

15. Construction noise

A Construction Noise Assessment Report has been prepared for the Project, which provides an assessment of noise effects relating to the construction phase of the Project. The Report does not include an assessment of operational noise effects, which are addressed in a separate report and summarised in Section 24 of this AEE.

A detailed description of the assessment criteria and methodology, and options for managing and mitigating construction noise effects is provided in the Construction Noise Assessment Report. The following is a summary of the issues and potential effects identified in that Report.

This summary and the Report subsequently inform the recommended mitigation contained in Section 28 and will inform the Project conditions.

15.1 Noise assessment criteria

New Zealand Standard NZS 6803:1999 "Acoustics – Construction Noise" is the most commonly used standard and is considered by the Noise team to be the most appropriate standard on which to base an assessment of construction noise effects for this Project. The Noise team reviewed all relevant documentation, including the Standard, the District Plan and ARP:C provisions in relation to construction noise. Both the District Plan and the ARP:C references a version of the Standard.

Application of NZS 6803:1999 will achieve equitable treatment of all affected parties and enables a reasonable balance between appropriate noise criteria and the need to progress construction. Where full compliance with the criteria is not practicable, alternative measures are to be employed to deal with the potential exceedance.

The Noise team recommends appropriate criteria for general construction noise and noise from blasting, based on the Standard.

The recommended noise criteria of NZS 6803:1999 are summarised in Table 15-1 and Table 15-2. Because construction will exceed 20 weeks' duration, the Noise team considers the "long-term duration" criteria to be most appropriate for this Project, in accordance with Section 7.2.1 of NZS 6803:1999.

Table 15-1: Recommended upper limits for construction noise received in residential zones and dwellings in rural areas¹⁰³

Time of week	Time period	Long-term duration	
		dB L _{Aeq(T)} *	dB L _{Amax}
Weekdays	0630-0730	55	75
	0730-1800	70	85
	1800-2000	65	80
	2000-0630	45	75
Saturdays	0630-0730	45	75
	0730-1800	70	85
	1800-2000	45	75
	2000-0630	45	75
Sundays and Public Holidays	0630-0730	45	75
	0730-1800	55	85
	1800-2000	45	75
	2000-0630	45	75

Note: shading shows the low noise times in accordance with NZS 6803:1999.

Table 15-2: Recommended upper limits for construction noise received in industrial or commercial areas for all days of the year¹⁰⁴

Time period	Long-term duration
All days of the year	L _{Aeq(T)} *
0730-1800	70
1800-0730	75

* T means a representative assessment duration between 10 and 60 minutes.

For residential areas and rural dwellings, the Standard allows higher noise criteria during daytime hours so that construction activity can take place. For Sundays and Public holidays, lower noise

¹⁰³ Refer to Section 3.1 of the Construction Noise Assessment Report

¹⁰⁴ *ibid*

criteria are set to provide days of rest from construction noise. Similarly, night-time criteria are low and only allow very quiet operations to be carried out.

For commercial and industrial areas, less stringent noise criteria are set out during night-time when it is less likely that persons or business activities would be affected by construction noise. In addition, criteria for daytime and night-time are consistently high, seven days per week, as businesses are less noise sensitive than residences.

The Standard does not anticipate that full compliance will necessarily be achieved at all times and at all receivers. It focuses on the implementation of the best practicable option (BPO) for construction noise management and mitigation rather than requiring that the criteria be achieved.

15.1.1 Blasting noise

Noise from explosives is normally described as 'airblast' or blasting noise. Blasting noise is the pressure wave that radiates out from the blasting area, caused by ground vibration, air movement around the rock face being blasted and air pressure venting from the holes that are drilled in the face. There is often sub-audible, low-frequency noise associated with blasting, which can result in the rattling of structures even when the blast is not clearly audible outdoors.

Blasting noise can cause annoyance or discomfort at low levels, and potentially damage structures or result in personal injury at very high levels. The NZS 6803 limit of 120dBC (refer to glossary at Appendix B of this AEE) is a human comfort noise limit related to annoyance and therefore a conservative limit at which no building damage will occur.

