TE TUPU NGĀTAHI
SUPPORTING GROWTH

# Trig Road Corridor Upgrade
# Assessment of Traffic Noise and Vibration Effects

December 2022

Version 1

WAKA KOTAHI
New Zealand Government

## Document Status

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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AADT** | Annual Average Daily Traffic |
| **AEE** | Assessment of Effects on the Environment |
| **AC** | Auckland Council |
| **AT** | Auckland Transport |
| **AUP: OP** | Auckland Unitary Plan Operative in Part |
| **BPO** | Best Practicable Option |
| **FTN** | Frequent Transit Network |
| **FUZ** | Future Urban Zone |
| **NIWA** | National Institute of Water and Atmospheric Research |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **NZS 6806** | NZS 6806:2010 Acoustics - Road-traffic noise - New and altered roads |
| **OGPA** | Open Graded Porous Asphalt |
| **PPF** | Protected Premises and Facilities |
| **RMA** | Resource Management Act 1991 |
| **SH16** | State Highway 16 |
| **SH18** | State Highway 18 |
| **Te Tupu Ngātahi** | Te Tupu Ngātahi Supporting Growth Programme |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |

# Glossary of Acronyms / Terms

| Acronym/Term | Description |
|---|---|
| **Auckland Council** | Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010. |
| **Altered Road** | As defined in NZS 6806:2010 Section 1.5.2:<br><br>Subject to 1.5.4, an altered road means an existing road that is subject to the alterations of the horizontal or vertical alignment where at any assessment position at any one or more PPF meets criteria 1.5.2 (a) or (b). |
| **New Road** | As defined in NZS 6806:2010 Section 1.6:<br><br>A new road is any road which is to be constructed where no previously formed legal road existed. A new road excludes any existing road and any altered road but includes the formation of previously unformed legal road. |

# Executive Summary

***Assessment undertaken***

This report provides an assessment of predicted road traffic noise effects for Trig Road Corridor Upgrade.

The report contains a review of the relevant traffic noise criteria and discussion of the appropriate criteria and assessment methodology for the Project. Predictions of road traffic noise were carried out using the method recommended in NZS 6806 in accordance with rule E25.6.33 of the Auckland Unitary Plan – Operative in Part (AUP:OP).

The assessment of effects undertaken was two-fold: in accordance with NZS 6806, and in relation to the predicted noise level changes comparing the future traffic noise levels with and without the project.

As required by NZS 6806, the assessment methodology included the prediction of existing and future traffic noise levels, both without the Project (Existing and Do Nothing scenarios) and with the Project with no acoustic mitigation applied (Do Minimum scenario).

The Existing scenario represents the current road network with current traffic volumes, i.e. the existing environment as it is experienced now. The Do Nothing scenario represents the current road network with future traffic volumes, assuming a full build out of the area. The Do Minimum scenario represents the proposed future road network. This scenario assumes a full build out of the area, and the transport infrastructure to enable the development. This is a realistic scenario at a point in time when the Project is operational.

Noise effects of road traffic on existing noise-sensitive locations, referred to as Protected Premises and Facilities (PPFs) within NZS 6806, have been assessed. PPFs within a 100m radius of the Project area have been included. Roads have been assessed by comparing the predicted noise levels in the design year without the Project (Do Nothing) with the predicted noise levels in the design year with the Project (Do Minimum).

Each PPF has been assessed against Noise Criteria Categories as set out in NZS 6806, with Category A setting the most stringent external noise criteria and being the preferred category. Where this cannot practicably be achieved, then Category B is the next-preferred, having higher external noise criteria. Category C, an internal noise criterion, is the least-preferred category and should only be applied where Category A and Category B external noise criteria cannot be achieved and where external noise levels cannot practicably be reduced any further. Where Category A noise levels can be achieved, no further mitigation is required.

Mitigation options have been considered for the Project where required under NZS 6806. The BPO mitigation in this case has been determined to be the implementation of low-noise road surface finish. The BPO mitigation formed the basis of determining the relevant Noise Criteria Category for each PPF. Since the project will be built some time in the future this BPO will be confirmed for all PPFs current at the time of construction. The review, confirmation and refinement of the BPO will aim to achieve the same noise criteria categories as determined with the current BPO as presented in Appendix 3.

In addition to an assessment against the Noise Criteria Categories of NZS 6806, the Project is also assessed against the change in noise level without and with the Project constructed, and a general subjective response is applied to the predicted changes in noise levels at PPFs.

Traffic from new or upgraded road projects is not generally expected to create any vibration issues. The smooth and even surface typical of urban roads would likely generate no more than negligible traffic vibration impacts. Therefore, traffic vibration has not been assessed for the Project.

***Assessment assumptions***

All predictions are based on traffic flow along roads at a significant time in the future (in the Design Year 2048). These traffic volumes rely on the urbanisation of the area and implementation of surrounding transport projects. A full list of assumptions is included in Appendix 1.

Development of the surrounding areas and urbanisation of the receiving environment over time and implementation of surrounding transport projects will likely increase activity and associated ambient noise levels. Therefore, any change predicted in this assessment may not hold the same significance at the Design Year, due to the change in environment at the time of construction.

As such, the results are indicative of a possible future scenario, but effects cannot be definitively determined at this stage. Reassessment of the road traffic noise at PPFs covered in this report should be carried out at the time of construction to determine if the recommended mitigation is still relevant at the time of construction.

***Results of assessment and recommended measures***

The Project involves the widening and upgrade of Trig Road between the SH18 off-ramps and Hobsonville Road. The widening has capacity to provide for a two-lane arterial standard corridor including new footpaths on both sides of the road and a cycleway which is indicatively shown as a dedicated bi-direction cycleway on the eastern side of the corridor. The Project will upgrade the current corridor to an urban standard, which is appropriate to support the future urban environment on either side of Trig Road.

For the Do Minimum scenario, 92 PPFs are predicted to fall within Category A, 9 PPFs are predicted to fall within Category B and 5 in Category C. Predicted noise levels range from 45 dB $L_{Aeq(24h)}$ to 69 dB $L_{Aeq(24h)}$.

One mitigation option modelled (Mitigation Option 1) comprised the implementation of a low-noise road surface of Asphaltic Concrete with a maximum nominal aggregate size of 14 mm (AC-14) or an equivalent low noise road surface for the entire road alignment. With the recommended mitigation option in place, all PPFs would achieve Category A with the exception of two PPFs in which fall into Category B.

Implementation of noise barriers was considered as a potential mitigation option. However, they were not considered BPO mitigation options as there is a need to maintain access to houses via driveways, which would mean that line-of-sight would still be achieved between specifically mitigated PPFs and the road. This means that the minimum 5 dB(A) reduction at individual PPFs (as required by NZS 6806 set out in Section 2.1.5) would not be achieved. Therefore, noise barriers were not considered a suitable mitigation option.

For Mitigation Option 1, noise levels are predicted to change by a negligible margin at 75 out of 106 PPFs. Noise levels are predicted to increase by a perceptible amount (more than 2 dB increase in

noise levels between the Do Minimum and Do Nothing Scenario) at 2 PPFs due to the required demolition for this Project of dwellings which would otherwise have provided screening from the road to PPFs behind. Noise levels will reduce by at least a perceptible margin (more than 2 dB reduction in noise levels between the Do Minimum and Do Nothing Scenario) at 29 PPFs due to implementation of the low-noise road surface.

# 1 Introduction

This traffic noise assessment has been prepared to support Auckland Transport's (**AT**'s) Notices of Requirement (**NoRs**) for the Trig Road Corridor Upgrade (the **Project**). The NoRs are to designate land for future local arterial transport corridors as part of the Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the future construction, operation and maintenance of the Project.

Auckland's population is growing rapidly; driven by both natural growth (more births than deaths) and migration to the area from overseas and other parts of New Zealand. The Auckland Plan 2050 anticipates that this growth will generate demand for an additional 313,000 dwellings and require land for approximately 263,000 additional employment opportunities.

In response to this demand, the Auckland Unitary Plan Operative in Part 2016 (**AUP:OP**) identifies 15,000 hectares of predominantly rural land for future urbanisation. To enable the urban development of this greenfield land, appropriate bulk infrastructure such as significant roads needs to be planned and delivered.

This report assesses the traffic noise effects of the proposed Trig Road Corridor Upgrade identified in Figure 1-1 below.


**Figure 1-1: Whenuapai - Trig Road Corridor Upgrade**

The Project consists of the widening and upgrade of Trig Road between the SH18 off-ramps and Hobsonville Road. The widening has capacity to provide for a two-lane arterial standard corridor including new footpaths on both sides of the road and a cycleway which is indicatively shown as a dedicated bi-direction cycleway on the eastern side of the corridor. The Project will upgrade the current rural standard corridor to an urban standard, which is appropriate to support the proposed urban environment on either side of Trig Road.

To tie into the existing road network, the Project also includes the signalisation of the intersections at Trig Road/Hobsonville Road and Luckens Road/Hobsonville Road, and the upgrade of Hobsonville

Road between these intersections. This will require some localised widening of the road corridor along Hobsonville Road.

## 1.1 Purpose and Scope of this Report

Trig Road, Whenuapai has been identified in the Supporting Growth Programme as a future arterial corridor which is needed to support the urban development of Whenuapai.

This report has been prepared to support **AT**'s notice of requirement (**NoR**) and application for resource consents for the Trig Road Corridor Upgrade (the **Project**). The NoR under the Resource Management Act 1991 (**RMA**) is to designate land for the construction, operation and maintenance of the Project.

Funding for the upgrade of Trig Road between Hobsonville Road and State Highway 18 (**SH18**) has been made available through the Housing Infrastructure Fund[1]. As there is funding available for construction, AT is also applying for the necessary resource consents under the RMA, concurrently with the NoR process.

This report provides an assessment of road traffic noise and vibration effects associated with the operation of the Project. This assessment has been prepared to inform the Assessment of Environmental Effects (**AEE**) for the NoR and resource consent application.

The key matters addressed in this report are as follows:

a. Identify and describe the existing noise environment;
b. Describe the predicted actual and potential adverse traffic noise and vibration effects of operation of the Project;
c. Recommend measures as appropriate to avoid, remedy or mitigate potential adverse noise and vibration effects (including any conditions/management plans required); and
d. Present an overall conclusion of the level of actual and potential adverse noise and vibration effects of the Project after recommended measures are implemented.

This report is structured to reflect the key matters listed above.

[1] See *North West Housing Infrastructure Fund Assessment of Environmental Effects* for further detail regarding the Housing Infrastructure Fund.

# 2 Assessment Criteria

## 2.1 Road Traffic Noise

Rule E25.6.33 of the Auckland Unitary Plan (AUP:OP) requires that New Roads and Altered Roads which are within the scope of NZS 6806:2010[2] comply with the requirements of that standard. The assessment has addressed the requirements of NZS 6806.

NZS 6806 provides criteria and an assessment method for road-traffic noise. The standard is a tool which provides performance targets and requires assessment of varying options for noise mitigation (ranging from low-noise road surfaces and barriers to building modification mitigation). These options are subject to an integrated design process in which the costs and benefits are considered. The performance targets in NZS 6806 are set to achieve reasonable noise levels considering adverse health effects associated with noise on people and communities, the effects of relative changes in noise levels, and the potential benefits of New and Altered Roads. NZS 6806 is an appropriate tool to assess road traffic noise from the Project as it provides a suitable and tested traffic noise assessment and mitigation methodology and includes relevant noise criteria.

NZS 6806 is not applicable to New and Altered Roads predicted to carry less than an Annual Average Daily Traffic ("AADT") of 2000 vehicles per day at the design year, or where the change in noise level due to a project (i.e. the horizontal or vertical realignment of a road) does not reach certain thresholds of effects (e.g. a change of at least 3 dB for at least one PPF).

