



DRAFT CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

NORTH SOLAR FARM
MATAMATA

PREPARED FOR
Unity Management Ltd

DATE
28 May 2025

Construction noise and vibration management plan prepared by Styles Group for Unity Management Ltd.

REVISION HISTORY

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1	19/05/25		Draft	Daniel Winter, MASNZ Senior Consultant Styles Group	Jamie Exeter, MASNZ, Assoc. NZPI Principal Styles Group
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Table of contents

1.0	Introduction	1
2.0	Contacts.....	1
3.0	Project conditions.....	2
4.0	Duration of works and hours of construction	2
5.0	Project construction noise limits.....	2
6.0	Project construction vibration limits.....	3
7.0	Closest buildings.....	4
8.0	Community liaison.....	5
9.0	Complaints about noise and vibration	6
10.0	Likely noise emissions and separation distances.....	6
11.0	Noise mitigation measures.....	8
11.1	General noise mitigation measures	8
11.2	Driven piling within 90 m of the closest dwellings	9
11.3	Woodchipper within 120 m of the closest dwellings	9
11.4	Acoustic barriers	9
11.4.1	Localised / portable acoustic barrier specifications	10
12.0	Vibration mitigation measures.....	10
13.0	Noise and vibration monitoring and reporting	11
14.0	Corrective action measures	11
15.0	Amendments to CNVMP	13
16.0	General requirements	13

Appendices

Appendix A	Glossary of terms
Appendix B	Proposed resource consent conditions
Appendix C	Noise monitoring form

1.0 Introduction

Unity Management Ltd has engaged Styles Group to prepare a Draft Construction Noise and Vibration Management Plan (**CNVMP**) for the construction of two solar farms located approximately 1.8km to the southwest of Matamata. The solar farms are referred to as the northern solar farm and the southern solar farm. This CNVMP specifically applies to the northern solar farm, which is proposed to be constructed before the southern solar farm. We have provided a separate CNVMP for the southern solar farm.

The objective of this CNVMP is to:

1. Set out the procedures to identify and adopt the best practicable option for minimising adverse construction noise and vibration effects on neighbours.
2. Define the procedures to be followed to ensure that the project construction noise and vibration conditions are being met.

This CNVMP has been prepared in accordance with the project conditions and with reference to Appendix E of NZS 6803:1999 *Acoustics – Construction noise* and the AAAC *Guideline for interpreting and applying NZS 6803 1999*.

This CNVMP may be updated to adapt to changes in equipment, methodology, or the receiving environment.

A glossary of the acoustical terms used in this document is provided as Appendix A.

2.0 Contacts

The contact for questions about the works or to make construction noise and vibration queries or complaints is:

TBA

Ph: TBA

The manager responsible for implementing this CNVMP is:

TBA

Ph: TBA

The acoustics consultants engaged to provide construction noise and vibration monitoring and advice are:

Styles Group Acoustics & Vibration Consultants

Ph: 09 308 9015

3.0 Project conditions

The recommended conditions of consent with respect to construction noise and vibration emissions are reproduced in Appendix B. These will be updated with the consented conditions when they are available.

Please refer to Sections 5.0 and 6.0 of this CNVMP for interpretation of the construction noise and vibration limits in accordance with the working hours and receiving sites.

4.0 Duration of works and hours of construction

The total duration of all construction works will be approximately 9 – 10 months.

Construction works for multiple panels will be undertaken simultaneously across different parts of the site. Stages of construction works for each panel will be undertaken progressively (e.g., mechanical works after civil works).

Noisy construction works will be undertaken on Monday to Saturday, between 7:30 am and 6:00 pm. There will be no noisy works in the evening or on Sundays. Noisy construction works include earthworks, trenching, piling, and heavy vehicle movements.

Quieter activities may be undertaken outside of these hours if they are generally inaudible at the neighbouring sites.