15.2 Existing environment

The ambient noise environment in the vicinity of most of the Project is relatively low due to the absence of major local roads and industry. Exceptions are the northern and southern connections of the Project with the existing SH1, where traffic on SH1 affects ambient noise levels at Pūhoi and Warkworth. Measured noise levels ranged from 40dB L_{Aeq} in rural areas to 73dB L_{Aeq} adjacent to SH1. Noise levels at the lower end represent positions away from the existing roading network, and levels at the higher end represent positions close to the existing SH1.

15.3 Assessment methodology

The Noise team's assessment methodology for determining construction noise effects takes into account issues such as:

- Duration and variability of construction activities, eg through staging and equipment moving along the alignment;
- Change in noise level. For construction, typically the change in noise level is greater than would be acceptable for ongoing operational noise;
- Potential adverse effects, which need to be balanced against development needs; and
- Potential for exceedance of construction noise criteria and what this means in the context of temporary activities.

The Construction Noise assessment is based on a construction methodology (refer to Section 6 of this AEE) developed to provide a feasible scenario under which the Project could be constructed. Details regarding staging, duration of works and construction activities are therefore indicative only and are subject to change following the appointment of a construction contractor.

15.4 Actual and potential noise effects

In terms of the RMA, noise effects can be described in relation to the potential noise level change that will be experienced by a person. Using the noise level change as the primary basis of an effects assessment is especially appropriate for ongoing noise such as traffic or industrial activities.

Construction is inherently noisy and generally results in a large noise level increase over existing levels, but for limited periods¹⁰⁵. This increase in noise level occurs particularly for existing low noise environments, where construction would introduce not only a new noise source, but may be the dominant noise source for the duration of construction.

The ambient noise levels in proximity to the indicative alignment are generally low. Therefore, even when achieving compliance with the daytime construction noise criteria of NZS 6803, there will be a significant increase in overall noise level during the construction phase. This increase is an expected and inevitable result of large construction projects in the vicinity of receivers, and is anticipated by the Standard.

15.4.1 Construction noise predictions

There are few dwellings in close proximity to the Project and these are mainly concentrated in and around Pūhoi and in the rural/residential area to the west of Warkworth. Table 15-3 summarises the key construction noise issues related to the potential construction activities that may occur in specific locations within the Project area.

Table 15-3: Key construction noise issues

Sector	Noise generating activities	Closest receiver areas
Pūhoi Sector	<ul style="list-style-type: none"> • Significant earthworks • Rock breaking and blasting • Viaduct construction at Billings Road and Pūhoi Road • Road construction and sealing • Construction staging areas near Okahu Creek Viaduct and Pūhoi River Viaduct • Ramp construction works south of Pūhoi • Spoil areas 	Billings Road, Pūhoi Close, Pūhoi Road, SH1

¹⁰⁵ Note that although the construction programme could be 5 years, localised noise effects will be of much shorter duration.

Sector	Noise generating activities	Closest receiver areas
Hungry Creek Sector	<ul style="list-style-type: none"> • Significant earthworks • Rock breaking and blasting • Viaduct construction at Hikauae and Schedewys Hill • Road construction and sealing • Construction yards and construction staging area near Schedewys Hill Viaduct • Spoil areas 	Pūhoi Close, SH1
Schedewys Hill Sector	<ul style="list-style-type: none"> • Earthworks • Rock breaking and blasting • Moirs Hill Road realignment • Road construction and sealing • Construction yards • Spoil areas 	Moirs Hill Road
Moirs Hill Road Sector	<ul style="list-style-type: none"> • Significant earthworks • Rock breaking and blasting • Road construction and sealing • Construction yards • Spoil areas 	n/a
Perry Road Sector	<ul style="list-style-type: none"> • Significant earthworks • Rock breaking and blasting • Viaduct construction at Perry Road • Wyllie Road alternate property access • Road construction and sealing • Construction yards and construction staging areas near Perry Road Viaduct and Mahurangi River Viaduct • Possible precast yard at Woodcocks Road • Spoil areas 	Perry Road, Wyllie Road, Woodcocks Road
Carran Road Sector	<ul style="list-style-type: none"> • Significant earthworks • Viaduct construction at Woodcocks Road • Roundabout construction at Warkworth • Road construction and sealing • Construction yard • Spoil areas 	Carran Road, Woodcocks Road, Viv Davie-Martin Drive, SH1

A list of likely equipment was compiled based on previous experience with other large roading projects throughout New Zealand. The Noise team used this list to predict construction noise levels and identify areas within the Project area where noise criteria may be exceeded. Activity sound power levels and compliance distances for specific construction activities are provided in Table 5 of the Construction Noise Assessment Report.

