



NOISE EFFECTS

1 RESIDENTIAL SOUTH DEVELOPMENT

DATE

31 August 2026

Acoustic assessment prepared by Styles Group.

REVISION HISTORY

Rev:	Date:	Comment:	Version:	Prepared by:	Reviewed by:
1	12/06/26		Draft	Jon Styles, MASNZ	Gemma Styles Consultant Styles Group
2	24/08/26		Final Draft	Director and Principal Styles Group	
3	31/08/26		Final		

Statement of experience

I am and have been the Director and Principal of Styles Group Acoustics and Vibration Consultants for over 21 years. I am a Council Member of the Acoustical Society of New Zealand, and I am on the Board of Directors of the Australasian Association of Acoustical Consultants.

I have over 24 years' experience advising on the management of construction and operational noise and vibration effects. I have worked on a significant number of plan changes and resource consent applications for large-scale residential and mixed-use developments across New Zealand. I have extensive experience advising on the management of noise effects between land use activities and the development of controls to achieve ongoing land use compatibility.

I am a regular and experienced expert witness for Council, Environment Court, District Court, High Court and Board of Inquiry hearings. I confirm that I have read Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 and referred to in the Fast-track Approvals Act 2024: Panel Convenors' Practice and Procedure Guidance. This assessment has been prepared in compliance with that Code

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Executive summary

This assessment has been prepared to accompany the substantive application for the Southern Links 1 project (SL1 or the Project) under the Fast Track Approvals Act 2024 (FTAA). This assessment relates to the residential portion of SL1, referred to as the Residential Area and Residential Development in this report.

The Residential Development provides for the establishment of approximately 938 residential units, together with a neighbourhood commercial node, open spaces, waterbodies, and infrastructure devices including wetlands and roading.

The application site is located in the Rural Zone of the Waipa District and interfaces with the Residential Zone of Hamilton City. We have assessed the noise effects from the proposal in accordance with the permitted noise standards prescribed by the Waipa District Plan (**WDP**). We have also assessed the potential noise effects received in the jurisdiction of the Hamilton District in accordance with the permitted standards prescribed by the Hamilton City District Plan (**HCDP**).

Our assessment confirms that operational noise generated from the Site will be compatible with the level of noise amenity that is anticipated and provided for in the Rural Zone of the Waipa District and Residential Zone of Hamilton City. We have recommended conditions of consent to deliver this outcome.

The potential construction noise and vibration effects will be typical for a development of this scale and nature. We have prepared a draft Construction Noise and Vibration Management Plan (**CNVMP**) that sets out the mitigation measures that must be implemented by the contractor to ensure that construction noise levels are managed to comply with the recommended construction noise limits. The draft CNVMP also addresses vibration from construction work, including measures required to comply with the recommended vibration limits in DIN 4150-3:1999 *Structural vibration – Effects of vibration on structures*.

The recommended construction noise limits require compliance with the recommended noise limits for long-term projects prescribed by NZS 6803:1999 *Acoustics – Construction Noise* at any occupied building on an adjacent site, but enable some short-term and intermittent exceedances associated with retaining wall construction and wetland construction works along the northern boundary of the Site.

The draft CNVMP will be updated when the contractor has been appointed and the construction methodology has been confirmed. The CNVMP will be submitted to Waipa District Council for certification, prior to commencement of construction work.

Overall, this assessment finds that the proposal can achieve compatibility with the level of acoustic amenity anticipated and provided for in the Rural Zone of Waipa District as well as the adjacent Residential Zone of Hamilton City. We have recommended conditions that will ensure the appropriate management of operational and construction noise and vibration effects. These conditions will ensure that the Project does not give rise to any unreasonable emission of noise, in accordance with clause 7(f) of Schedule 5 to the Fast-track Approvals Act 2024.

1.0 Introduction

Styles Group has assessed the operational and construction noise and vibration effects from the Residential Development (the **Project**). This advice has been prepared accompany a substantive application under the Fast-track Approvals Act 2024.

This report includes an assessment of compliance with the permitted noise standards of the Waipa District Plan (**WDP**). We have also assessed the potential noise effects received in the jurisdiction of the Hamilton District in accordance with the permitted standards prescribed by the Hamilton City District Plan (**HCDP**).

This report should be read in conjunction with the documentation submitted with the Referral application and plans. A glossary of acoustical terms used within this document is attached as Appendix A.

2.0 The Project

The Residential Development provides for the establishment of approximately 938 residential units, together with a neighbourhood commercial node, open spaces, waterbodies, and infrastructure devices including wetlands and roading. The masterplan is shown in Figure 1.

The proposal includes substantial enabling works to establish developable land, including bulk earthworks across the site. An integrated stormwater management system including wetlands, detention/attenuation devices and treatment ponds supports the development.

Access and integration with the surrounding Hamilton area is provided through a connected transport framework, including the establishment of intersections, roading, and walking and cycle networks, along with upgrades to existing transport infrastructure. The Residential Development is proposed to be serviced via a coordinated strategy, including the extension of public networks, upgrades, and installation of appropriate infrastructure.

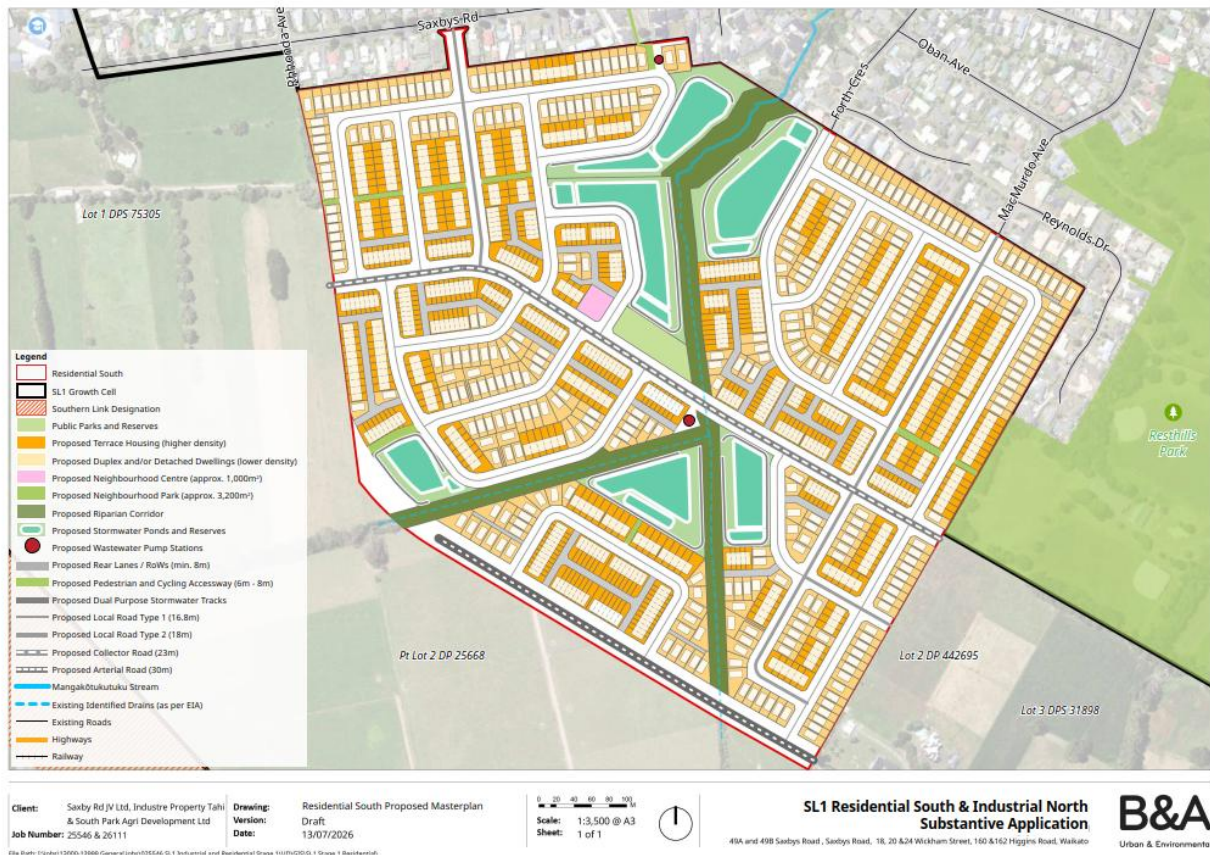


Figure 1 Residential South Masterplan

3.0 The Site and receivers of noise

Figure 2 displays the zoning arrangements and receivers of noise that are adjacent to the Site.

The Site is in the Rural Zone of the Waipa District. The adjacent sites to the west, south and part of the south-eastern boundary are also within the Rural Zone of the Waipa District.

The northern and eastern boundaries of the Site interface with the territorial boundary of Hamilton City. The receivers within Hamilton City include:

- The established residential development in the General Residential Zone to the north, north-east and part of the eastern extent of the Site. The proposed residential development forms an extension to this established residential area.
- Resthills Sports Centre in the Sports and Recreation Open Space Zone (**SARoz**) of the HCDP to the east of the Site.



Figure 2 Zoning arrangements and receivers of noise

The notional boundaries of the closest Waipa District Rural Zone receivers are identified with a red circle.