5.0 Project construction noise limits

All construction work shall be designed, managed and conducted to ensure noise levels at the façade of any occupied dwelling on any other site complies with the noise limits prescribed in Rule 5.2.1 of the District Plan and NZS6803P:1984, with the following exception:

Receiver address	Noise limits during piling
164 Station Road	72 dB L _{A10} and 87 dB L _{Amax}

The Project construction noise limits are displayed in Table 1. These noise limits apply at 1 m from the façade of any occupied dwelling on any other site.

Table 1: Applicable construction noise limits

Receiver	Activity	Noise limits
All sites except 164 Station Road	All construction activities between 07:30 and 18:00 Monday to Saturday	70 dB L _{A10} and 85 dB L _{Amax}
164 Station Road	All construction activities (except piling) between 07:30 and 18:00 Monday to Saturday	70 dB L _{A10} and 85 dB L _{Amax}
164 Station Road	Piling between 07:30 and 18:00 Monday to Saturday	72 dB L _{A10} and 87 dB L _{Amax}

All construction noise will be measured and assessed in accordance with NZS6803P:1984 *The Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work*.

6.0 Project construction vibration limits

Our recommended conditions require vibration to be measured and assessed in accordance with German Standard DIN 4150-3:2016 *Structural Vibration - Effects of Vibration on Structures* and comply with the limits in Tables 1 and 3 of the Standard.

The Standard uses a three-tiered classification system for buildings according to their susceptibility to vibration damage, as follows:

- Line 1: Buildings used for commercial purposes, industrial buildings and buildings of similar design (Line 1);*
- Line 2: Dwellings and buildings of similar design and/or occupancy (Line 2);*
- Line 3: Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value e.g. buildings listed buildings under preservation order (Line 3).*

The DIN 4150-3:2016 guideline values are also determined by the frequency and the nature of the vibration (short-term or long-term). The short-term vibration limits of the Standard should be applied unless measurements demonstrate that the vibration is producing resonance in the structure, or it is occurring often enough to cause structural fatigue.

The applicable limits also depend on whether the vibration is measured and assessed at the foundations of the building or at the upper level. The Standard should therefore be referred to in full when being applied. A suitably qualified structural expert should be consulted if there are concerns about a building being particularly sensitive to vibration, or where the DIN 4150-3:2016 classification of the building or the nature of the vibration requires confirmation.

The DIN 4150–3:2016 frequency-dependant guideline values for short-term vibration measured at the foundations of the building are illustrated in Figure 1. Construction vibration measured in residential, commercial, and industrial buildings is typically less than 50 Hz. It occurs for a limited duration, and it does not often produce resonance in low rise structures.