The predicted noise levels are conservative and do not take into account any topographical shielding. Therefore, the predicted noise levels and compliance distances are applicable to a worst case scenario.

The Noise team identified several receivers in proximity to the alignment where the noise criteria may be exceeded using the activity sound power levels and compliance distances. These locations may receive noise levels above the daytime noise criteria, generated as a result of bulk earthworks, ground improvement, entrainment or detention pond excavation, haul roads, spoil disposal and blasting activities. The areas of potential noise criteria exceedance of anticipated construction activities along the indicative alignment are shown in Drawings CN-101 to CN-117.

Table 15-4 shows the risk of exceeding the daytime noise criteria at receivers close in proximity to the Project.

Table 15-4: Risk of exceeding daytime noise criteria (70 dB L_{Aeq})

Activity	Activity Sound Power Level	Risk distances	Sector	Potential addresses (depending on alignment within designation)
Bulk earthworks Ground improvement Retainment pond excavation Haul road Spoil disposal	118	High: <65m Medium: 65 – 90m Low: >90m	Pūhoi Sector Schedewys Hill Sector Perry Road Sector Carran Road Sector	M: 24, 26 Billings Road, 466 SH1 M: 187 Moirs Hill Road M: 70, 75, 161, 217, 221 Wyllie Road M: 63, 102, 104 SH1
Rock breaking	120	High: <75m Medium: 75 – 110m Low: >110m	N/A	L: No receivers within 110m of breaking
Piling / foundations	110	High: <30m Medium: 30 – 40m Low: >40m	N/A	L: No receivers within 40m of works
Viaduct construction	110	High: <30m Medium: 30 – 40m Low: >40m	N/A	L: No receivers within 40m of works
Pavement construction	110	High: <30m Medium: 30 – 40m Low: >40m	N/A	L: No receivers within 40m of works

Activity	Activity Sound Power Level	Risk distances	Sector	Potential addresses (depending on alignment within designation)
Staging area / Construction yard	100	High: <10m Medium: 10 – 30m Low: >30m	N/A	L: No receivers within 30m of sites
Pre-cast yard	112	High: <50m Medium: 50 – 70m Low: >70m	N/A	L: No receivers within 50m of site
Blasting	12 kg charge weight assumed	High: <160m Medium: 160 – 200m Low: >200m	Hungry Creek Sector Schedewys Hill Sector Perry Road Sector	H: 20 Pūhoi Close M: 446 SH1; 5, 6 Hungry Creek Road M: 187 Moirs Hill Road M: 83, 97 Perry Road; 221 Wyllie Road

Note: this table also includes dwellings that may potentially be affected should the alignment move a likely distance towards the designation boundary.

Noise level predictions for all Sectors indicate that construction activities can be undertaken in compliance with the relevant daytime noise criteria outlined in NZS 6803; provided that appropriate mitigation and management measures are implemented (refer to Section 28 of this AEE). Mitigation measures may include using a lower charge weight for blasting in the vicinity of Pūhoi Village, where blasting noise could otherwise exceed the criteria.

A summary of construction noise for each Sector is included in Section 6 of the Construction Noise Assessment Report.

15.4.2 Night-time construction

Generally, Project construction activities will occur during daytime only, particularly in areas where receivers are located. However, some construction works may be undertaken during night-time.

Preparatory work may be undertaken in the construction yards and staging areas at night. These yards and areas do not contain particularly noisy operations, so the night-time construction noise criteria can be complied with (without mitigation) at dwellings that are 140m or more from the relevant yard. If yards are closer than 140m to a dwelling (eg in Billings Road and some dwellings at SH1), mitigation may involve solid site hoardings and placement of activities in the yard as far as possible from dwellings during night works.

Construction of the tie-ins with the existing SH1 at the southern and northern ends of the Project may also require night-time works so as to avoid disruption to traffic on SH1. Such works will be communicated with the potentially affected residents in the vicinity and mitigation implemented as required and practicable.