4.0 Operational noise assessment

The Project proposes to enable a comprehensive residential development in the Rural Zone of the WDP that will interface with the established Residential Zone in Hamilton City.

The underlying noise limits for the Rural Zone (and requirement for noise levels to be assessed at the notional boundary position) are generally designed to manage noise levels between large sites containing rural activities. This assessment therefore considers:

- Whether appropriate conditions should be attached to the consent to manage operational noise levels between sites **inside the Site** in what will be a predominantly residential development, with a small neighbourhood commercial node; and
- Whether bespoke noise limits are required to achieve compatibility with adjacent noise sensitive land use **outside the Site** in the Residential Zone of Hamilton City and in the Rural Zone of the Waipa District.

4.1 Noise levels between residential sites

The character, timing and level of noise from residential activity within the Site is expected to be consistent with a typical residential area, where the noise environment is primarily controlled by vehicle movements on public roads and intermittent noise from typical household activities (such as household maintenance and children's play). These activities and noise levels are expected to be consistent with the noise environment in the adjacent Residential Zone of Hamilton City.

We have compared the permitted noise levels prescribed for the underlying Rural Zone to the permitted noise levels that apply in the Residential Zone of Hamilton City.

Table 1 Permitted noise standards for the Rural Zone (Waipa District) and Residential Zone (Hamilton City)

Rule 4.4.2.15 of the WDP	Rule 25.8.3.7 of the HCDP
<i>This rule controls noise generated in the Rural Zone and received at the notional boundary of any dwelling in the Rural Zone of the Waipa District</i>	<i>This rule controls the level of noise received between sites in the Residential Zones of Hamilton City (measured at the site boundary).</i>
	45 dB L_{Aeq} and 75 dB L_{Amax} between 6am and 7am
50 dB L_{Aeq} between 7am and 10pm	50 dB L_{Aeq} between 7am and 8pm
40 dB L_{Aeq} and 70 dB L_{Amax} between 10pm and 7am.	45 dB L_{Aeq} between 8pm and 11pm
	40 dB L_{Aeq} and 75 dB L_{Amax} between 11pm and 6am

Table 1 shows that permitted noise levels prescribed by the WDP for the Rural Zone are similar to the permitted noise standards prescribed by the HCDP in the adjacent Residential Zone. The only difference is that the HCDP standards allow a slightly higher noise level (+ 5dB) in the mornings between 6am and 7am and late at night between 10pm and 11pm. The WDP rule allows 5dB higher noise levels between 8pm and 10pm. In practice, the limits allow a similar level of effect and adopting the underlying noise standards for the Waipa District will deliver a level of acoustic amenity that is similar to the permitted noise environment in the Residential Zone of the HCDP. This demonstrates that relying on the WDP numerical noise limits will deliver a similar level of acoustic amenity to what could reasonably be expected by a resident in the Hamilton district.

We note that the permitted noise standards for the Residential Zone of Hamilton City do not apply to road traffic noise or noise ancillary to residential activities¹ in Residential Zones, including the use of garden equipment (such as lawnmowers, chainsaws or wood chippers). These noise sources are therefore anticipated and provided for in the Residential Zone of the Hamilton District.

¹ Defined by the HCDP to mean the use of land and buildings by people for living accommodation (whether or not any person is subject to care or supervision).

Our experience is that such ‘exemptions’ are a common and important part of residential noise limits. By contrast, the noise standards in the WDP do not contain any similar exemptions for residential activity in either the residential or rural zone noise standards.

We consider that the most appropriate way to control noise between the residential sites will be to attach a condition of consent that:

- a) contains the same numerical noise limits for the underlying zoning,
- b) requires compliance at the site boundary (rather than the notional boundary), and
- c) includes exemptions to provide for normal household activities (such as lawn mowing or children playing) provided it is intermittent and undertaken at reasonable times of the day.

We provide a specific recommendation in Section 4.5 of this report.

Overall, we consider that the character, timing and level of noise associated with residential activity in the Site will be consistent with the noise environment in the established Residential Zone directly adjacent to the Site. The noise levels generated from a residential lot and received at adjacent Rural Zone dwellings will also comply with the permitted noise standards for the underlying zoning.

4.2 Road noise

Access to the Site will be provided from roads which connect to MacMurdo Avenue, Forth Crescent and two connections to Saxby’s Road. These roads are defined as local transport corridors². Neither the WDP nor HCDP control road traffic noise levels generated from the alteration of local transport corridors. We do not consider that any control is required for road noise.

4.3 Noise from the neighbourhood commercial node

The proposal includes a small (700m²) neighbourhood commercial node that will provide small-scale amenities and services to support the residential development. We understand that this area will not include any noise sensitive activities. The noise from this area is likely to be generated by people coming and going, deliveries and external mechanical plant (i.e. for refrigeration).

Noise levels from commercial activities within the neighbourhood commercial node could be controlled by the requirement to comply with the underlying operational noise standards for the Rural Zone (50dB L_{Aeq} during the day and 40dB L_{Aeq} at night) when measured and assessed at the notional boundaries of dwellings within the Site. However, these noise limits are slightly lower than what is typically applied at the interface between business activities and residential. It is common to apply limits 5dB higher than those set out above to recognise that the neighbourhood commercial node might be slightly noisier than a standard residential site and that enabling some

² Standard 25.8.3.4(b)iii) *Design and Construction of New and Altered Roads* states that the standard does not apply to local transport corridors identified within Volume 2, Appendix 15-4, Figures 15-4b to 15-4f of the HCDP.

noise generating activity in this node is appropriate, provided that the noise levels at the immediately adjacent residential sites remain reasonable.

Accordingly, we recommend that a consent condition is applied that requires activities in the neighbourhood commercial node to comply with noise limits of 55dB L_{Aeq} between 7am and 10pm and 45dB L_{Aeq} and 75dB L_{AFmax} at all other times. The noise limits should apply and be assessed at or within the boundary of any residential lot. A recommended condition is provided in Section 4.5 of this report.

The neighbourhood commercial node is located within the Site and is well separated from the established Residential Zone receivers in Hamilton City and adjacent Rural Zone dwellings. The requirement for the activities in the neighbourhood commercial node to comply with the proposed consent conditions at its immediate residential neighbours within the Site will readily ensure compliance with the permitted noise limits at all dwellings outside the Site.

4.4 Pumpstation(s)

Pump station infrastructure will be required to service the development. We recommend that a condition is attached to the consent that will ensure noise from any pumpstation achieves a high level of compatibility with adjacent residential activity. We consider this can be achieved through a condition with numerical noise limits that will deliver the following outcomes:

- i. Require the noise emissions from any mechanical plant associated with the pumpstation to comply with noise levels that are 5dB lower than the maximum permitted noise levels applying to residential lots. This will ensure that any new pumpstation is designed and constructed to ensure that constant mechanical plant noise is not dominant or intrusive when observed from adjacent dwellings. The lower night time noise limits will also provide receivers with a high level of amenity and protection from sleep disturbance effects during the night time period.
- ii. Provide for occasional service, inspection and maintenance activities during the daytime by applying noise limits that are consistent with the recommended residential noise limits.

The wastewater pumpstations will be underground. Based on our experience with similar pumpstations we expect the recommended noise limit can be easily complied with.

4.5 Recommended conditions for managing operational noise

Noise limits for noise generated and received between residential sites including in the Hamilton jurisdiction	The noise (rating) level and maximum noise level from any residential site must not exceed the following limits when measured and assessed anywhere within the boundary of any other site containing a residential activity: i. 50 dB LAeq (15min), between the hours of 7am and 10pm; ii. 40 dB LAeq (15min) and 70 dB LAmax, between the hours of 10pm and 7am The daytime noise limits do not apply to normal and intermittent residential activities (including children's play and the use of garden equipment). Noise levels shall be measured and assessed in accordance with the requirements of New Zealand Standard NZS 6801:2008 Acoustics – Measurement of Environmental Sound and New Zealand Standard NZS 6802:2008 Acoustics – Environmental Noise.													
Noise limits for noise generated from the neighbourhood commercial node	The noise (rating) level and maximum noise level from any site in a neighbourhood commercial node must not exceed the following limits when measured and assessed anywhere within the boundary of any site containing a Noise Sensitive Activity: i. 55 dB LAeq (15min), between the hours of 7am and 10pm; ii. 45 dB LAeq (15min) and 75 dB LAmax, between the hours of 10pm and 7am Noise levels shall be measured and assessed in accordance with the requirements of New Zealand Standard NZS 6801:2008 Acoustics – Measurement of environmental sound and New Zealand Standard NZS 6802:2008 Acoustics – Environmental noise.													
Pump station noise limits	The noise (rating) level and maximum noise level from any pumpstation must not exceed the limits in the table below, when measured and assessed at the boundary of any site containing Noise Sensitive Activity. <table><tr><th>Noise source</th><th>Timeframe</th><th>Noise rating level</th></tr><tr><td rowspan="2">Fixed mechanical plant and processes or noise sources that operate continuously or on an automated basis</td><td>7am – 10pm</td><td>45 dB LAeq</td></tr><tr><td>10pm – 7am</td><td>35 dB LAeq 60 dB LAFmax</td></tr><tr><td rowspan="2">All other activities, including but not limited to vehicle movements, deliveries and inspections.</td><td>7am – 10pm</td><td>50 dB LAeq</td></tr><tr><td>10pm – 7am</td><td>40 dB LAeq 65 dB LAFmax</td></tr></table> Noise levels shall be measured and assessed in accordance with the requirements of New Zealand Standard NZS 6801:2008 Acoustics – Measurement of Environmental Sound and New Zealand Standard NZS 6802:2008 Acoustics – Environmental Noise.	Noise source	Timeframe	Noise rating level	Fixed mechanical plant and processes or noise sources that operate continuously or on an automated basis	7am – 10pm	45 dB LAeq	10pm – 7am	35 dB LAeq 60 dB LAFmax	All other activities, including but not limited to vehicle movements, deliveries and inspections.	7am – 10pm	50 dB LAeq	10pm – 7am	40 dB LAeq 65 dB LAFmax
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All other activities, including but not limited to vehicle movements, deliveries and inspections.	7am – 10pm	50 dB LAeq												
	10pm – 7am	40 dB LAeq 65 dB LAFmax												

5.0 Assessment of compatibility with adjacent land use

5.1 Resthills Sports Centre

The Project includes residential development near to the Resthills Sports Centre (the **Sports Centre**) in the SAROZ of the HCDP.