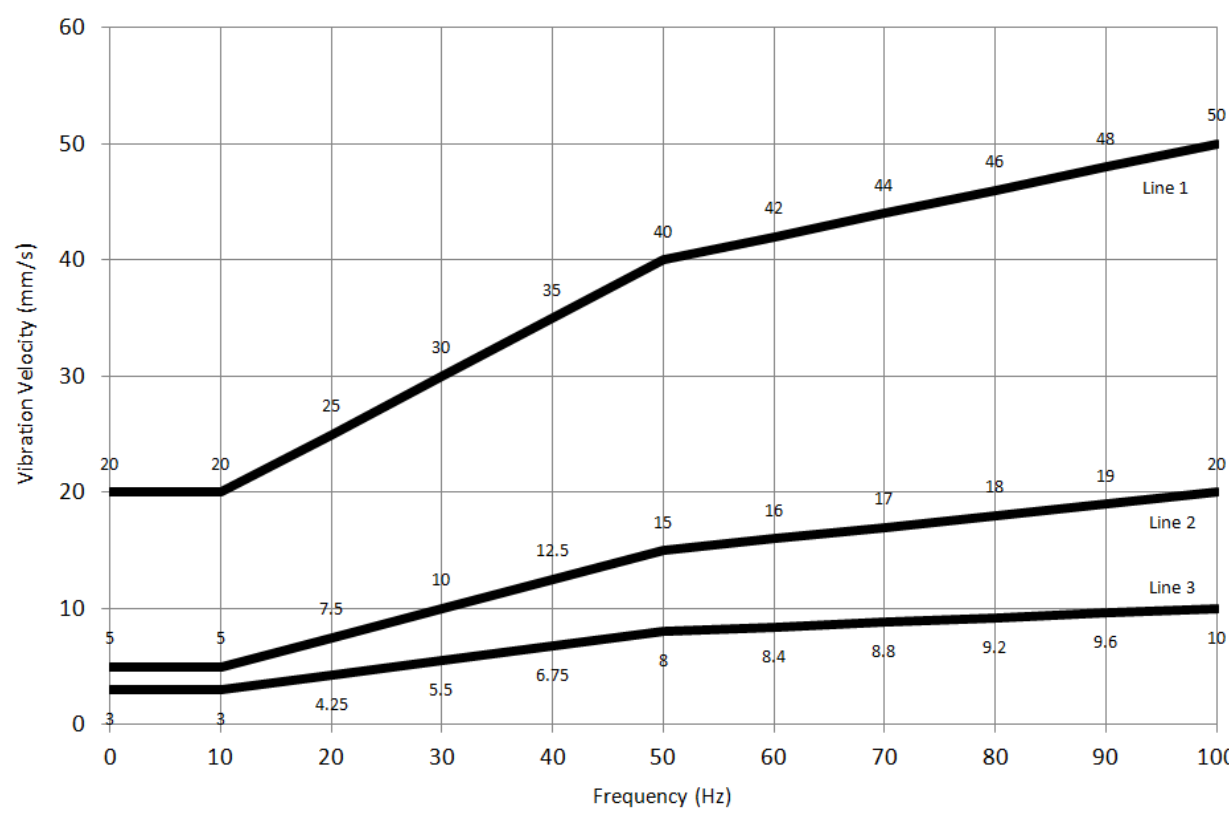


Figure 1: DIN 4150–3:2016 guideline values for short-term vibration

7.0 Closest buildings

The nearest buildings where construction noise and vibration will be experienced (**receivers**) are set out in Table 2 below.

Table 2: Closest receivers to the site

Address	Distance from dwelling to the site boundary	Distance from dwelling to piling work
164 Station Road	20 m	35 m
Proposed subdivision	28 m	40 m
172 Station Road	30 m	44 m
182 Station Road	40 m	60 m

Address	Distance from dwelling to the site boundary	Distance from dwelling to piling work
60 James Avenue	80 m	120 m
196 Station Avenue	90 m	100 m

The construction site (red) and nearest noise and vibration receivers are illustrated in Figure 1 below:



Figure 2: The Northern Solar Farm and closest dwellings (receivers).

8.0 Community liaison

All receivers within 90 m of works will be informed of the following information by letter drop at least 5 working days before works commence on site:

- A brief overview of the works
- The expected start date of works
- The expected duration of the works
- The days and hours of the week when works may be undertaken
- The approximate timing of the highest noise and vibration activities

- vi. The noise and vibration mitigation to be implemented
- vii. The availability of noise and vibration monitoring to address any concerns
- viii. Contact details for the receipt of any noise or vibration complaints or concerns.

9.0 Complaints about noise and vibration

Any complaints received by staff from the public will be directed to the contacts in Section 2.0 of this CNVMP. Staff will not enter into debate or argue with members of the public about noise or vibration issues.

A register will be kept and maintained on site to record the details of any complaints, including:

- i. The time and date of the noise and/or vibration giving rise to the complaint
- ii. The nature of the noise and/or vibration and what it was caused by (if known)
- iii. The name and contact number of the complainant (if given)
- iv. The action taken in response to the complaint
- v. Any corrective action measures implemented in accordance with Section 14.0.

The complaints register will be made available to Matamata–Piako District Council on request.

10.0 Likely noise emissions and separation distances

Table 3 and Table 4 set out minimum separation distances for noise sources on site, including the acoustic screening that is required by the recommended consent conditions. These are the shortest distances that the activities can be undertaken from the most exposed facade of the nearest occupied building whilst remaining compliant with the consented noise limits.