To be defined as an Altered Road in accordance with NZS 6806 the following must apply:

- The Do Minimum noise environment would be greater than or equal to 64 dB $L_{Aeq(24h)}$ and, if no specific noise mitigation was undertaken, the alterations would increase road traffic noise at the assessment position by 3 dB $L_{Aeq(24h)}$ or more at the design year, when compared with the Do Nothing noise environment; or
- The Do Minimum noise environment is greater than or equal to 68 dB $L_{Aeq(24h)}$ and, if no specific noise mitigation was undertaken, the alterations would increase road-traffic noise at the assessment position by 1 dB $L_{Aeq(24h)}$ or more at the design year, when compared with the Do-Nothing noise environment.

### 2.1.1 Protected premises and facilities

NZS 6806 requires noise effects to be assessed at noise-sensitive locations within set distances of any project. These locations are known as Protected Premises and Facilities (PPFs), and include existing houses, schools, marae and various other premises as defined in NZS 6806. Commercial and industrial premises do not fall within the definition of a PPF. Future (unbuilt) noise-sensitive premises are also not PPFs, unless they have already been granted building consent at the time of this assessment.

The distances from the road within at which properties are considered to be PPFs is set in the Standard as:

- Urban Areas – 100 metres from the edge of the nearside traffic lane.

[2] New Zealand Standard 6806:2010 Acoustics - Road Traffic Noise

- Rural Areas – 200 metres from the edge of the nearside traffic lane.

The Project extent falls within an Urban Area as defined by Statistics New Zealand[3] and therefore PPFs within 100 metres of the Project's road alignments have been assessed in this report. Buildings outside of these areas have not been assessed.

The assessment distance of 100 metres ensures the assessment is made at the most relevant receivers. Potential noise effects are still controlled at receivers further away by virtue of noise criteria applying at receivers nearest to the road.

### 2.1.2 NZS 6806 Noise Criteria

For this Project, the noise criteria as summarised below are applicable.

**Table 2-1: NZS 6806 noise criteria**

| Category | Criterion | Altered Road | New Roads with a predicted traffic volume of 2000 to 75000 AADT at the design year |
|---|---|---|---|
| **A** | Primary (External) | 64 dB $L_{Aeq(24h)}$ | 57 dB $L_{Aeq(24h)}$ |
| **B** | Secondary (External) | 67 dB $L_{Aeq(24h)}$ | 64 dB $L_{Aeq(24h)}$ |
| **C** | Internal | 40 dB $L_{Aeq(24h)}$ | 40 dB $L_{Aeq(24h)}$ |

The Project is an "Altered Road" as defined by NZS 6806 because:

- Trig Road and Hobsonville Road are existing roads;
- The Do Minimum (the Project implemented, but without any specific noise mitigation) noise environment is greater than or equal to 68 dB $L_{Aeq(24h)}$ at one or more Protected Premises and Facilities (PPFs) and the alteration would cause a predicted increase in road traffic noise at that assessment position by 1 dB or more.

Traffic volumes will likely change from current predictions with development intended for the Project area, and traffic noise will need to be reassessed nearer the time of detailed design and construction to confirm the recommended mitigation measures for the existing PPFs.

### 2.1.3 Noise Prediction Scenarios

In accordance with NZS 6806 the following scenarios have been modelled:

- The "Existing noise environment", which is the ambient noise levels at the date of assessment (2022).
- A "Do Nothing" scenario, which represents the traffic noise levels at the PPFs at the design year assuming no physical alterations are made to the existing road.
- A "Do Minimum" scenario, which represents the traffic noise levels at the PPFs at the design year with the Project implemented, but without any specific noise mitigation. Road surfaces, safety

[3] New Zealand: An Urban/Rural profile, Statistics New Zealand

barriers and other structures which are required for non-acoustic purposes may provide incidental noise mitigation and are included in this scenario.
- "Mitigation" scenarios, which represent the traffic noise levels at the PPFs at the design year with various specific noise mitigation options implemented with the aim of achieving the noise criteria categories.

Noise mitigation options have been determined based on comparison of the "Do Minimum" scenario results against the traffic noise criteria identified in Section 2.1.2.

Further to the requirements of NZS 6806, in order to determine the potential change in noise levels at PPFs due to operation of the Project, the chosen Mitigation scenario has been compared with the "Do Nothing" scenario.

Under NZS 6806, PPFs do not include premises which are not yet built, other than those for which building consent has already been obtained but not yet lapsed. Although the NZS 6806 assessment does not consider sites unless they contain, or have building consent for a PPF, the predicted noise levels can be considered indicative of the noise environment at adjacent sites without a PPF. This includes sites that are earmarked for residential redevelopment in the near or medium future.

### 2.1.4 Design Year

The criteria apply to a design year 10 to 20 years after the completion of the altered road. In this case, the opening year has not yet been determined, but the year 2048 has been selected as the design year for assessment purposes. This decision was made in conjunction with the Project team on the basis that urban development envisaged within the wider area, which will influence traffic flow data along the Project, is likely to be completed by 2048. Adopting the design year therefore provides appropriate traffic data for assessment purposes.

We note that the traffic flows used in the Do Nothing and Do Minimum scenarios were modelled assuming other planned roading projects in the area are implemented. A full list of assumptions is included in Appendix 1.

### 2.1.5 Noise Mitigation

NZS 6806 requires that noise mitigation options are to be assessed, and if practicable, the category A criterion should be achieved. If this is not practicable then mitigation should be assessed against category B. However, if it is still not practicable to comply with categories A or B then mitigation should be implemented to ensure the internal criterion in category C is achieved. Depending on the specific building, mitigation in category C could include ventilation and/or noise insulation improvements ranging from upgraded glazing through to new wall and ceiling linings. The achievement of category C provides no additional protection of outdoor amenity.

In circumstances where noise mitigation is warranted, NZS 6806 adopts a "Best Practicable Option" (BPO) approach. BPO considers the extent to which a mitigation option will achieve compliance with the relevant noise criteria and result in a noticeable noise reduction at assessment locations. The value-for-money of the option and the potential visual, shading and safety effects are also considered, amongst other things.

Where a requirement to consider mitigation measures is identified, NZS 6806 states that structural mitigation (low-noise road surfaces and noise barriers) should only be implemented if it achieves the following:

a. An average external noise reduction of at least 3 dB $L_{Aeq(24h)}$ at relevant assessment positions of all PPFs which are part of a cluster; or

b. A minimum external noise reduction of 5 dB $L_{Aeq(24h)}$ at any assessment position(s) for each PPF not in a cluster.

### 2.1.6 Road Traffic Vibration

Traffic vibration from new or upgraded roading projects is not generally expected to create issues at receivers. A key factor with new roads is the uniformity of the basecourse/pavement and the absence of near surface services. This is due to new or upgraded roads being designed to be smooth and even and avoiding vibration generated from passing traffic over uneven surfaces. Therefore, traffic vibration effects arising from operation of the Project has not been assessed.

# 3 Existing Ambient Noise Environment

The criteria in NZS 6806 to assess road traffic noise are not dependent on the existing noise levels. Measurements of existing levels are therefore not required for the assessment against that standard. However, an appreciation of the existing environment is useful to understand the potential noise effects, regardless of compliance with any particular noise criteria.

Measurement results have also been used to verify the computer noise model for the existing environment, ensuring that predictions are accurate to within the relevant tolerance.

### 3.1.1 Noise Monitoring Procedure

Noise survey equipment, meteorological conditions, data analysis and results are described below.

The noise monitoring was undertaken in general accordance with the relevant requirements of NZS 6801[4], 6802[5] and 6806. This means that the results could adequately inform the operational noise assessment, whilst providing a robust baseline dataset for the Project.

A measurement position at 22 Trig Road was selected to represent an existing environment which is unlikely to change significantly up until the design year, and where road traffic is currently the controlling noise source. The measurement position was free-field to avoid reflections from buildings or extraneous factors which could influence the sound levels, where practicable. Measurement and calibration details required by NZS 6801 are held on file.

The unattended noise monitoring results can be found in Appendix 2.

### 3.1.2 Meteorological Conditions

During the survey, meteorological data was obtained from Electronic Weather Station (EWS) 41351 weather station operated by the National Institute of Water and Atmospheric Research (NIWA). This is the closest station to the Project area at which data was available at an hourly resolution or less.

The meteorological data from this weather station was used to identify periods during which conditions were likely to have been outside the meteorological restrictions given in NZS 6801; data measured during these periods has been excluded from the noise analysis.

### 3.1.3 Data Analysis

Road traffic was the dominant noise source, with birdsong clearly audible. There is a natural variation in the noise environment throughout the day, and often variations for the weekends. Each day's data was analysed, and abnormal events excluded. A summary of the measured noise levels has been included in Table 3-1. The $L_{Aeq(24h)}$ was calculated for each day where there was sufficient data after unsatisfactory meteorological conditions and abnormal events were excluded.

The average $L_{Aeq(24h)}$ for the unattended measurement period was 59 dB.

[4] New Zealand Standard 6801:2008 Acoustics – Measurement of environmental sound

[5] New Zealand Standard 6802:2008 Acoustics – Environmental noise

**Table 3-1: Summary of measured noise levels – 22 Trig Road**

| **Date** | **$L_{Aeq\ (24h)\ (dB)}$** |
|---|---|
| 19/11/2019 | 62 |
| 20/11/2019 | 61 |
| 21/11/2019 | 61 |
| 22/11/2019 | 61 |
| 23/11/2019 | 59 |
| 24/11/2019 | 59 |
| 25/11/2019 | 61 |
| 26/11/2019 | 62 |
| 27/11/2019 | 62 |
| 28/11/2019 | 61 |
| **Average** | **59** |

# 4 Assessment Methodology

Road traffic data provided for the Trig Road Corridor Upgrade relies on the development and urbanisation of the local areas, as it forms part of the wider strategic transport network. Other projects will have a direct impact on the traffic flow and have been accounted for in the future road traffic data as set out in Section 2.1.4.

The purpose of this assessment is to determine the future potential impacts to support the future growth within the area. Therefore, it has been assumed all transport infrastructure developments will be constructed by the design year 2048 as indicated in Section 2.1.3.

It should be noted a planned urban speed reduction is expected within the transport model at the time of growth and at the "Do Nothing" scenario (design year without Project). The planned speed limit change has been included in both the Do Nothing and Do Minimum scenarios, as it will go ahead regardless of whether or not the Project is constructed.

NZS 6806 sets criteria for road traffic noise levels, considering health issues associated with noise and other matters. It is considered that external road traffic noise levels in compliance with NZS 6806 Category A would generally result in acceptable noise effects. Achieving the Category B criteria may also give rise to acceptable noise effects when considered in conjunction with the existing environment.

To determine the potential change in noise level due to the Project, the "Do Minimum" (design year with Project) scenario has been compared with the "Do Nothing" (design year without Project) scenario.

Under NZS 6806, PPFs do not include premises which are not yet built, other than those where building consent has already been obtained but not yet lapsed. No such premises that fall under this Category were known at the time of this assessment.

Although the NZS 6806 assessment does not consider sites unless they contain, or have building consent for, a PPF, the predicted noise levels shown in the noise contour maps in Appendix 4 can be considered indicative of the noise environment at adjacent sites without a PPF, including the future urbanisation areas.

## 4.1 Road Traffic Noise Model

A computer noise modelling software SoundPLAN (V8.2) has been used to predict road traffic noise impacts. The road traffic noise modelling employs the "*Calculation of Road Traffic Noise*" (CoRTN) algorithm, as recommended in NZS 6806. The CoRTN methodology has been adjusted for New Zealand Road Surfaces in accordance with Land Transport New Zealand (d) Report No. 326[6] and the Waka Kotahi *Guide to state highway road surface noise*[7]. The model settings are described in Table 4-1 below.