We understand that the HCDP does not control noise levels received in the Waipa District and vice versa. For this reason, we understand that the residential lots introduced by the Project will not introduce any new noise compliance locations for the Sports Centre.

The Sports Centre is currently controlled by the requirement to comply with the HCDP noise limits prescribed by Rule 25.8.3.9 which apply at the proximate Residential Zone boundaries adjacent to the northern and eastern boundaries of the Sports Centre. This rule permits the Sports Centre to generate maximum noise levels of:

- 55 dB L_{Aeq} between the hours of 0700 and 2300,
- 40 dB L_{Aeq} and 75 dB L_{AFmax} between 2300 and 0600, and
- 45 dB L_{Aeq} and 75 dB L_{AFmax} between 0600 and 0700 hours.

The daytime noise limits do not apply to crowd noise from events. The noise limits apply at any point within the boundary of a Residential Zone. The Sport Centre's existing noise compliance locations are represented by the red-dashed line in Figure 3.

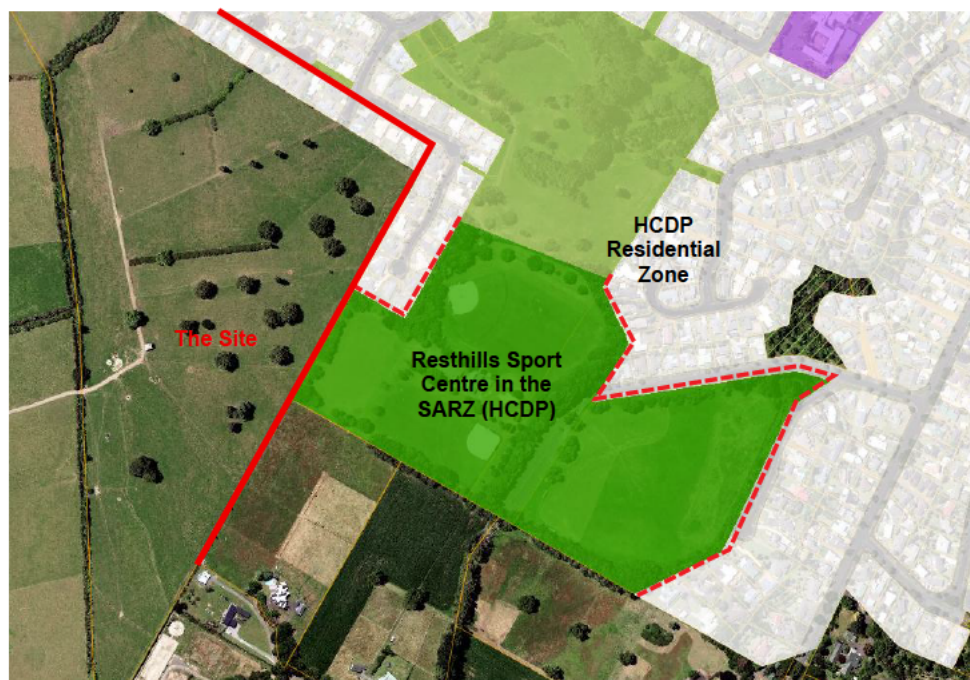


Figure 3 Existing noise compliance locations for the Sports Centre (red-dash line)

We expect that recreational and sporting noise (including crowd noise) may be clearly audible at the proposed residential lots when the sports fields in the western extent of the Sports Centre are in use. These noise effects will be confined to the daytime period and generally offset with periods of respite during the week, and between seasons.

Overall, we consider that the sporting and recreational noise levels will be reasonable across the Site given the requirement for the Sports Centre to comply with the noise limits in Rule 25.8.3.9 of the HDCP at its more proximate noise compliance locations in the Hamilton district. The application of these noise limits in the Hamilton district means that the noise levels on the closest parts of the Site will be similar or no greater than the levels in the Residential Zone of the HDCP.

The Project will not introduce a noise-related constraint on the Sports Centre given the proximity of the established noise compliance locations (i.e. the Residential Zone boundary) within the jurisdiction of Hamilton City that form part of the existing noise environment.

5.2 Productive land use in the adjacent Rural Zone

The adjacent land to the south-west of the Site is zoned Rural and used for rural production (grazing).

The Project will not introduce a noise compliance location for adjacent general farming activities as Rule 4.4.2.15 of the WDP does not control the noise levels from farm dogs, agricultural vehicles (when not being used for recreational purposes), agricultural machinery or equipment.

We expect the noise associated with agricultural machinery will occasionally be audible in the Site, however the noise will be seasonal, temporary and intermittent. On this basis, the noise effects are expected to be compatible with future residential activity within the Site. The interface (between rural and residential) that the Development creates is the same interface that currently exists at the WDC and HDC boundaries and the same as the interface that exists in many places in the area and wider region.

6.0 Construction noise and vibration effects

The Project will be delivered in accordance with the staging overview plan shown in Figure 4, over a 20-year timeframe.

We understand that the majority of enabling works will comprise bulk earthworks at the beginning, followed by recontouring, compaction and paving of access roads and installation of services. This work will be followed by construction of built development, at an approximate rate of 50 houses per year.

We understand the preliminary bulk earthworks and civil works will be carried out using standard civil construction plant and equipment, such as hydraulic excavators for bulk excavation and trimming, bulldozers for stripping and spreading, articulated dump trucks for haulage of materials, and graders for final contouring. Compaction will be undertaken using rollers suitable for the material type, while water carts will be used for dust suppression and moisture conditioning. Additional equipment such as loaders, trenchers, and small plant may be used as required for

specific tasks. We understand that the ground conditions mean that no blasting or rock breaking will be required.

Reinforcement of the perimeters of the artificial wetland could be undertaken using a range of methods (subject to compliance with the proposed Project Noise Standards³) such as (but not limited to) continuous sheet piles, a secant bored pile wall, a bentonite slurry wall or a cutter mix wall.

Construction vehicles associated with Stages 1 and 5 will access the Site via Macmurdo Avenue and Forth Crescent. Stages 2, 3 and 4 will access the site via Saxbys Road.



Figure 4 Staging Overview Plan

6.1 Permitted construction noise and vibration standards

6.1.1 Construction noise

Rule 4.4.2.19 of the WDP and Rule 25.8.3.2 of the HCDP require that construction noise levels are managed in accordance with the recommended numerical limits and assessment procedures set out in NZS 6803:1999 'Acoustics – Construction Noise' (**NZS6803**).

³ The CNVMP provides specific recommendations for these works.

NZS6803 provides guideline noise limits that are based on the duration of construction works at any one location, and the occupation of the receiving site. We understand that the Project will be constructed over a 20 year timeframe. We have therefore assessed the potential construction noise levels in accordance with the NZS6803's recommended noise limits for long term projects⁴.

Construction activity will take place between 7:30am and 6:00pm, Monday to Saturday, when NZS6803 recommends that a noise limit of 70 dB L_{Aeq} and 85 dB L_{AFmax} applies when measured and assessed 1m from the façade of any occupied dwelling in a rural or residential zone. The construction noise limits do not apply at vacant sites or buildings that are not occupied at the time of construction work.

The permitted construction noise limits only apply to construction vehicles when they are within the Site. There is no noise limit applying to trucks operating on public roads.

6.1.1.1 Proposed project noise standards

We understand that Rule 4.4.2.19 of the WDP does not control construction noise levels received in the jurisdiction of Hamilton City. We have therefore proposed project construction noise standards that will control construction noise levels that will be received at the closest receivers (occupied dwellings) in the Residential Zone of Hamilton City, as well as dwellings in the Rural Zone of Waipa District.

The proposed project construction noise standards have been developed by reviewing the potential⁵ construction noise levels from proposed civil and general construction works that will be undertaken on the Site.

Our review finds that the vast majority of the construction phase is expected to readily comply with the permitted construction noise limits. Construction work that is well separated from the boundaries with adjacent residential lots (by distances greater than 50m) will readily comply with the permitted noise limits by a comfortable margin.