The mitigated distances are based on an acoustically effective barrier blocking line of sight between the noise source and receiving dwelling, reducing the noise levels by 10 dB. The specifications for the acoustically effective barriers are set out in Section All calculations have been made in accordance with ISO 9613-2:2004 *Acoustics - Attenuation of sound during propagation outdoors*.

If works are required closer to an occupied building than the mitigated separation distances stated in the tables below, further noise mitigation measures, such as localised screening, will be required (see Section 11.0). The reference noise levels include +3 dB for façade reflection in accordance with NZS 6803:1999.

Table 3: Minimum separation distances for compliance with project limit of 70 dB L_{Aeq}

Construction activity	Reference noise level 10 m from plant	Minimum distance for compliance (unmitigated)	Minimum distance for compliance (mitigated)
Woodchipper	89 dB L _{A10}	120 m	30 m
Petrol chainsaw felling trees (33% on-time) used at ground level	86 dB L _{A10}	90 m	35 m
Petrol chainsaw felling trees (33% on-time) used above 2.0m	86 dB L _{A10}	90 m	--
Driven piling (ramming machine)	86 dB L _{A10}	90 m	28 m
Directional drill	80 dB L _{A10}	45 m	12 m
Vibratory compaction roller*	75 dB L _{A10}	25 m	8 m
Bulldozer	75 dB L _{A10}	26 m	10 m
5-t excavator	75 dB L _{A10}	26 m	10 m
Concrete pump and truck discharging	74 dB L _{A10}	22 m	9 m
Use of power tools	68 dB L _{A10}	11 m	< 5 m
Compaction roller	68 dB L _{A10}	11 m	< 5 m
Generator	68 dB L _{A10}	11 m	< 5 m
Idling dump truck	68 dB L _{A10}	11 m	< 5 m

* The reference level assumes the plant is making short passes near to the site boundary. When the plant makes longer passes or moves away from the boundary the level will be lower.

Table 4: Minimum separation distance for driven piling compliance at 164 Station Road with project limit of 72 dB L_{Aeq}

Construction activity	Reference noise level 10 m from plant	Minimum distance for compliance (unmitigated)	Minimum distance for compliance (mitigated)
Driven piling (ramming machine)	86 dB L _{A10}	70 m	22 m

Where it is predicted or measured that any activity will exceed the noise limits for the project, Sections 14.0, 11.0 and 12.0 of this CNVMP will be referred to and mitigation implemented wherever practicable to reduce the noise effects at the nearest occupied sites.

11.0 Noise mitigation measures

The contractor will take all practicable steps to reduce the noise associated with the works by implementing the noise mitigation measures listed below:

11.1 General noise mitigation measures

- The minimum separation distances set out in Section 10.0 will be observed at all times.
- The quietest plant, machinery, and methods available will be used wherever practicable. This includes using plant that is no larger than necessary to complete the works.
- All construction equipment will be maintained throughout the project to ensure it is not generating unnecessary noise. For example, all tracked plant will be greased to reduce squeaking.
- When machinery or plant is not required to be running, it should be switched off and not left idling.
- Noisy plant and machinery should be strategically positioned on the site to reduce the effects on neighbours where practicable.
- All plant on site will utilise broadband reverse alarms in place of traditional pure tone 'beepers' where practicable.
- The tail gates of trucks will be closed with care and not slammed or allowed to fall closed.
- Material will not be dropped from height into empty trucks. Softer materials will be loaded into trucks first, where possible.
- Tools and equipment will not be dropped on hard ground. Materials will not be dragged along the ground.
- Vehicle horns will not be used unless in the case of an emergency.
- Any radios or music played on site will be used quietly so they are inaudible at the nearest dwellings.
- Stationary equipment such as pumps and generators will be located as far from occupied dwellings as practicable.
- There will be no shouting or swearing on site. Communication over distance will be by radio or phone.
- Equipment generating excess or unnecessary noise will be stopped (where safe) and reported to the Site Manager.
- Daily pre-start meetings held by the Site Supervisor will include discussions about any noise and vibration issues, and any complaints received.