[6] https://www.nzta.govt.nz/assets/resources/research/reports/326/docs/326.pdf

[7] https://www.nzta.govt.nz/assets/resources/road-surface-noise/docs/nzta-surfaces-noise-guide-v1.0.pdf

**Table 4-1: Road traffic noise modelling parameters**

| Parameter | Setting/source |
|---|---|
| Software | Sound Plan 8.2 |
| Algorithm | CoRTN |
| Reflection | CoRTN |
| Ground absorption | 0.6 for urban areas; 1 for grassed areas |
| Receiver height | 1.5 m above height of each floor |
| Noise contour grid | 1.5 m height, 5 m resolution |
| Receivers and grid position | Free-field |

The CoRTN algorithm gives results in $L_{A10(18h)}$. To convert these results to $L_{Aeq(24h)}$ a minus 3 dB adjustment has been made. This adjustment has been implemented in the software in conjunction with the road surface adjustment detailed below.

The limitations and uncertainties of the prediction methodology, including input data, are discussed below.

### 4.1.1 Traffic data

All traffic data including AADT, percentage of heavy vehicles and posted speed limit has been sourced from the Project team and based on the Simulation and Assignment of Traffic to Urban Road Networks (SATURN) model.

2048 has been selected as the design year, based on the availability of traffic modelling data, and represents a conservative year for assessment purposes, as traffic will tend to increase over time as the area develops. The "Existing" scenario has been based on 2015 data as provided. Traffic modelling methodology and results are described in the *Project Integrated Transport Assessment*. Traffic volumes would need to change significantly to affect noise levels to a meaningful degree. Therefore, using traffic data from 2015 is appropriate to represent the existing circumstances. The change in traffic volume from 2015 to 2022 would amount to less than 1 decibel change in noise level.

The CoRTN model has been developed based on 18-hour traffic data. However, in accordance with the requirements of NZS 6806, traffic data has been entered as the 24-hour daily traffic (AADT), which results in noise levels in the order of +0.2 dB higher than those which would have been calculated by CoRTN based on the 18-hour AADT. The CoRTN model assumes that traffic is free-flowing, it does not apply to interrupted vehicle flows, such as at intersections, and for low volume roads (under 2,000 AADT).

### 4.1.2 Topography

Topographic contours for the existing scenario have been provided from the Project team at a 1m resolution.

Contours for the "Do Minimum" scenario were obtained from the Project team for the assessment area and joined with the existing contours for the surrounding areas. Road gradients and screening have been extrapolated by the SoundPLAN model from the contours.

### 4.1.3 Buildings

The footprints and heights for all buildings, building usage and all other structures within 100 metres of the roads have been obtained from the Project team. The number of floors was determined assuming 2.8 m height per floor.

Noise levels were calculated at the centre of each façade, 1.5 m above each floor height with the noise levels stated being the highest of any façade.

Any buildings or structures within the designation boundary for the Project have been removed from the model and not assessed for the "Do Minimum" scenario as they will be removed/demolished to provide for the Project road alignment.

Road alignments for existing roads were provided by the Project team as centrelines and widths for each carriageway section. Road gradients were calculated within the SoundPLAN model.

### 4.1.4 Road Surfaces

Surfaces of existing roads in the "Do Nothing" scenario have been modelled as the current surfaces recorded by the Project team, which is two-coat chipseal. For the "Do Minimum" scenario the road surface has also been modelled as two-coat chipseal, retaining the existing surface type, as advised by the Project team.

The procedure used to incorporate different road surfaces in the model is as follows:

- A minus 2 dB adjustment was applied for New Zealand conditions in accordance with Transit Research Report 28
- A surface correction relative to asphaltic concrete was made in accordance with LTNZ Research Report 326 and the Waka Kotahi Guide to state highway road surface noise.
- The combination of surface corrections for cars and heavy vehicles was made using the equation in the Waka Kotahi Guide to state highway road surface noise.
- The combined correction was entered in the modelling software as a total road surface correction applied to the source line.

### 4.1.5 Existing noise barriers

Existing noise barriers along the Project route were identified during site visits and confirmed by the Project team. The only existing noise barrier identified was between SH18 and 46 Trig Road.

Existing boundary fences of private properties have not been included in the noise model as their condition is unknown and they may not provide effective acoustic shielding nor be retained by property owners during the course of the Project development.

This means that for some properties, the predicted traffic noise levels may be slightly higher than would actually be experienced. However, the assessment process will identify properties which need new noise barriers to be erected or existing fences to be upgraded to provide adequate attenuation, as part of the mitigation appraisal.

### 4.1.6 Bridges

The SH18 over-bridge is configured to be a 'self-screening' road, which blocks the noise of the road passing through it and its parapets. The existing screens will remain on the SH18 over-bridge as no widening works are proposed.

### 4.1.7 State Highway 18

SH18 runs perpendicular to the Project alignment and is approximately 70m from the nearest PPF at 52 Trig Road. The property is at an approximately 9m elevation above the highway with a 2m high barrier sitting between SH18 and the dwelling.

Future scenario data was not provided for this section of SH18, thus a test model to consider the noise impact from SH18 on 52 Trig Road was run using existing State Highway traffic data obtained directly from Waka Kotahi. The test model shows that the inclusion of SH18 results in a + 2dB increase on the north façade directly facing the highway. The eastern façade located closest to Trig Road has minimal difference of +0.6dB. Since the noise impact from SH18 is minimal in relation to the façade closest to the Project area, SH18 has not been included into the assessment model.

## 4.2 Uncertainties and Limitations

The predicted road traffic noise levels presented in the following sections are based on a road traffic noise model developed in accordance with NZS 6806 and relevant guidance. The accuracy of the model is largely dependent upon the limitations of the available input data as detailed above.

Uncertainties in the modelled noise levels can occur for a number of reasons. Uncertainties are typically related to the effects of topographical screening, appropriateness of the traffic data in terms of volumes of light and heavy vehicles, and speeds (observed vs signposted) and road surface type.

As stated, the model has been developed by the Project team based on 1m vertical resolution, which provides sufficient detail to accurately account for any acoustic shielding from localised topographical features. The traffic data has been sourced from the Project team and it is accepted that the forecasting of future traffic flows may not necessarily reflect the actual flows when the Design Year is reached. The sensitivity of the noise predictions to changes in traffic data is not as significant as the effects of topographical screening. For example, if all other factors of the traffic data remain unchanged (speed and % of heavy vehicles), then a doubling or halving of the traffic data will only result in a 3 dB change which is only just perceptible by most people. A change in traffic volume data by +25 % or -25% will result in up to a 1 dB change in predicted noise level.

The resulting accuracy of the model can be quoted to a reasonable degree based upon known validations of the CoRTN model and comparisons with the measured existing noise levels. Generally, road traffic noise levels can be predicted with an accuracy of 2 dB. NZS 6806 states in section 5.3.4.2 that "The difference between measured and predicted levels should not exceed ±2 dB."

Table 4-2 compares the measured data (date of measurements) with the predicted noise levels. The predicted traffic noise levels are within the tolerance of NZS 6806 and therefore the existing model is appropriately validated for the calculation of traffic noise levels for all scenarios.

**Table 4-2: Comparison of measured and predicted noise levels**

| Address | Measured noise level, $L_{Aeq,24hr}$, dB(A) | Predicted noise level, $L_{Aeq,24hr}$, dB(A) | Difference, dB(A) | Notes |
|---|---|---|---|---|
| **22 Trig Road** | 61.0 | 62.8 | +1.8 | Within tolerance |

## 4.3 Potential Traffic Noise Mitigation Options

For those PPFs where the NZS 6806 Category A criterion is predicted to be exceeded, the effect of the mitigation options on road traffic noise levels at each PPF were modelled.

Traffic noise mitigation measures can be broadly categorised into three methods; low noise road surfaces, traffic noise barriers, and building modification. The first two methods involve structural mitigation as described in NZS6806, whilst the third involves at-building modification mitigation.

### 4.3.1 Road surfaces

The noise mitigation measure with the largest influence on the generation of road traffic noise is the road surface material.

The "Do Minimum" road surface has been modelled as two-coat chip seal as advised by Auckland Transport. Where mitigation of noise through selection of a low-noise road surface has been investigated, AC-14 has been used.

The Project team raised concerns about the use of Open Graded Porous Asphalt (OGPA) in place of AC-14, which reduces noise levels further, as it is considered to be impractical for durability and maintenance reasons and is better suited to high-speed environments with limited side friction from driveways. The possibility of Epoxy OGPA was discussed with the Project team, however the limited supply in New Zealand and costs associated with the production meant that this has not been considered further as a potential mitigation option by direction of AT.

### 4.3.2 Noise barriers

If low-noise road surfaces do not provide the required level of noise mitigation or are not practicable, traffic noise barriers may be considered. Generally, barriers will only mitigate noise if they block the line-of-sight between the noise source and receiver. They are most effective and provide the widest area of mitigation when placed immediately adjacent to traffic lanes. In order to provide the most effective noise level reduction, an acoustic barrier must be of solid material (i.e. have no gaps) and have a minimum surface weight of 15 kg/m$^2$ (e.g. 17mm ply sheeting, 9 mm fibre cement, concrete, earth bunds etc.).

We note that as per Section 2.1.5, NZS 6806 requires noise barriers to achieve:

- An average reduction of at least 3 dB $L_{Aeq(24h)}$ at relevant assessment positions of all PPFs which are part of a cluster; or
- A minimum reduction of 5 dB $L_{Aeq(24h)}$ at any assessment position(s) for each PPF not in a cluster.

### 4.3.3 Building modification

NZS 6806 requires that structural mitigation, such as noise barriers and low-noise road surfaces, should be implemented in preference to building modification mitigation.

Building modification can potentially inconvenience residents, provides mitigation only to those receivers directly upgraded, and does not provide any protection to outdoor amenity. However, if low-noise road surfaces and noise barriers are not practicable or do not provide the required level of noise reduction, building modification to PPFs may be considered.

Depending on the level of reduction required, building modification measures may range from provision of mechanical ventilation only (to allow doors and windows to be closed), to the upgrade or replacement of windows, wall linings, floors and ceiling linings.

### 4.3.4 Maintenance of structural mitigation measures

The effectiveness of the acoustic performance of noise mitigation measures will need to be maintained over time. NZS 6806 states that "structural mitigation measures should be designed in such a way that they retain the same noise-reduction properties up to the design year".

This means that any barrier proposed for the Project should not develop gaps or other openings or material failure. Any damage and vandalism to the barrier affecting its material properties will need to be replaced/fixed, and asphalt surfaces should be maintained to be smooth and even, in order to achieve the same noise-reduction qualities as following initial installation.

Maintenance of structural mitigation measures to the performance standards of NZS 6806 should be undertaken for the Project up to the design year in order to achieve the noise level reductions on which the noise level predictions are based.

## 4.4 Overview of Traffic Noise Effects

Adverse noise effects as a result of high levels of traffic noise may include sleep disturbance, loss of concentration, annoyance, a reduction in speech intelligibility and reduced productivity. The effects are not restricted to PPFs but may also affect future residential and other noise-sensitive developments which are not included in the NZS 6806 definition of a PPF. Where new noise-sensitive developments are established in the vicinity of a road, their design should take account of the potential noise effects and care should be taken to avoid or minimise them.

The magnitude of effects will largely depend on noise levels received in noise-sensitive spaces within buildings, although there are also potential annoyance effects associated with a loss of amenity when high noise levels are received in outdoor living or recreation spaces.

The subjective perception can generally be correlated with the numerical change in noise level. A 3 dB change in noise level is just perceptible to the majority of people. A 10 dB increase in noise level is subjectively considered to be a doubling of loudness.