Our assessment finds that noise levels from the following activities could exceed the permitted construction noise limit of 70 dB L_{Aeq} :

- Reinforcement of the northern part of the perimeter of Wetland A (Stage 1A) and Wetland B (Stage 2A).
- Retaining wall construction in the northern part of the Site, along the common boundary with adjacent residential dwellings along Saxbys Road (Stage 2B). The location of these works are shown in Figure 5.

⁴ The construction noise limit applying to construction projects greater than 20 weeks in duration.

⁵ At the time of preparing this report, a contractor has not yet been appointed. As the exact construction methodology has not yet been confirmed, it is not practicable to specify the exact mitigation measures that will need to be implemented during the construction phase. The draft CNVMP will be updated when the construction methodology and equipment has been confirmed.

The proposed temporary infringements arise from the need to operate heavy construction equipment near to potentially occupied dwellings that are located in close proximity to the common boundary with the Site. The proposed infringements arise simply due to the close proximity of the work and because effective acoustic screening is impracticable. The infringements are not due to unusual methodologies or working hours.

We have recommended the conditions of consent seek to authorise the following construction noise levels:

Construction activity	Assessment locations	Recommended noise limits and timeframes
Perimeter reinforcement works associated with Wetlands A and B	Residential dwellings adjacent to Wetlands A and B	75 dB L_{Aeq} and 90 dB L_{Amax} between the hours of 9am and 5pm, Monday to Friday
Retaining wall construction along the northern Site boundary	Dwellings on 73B, 69B, 67A, 65B, 63B, 61B, 59A and 57A Saxbys Road (identified in Figure 5).	80 dB L_{Aeq} and 95 dB L_{Amax} between the hours of 9am and 5pm, Monday to Friday
	Dwelling on 71B Saxbys Road (identified in Figure 5).	80 dB L_{Aeq} and 95 dB L_{Amax} between the hours of 9am and 5pm, Monday to Friday
All other construction works	All receivers	70 dB L_{Aeq} and 85 dB L_{Amax} between the hours of 7:30am and 6:00pm, Monday to Saturday (the permitted standards)



Figure 5 Retaining wall construction: receivers predicted to experience noise levels of up to 75 dB L_{Aeq} (blue circle) and 80 dB L_{Aeq} (orange circle)

We have prepared a draft Construction Noise and Vibration Management Plan (**CNVMP**) that sets out the mitigation measures that must be implemented by the contractor to ensure that the project noise limits are complied with at all times.

The CNVMP provides specific mitigation requirements for retaining wall construction along the northern boundary, works associated with the reinforcement of artificial Wetlands A and B and the construction of the haul road access from Saxbys Road. All other construction works are expected to comply with the permitted noise limits without the need for mitigation.

The draft CNVMP is provided in Appendix C. The DNVMP will be updated following engagement with the contractor, and submitted for certification by Waipa District Council prior to construction.

6.1.2 Construction vibration

The WDP does not include any rules or standards to control vibration generated from construction work.

Rule 25.8.3 of the HCDP requires that construction vibration received by any building on any other site shall comply with the provisions of and be measured and assessed in accordance with German Standard DIN 4150-3:1999 *Structural vibration – Effects of vibration on structures* (the **DIN limits**). The DIN limits are designed to ensure that construction vibration avoids damage to buildings and are commonly adopted in District Plans and resource consents throughout New Zealand.

We consider that compliance with the DIN limits is important for avoiding building damage. We have recommended conditions that will require construction vibration levels to be managed to comply with the DIN limits at any building on an adjacent site.

6.2 Construction noise effects

The proposal is to implement a CNVMP to ensure construction noise and vibration effects will be reasonable for the receivers adjacent to the Site.

In our experience, a CNVMP is an important tool for the successful management of noise and vibration effects on receivers in proximity to large scale construction works. The engagement required by the CNVMP will ensure that the receivers are provided with advanced notice of the timing and duration of construction works, enabling them to plan around any potential disruption. Higher noise levels from temporary construction activities are generally tolerated if there is consultation with the neighbours, the works are no louder than necessary, and the noise only occurs during daytime hours. In most cases where people are exposed to construction noise outside, they will be able to find respite indoors or at locations that are further screened from the works.

The vast majority of the construction phase is expected to comply with the permitted construction noise limits. Construction works higher than the permitted limits are expected to be very short-term and in localised areas. We expect that the retaining wall construction works in the northern part of the Site will generate noise levels higher than the permitted noise standards at any

individual receiver for no more than 1-3 days, while construction works associated with Wetlands A and B is expected to take approximately 2.5 months (per wetland).

The noise effects from activities that are likely to generate noise levels higher than the permitted noise standards are expected to be tolerated as the works will be short-term, the receivers will have advanced notice of the works, and these works will be conducted between 9am and 5pm, Monday to Friday, when many receivers are more likely to be at work or school.

Table 2: Temporary construction noise effects at the nearest sites

Construction works	Noise level at 1 m from the façade L_{Aeq} (15 min)	Potential effects outside the buildings	Potential effects inside the nearest rooms of the buildings
Earthworks, civil works (road construction and vertical construction work within 50m-150m of occupied dwellings)	55 – 65 dB	Construction noise clearly noticeable. Conversation over longer distances may require raised voices	Noise levels will be noticeable, but they are unlikely to interfere with daily residential activities
Earthworks and civil works (road construction) within 60m of an occupied dwelling	65 – 70 dB	Conversation will require raised voices. People are unlikely to spend time outside	Slightly raised sound levels may be necessary for television, radio, and phone conversations
Retaining wall construction and perimeter reinforcement works for Wetland A and B	70 – 75 dB	Conversation will require raised voices. People are unlikely to spend time outside.	Raised sound levels may be necessary for television, radio, and phone conversations
Retaining wall construction (dwelling on 71B Saxbys Road only)	76 – 80 dB	Conversation will be difficult even with raised voices. People are unlikely to spend time outside.	Occupants likely to seek respite by moving to rooms that face away from the construction work.

The construction noise levels generated from areas of the Site that are more than 150m of the closest receivers will be lower than 55dB L_{Aeq} and are unlikely to be dominant or intrusive in the context of background traffic noise from nearby urban areas. The noise is likely to be noticeable but at a low level. This will be the case for the majority of the project.

The construction work will be staged over a long-term period with dwellings constructed at a rate of approximately 50 houses per year. The vertical build out of dwellings along the northern and north-eastern boundaries (Stages 1A, 1B, 1E and Stages 2A and 2B) will provide the Residential Zone receivers with a very good degree of acoustic screening from construction works associated with the remaining stages.

We consider that the construction noise levels will be typical for a project of this scale and nature and will be managed to be reasonable through the implementation of the CNVMP.

6.2.1 Construction vibration effects

The proposal is to ensure vibration generated from construction work complies with the limits in German Standard DIN 4150-3:1999 *Structural vibration – Part 3 Effects of vibration on structures* at all adjacent sites. These limits are designed to ensure that construction vibration avoids damage to buildings.

We consider that the works can be undertaken in compliance with the relevant limits with relative ease. The CNVMP includes specific mitigation requirements that must be implemented by the contractor to ensure the DIN limits are complied with when construction works are undertaken in areas of the Site that are in close proximity to neighbouring dwellings.

We expect the highest construction vibration levels that will be experienced by occupants will be generated during excavation, compaction, and heavy vehicle movements when they are operating close to the boundaries of the Site. These levels will not exceed the DIN limits. The vibration from works further within the Site (>30-50m) will generally go unnoticed at neighbouring sites.

Table 3 presents typical vibration levels for the relevant construction activities.⁶ These are derived from previous measurements using a geophone buried in the ground. Measuring these activities from a building will likely provide lower results due to the loss of energy when the vibration transfers from the ground into the foundations and structure. The vibration levels in nearby buildings will depend on the separation distance, the size of the plant and how it is used, the ground conditions, and the response of the building itself.

Table 3 Typical construction vibration levels

Construction activity	Distance	Typical vibration level (PPV)
Vibratory compaction with a 15-t – 20-t roller	10 m	3-4 mm/s
Vibratory compaction with a 5-t – 7-t roller	10 m	2-3 mm/s
Compaction with a large static roller	10 m	1 mm/s
Cut and fill works, loading trucks, and tracking slowly with a 20-t excavator	10 m	1-2 mm/s

⁶ Construction vibration levels are largely dependent on the equipment used, the skill of the operator, the subsoil conditions and the response of the receiving structure. Accurate predictions are not always possible without site, receiver and plant specific data.

Construction activity	Distance	Typical vibration level (PPV)
Heavy vehicle or tractor pass-by on even ground	10 m	<1 mm/s

Construction vibration between 2 mm/s and 5 mm/s will be clearly felt within buildings and may be experienced as small jolts or short periods of steady vibration that are just perceptible. Depending on the separation distances, the vibration may at times reach levels that are clearly felt and high enough to rattle crockery and glassware (levels between 2 mm/s and 5 mm/s PPV). The vibration levels will range from not noticeable to noticeable but are unlikely to unreasonably disrupt residential activities. The levels will not be high enough to cause building damage.

The effects of the vibration are expected to be tolerated because the receivers will receive advance notice of the timing and duration of the proposed construction works through the CNVMP, the vibration will only occur during the day, the effects will be intermittent and will be of short duration only when works are near to receivers.