- All workers on site shall be familiar with the provisions of this CNVMP and made aware of the potential impacts of noise on neighbours.

11.2 Driven piling within 90 m of the closest dwellings

A sole pile ramming machine will not be used within 90 m (i.e., the compliance distance for one piling rig) of a dwelling unless:

- a. The dwelling is unoccupied.
- b. Acoustically effective screening is used; or
- c. Site specific noise measurements show that noise from the pile ramming machine can comply with the consented noise limits without requiring additional mitigation.

11.3 Woodchipper within 120 m of the closest dwellings

The woodchipper must be located at a distance of at least 120m to the façade of the closest dwelling unless:

- a. The dwelling is unoccupied.
- b. Acoustically effective screening is used; or
- c. Site specific noise measurements show that noise from the woodchipper can comply with the consented noise limits without requiring additional mitigation.

11.4 Acoustic barriers

- All acoustic barriers will be at least 2.4 m high, have a surface mass of no less than 7 kg/m² (e.g., 12 mm plywood) and be solid with no gaps between panels or between the barriers and the ground. Alternatively, proprietary construction noise barriers may be used (such as Echo Barrier¹, Soundbuffer² or Hushtec³). All acoustic barriers must block line of sight between the noise source and the receiver and be positioned as close as practicable to the noise source.
- Acoustic barriers will be used where any construction plant must be operated within the unmitigated compliance distances (Table 3 and Table 4).
- Where a receiver is two storey, acoustic barriers will need to either be modified to be higher to ensure they block line of sight between the noise source and the receiver or a localised / portable barrier used (see Section 11.4.1).

¹ <https://supplyforce.co.nz/echo-barrier>

² <http://soundbuffer.co.nz>

³ <https://duraflex.co.nz/hushtec>

- Acoustic barriers will be located as close as practicable to the noise sources to improve its effectiveness.
- Quiet machinery and structures should be positioned to provide as much screening as possible to noisy equipment on the site.
- The acoustic barrier should extend past the noise source by a distance of 1.5 times the height of the plant/machinery. If possible, the screening should partially surround the noise source.

11.4.1 Localised / portable acoustic barrier specifications

- Localised acoustic barriers will be used where any construction plant must be operated within the mitigated compliance distances (Table 3 and Table 4).
- Localised acoustic barriers can be U-shaped and wrap around the noise source or in a straight line.
- If a U-shaped barrier is used it will need to be 3 m high, and at least 2 m x 3 m x 2 m wide. The proprietary flexible screens used to line the scaffolding should have a mass of at least 6 kg/m² and there should be no gaps between the sheets.
- If a straight barrier is used it needs to be solid with no gaps and should block line-of-sight from the noisiest part of the plant/machinery to the receiver by as much as possible (including windows at upper-level facades).

12.0 Vibration mitigation measures

The operation of the piling rig, trucks, tracked excavators, and other heavy plant and vehicles on site has the potential to generate vibration that may be felt within the nearest dwellings.

The vibration received within the nearest dwellings will depend largely on the equipment used, the separation distance, the ground conditions, how the plant is operated, and the response of the receiving structure.

The following measures will be observed when working within 50 m of any occupied dwelling, to ensure that vibration complies with the project conditions and does not cause unreasonable disturbance:

- Workers will be informed of the need to reduce vibration effects at the nearest dwellings and the mitigation measures available to achieve this.
- Excavators and heavy vehicles will be driven slowly (fast movement across an uneven site can generate high vibration levels).
- The lightest plant practicable and available will be used for the works.
- Wheeled plant will be selected over tracked plant where practicable.

- Excavator operators will avoid banging buckets on the ground.

Equipment generating excessive or unnecessary vibration will be stopped (where safe) and reported to the Site Manager.

13.0 Noise and vibration monitoring and reporting

This section sets out requirements for construction noise and vibration monitoring during the project.