**Table 4-3 Noise level change compared with general subjective perception**

| Noise level increases | General subjective perception |
|---|---|
| **1 – 2 decibels** | Insignificant change |
| **3 – 4 decibels** | Perceptible change |
| **5 – 8 decibels** | Noticeable change |
| **9 – 11 decibels** | Halving/doubling of loudness |
| **> 11 decibels** | More than halving/doubling of loudness |

# 5 Road Traffic Noise Assessment

## 5.1 Project Corridor Features

The Project extends between intersections with Hobsonville Road in the south and ties in with the existing Trig Road just to the north of SH18. An overview of the proposed design has been provided in Section 1.


**Figure 5-1: Overview of the Trig Road Corridor Upgrade**

## 5.2 Existing and Likely Future Environment

### 5.2.1 Planning context

Within the Project area there are a range of zones under the AUP:OIP which influence the existing and likely future land use patterns for assessment purposes.

Table 5-1 provides a summary of the existing and likely future environment as it relates to the Project area.

**Table 5-1 Existing and Future Environment Likelihood of Change**

| Project area | Environment today | Current Zoning | Likelihood of Change | Likely Future Environment |
|---|---|---|---|---|
| **Context A** | Rural | Future Urban | High | Urban |
| **Context B** | Urban – Low Density | Future Urban | High | Urban |
| **Context C** | Urban – Medium Density | Urban | Moderate | Urban |
| **Context D** | Urban | Urban | Moderate | Urban |

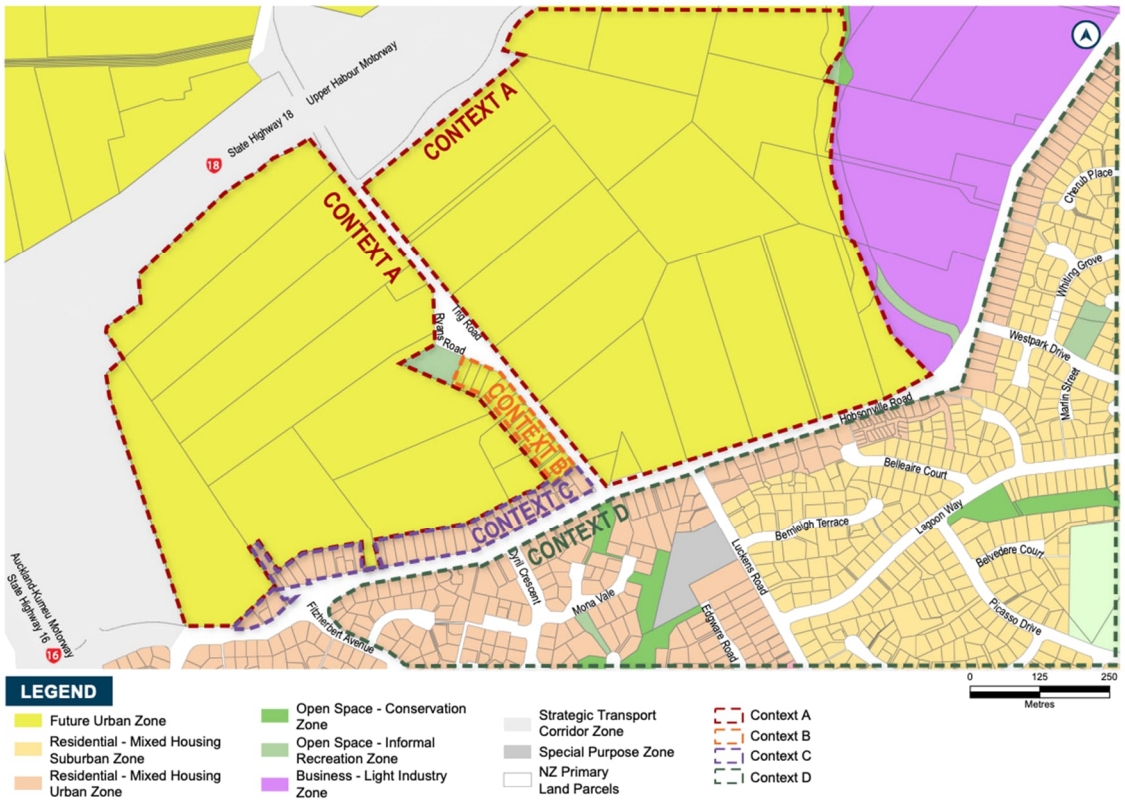



**Figure 5-2 Existing and Future Zoning**

Please refer to the AEE for further information on the planning context.

### 5.2.2 Noise Environment

The Trig Road Corridor Upgrade is currently located within an urban area (in accordance with the definition of urban areas as per Statistics New Zealand 2004). The noise environment is currently dominated by road traffic noise from vehicles on SH18, Hobsonville Road, Trig Road, and the surrounding road network as well as aircraft noise associated with the Whenuapai Air Base.

## 5.3 Assessment of Road Traffic Noise Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Predicted road-traffic noise levels at all existing PPFs for the "Existing", "Do Nothing", "Do Minimum" and "Mitigation Option" scenarios are shown in Appendix 3. The cells are colour-coded according to the NZS 6806 noise impact category: Category A – green, Category B – orange, and Category C – red. Where a property has multiple dwellings per address, only the most affected PPF is represented in the tables and maps.

Noise contour maps showing indicative levels across a 200m radius from the alignment are provided in Appendix 4. Specific noise level values should not be taken directly from the contours as they are interpolated from a grid, resulting in some localised inaccuracies.

Based on information provided by the Project team, the following residential buildings will be removed to make room for the Project alignment and have not been considered in the assessment:

- 19 Trig Road
- 72C Hobsonville Road
- 7 Trig Road
- 9 Trig Road

### 5.3.1 Road Traffic Noise Model Results Analysis

The Project meets the definition of an Altered Road in accordance with NZS 6806. A summary of the results of the NZS 6806 assessment is shown in Table 5-2.

**Table 5-2: NZS 6806 Assessment and Summary**

| Category | | Number of PPFs | | | |
|---|---|---|---|---|---|
| | Criterion | Existing | Do Nothing | Do Minimum | Mitigation 1 |
| **Cat A** | 64 dB $L_{Aeq(24h)}$ | 104 | 92 | 92 | 104 |
| **Cat B** | 67 dB $L_{Aeq(24h)}$ | 2 | 11 | 9 | 2 |
| **Cat C** | 40 dB Internal $L_{Aeq(24h)}$ | 0 | 3 | 5 | 0 |
| **Total** | | **106** | **106** | **106** | **106** |

"Existing" scenario predictions show the noise level within the Project area is between 43 – 65 dB $L_{Aeq(24h)}$ with no PPFs in Category C.

Under the "Do Nothing" scenario, predictions show a traffic noise level range between 45 – 68 dB $L_{Aeq(24h)}$, with a total of 3 PPFs in Category C and 11 PPFs in Category B.

The "Do Minimum" scenario shows a similar predicted range of 45 – 69 dB $L_{Aeq(24hr)}$. A total of 5 PPFs are in Category C under the "Do Minimum" scenario.

One mitigation option (Mitigation Option 1) has been considered to reduce noise levels at PPFs. The mitigation option implements AC-14 road surface to the entire length of the Project. With this option, there are no PPFs predicted to remain in Category C. 2 PPFs are predicted to receive noise levels within Category B and 104 PPFs in Category A. Considering the above options regarding the construction of the Project, Mitigation Option 1 will result in the lowest number of PPFs remaining in Categories B & C.

Implementation of noise barriers was considered as a potential mitigation option. However, these were not considered to be BPO mitigation as there is a need to maintain access to houses via driveways, which would mean that line-of-sight would still be retained between the PPF and the road where screening would be required. This means that the minimum 5 dB(A) reduction at individual PPFs as required by NZS 6806 Section 2.1.5 would not be achieved at the PPF façades where barriers would be implemented. Therefore, noise barriers were not considered a suitable mitigation option.

Overall, Mitigation Option 1 is recommended as the BPO.

### 5.3.2 Assessment of Road Traffic Noise Effects

The effects associated with a change in noise level have been considered in addition to the NZS 6806 assessment. The "Do Nothing" scenario and Mitigation 1 scenarios can be compared to determine the predicted noise level increase or decrease at PPFs as a result of the Project. Figure 5-3 shows the predicted change in noise level at PPFs when comparing the "Do Nothing" and "Mitigation 1" scenarios.

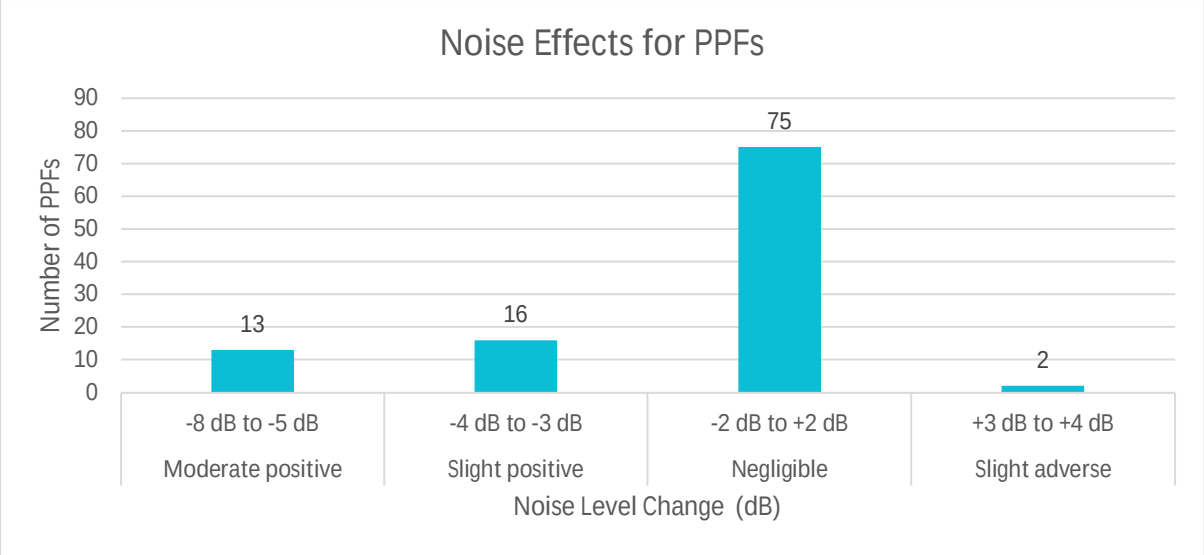



**Figure 5-3: Noise change assessment – Do Nothing vs Mitigation Option 1**

When comparing the Mitigation 1 scenario and the Do Nothing scenario, noise levels at the PPFs are generally expected to remain similar between the Do Nothing and Mitigation Option 1 scenarios with the majority of PPFs predicted to experience a negligible change in noise level of 2 dB or less as shown in Figure 5-3.

Two PPFs are predicted to experience an increase in noise level of 3-4 dB resulting in slight adverse effects. The increase in noise level is due to the demolition of several dwellings which would otherwise provide acoustic shielding to PPFs behind in the “Do Nothing” scenario when compared to the “Mitigation 1” scenario.

29 PPFs are predicted to experience a perceptible decrease in noise levels overall, with 16 PPFs experiencing a reduction of 3 to 4 dB resulting in slight positive effects, and 13 PPFs having reduced noise levels of 5 to 8 dB resulting in moderative positive effects. This is due to the proposed asphaltic concrete AC-10 road surface proposed in the “Mitigation 1” scenario providing a reduction in road traffic noise compared to the Do Nothing scenario.

It is noted that some PPFs may no longer exist at the time of road construction, particularly given the proposed zone change in the area allowing for urban development. Therefore, the predicted effects may not be experienced by current residents, where buildings between the proposed corridor and the residence have been demolished.