6.3 Recommended conditions to manage construction noise and vibration effects

We recommend the following conditions are attached to the consent to manage construction noise and vibration effects:

1. Construction work 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.

2. Construction noise limits

Construction noise shall comply with the following limits, when measured and assessed 1m from the façade of any occupied dwelling or building on any other site*, in accordance with NZS 6803:1999: *Acoustics – Construction Noise*:

Construction activity	Assessment locations	Timeframes and noise limits
Perimeter reinforcement works associated with artificial Wetlands A and B	Residential dwellings near to Wetlands A and B	Between the hours of 9am and 5pm, Monday to Friday 75 dB LAeq(30min) and 90 dB LAmax
Retaining wall construction along the northern Site boundary	Dwellings at 73B, 69B, 67A, 65B, 63B, 61B, 59A and 57A Saxbys Road.	Between the hours of 9am and 5pm, Monday to Friday 75 dB LAeq(30min) and 90 dB LAmax

Construction activity	Assessment locations	Timeframes and noise limits
	Dwelling at 71B Saxbys Road.	Between the hours of 9am and 5pm, Monday to Friday 80 dB LAeq(30min) and 95 dB LAmax
All other construction works	All receivers	Between the hours of 7:30am and 6:00pm, Monday to Saturday - 70 dB LAeq(30min) and 85 dB LAmax At all other times - 45 dB LAeq(30min) and 75 dB LAmax No noisy works shall be undertaken on Sundays or public holidays**.

*The construction noise limits shall not apply at any dwelling that is within the site, or is in common ownership with the Site, including 37B Saxbys Road. The construction noise limits apply at occupied buildings in the Hamilton and Waipa jurisdiction.

** This condition does not preclude quiet works from taking place outside of standard construction hours, providing they comply with the permitted construction noise limits at these times (for example, site meetings, electrical fitout, painting etc) where they are authorised by the CNVMP.

3. Construction vibration limits

All construction works must be designed and conducted to ensure that vibration generated from construction work within the site does not exceed the guideline vibration values set out in the German Standard DIN 4150-3:1999 *Structural vibration – Effects of vibration on structures* when measured from any building that is not on the construction site, in accordance with the Standard.

4. Construction noise and vibration management plan (CNVMP)

The consent holder must submit a Construction Noise and Vibration Management Plan (CNVMP) to Waipa 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 objectives of the CNVMP are:

- To identify and require the adoption of the best practicable option to minimise construction noise and vibration effects at all receivers
- Ensure compliance with the project noise and vibration conditions.
- Set out the specific requirements for all construction work within 40m of any occupied building on another site
- Set out the requirements for construction activities that are subject to activity-specific noise and vibration limits.

- v. Set out the specific requirements for all construction work undertaken outside the hours of 7:30am- 6:00pm, Monday to Saturday.

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 Waipa 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 Waipa 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.

5. Notice of construction work

The consent holder must advise the occupants of all dwellings within 50m of the site boundary about the construction works that will be undertaken at least five days before the commencement of each construction stage. The advice must be provided in writing and include the following information:

- i. An overview of the construction works including the duration of the project and the working hours on site.
- ii. 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.
- iii. The approximate dates and duration of the noisiest activities on site.

7.0 Summary

Styles Group has assessed the potential operational and construction noise and vibration effects from the Stage 1 of the Southern Links 1 Residential Area.

This assessment finds that the proposal will achieve compatibility with the level of acoustic amenity anticipated and provided for in the Rural Zone of Waipa District as well as the adjacent Residential Zone of Hamilton City. We have recommended conditions that will deliver this outcome.

The potential construction noise and vibration effects associated with the Project will be typical for a residential development of this scale and nature. A CNVMP will be implemented to ensure the timing, level and duration of effects will be reasonable for the receivers.

We have recommended conditions that will ensure the appropriate management of operational and construction noise and vibration effects. These conditions will ensure that the Project does not give rise to any unreasonable emission of noise, in accordance with clause 7(f) of Schedule 5 to the Fast-track Approvals Act 2024.

Appendix A WDP Noise standards

These provisions apply to noise generated from the Site and received between sites in the Waipa District

Definition of Noise Sensitive Activities

*“BUILDINGS used for RESIDENTIAL ACTIVITIES, including boarding establishments, homes for elderly persons, RETIREMENT VILLAGE ACCOMMODATION AND ASSOCIATED CARE FACILITIES, in-house aged care facilities, hotels and motels, and other BUILDINGS used for residential accommodation but excluding camping grounds; and
MARAE ;and
HOSPITALS; and
Teaching areas and sleeping rooms in an EDUCATION FACILITY.”*

Rule 4.4.2.15 Noise (Rural Zone)

Noise generating activity other than that from farm animals including farm dogs, agricultural vehicles (when not being used for recreational purposes), agricultural machinery or equipment (including produce packing facilities where the only produce packed is grown on-site) operated and maintained in accordance with the manufacturer's specifications and in accordance with accepted management practices (e.g. for milking, spraying, harvesting, packing and the like, but not including frost fans) and provided that the best practicable option (including the option for the activity to take place at another time of the day), is adopted to ensure that the emission of noise does not exceed a reasonable level; shall be conducted and buildings located, designed and used to ensure that they do not exceed the following limits within the notional boundary of any dwelling (excluding dwellings within mineral extraction sites):

- | | | |
|----|-------------------------------|--------------|
| a. | Day time - 7.00am to 10.00pm | 50dBA (Leq) |
| b. | Nighttime- 10.00pm to 7.00am | 40dBA (Leq) |
| c. | Night time single noise event | 70dBA (Lmax) |

The noise levels shall be measured and assessed in accordance with the requirements of New Zealand Standard NZS 6801:2008 Acoustics – Measurement of environmental sound and assessed in accordance with New Zealand Standard NZS 6802:2008 Acoustics – Environmental noise. Provided that this rule shall not apply to the use or testing of station and vehicle sirens or alarms used by emergency services.

Activities that fail to comply with this rule will require a resource consent for a discretionary activity.

Rule 4.4.2.19 Construction noise

Construction noise emanating from a site shall meet the limits recommended in and be measured and assessed in accordance with New Zealand Standard NZS 6803:1999 Acoustics – Construction noise.

Appendix B HCDP Noise standards

These provisions are relevant to cross territorial noise effects generated from the Site and received in Hamilton City.

Definition of Noise-Sensitive Activities

Noise-sensitive activities: Means residential activities (including residential accommodation in buildings which predominantly have other uses such as commercial or industrial premises), marae, spaces within buildings used for overnight patient medical care, and teaching areas and sleeping rooms in buildings used as educational facilities. For the purpose of this definition educational facilities includes tertiary institutions and schools, and premises licensed under the Education (Early Childhood Services) Regulations, and playgrounds which are part of such facilities and located within 20m of buildings used for teaching purposes.

Construction noise and vibration

25.8.3.2

Construction Noise

All construction noise shall comply with the relevant noise levels stated in NZS6803: 1999, section 7.2 'Recommended numerical limits for construction noise' and shall be measured and assessed in accordance with NZS 6803:1999 'Acoustics – Construction Noise'.

25.8.3.3

Construction Vibration

Construction vibration received by any building on any other site shall comply with the provisions of and be measured and assessed in accordance with German Standard DIN 4150-3:1999 Structural vibration – Effects of vibration on structures.

Noise performance standards for noise received in the Residential Zone

25.8.3.7

Noise Performance Standards for Activities in all Zones Except Major Facilities, Knowledge, Open Space, Ruakura Logistics and Ruakura Industrial Park Zones

Activities in all Zones except Major Facilities, Knowledge, Open Space, Ruakura Logistics and Ruakura Industrial Park Zones, shall not exceed the following noise levels at any point within the boundary of any other site in the:

i. Residential Zones.

Time of day	Noise level measured in L _{Aeq} (15min)	Noise level measured in L _{AFmax}
0600- 0700 hours	45 dB	75 dB
0700- 2000 hours	50 dB	-
2000- 2300 hours	45 dB	-
2300- 0600 hours	40 dB	75 dB

- f. Application of this standard.
 - i. This standard does not apply to activities provided for by Rule 25.3.5.2.c and 25.3.5.3.e.
 - ii. This standard does not apply to helicopter noise at helicopter landing areas, road traffic noise, or construction noise.
 - iii. This standard does not apply to residential activities, including the use of garden equipment (such as lawnmowers, chainsaws or wood chippers) ancillary to residential activities. Short duration use at reasonable times will usually be acceptable.
 - iv. This standard does not apply to noise from temporary emergency use of generators for continued power supply provided that the best practicable option to control the noise is adopted.
 - v. This standard does not apply to activities within the Te Rapa Dairy Manufacturing Site.
 - vi. This standard applies to all other activities, including home-based businesses, pool pumps, air conditioning units and domestic wind turbines

Rules – Specific Standards

25.8.3.1

Measurement and Assessment of Noise

Noise levels shall be measured in accordance with NZS 6801:2008 “Acoustics – Measurement of Environmental Sound” and assessed in accordance with NZS 6802:2008 ‘Acoustics – Environmental Noise’. These apply unless otherwise stated.

Appendix C Draft CNVMP



ON NOISE AND AGEMENT PLAN

SOUTHERN LINKS 1
L SOUTH DEVELOPMENT

DATE

31 August 2026

Draft construction noise and vibration management plan prepared by Styles Group for SL1 Consortium.