Noise and vibration measurements will be performed:

- i. If the noise or vibration from any activity on the site appears excessive in the opinion of the Site Manager or Matamata–Piako District Council.
- ii. Following the receipt of any reasonable construction noise or vibration complaint.
- iii. By a suitably qualified and experienced person (e.g., MASNZ) or any person trained by the project construction noise and vibration consultant.
- iv. Using a sound level meter conforming to at least IEC651 Type 2 criteria, and in accordance with NZS 6803:1999 *Acoustics - Construction Noise* (noise only).
- v. In accordance with DIN 4150-3:2016 *Structural Vibration – Part 3 Effects of Vibration on Structures* (vibration only).

A noise monitoring form is attached as Appendix D.

The results of any site and plant specific noise and vibration monitoring will be used to update this CNVMP to ensure that minimum compliance distances and mitigation measures are specifically tailored to the project.

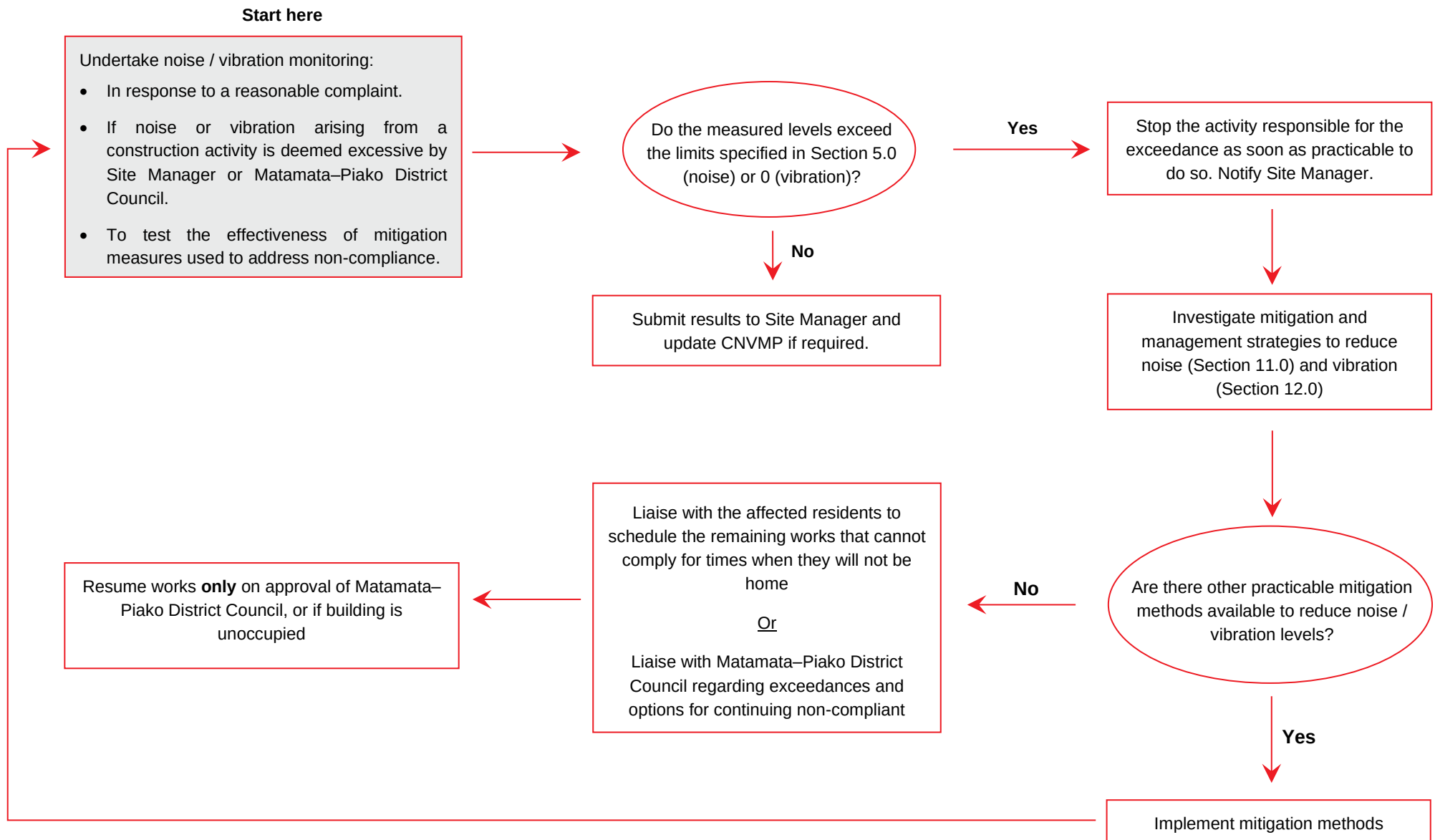
The results of all noise and vibration monitoring will be retained for the duration of the project and made available to Matamata–Piako District Council on request.