15.4.3 Construction traffic

Construction traffic will use the alignment as a haul road throughout construction, and this has been assessed as part of the earthworks activities. However, construction traffic will need to enter the alignment at various points along the alignment. Upgrades of existing roads and new access roads will need to be constructed, connecting the Project with the local road network and SH1. Particularly the construction yards will require access for materials to be delivered and stored at the yards before being distributed along the Project.

Most construction traffic cannot be distinguished from general traffic (eg freight, logging trucks). Therefore, the potential change in noise level from the inclusion of construction traffic on public roads is described in the Construction Noise Assessment Report and below, rather than the construction traffic per se.

The character and level of noise as a result of construction traffic will remain the same as existing noise levels for receivers in proximity to access routes for indicative staging areas, project offices and construction yards. The exceptions to this assessment are receivers near to access routes for indicative construction yards 7 and 8. Access to these yards would be via Moirs Hill Road.

Access to construction yard 7 would be immediately alongside two dwellings (99 and 101 Moirs Hill Road). The Noise team recommends that solid site hoardings of 2m height are erected between the access road and dwellings to reduce noise events of individual trucks.

Individual truck movements would be audible at 187 Moirs Hill Road, which is approximately 100m from the access to construction yard 8. However, the small increase in noise over existing levels is well within acceptable noise criteria.

A summary of construction traffic noise predictions for each of the construction yard accesses is provided in Section 6.9 of the Construction Noise Assessment Report. Overall, construction traffic effects relating to noise will be negligible to minor.

15.5 Overall construction noise effects

In general, construction activities can be undertaken in compliance with the daytime construction noise criteria without the need to implement mitigation measures beyond best practice general mitigation. Where night-time construction is required, mitigation such as scheduling, solid site hoardings, enclosure or similar common mitigation is predicted to generally achieve compliance with the relevant criteria. Such measures should be supported by early and on-going consultation with potentially affected communities.

Blasting will need to be undertaken at several sites along the alignment. While generally blasting can be undertaken in compliance with the relevant noise limit, there is one dwelling at 20 Pūhoi Close where the noise limit may be exceeded with the use of 12 kg blast charges. For this dwelling, we recommend that the blast charge is reduced to achieve lower noise levels. As general best practice, we recommend a regime of notification of residents and warning sirens prior to blasts and that no blasting is undertaken at night-time.

The Noise team evaluated anticipated construction traffic along the alignment, predicted construction traffic noise levels and assessed potential noise effects. Generally, before entering the designation, trucks will use existing roads such as SH1 and Woodcocks Road to reach the construction yard access roads. These roads carry comparatively large numbers of traffic, including trucks, each day. Construction trucks will be of the same character and at a lower level than existing traffic noise. Therefore, construction traffic noise effects will be negligible to minor.

15.5.1 Recommendations and mitigation

Even when complying with the construction noise criteria, noise levels will increase significantly for many of the affected dwellings, compared with the existing noise levels and will be evident to residents. The recommended noise criteria achieve a balance between the need for development to be progressed while avoiding adverse health and annoyance effects on residents.

We recommend the adoption of general noise management and mitigation measures throughout construction, such as considerate operating procedures on and off-site and appropriate communication with affected residents. Examples of on-site measures include training of personnel, maintenance of equipment, noise barriers and enclosures and considerate behaviour and use of equipment. Examples of off-site measures include public liaison and communication, temporary barriers, offers of resident relocation and noise level monitoring. In addition, targeted mitigation such as individual engagement with residents should be undertaken for 'at risk' receivers.

Any potential exceedances of the recommended criteria can be managed and mitigated through a Construction Noise and Vibration Management Plan (CNVMP), which would be developed during the OPW process (refer Section 1.9 above). The CNVMP would be formulated by the contractor following the detailed design phase to identify at risk receivers and mitigation proposed specifically for them. A CNVMP has the advantage of being a flexible tool that can be adjusted as construction progresses. Therefore, we considered it is the most appropriate instrument to respond in a proactive manner to any potential construction noise issue.

I consider it is appropriate that the designation conditions should include the Noise team's recommended noise performance criteria and the requirement for a CNVMP to be produced prior to, and implemented and updated throughout, construction.