REVISION HISTORY

The CNVMP is a living document. It will be updated throughout the works if necessary to adapt to changing work methodologies or a changing receiving environment.

CERTIFICATION

The final version of this CNVMP must be certified by Waipa District Council prior to commencement of construction.

AMENDMENTS TO THIS CNVMP

Any material updates to the certified CNVMP will be clearly marked using underlining for additional text and strikethrough for any deletions. Any amendments to a certified CNVMP will be provided to Waipa District Council for re-certification before being implemented.

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

Rev:	Date:	Comment:	Version:	Prepared by:	Reviewed by:
1	24/08/26	Draft for review.	Draft	Martyn Chambers, MASNZ Senior Consultant Styles Group	Jon Styles, MASNZ Director and Principal Styles Group
2	31/08/26	Draft for lodgement	Final draft	Jon Styles, MASNZ Director and Principal Styles Group	

This document is a draft CNVMP. It will be updated to reflect the conditions of consent and the results of further engagement with contractor, prior to construction commencing. The final version will be submitted for certification by Waipa District Council prior to commencement of construction.

Sections that must be updated are highlighted in grey.

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1.0 Introduction

Styles Group has prepared a draft Construction Noise and Vibration Management Plan (CNVMP) to ensure the appropriate management of the construction noise and vibration effects associated with the Southern Links 1 (SL1) Residential Development (the **Project**).

This CNVMP sets out the measures to be implemented to ensure appropriate management of noise and vibration effects during the construction period of the Project and to ensure noise and vibration generated from construction work complies with the resource consent conditions for the Project.

This CNVMP has been prepared in accordance with the *recommended* conditions that are contained in Appendix C of the *Assessment of Noise Effects* prepared by Styles Group for SL1 Residential South and Appendix E of NZS 6803:1999 *Acoustics – Construction noise*.

Appendix B of this CNVMP must be updated to include the final conditions of consent.

This CNVMP is a 'living document' that will be updated as the works progress and if changes become necessary. It must be certified by Waipa District Council before construction work commences.

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

2.0 Objectives of this CNVMP

The objectives of this CNVMP are:

1. To identify and require the adoption of the best practicable option to minimise construction noise and vibration effects at all receivers.
2. Ensure compliance with the Project Noise and Vibration Conditions.
3. Set out the specific requirements for all construction work within 40m of any occupied building on another site.
4. Set out the requirements for construction activities that are subject to activity-specific noise and vibration limits.
5. Set out the specific requirements for all construction work undertaken outside the hours of 7:30am- 6:00pm, Monday to Saturday.

3.0 Contacts

The contact for queries or complaints regarding the project, and the manager responsible for implementing this CNVMP is:

Dillon Kelliher

ph: [REDACTED]

The consultant engaged to provide construction noise and vibration monitoring and advice is:

Styles Group Acoustics & Vibration Consultants

ph: [REDACTED]

4.0 Updates to this CNVMP

The CNVMP is a living document, and it will 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 must be clearly marked using underlining for additional text and strikethrough for any deletions. Any amendments to a certified CNVMP must be provided to Waipa District Council for re-certification before being implemented.

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

This is a draft CNVMP and not the version to be certified by the Waipa District Council.

5.0 General requirements

A copy of this CNVMP must 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 Waipa District Council.

All personnel must 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.

6.0 Project conditions

This draft CNVMP is based on the recommended conditions to control construction noise and vibration that are contained in Appendix C of the *Assessment of Noise Effects* prepared by Styles Group for SL1 Residential South. Appendix B of this CNVMP must be updated to include the conditions of consent.

7.0 Permitted hours of construction work

Noisy construction works may only be undertaken from Monday to Saturday between 7:30 am and 6:00 pm. There can be no works in the evening or on Sundays that generate audible construction noise at any receiver.

Quieter activities and works inside buildings may occur outside these hours if they do not generate any audible noise at the neighbouring sites. Examples include light vehicle movements, planting, electrical work, works set well back from receivers, site meetings, surveying or monitoring activities.

If a contractor is unsure whether an activity qualifies as a quieter activity, they must carry it out during normal construction hours or seek advice before doing it outside those hours.

8.0 Management of construction noise

This CNVMP identifies the areas where contractors must carefully consider noise and vibration when selecting plant, equipment and construction methods.

The Project Construction Noise and Vibration Limits set specific noise limits for certain activities in defined areas of the site. This approach sets specific controls on activities that may exceed the permitted standards.

8.1 Construction noise limits

The construction noise limits for the Project are set out in

[Table of consented noise limited to be inserted]

Table 1. The noise limits **apply** at 1 m from the façade, and 1.2 to 1.5 m above the relevant floor level, of any building not on the Site that is occupied during the works (the **Receivers**).

The noise limits **do not apply** at buildings on the Site itself or at buildings on neighbouring sites that are unoccupied.

[Table of consented noise limited to be inserted]

Table 1: Noise limits for construction work

8.2 Plant noise levels and minimum separation distances

Table 2 lists the plant and minimum separation distances required for the plant to comply with the daytime noise limits of 70 dB L_{Aeq} and 85 dB L_{AFmax} .

Table 2: Noise sources levels and minimum separation distances where a noise limit of 70 dB L_{Aeq} applies

Construction activity	Unmitigated L_{Aeq} noise level at 10 m	Unmitigated compliance distance	Mitigated compliance distance (based on 2m noise barrier) ¹	
			One story dwelling	Two story dwelling
Sheet piling for stormwater ponds	86 dB	85 m	n/a	n/a
Bored piling with a 20-t excavator	79 dB	38 m	12 m	21 m
Chainsaw works to remove trees (33% on-time)	77 dB	30 m	10 m	18 m
D6, D7, or D8 bulldozer working in small area	76 dB*	27 m	9 m	16 m
Vibratory compaction roller 15t – 20-t	76 dB*	27 m	9 m	16 m
Cut and fill, clearing, and loading trucks with a 40-t – 50-t excavator	75 dB	24 m	8 m	14 m
Wetland works using 40-t – 50-t excavator	75 dB	24 m	8 m	14 m
Retaining wall construction using a 14 - 20-t excavator and auger	74 dB	22 m	7 m	12 m
Cat 825 static compactor 30-t	72 dB*	17 m	6 m	10 m
Cut and fill, clearing, and loading trucks with a 20-t excavator	69 dB	12 m	4 m	7 m
Cat 815 static compactor 18-t	69 dB*	12 m	4 m	7 m
Concrete pump and truck discharging	69 dB	12 m	4 m	7 m

¹ In accordance with the specifications set out in Section 8.5.

Construction activity	Unmitigated L_{Aeq} noise level at 10 m	Unmitigated compliance distance	Mitigated compliance distance (based on 2m noise barrier) ¹	
			One story dwelling	Two story dwelling
Cut and fill, clearing, and loading trucks with a 12-t excavator	67 dB	10 m	3 m	6 m
Large generator	66 dB	9 m	3 m	5 m
Terrex TS14 30-t motor scraper	65 dB*	8 m	3 m	4 m
7,000 L watercart	65 dB	8 m	3 m	4 m
Grader	62 dB*	6 m	2 m	3 m
Idling delivery truck, dump truck, moxy, tractor	62 dB	6 m	2 m	3 m
Paving works (with all ancillary equipment operating)	75 dB	25 m	8 m	14 m

*Reference noise level is for a moving noise source that moves past a receiver repeatedly.

The reference noise levels in Table 2 should be updated based on the results of noise measurements undertaken during the project.

8.3 Noise Control Zone within 40m of any occupied dwelling on an adjacent Site

This CNVMP establishes a “Noise Control Zone” for all parts of the Site that are within 40 m of an occupied dwelling on an adjacent site. The Noise Control Zone represents the area in which high noise generating construction work will require specific mitigation or management to comply with the noise limits.

Except for sheet piling, construction works *outside* the Noise Control Zone are expected to comply with the noise limits without specific mitigation.

Mitigation requirements for sheet piling and required separation distances are addressed separately in Section 8.4.1.

Figure 1 shows the extent of the Noise Control Zone.



Figure 1 Noise Control Zone – all construction work within this area must be managed to comply with the noise limits.

Note: Specific requirements apply to sheet piling inside and outside the Noise Control Zone

Before starting construction work (except sheet piling²) within areas of the site that are subject to a Noise Control Zone, the contractor must follow these steps:

1. Identify the proposed construction activity and the equipment required.
2. Determine the shortest distance between the proposed work area and the nearest occupied dwelling.
3. Find the applicable compliance distance for the activity and equipment in Table 2.
4. Compare the actual distance with the compliance distance:

² All mitigation requirements and separation distances for works involving sheet piling are set out in Section 8.4.1.

- If the dwelling is outside the compliance distance, the activity may proceed without further noise mitigation.
- If the dwelling is within the compliance distance, noise mitigation must be implemented before the activity begins.