Any non-compliance with the noise limits identified through monitoring will be addressed by following the corrective action measures in Section 14.0 of this CNVMP.

14.0 Corrective action measures

The corrective action measures illustrated overleaf in Figure 3 will be followed if non-compliance with the project noise or vibration limits is identified through monitoring.

Figure 3: Process for corrective action measures



15.0 Amendments to CNVMP

The CNVMP is a living document, and it may be updated throughout the works if necessary to adapt to changing work methodologies or a changing receiving environment.

Any material updates to the certified CNVMP will be clearly marked using underlining for additional text and strikethrough for any deletions. The amended CNVMP will be provided to Matamata–Piako District Council for verification before being actioned.

All activities will be undertaken in accordance with the latest version of the certified CNVMP.

16.0 General requirements

A copy of this CNVMP will be kept at the work site for the duration of the project.

This CNVMP may be updated throughout the works with the approval of the Project Manager and in consultation with Matamata–Piako District Council.

All personnel will be informed about the need to reduce noise and vibration to a minimum and about the effects of excessive noise on the neighbouring sites. As part of their training, special attention will be given to:

- i. Proper selection, use and maintenance of tools and plant.
- ii. Positioning of machinery on site.
- iii. Avoidance of unnecessary noise.
- iv. Procedures for receiving, reporting and investigation of noise and vibration complaints.

Appendix A Glossary of terms

Noise	A sound which serves little or no purpose for the exposed persons and is commonly described as ‘unwanted sound’. The Resource Management Act definition of noise is “includes vibration”.
dB (decibel)	The basic measurement unit of sound. The logarithmic unit used to describe the ratio between the measured sound pressure level and a reference level of 20 micropascals (0 dB).
A-weighting	A frequency filter applied to the full audio range (20 Hz to 20 kHz) to approximate the response of the human ear at lower sound pressure levels.
$L_{Aeq(t)}$ (dB)	The A-weighted equivalent sound pressure level with the same energy content as the measured varying acoustic signal over a sample period (t). The preferred metric for sound levels that vary over time because it takes into account the total sound energy over the time period of interest.
L_{AFmax} (dB)	The maximum A-weighted sound pressure level recorded during the measurement period using a fast time-weighting response.
NZS 6803:1999	N.Z. Standard NZS 6803:1999 <i>Acoustics – Construction noise</i>.
DIN 4150–3:2016	German Standard DIN 4150-3:2016 <i>Structural Vibration – Part 3: Effects of vibration on structures</i>. Typically adopted for the assessment of structure borne vibration in New Zealand.
PPV	Peak particle velocity, measured in mm/s. The standard metric for the measurement of ground borne vibration in New Zealand. The instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position.
CNVMP	Construction noise and vibration management plan. A document to help the contractor manage noise and vibration emissions during construction works.

