sup>	68	5	5	10	15	15	30	70
• Spray truck 10 ton load	64	0	5	5	10	15	20	50
• Water cart 10 ton	64	0	5	5	10	15	20	50
<b>Line marking</b>	<b>77</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>30</b>	<b>50</b>	<b>80</b>	<b>200</b>
• Ute	70	5	5	10	20	20	35	85
• Flatbed truck	72	5	5	15	20	25	40	100
• truck (mobile)	71	5	5	10	20	25	35	90
• Line marking plant	76	5	10	20	25	35	60	145
• Road sweeper	70	5	5	10	20	20	35	85

Note – equipment may differ depending on project details and contractor

**Appendix C Table 2: Maintenance activity sound levels and set back distances – mitigated (where practicable)**

Activity	Lp @ 10m	Set back distance to NZS 6803 threshold (LAeq) / m						
		80 dB	75 dB	70 dB	65 dB	60 dB	55 dB	45 dB
<b>Sawcut/Breakout removal</b>	<b>79</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>30</b>	<b>50</b>	<b>75</b>	<b>190</b>
• Roadsaw for AC cutting	79	10	15	20	30	50	75	190
• Handsaw for concrete cutting	77	5	15	20	25	40	65	160
• Slurry vacuum	78	10	15	15	30	45	70	175
• 5T excavator rubber tracked	72	5	5	15	20	25	40	100
• Handheld breaker	75	5	10	20	20	35	50	130
• 4.5m <sup>3</sup> Tip Truck	70	5	5	10	20	20	35	85
<b>Excavation &amp; prep</b>	<b>74</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>30</b>	<b>50</b>	<b>120</b>
• 5T Excavator rubber tracked	72	5	5	15	20	25	40	100
• 4.5m <sup>3</sup> Tip Truck	68	5	5	10	15	15	30	70
• 450kg Reversible Plate	71	5	5	10	20	25	35	90
• 88kg Trench Rammer	74	5	10	15	20	30	50	120
<b>Milling</b>	<b>83</b>	<b>15</b>	<b>25</b>	<b>25</b>	<b>40</b>	<b>65</b>	<b>105</b>	<b>265</b>
• Rotomill - 1.3m 19 ton	82	15	20	25	40	65	100	250
• Bobcat with broom attachment	74	5	10	15	20	30	50	120
• Tipper trucks 7m <sup>3</sup>	68	5	5	10	15	15	30	70
• Concrete saw	77	5	15	20	25	40	65	160
<b>Paving</b>	<b>81</b>	<b>10</b>	<b>20</b>	<b>20</b>	<b>35</b>	<b>55</b>	<b>85</b>	<b>220</b>
• Paver 1.7m - 3.4m 14 ton	77	5	15	20	25	40	65	160
• Roller twin steel 10 ton	72	5	5	15	20	25	40	100
• Roller 5 ton	72	5	5	15	20	25	40	100
• PTR 12 ton	74	5	10	15	20	30	50	120
• Tipper trucks 7m <sup>3</sup>	68	5	5	10	15	15	30	70
• Spray truck 10 ton load	64	0	5	5	10	15	20	50
• Water cart 10 ton	64	0	5	5	10	15	20	50
<b>Line marking</b>	<b>77</b>	<b>5</b>	<b>15</b>	<b>25</b>	<b>25</b>	<b>40</b>	<b>65</b>	<b>160</b>
• Ute	70	5	5	10	20	20	35	85
• Flatbed truck	72	5	5	15	20	25	40	100
• truck (mobile)	71	5	5	10	20	25	35	90
• Line marking plant	76	5	10	20	25	35	60	145
• Road sweeper	70	5	5	10	20	20	35	85

Note – equipment may differ depending on project details and contractor