Ambient noise levels will likely increase as the area urbanises and therefore changes in noise level, due to the Project may not be as noticeable at the time.

We consider that noise effects from road traffic will be reasonable after construction of the project.

# 6 Conclusion

An assessment of traffic noise has been carried out for the Trig Road Corridor Upgrade based on NZS 6806 and predicted changes in noise levels at PPFs. To determine the change in noise level, comparisons were made between the predicted road traffic noise levels in the "Do Nothing" scenario (representative of the design year without the Project, assuming traffic from full area development on the existing road network) and "Mitigated" scenario.

All existing PPFs within 100m of each alignment have been considered within the assessment (in accordance with the definition of urban areas as per Statistics New Zealand 2004). Buildings which are within the NoR areas have been removed from the "Do Minimum" and "Mitigated" scenario as they will not remain following the Project implementation.

"Mitigation Option 1", consisting of a low noise road surface, provides the best practicable solution in terms of noise reduction and is therefore recommended. After implementation of "Mitigation Option 1", the Category A criterion will be achieved at 104 out of 106 PPFs, with the remaining two PPFs achieving the Category B criterion. There are no PPFs which are predicted to receive noise levels in Category C.

Implementation of noise barriers was considered as a potential mitigation option. However, these were not considered to be BPO mitigation as there is a need to maintain access to houses via driveways, which would mean that line-of-sight would be retained between the PPF and road. This means that the minimum 5 dB reduction at individual PPFs as required by NZS 6806 set out in Section 2.1.5 would not be achieved at the exposed façades. Therefore, noise barriers were not considered part of the BPO mitigation.

For "Mitigation Option 1", noise levels are predicted to change by a negligible margin (±2 dB) at 75 out of 106 PPFs when compared to the Do Nothing scenario. Noise levels will reduce by at least a perceptible margin at 29 PPFs due to implementation of the low noise road surface resulting in slight to moderate positive noise effects. Noise levels are predicted to increase by a perceptible amount (3-4 dB) at 2 PPFs due to known demolition of dwellings which would otherwise have provided screening from the road, resulting in slight adverse noise effects.

All predictions are based on traffic flow along Altered Roads at the design year (2048). These traffic volumes are predicated on the anticipated urbanisation of the area and implementation of surrounding infrastructure projects. Development of the surrounding areas will likely increase activity and associated ambient noise levels. Therefore, any changes predicted for the traffic noise effects related to this Project are not likely to represent such a significant change at the time of construction due to the change in environment resulting from other development.

As such, the results are indicative of a possible future scenario, but effects cannot be definitively determined at this stage. Reassessment of the road traffic noise at current PPFs will be carried out nearer the time of construction to confirm that the recommended mitigation still represents the best practicable option. The review, confirmation and refinement of the BPO shall aim to achieve the same noise criteria categories as determined with the current BPO.

Nevertheless, the predictions show that most PPFs (with the exception of two Category B PPFs) will receive levels within the Category A criterion, which is the most stringent Category and represents the lowest design noise levels.

We consider that noise effects from road traffic will be reasonable after construction of the project.

Traffic vibration from new or upgraded roading projects is not generally expected to create any vibration issues regarding structural damage. There are no notable operational factors which would be likely to generate more than negligible operational vibration impacts. Therefore, operational vibration has not been assessed for the Project.

# Appendix 1: Assumptions

| Package | Project(s) | Existing | Do Nothing | Do Minimum |
|---|---|---|---|---|
| **Whenuapai Arterials** | Trig Road upgrade (NoR W1) | x | x | √ |
| | Māmari Road upgrade (NoR W2) | x | x | √ |
| | Brigham Creek Road upgrade (NoR W3) | x | x | √ |
| | Spedding Road upgrade (NoR W4) | x | x | √ |
| | Hobsonville Road upgrade (NoR W5) | x | x | √ |
| **Redhills Arterials** | Fred Taylor Drive FTN upgrade | x | √ | √ |
| | Northside Drive East extension | x | √ | √ |
| | Don Buck Road FTN upgrade | x | √ | √ |
| | Royal Road FTN upgrade | x | √ | √ |
| **Riverhead Arterials** | Coatesville – Riverhead Highway upgrade | x | √ | √ |
| | Riverhead Road upgrade | x | √ | √ |
| **Strategic Projects** | Rapid Transit Corridor (RTC) | x | √ | √ |
| | Alternative State Highway (ASH) | x | √ | √ |
| | Brigham Creek Interchange | x | √ | √ |
| | Regional Active Mode Corridor (RAMC) | x | √ | √ |
| | SH16 Main Road upgrade | x | √ | √ |
| | Access Road upgrade | x | √ | √ |
| | Station Road upgrade | x | √ | √ |
| **Growth** | Land Use Assumptions | up to 2015 | up to 2048+ | up to 2048+ |

| Key | | |
|---|---|---|
| | √ | Included |
| | x | Excluded |
| | * | Minimal Network Change |

# Appendix 2: Noise Monitoring Results

# Noise Logger Report

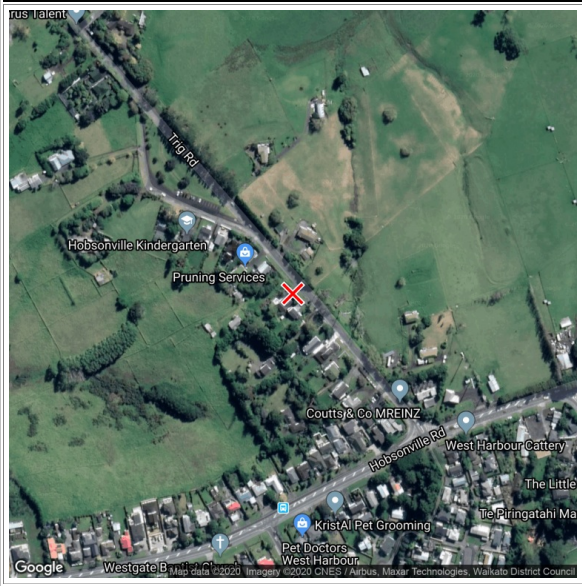
**22 Trig Road, Whenuapai**

| Item | Information |
|---|---|
| Logger Type | NL-52 |
| Serial number | 898331 |
| Address | 22 Trig Road, Whenuapai |
| Location | Front yard |
| Facade / Free Field | Free field |
| Environment | Ambient nosie controlled by Trig Road |

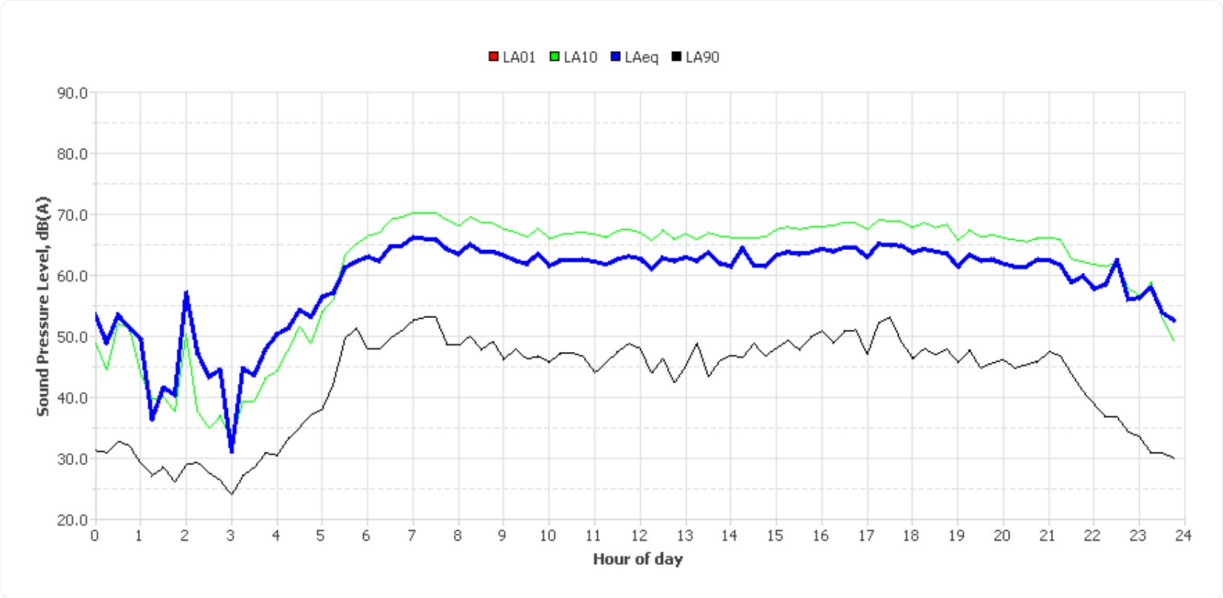
### Measured noise levels

| Logging Date | $L_{Aeq,24hr}$ | $L_{Aeq,day}$ 7am-6pm | $L_{Aeq,evening}$ 6pm-10pm | $L_{Aeq,night}$ 10pm-7am | ABL Day | Eve | Night |
|---|---|---|---|---|---|---|---|
| Tue Nov 19 2019 | 62 | 65 | 62 | 58 | - | 42 | - |
| Wed Nov 20 2019 | 63 | 65 | 62 | 58 | 48 | 38 | 31 |
| Thu Nov 21 2019 | 63 | 64 | 62 | 58 | 45 | 38 | 28 |
| Fri Nov 22 2019 | 62 | 64 | 62 | 58 | 45 | 40 | 26 |
| Sat Nov 23 2019 | 61 | 63 | 61 | 56 | 42 | 39 | 28 |
| Sun Nov 24 2019 | 60 | 62 | 62 | 54 | 41 | 40 | 23 |
| Mon Nov 25 2019 | 62 | 64 | 61 | 58 | 45 | 36 | 27 |
| Tue Nov 26 2019 | 62 | 63 | 62 | 58 | 43 | 39 | 24 |
| Wed Nov 27 2019 | 62 | 63 | 63 | 58 | 45 | 42 | 28 |
| Thu Nov 28 2019 | - | 63 | - | 58 | 44 | - | 26 |
| **Summary** | **62** | **64** | **62** | **58** | **45** | **39** | **27** |