5. Select one or more of the following mitigation measures:

- Use smaller or quieter equipment. Check Table 2 to confirm that the revised equipment will comply.
- Install a noise barrier in accordance with the guidance set out in Section 8.5 and use the mitigated compliance distance in Table 2 to confirm compliance. Position the barrier as close to the activity as practicable and ensure it blocks the line of sight between the equipment and the dwelling. Section 8.5 sets out the barrier requirements.
- Use a combination of quieter equipment and a noise barrier to achieve the applicable compliance distance in Table 2.
- Carry out the work while the dwelling is unoccupied. The construction noise limits do not apply when the dwelling is unoccupied.

6. Seek advice from Styles Group. Further assessment may include on-site noise measurements to determine whether an exceedance is likely.

7. Confirm that the selected mitigation measures are in place and that compliance has been demonstrated before commencing the activity.

8.4 Specific mitigation requirements

This section sets out specific mitigation measures that must be followed for specific construction works

8.4.1 Specific mitigation requirements for sheet piling works

The following mitigation measures are expected to be required as part of perimeter reinforcement works for Wetlands A and B. These measures will be confirmed when a contractor has been appointed and the final construction methodology has been confirmed.

This section of the CNVMP will be updated to include the areas of the Site where sheet piling may be used, and the specific methods, mitigation requirements and procedures that must be implemented to ensure compliance.

This section of the CNVMP will also identify the specific areas of the Site where alternative methods to sheet piling must be used, and will identify the specific methods, mitigation requirements and procedures that must be implemented to ensure those methods also achieve compliance.

Section 10 of this CNVMP will be updated to include the specific engagement procedures for receivers that may be exposed to noise levels above 70 dB L_{Aeq} .

An activity-specific Project Noise Limit of 75 dB L_{Aeq} has been set for works associated with the perimeter reinforcement of Wetlands A and B.

This noise limit allows sheet piling to be used in areas of the Site where sheet piling can comply with the Project Noise Limit. This noise limit will require the use of alternative methods (such as bored piling) in areas of the Site where sheet piling cannot comply with the noise limits due to the proximity of occupied buildings on adjacent sites.

8.4.1.1 Specific procedure for sheet piling

The following process must be undertaken at the commencement of sheet piling works:

- 1) Sheet piling works must commence in areas of the Site that are well separated (by distances exceeding 100m) from any potentially occupied building;
- 2) Noise measurements of the initial sheet piling work shall be undertaken;
- 3) The noise measurements shall be used to determine:
 - a. How close sheet piling can be undertaken in proximity to receivers whilst remaining compliant with the noise limits;
 - b. What noise mitigation measures are available to reduce the noise levels of piling and therefore decrease the distance in (a). Any reduction in noise level and therefore decrease in distance must be supported by noise measurements.
 - c. The specifications of any noise mitigation measures or requirements for the use of alternative perimeter reinforcement methods that will consistently comply with a noise limit of 75dB L_{Aeq} , where sheet piling cannot comply.

8.4.2 Specific mitigation requirements for retaining wall construction along Saxbys Road

The following mitigation measures are expected to be required as part of retaining wall construction works adjacent to dwellings on Saxbys Road. These measures will be confirmed when a contractor has been appointed and the final construction methodology has been confirmed.

An activity-specific Project Noise Limit has been set for retaining wall construction works in the northern part of the Site, adjacent to dwellings on Saxbys Road.

Due to the short distance between the retaining wall works and receivers on Saxbys Road, an activity-specific Project Noise Limit of 75 dB L_{Aeq} applies at the closest dwellings, with the exception of 71B Saxbys Road (the closest dwelling) where a Project Noise Limit of 80 dB L_{Aeq} applies. Figure 2 shows the retaining wall locations and the receivers within 22 m of the works.



- iii. Offer the occupants of 71B Saxbys Road an in-person meeting before the works begin. A noise barrier is unlikely to be practicable due to the short distance between the property and the works. The contractor must therefore consult the occupants about the timing and duration of the section of retaining wall that runs parallel to their property.

8.4.3 Saxbys Road access road construction

The following mitigation measures are expected to be required as part of the construction of the haul road. These measures will be confirmed when a contractor has been appointed and the final construction methodology has been confirmed.

During the construction of the cut through road from Saxbys Road into the Site, the use of earthmoving and compaction equipment, particularly vibratory compaction rollers, may exceed the Project Noise Limits that apply at 55 Saxbys Road. Mitigation is likely to be required to achieve compliance.

Before construction begins, the contractor must install a noise barrier along the Site boundary adjoining this property, as shown in Figure 3. The barrier must be at least 2 m high to provide suitable screening. The barrier must meet the specifications in Section 8.5.

Static compaction equipment should be used for works close to 55 Saxbys Road.

If **vibratory compaction** or other noisy equipment is required, the contractor must follow the process in Section 8.3 before starting the activity. This may require smaller or quieter equipment, localised barriers, an increased separation distance, real-time noise and vibration monitoring and/ or advice from Styles Group.

If a fixed boundary barrier is impracticable, the contractor must use localised barriers in accordance with Section 8.5.1.



Figure 3 Noise barrier requirements for Saxby Road site access road construction works

8.4.4 Heavy vehicles accessing the site via Saxbys Road

Stages 2, 3 and 4 construction works will access the site via Saxbys Road. Construction traffic movements using this site access must comply with the construction noise limits in Section 8.1.

During normal construction hours, up to 40 heavy vehicle movements distributed over a day will comply³ with the construction noise limits, provided that no other construction works occur on the access road at the same time.

Heavy construction vehicles must not use the Saxbys Road access outside the normal construction hours of 7:30 am to 6:00 pm, Monday to Saturday.

Drivers must schedule their arrival to the Site so that they arrive at or after 7:30 am. Trucks must not queue, park or idle on Saxbys Road or nearby local roads while waiting to enter the Site.

Any truck that arrives early must wait at a suitable location away from residential properties.

8.5 Acoustic barriers

Acoustic barriers must be used where compliance with the construction noise limits in Table 2 cannot be achieved without other forms of mitigation.

The barriers must comprise of either fixed barriers located on the site boundary, or localised acoustic barriers around the specific noise-generating activity.

The barriers will need to be a minimum of 2m high and positioned to block line of sight between the receiving property, and the noise-generating aspects of the construction works.

The barriers must be constructed from solid timber with a surface mass of at least 7 kg/m², such as 12 mm plywood or proprietary construction noise barriers (scaffolding and acoustic blankets such as Echo Barrier⁴, Soundbuffer⁵ or Hushtec⁶).

8.5.1 Localised / portable acoustic barrier specifications

- Localised acoustic barriers can be U-shaped and wrap around the noise source or in a straight line.

³ This is based on a maximum of 20 truck visits (where each visit includes one arrival and one departure) per day during the earthworks stage.

⁴ <https://supplyforce.co.nz/echo-barrier>

⁵ <http://soundbuffer.co.nz>

⁶ <https://duraflex.co.nz/hushtec>

- 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. If proprietary flexible screens are used to line scaffolding, the barriers must 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).
- 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.

8.6 General noise mitigation measures

The contractor must take all practicable steps to reduce noise from works within the 40m noise control zone by implementing the mitigation measures listed below:

- The minimum separation distances identified in this CNVMP must be complied with at all times unless the noise levels can be made to comply with the relevant noise limits using other methods (e.g. screening).
- 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 to ensure it is not generating unnecessary noise.
- When machinery or plant is not required to be running, it should be switched off and not left idling for extended periods.
- 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 if it creates high noise levels. 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.
- Any regular 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.

9.0 Management of vibration effects

Sheet piling, tracked excavators, vibratory rollers and other heavy plant and vehicles operating close to houses may generate vibration that can be felt within nearby dwellings.

The specific vibration management and monitoring requirements for sheet piling are set out separately in Section 9.3.

The following measures apply when undertaking any works within 20 m of an occupied dwelling. These measures should ensure that vibration complies with the Project Conditions and does not cause unreasonable disturbance.

9.1 Project construction vibration limits

The applicable vibration limits for the Project are set out in Table 3.

Table 3: Applicable vibration limits

Location	Limit
All buildings, at all times	DIN 4150 guideline values

All construction vibration will be measured and assessed in accordance with DIN 4150-3:1999

The DIN 4150-3:1999 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 Standard is specifically concerned with the structure of the building, not the effect of the vibration on the people within the building. Assessment is in terms of a reduction in

'serviceability' as defined in the DIN standard, which includes minor cosmetic damage such as cracked plaster.

The DIN standard frequency-dependant vibration limits for short-term vibration are reproduced in graphical form as Figure 3. Line 2 of the DIN criteria is very typically applied to residential dwellings unless the receiving structure is particularly sensitive to vibration. A suitably qualified structural expert should be consulted: where there are concerns about a building's susceptibility to vibration; or where the appropriate assessment classification under DIN 4150-3:1999 requires confirmation.

The DIN standard includes many other recommendations and prescribes more stringent limits for long-term vibration (which may induce fatigue or resonant movement). The DIN standard should therefore be referred to in full when being applied.