Appendix B Proposed resource consent conditions

We have recommended that the following construction noise and vibration conditions:

1. **Construction noise limits**

All construction work shall be designed, managed and conducted to ensure noise levels at the façade of any occupied dwelling on any other site comply with the noise limits prescribed in Rule 5.2.1 of the District Plan and NZS6803P:1984, with the following exception:

Receiver address	Noise limits during piling
164 Station Road	72 dB L _{A10} and 87 dB L _{Amax}

2. **(Construction hours)** Construction work and heavy vehicle movements on the site must only take place between the hours of 7:30 am. and 6:00 pm, Monday to Saturday. No noisy works will be undertaken on Sundays or public holidays. This condition does not preclude quiet works from taking place outside of standard construction hours, providing they are generally inaudible at the neighbouring sites.
3. **(Community consultation)** The consent holder must advise the occupants of all dwellings within 90 m of the site boundary about the construction works at least five days before works begin on site. The advice must be provided in writing and include the following information:
- (a) An overview of the construction works including the duration of the project and the working hours on site.

(b) A contact name and phone number to advise of any sensitive times for high noise levels and for any questions or complaints regarding noise and vibration throughout the project.

(c) The approximate dates and duration of the noisiest activities on site.
4. **(Construction vibration limits)** All construction works on the site must be designed and conducted to ensure that the construction vibration does not exceed the guideline vibration values set out in the German Standard DIN 4150-3:2016 *Structural vibration – Effects of vibration on structures* when measured from any surrounding building in accordance with the Standard.
5. **Construction noise management plan (CNVMP)**
- The consent holder must submit a Construction Noise and Vibration Management Plan (CNVMP) to Matamata Piako District Council for certification. The CNVMP must be

submitted a minimum of ten working days before starting any construction works authorised by this consent. The objective of the CNVMP must be to identify and require the adoption of the best practicable option to minimise construction noise and vibration effects and ensure compliance with the project noise and vibration conditions.

The CNVMP must address the requirements of Annex E of NZS 6803:1999 *Acoustics – Construction Noise* and the AAAC *Guideline for interpreting and applying NZS 6803 1999* as a minimum. Construction works must not begin until certification has been received in writing from Matamata Piako District Council. The CNVMP and any amendments must be prepared by a suitably qualified acoustics consultant (e.g., MASNZ). Amendments that include changes to the construction methodology must be tracked and the revised CNVMP submitted to Matamata Piako District Council for certification.

All construction works on the site must be carried out in accordance with the certified CNVMP. A copy of the CNVMP must be kept on site during construction hours.

Appendix C Noise monitoring form

Name:

Date:

Notes for noise monitoring

All sections of this form must be completed when undertaking construction noise measurements for the project. Please provide a sketch of the area, sound sources and measurement position on the rear of this form.

Measurements are to be undertaken at 1 m from the façade of the receiving building most exposed to the sound under investigation, and 1.2 m to 1.5 m above the relevant floor level. No adjustment to the measured level is to be made for reflected sound from the façade. Valid measurements cannot be undertaken in persistent rain or in wind speeds greater than 5 m/s.

Adjustments to the measured level may be required to correct for distance and façade reflections if measurements must be undertaken at a proxy location.

Sound source and instrumentation

Location of works	
Description of construction activity being monitored	
Measurement instrumentation (type and serial number)	
Date of most recent laboratory calibration	
Field calibration check (time and adjustment)	

Meteorological conditions

Cloud cover (octas)	
Rain	
Wind speed and direction	

Methodology

Location/orientation of microphone	
Height of microphone above ground and distance to facade of receiving building	
Distance between microphone and sound source	
Ground conditions between sound source and microphone	
Any barriers or objects between sound source and microphone	
Distance to any reflective surfaces other than receiving facade	
Extraneous noise sources	

Measurement results

Sample start time	Duration of sample	L _{Aeq} (dB)	L _{AFmax} (dB)	Sound source controlling the measured levels	Adjustments required for distance, facade correction or barriers

Do the measurements show full compliance with the project noise limits?

Yes: *The measurement results shall be used to update the site-specific noise levels and construction separation distances within the CNVMP.*

No: *The CNVMP shall be referred to for the appropriate corrective action measures and further noise mitigation options*