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

| Logger Location | Logger Deployment Photo |
|---|---|
|  |  |

## Typical Day

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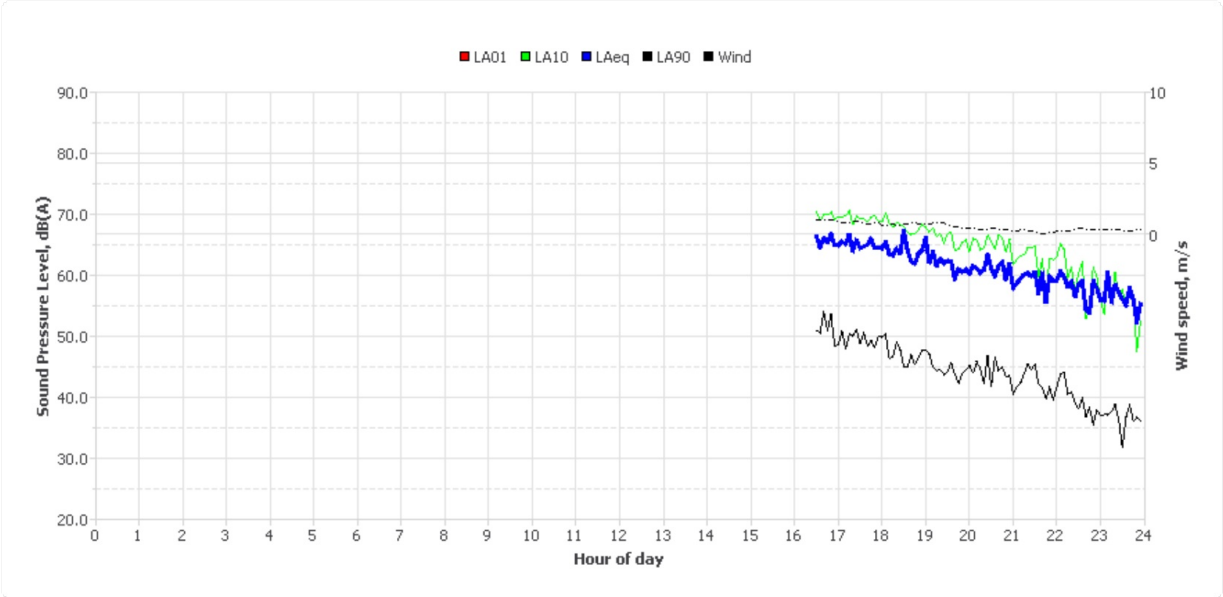
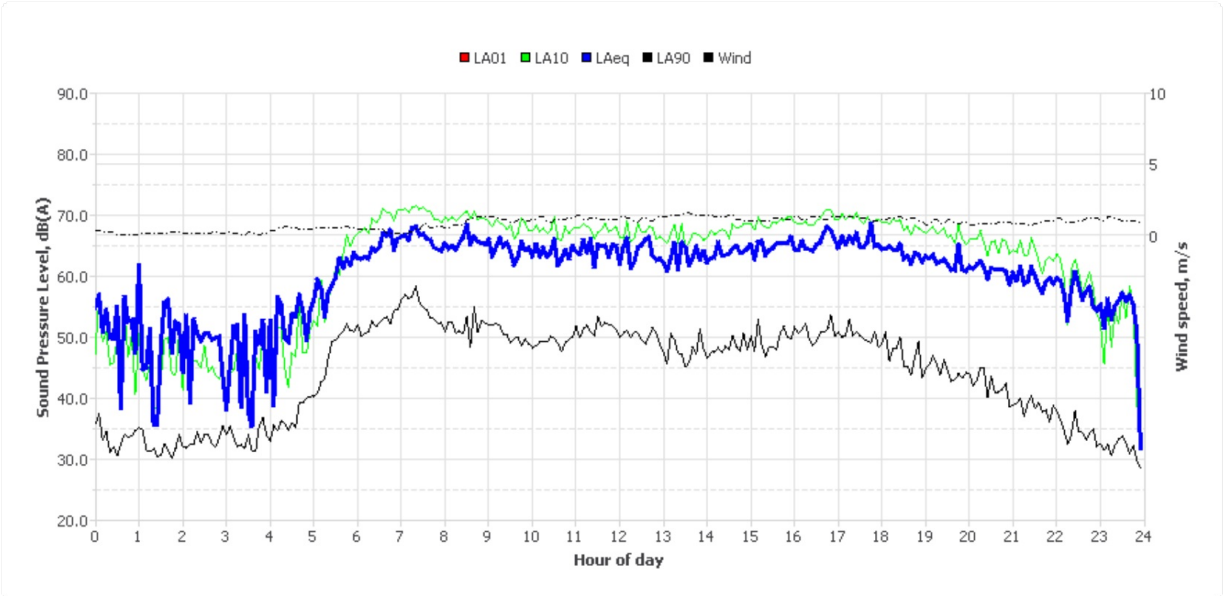
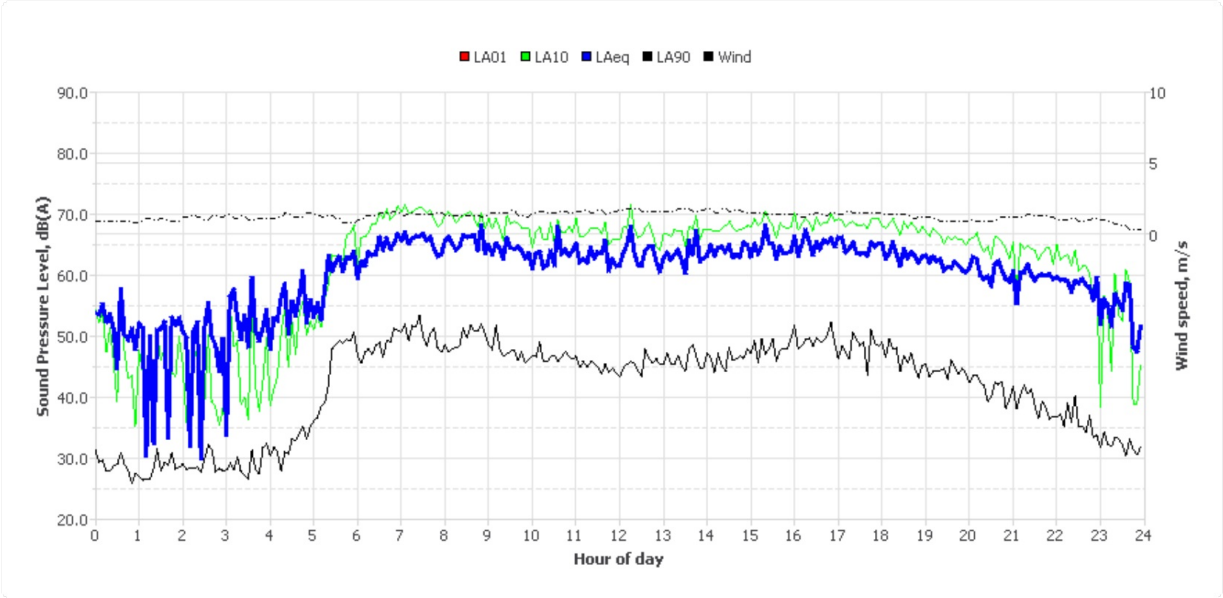