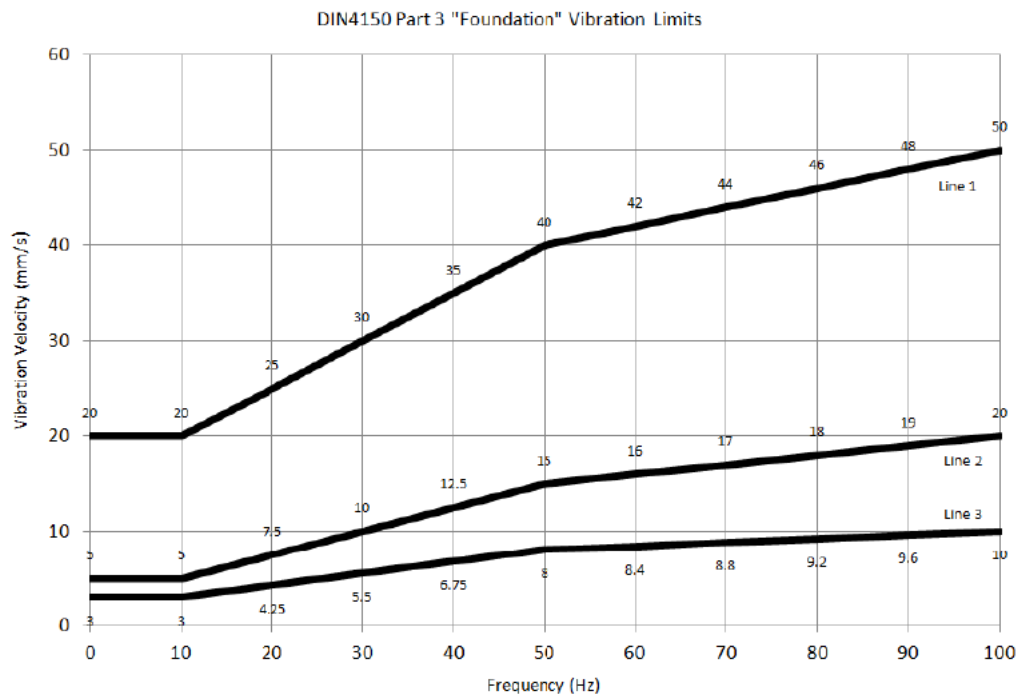


Figure 4: Curves for guideline values (short-term vibration) specified in DIN 4150-3:1999

9.2 Vibration mitigation measures within 20m of any occupied dwelling

The operation of tracked excavators, vibratory compaction rollers, and other heavy plant and vehicles on site have 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 20 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.
- Any vibratory compaction works necessary will be undertaken making passes parallel to the site boundary. The operator will not change direction or stop in the nearest part of the site to an occupied dwelling.

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

9.3 Sheet piling vibration

These measures will be confirmed when a contractor has been appointed and the final construction methodology has been confirmed.

Following the measures set out to ensure compliance with the Project Noise Limits should also result in sheet piling complying with the Project Vibration Limits.

Sheet piling must not occur within 20m of a dwelling (even when it is unoccupied), unless vibration monitoring is in place to confirm compliance with the Project Vibration Limits.

Vibration from works within 50m of a building may still be perceptible within nearby dwellings and may cause some disturbance. However, the vibration is expected to remain tolerable if residents receive advance notice of the works and clear information about the expected timing and duration.

The specific community engagement procedures for sheet piling are set out in Section 10.1.

10.0 Community liaison and complaints

10.1 Community liaison

This section will be updated when the contractor has been appointed and the final construction methodology has been confirmed. This section will include any specific community engagement requirements for sheet piling works.

All receivers within 50 m of works must be informed of the following information by letter drop at least 10 working days before works commence on site:

- i. A brief overview of the works;
- ii. The expected start date of works;

- iii. The expected duration of the works;
- iv. The days and hours of the week when works may be undertaken;
- v. The approximate timing of the highest noise and vibration activities;
- vi. The noise and vibration mitigation to be implemented; and
- vii. Contact details for the receipt of any noise or vibration complaints or concerns.

10.2 Complaints about noise and vibration

Any complaints received will be directed to the manager identified in Section 3.0. 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 causing 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 taken in accordance with Section 12.0.

The complaints register must be made available to Waipa District Council on request.

11.0 Noise and vibration monitoring and reporting

This section sets out requirements for construction noise and vibration monitoring during construction of the Project. This section will be updated when the contractor has been appointed and the final construction methodology has been confirmed.

Noise and vibration measurements will be performed:

- i. At the beginning of any activity within the mitigated (with barrier) setback distances specified in Table 2 to monitor compliance with the Project Noise Limits.
- ii. If the noise or vibration from any activity on the site appears excessive in the opinion of the Site Manager or Waipa District Council.
- iii. Following the receipt of any reasonable construction noise or vibration complaint.
- iv. By a suitably qualified and experienced person (e.g., MASNZ) or any person trained by the project construction noise and vibration consultant.
- v. 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).
- vi. In accordance with DIN 4150-3:1999 *Structural Vibration – Part 3 Effects of Vibration on Structures* (vibration only).

A noise monitoring form is attached as Appendix C

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.

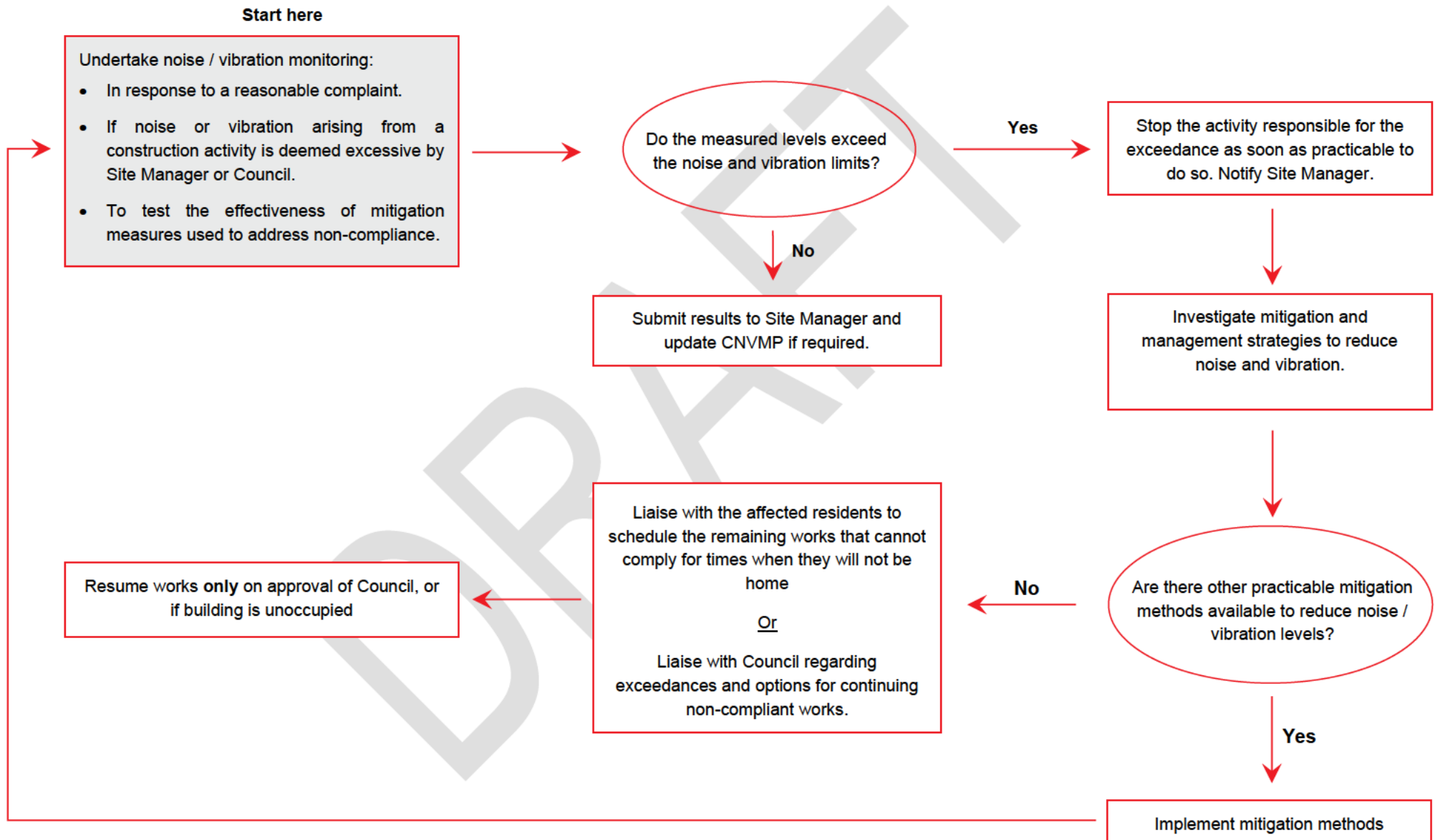
The results of all noise and vibration monitoring will be retained for the duration of the Project and made available to Waipa District Council on request.

Any non-compliance with the noise limits identified through monitoring will be addressed by following the corrective action measures in Section 12.0 of this CNVMP.

12.0 Corrective action measures

The corrective action measures illustrated in Figure 5 will be followed if non-compliance with the Project Noise or Vibration limits is identified through monitoring.

Figure 5: Process for corrective action measures



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 4150–3:1999	German Standard DIN 4150-3:1999 <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 Consent conditions

This section must be updated to include the conditions of consent.

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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	

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Measurement results

Sample start time	Duration of sample	L _{Aeq} (dB)	L _{AFmax} (dB)	Sound source controlling the measured levels

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 option*