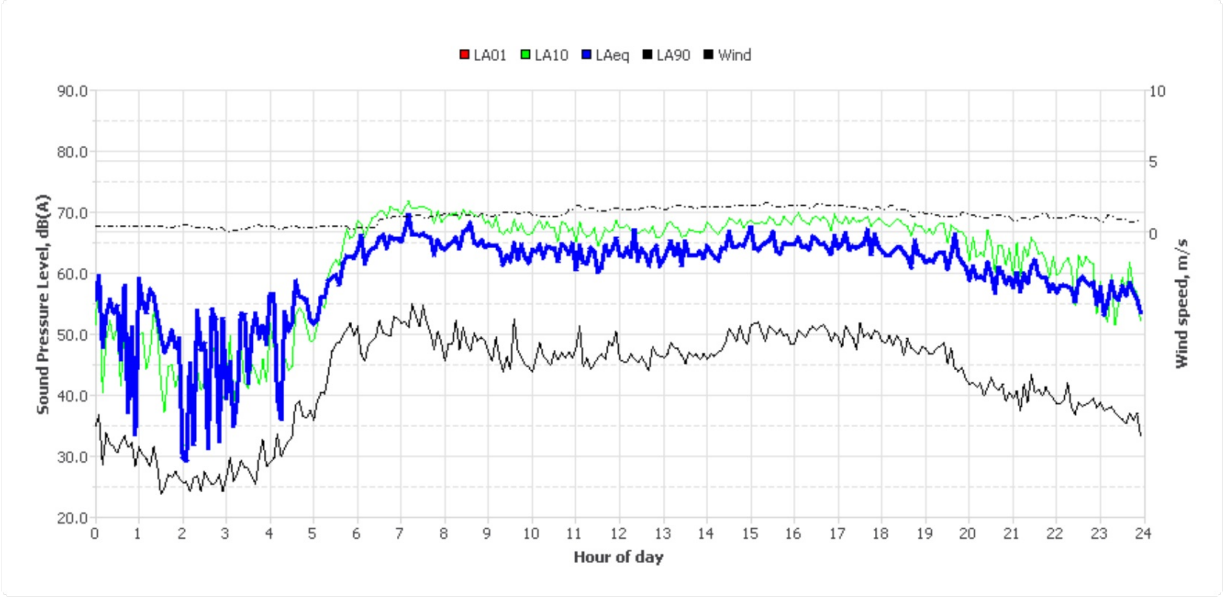

## Wednesday, 20 Nov 2019



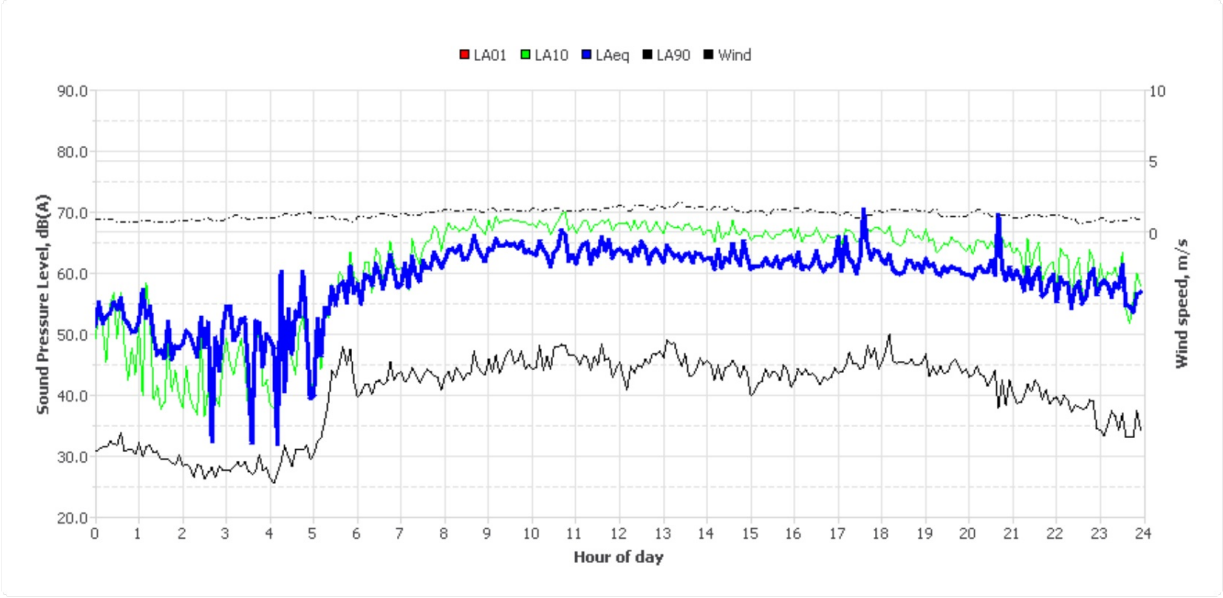
## Thursday, 21 Nov 2019



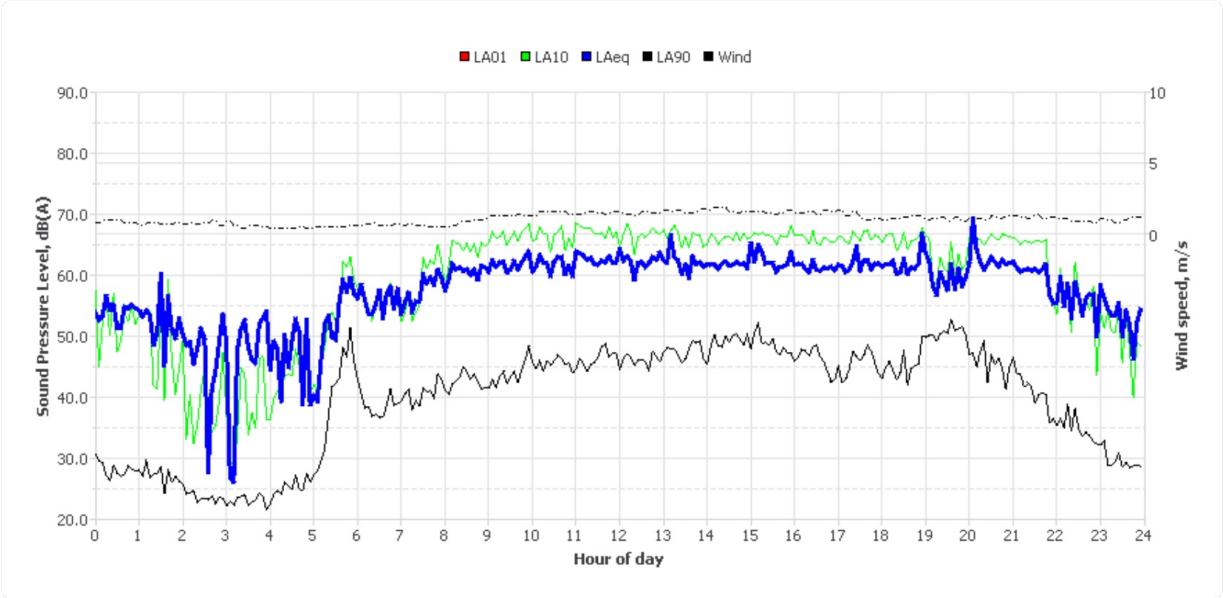

## Friday, 22 Nov 2019



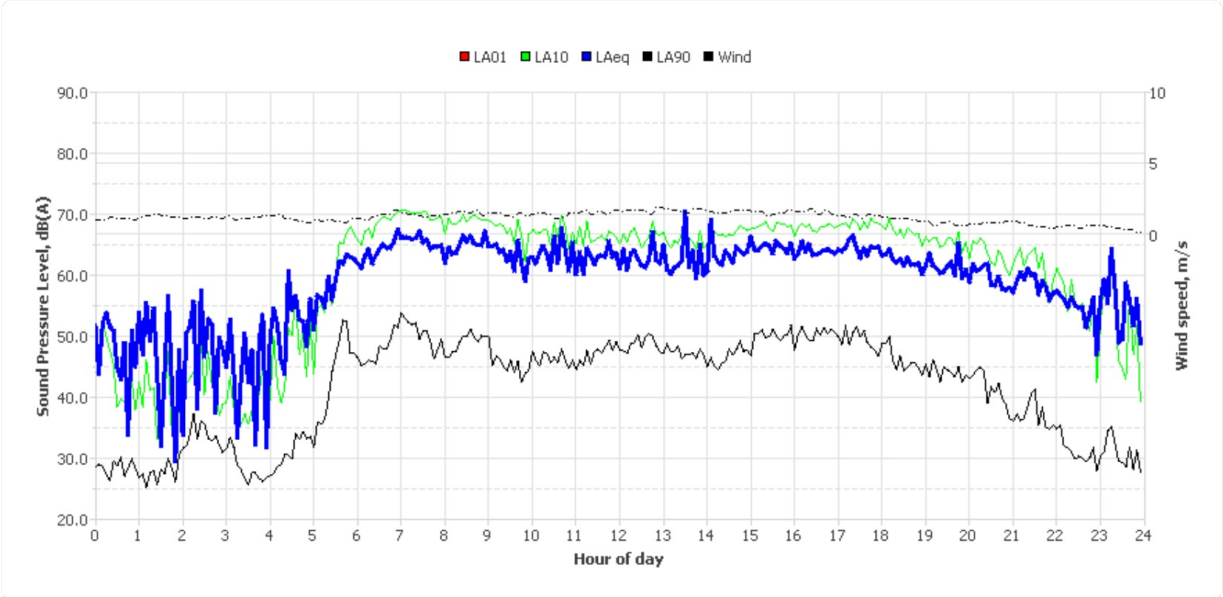

## Saturday, 23 Nov 2019



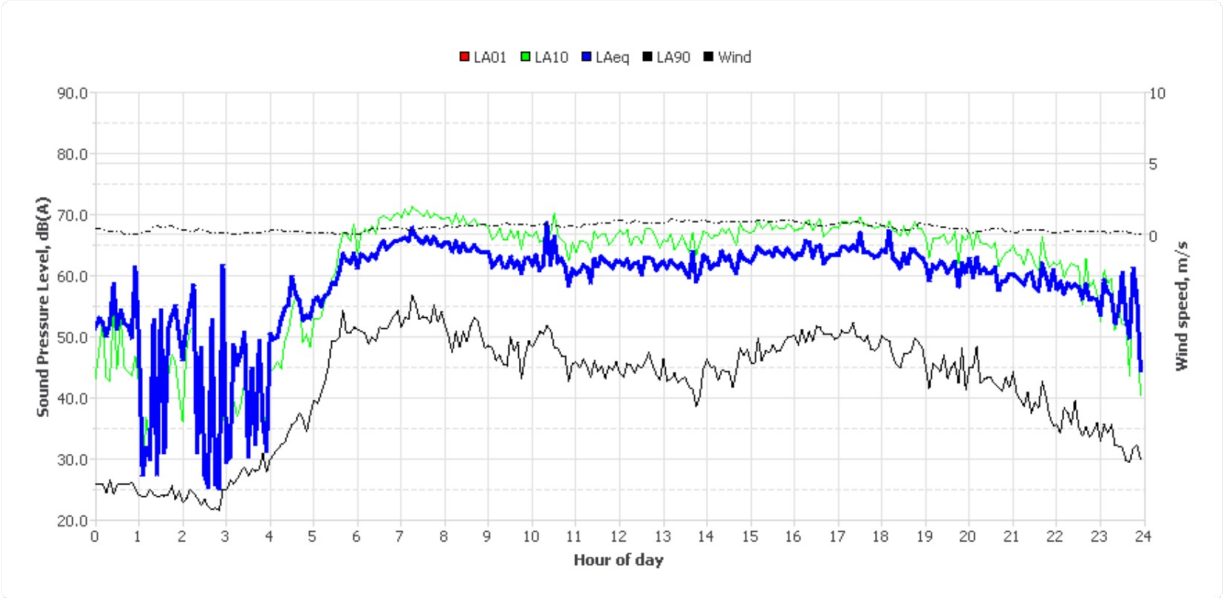
## Sunday, 24 Nov 2019



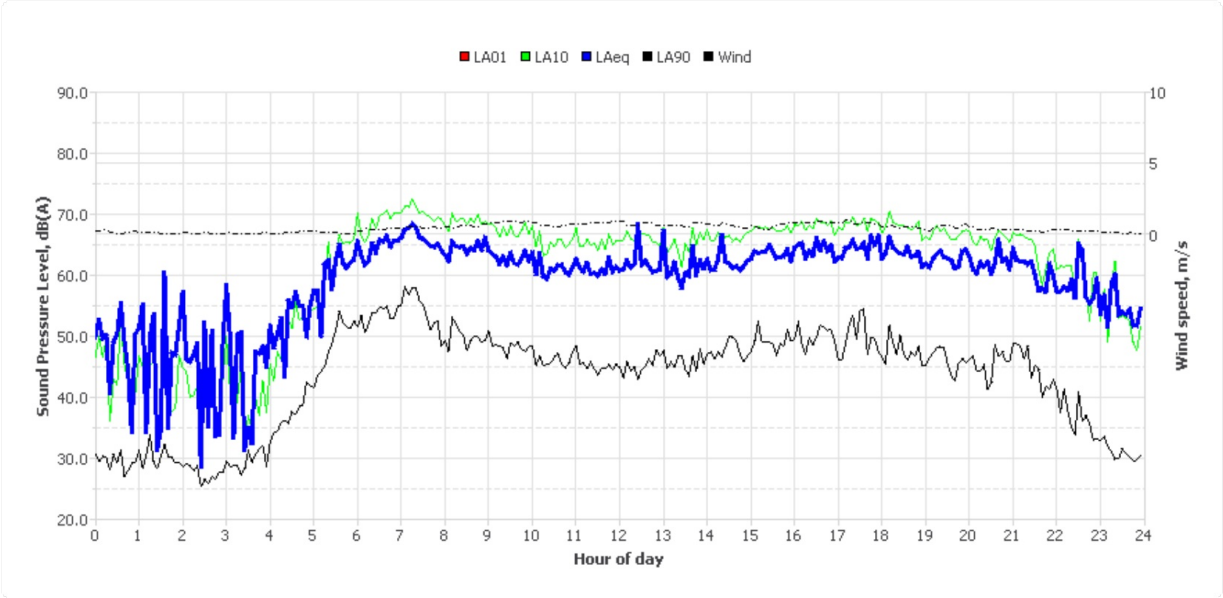

## Monday, 25 Nov 2019



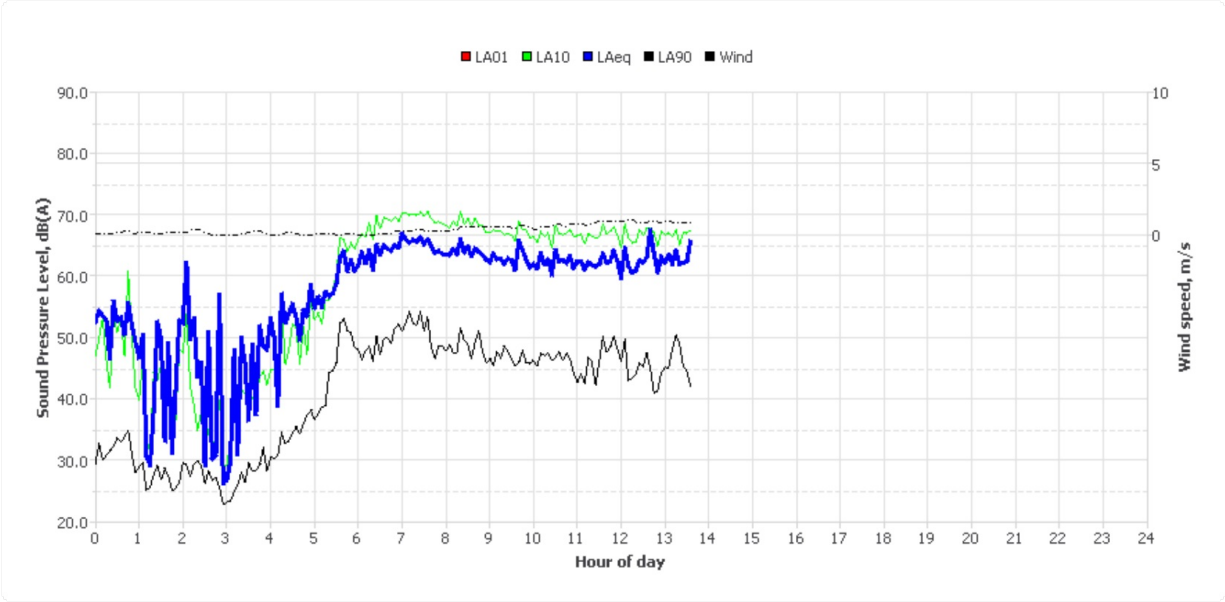

## Tuesday, 26 Nov 2019



## Wednesday, 27 Nov 2019




## Thursday, 28 Nov 2019



# Appendix 3: Predicted Traffic Noise Levels

**KEY**

| Cat A | Cat B | Cat C |
|---|---|---|

| **Address** | Existing | Do Nothing | Do Minimum | **Mitigation 1** |
|---|---|---|---|---|
| 72 Hobsonville Road | 65 | 68 | 69 | 66 |
| 26 Trig Road | 64 | 68 | 68 | 63 |
| 64 Hobsonville Road | 65 | 68 | 68 | 64 |
| 66 Hobsonville Road | 63 | 67 | 68 | 65 |
| 40 Trig Road | 63 | 67 | 68 | 63 |
| 1/93, 2/93, 2/14, 3/93, 3/14, 4/14, 1/14 Hobsonville Road | 62 | 65 | 65 | 63 |
| 16 Trig Road | 62 | 66 | 65 | 61 |
| 97 Hobsonville Road | 62 | 65 | 65 | 63 |
| 6 Trig Road | 61 | 64 | 65 | 61 |
| 22 Trig Road | 62 | 66 | 65 | 60 |
| 62 Hobsonville Road | 61 | 64 | 65 | 62 |
| 18, 2 Luckens Road | 64 | 66 | 65 | 64 |
| 72B Hobsonville Road | 59 | 62 | 65 | 60 |
| 16 Luckens Road | 64 | 66 | 65 | 64 |
| 8 Trig Road | 61 | 65 | 64 | 60 |
| 12 Trig Road | 60 | 64 | 64 | 60 |
| 60 Hobsonville Road | 60 | 63 | 64 | 62 |
| 119 Hobsonville Road | 63 | 65 | 64 | 64 |

| | | | | |
|---|---|---|---|---|
| 10 Luckens Road | 63 | 66 | 64 | 64 |
| 1B Luckens Road | 61 | 63 | 64 | 64 |
| 28 Trig Road | 61 | 64 | 64 | 59 |
| 70 Hobsonville Road | 60 | 63 | 64 | 60 |
| 24 Belleaire Court | 61 | 63 | 63 | 62 |
| 30 Trig Road | 61 | 63 | 63 | 58 |
| 75 Hobsonville Road | 59 | 61 | 62 | 61 |
| 32 Trig Road | 59 | 62 | 61 | 56 |
| 56 Hobsonville Road | 58 | 61 | 61 | 61 |
| 76 Hobsonville Road | 58 | 61 | 61 | 56 |
| 1/111, 2/111 Hobsonville Road | 59 | 61 | 60 | 61 |
| 133 Hobsonville Road | 57 | 58 | 60 | 58 |
| 1/93, 2/93, 2/14, 3/93, 3/14, 4/14, 1/14 Hobsonville Road | 57 | 60 | 60 | 56 |
| 72A Hobsonville Road | 54 | 58 | 60 | 56 |
| 8 Luckens Road | 59 | 61 | 60 | 59 |
| 52 Hobsonville Road | 56 | 59 | 60 | 60 |
| 127 Hobsonville Road | 58 | 59 | 60 | 59 |
| 5 Luckens Road | 57 | 59 | 59 | 59 |
| 34 Trig Road | 57 | 60 | 59 | 54 |
| 50 Hobsonville Road | 56 | 59 | 59 | 60 |
| 46 Trig Road | 57 | 60 | 59 | 54 |
| 54 Hobsonville Road | 56 | 59 | 59 | 58 |
| 26 Belleaire Court | 56 | 58 | 59 | 57 |
| 48 Hobsonville Road | 55 | 58 | 58 | 59 |
| 1/93, 2/93, 2/14, 3/93, 3/14, 4/14, 1/14 Hobsonville Road | 53 | 56 | 58 | 54 |
| 107 Hobsonville Road | 57 | 59 | 58 | 58 |
| 79A Hobsonville Road | 48 | 51 | 58 | 54 |

| | | | | |
|---|---|---|---|---|
| 68 Hobsonville Road | 55 | 58 | 58 | 54 |
| 58 Hobsonville Road | 54 | 57 | 57 | 58 |
| 19 Luckens Road | 54 | 56 | 57 | 57 |
| 1/93, 2/93, 2/14, 3/93, 3/14, 4/14, 1/14 Hobsonville Road | 51 | 54 | 57 | 53 |
| 80 Hobsonville Road | 55 | 57 | 57 | 57 |
| 5 Louise Place | 47 | 50 | 56 | 52 |
| 22A Trig Road | 52 | 56 | 56 | 51 |
| 1/93, 2/93, 2/14, 3/93, 3/14, 4/14, 1/14 Hobsonville Road | 54 | 57 | 56 | 52 |
| 2/12, 1/12 Mona Vale | 50 | 53 | 56 | 52 |
| 34A Trig Road | 54 | 56 | 56 | 51 |
| 8A, 10, 8 Louise Place | 46 | 49 | 56 | 52 |
| 8A, 10, 8 Louise Place | 47 | 49 | 56 | 51 |
| 3A Louise Place | 49 | 52 | 55 | 51 |
| 18 Trig Road | 50 | 54 | 55 | 50 |
| 6 Louise Place | 46 | 49 | 54 | 50 |
| 10 Mona Vale | 48 | 51 | 54 | 50 |
| 78 Hobsonville Road | 52 | 53 | 54 | 54 |
| 1/93, 2/93, 2/14, 3/93, 3/14, 4/14, 1/14 Hobsonville Road | 48 | 50 | 54 | 50 |
| 33 Cyril Crescent | 45 | 48 | 54 | 49 |
| 70A Hobsonville Road | 51 | 54 | 54 | 49 |
| 97 Hobsonville Road | 51 | 53 | 53 | 50 |
| 10 Trig Road | 49 | 52 | 53 | 48 |
| 22 Cyril Crescent | 47 | 50 | 52 | 49 |
| 99 Hobsonville Road | 51 | 53 | 52 | 52 |
| 147F Hobsonville Road | 50 | 52 | 52 | 51 |
| 29 Cyril Crescent | 45 | 48 | 52 | 48 |
| 8A, 10, 8 Louise Place | 45 | 48 | 51 | 47 |

| | | | | |
|---|---|---|---|---|
| 1A Luckens Road | 49 | 51 | 51 | 50 |
| 1/93, 2/93, 2/14, 3/93, 3/14, 4/14, 1/14 Hobsonville Road | 48 | 51 | 51 | 47 |
| 3A Louise Place | 45 | 48 | 51 | 46 |
| 131 Hobsonville Road | 49 | 50 | 50 | 50 |
| 31 Cyril Crescent | 46 | 48 | 50 | 48 |
| 145A Hobsonville Road | 48 | 50 | 50 | 49 |
| 8 Bernleigh Terrace | 48 | 50 | 50 | 49 |
| 4 Louise Place | 44 | 47 | 49 | 45 |
| 127A Hobsonville Road | 48 | 49 | 49 | 49 |
| 14 Luckens Road | 48 | 50 | 49 | 48 |
| 121 Hobsonville Road | 48 | 50 | 49 | 49 |
| 145B Hobsonville Road | 47 | 49 | 49 | 48 |
| 2/95, 1/95, 95 Hobsonville Road | 47 | 50 | 49 | 46 |
| 12 Luckens Road | 47 | 49 | 49 | 49 |
| 123 Hobsonville Road | 47 | 49 | 49 | 48 |
| 20 Belleaire Court | 47 | 49 | 49 | 48 |
| 20A Belleaire Court | 47 | 49 | 48 | 48 |
| 3A Luckens Road | 46 | 48 | 48 | 47 |
| 3B Luckens Road | 45 | 47 | 48 | 47 |
| 133A Hobsonville Road | 46 | 48 | 48 | 48 |
| 131A Hobsonville Road | 47 | 48 | 48 | 48 |
| 129 Hobsonville Road | 46 | 48 | 48 | 48 |
| 129C Hobsonville Road | 46 | 48 | 47 | 47 |
| 129B Hobsonville Road | 46 | 48 | 47 | 47 |
| 22 Belleaire Court | 45 | 47 | 47 | 46 |
| 121B Hobsonville Road | 46 | 48 | 47 | 47 |
| 18 Belleaire Court | 45 | 47 | 47 | 46 |
| 4 Bernleigh Terrace | 45 | 47 | 47 | 46 |

| | | | | |
|---|---|---|---|---|
| 133A Hobsonville Road | 45 | 47 | 47 | 46 |
| 2/95, 1/95, 95 Hobsonville Road | 45 | 48 | 46 | 44 |
| 121A Hobsonville Road | 44 | 46 | 45 | 45 |
| 123A Hobsonville Road | 44 | 46 | 45 | 45 |
| 123B Hobsonville Road | 44 | 45 | 45 | 45 |
| 19 Belleaire Court | 43 | 45 | 45 | 44 |

# Appendix 4: Noise Contour Maps

Date Printed: 4/11/2022 10:53 AM

Name: 1_Trig_Existing

Path: C:\GIS\SGA HIF_JR\SGA_HIF_JR.aprx


Map Scale @ A3:

N

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | Author | DRAFT | DRAFT | dd/mm/yyyy |

Title:

# Supporting Growth

## Trig Road - Existing Scenario

*Working Plans of Te Tupu Ngatahi.*
*For the purpose of INTERNAL workshops (not for wider distribution)*

Client: **Supporting Growth**

Project: **North West HIF**

TE TUPU NGĀTAHI Supporting Growth

Discipline: **GIS**

Drawing No: **SGA-NV-NW-013**

Date Printed: 4/11/2022 10:53 AM

Name: 2_Trig_Do_Nothing

Path: C:\GIS\SGA HIF_JR\SGA_HIF_JR.aprx

Upper Harbour Mtwy

Trig Rd

Weiarohia Stream

Hobsonville Rd

Ryans Rd

Luckens Rd

Belleaire Ct

Bernleigh Ter

Lagoon Way

Picasso Dr

Cyrill Cres

Mona Vale

## PPFs Altered

dB $L_{Aeq\ 24\ hr}$

- ≤ 64
- 64 - 67
- ≥ 67
- Not Assessed
- Assessment Area

Roads

## Noise Level

dB $L_{Aeq\ 24\ hr}$

- 55 - 60
- 60 - 65
- 65 - 70
- ≥ 70





Map Scale @ A3:

N

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | Author | DRAFT | DRAFT | dd/mm/yyyy |

Title:

# Supporting Growth

## Trig Road - Do Nothing Scenario

*Working Plans of Te Tupu Ngatahi.*
*For the purpose of INTERNAL workshops (not for wider distribution)*

Client: **Supporting Growth**

Project: **North West HIF**

TE TUPU NGĀTAHI Supporting Growth

Discipline: **GIS**

Drawing No: **SGA-NV-NW-013**

Date Printed: 4/11/2022 10:53 AM

Name: 3_Trig_Do_Min

Path: C:\GIS\SGA HIF_JR\SGA_HIF_JR.aprx

Upper Harbour Mtwy

Trig Rd

Ryans Rd

Hobsonville Rd

Waiarohia Stream

Luckens Rd

Belleaire Ct

Bernleigh Ter

Lagoon Way

Picasso Dr

Cyril Cres

Mona Vale

## PPFs Altered

dB $L_{Aeq\ 24\ hr}$

- ≤ 64
- 64 - 67
- ≥ 67
- Not Assessed
- Assessment Area

Roads

## Noise Level

dB $L_{Aeq\ 24\ hr}$

- 55 - 60
- 60 - 65
- 65 - 70
- ≥ 70





Map Scale @ A3:

N

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | Author | DRAFT | DRAFT | dd/mm/yyyy |

Title:

# Supporting Growth

## Trig Road - Do Minimum Scenario

*Working Plans of Te Tupu Ngatahi.*
*For the purpose of INTERNAL workshops (not for wider distribution)*

Client: **Supporting Growth**

Project: **North West HIF**

TE TUPU NGĀTAHI Supporting Growth

Discipline: **GIS**

Drawing No: **SGA-NV-NW-013**

Date Printed: 4/11/2022 10:53 AM

Name: 4_Trig_Mit1

Path: C:\GIS\SGA HIF_JR\SGA_HIF_JR.aprx

Upper Harbour Mtwy

Trig Rd

Ryans Rd

Hobsonville Rd

Weiarohia Stream

Belleaire Ct

Bernleigh Ter

Lagoon Way

Picasso Dr

Luckens Rd

Cyril Cres

Mona Vale

## PPFs Altered

dB $L_{Aeq\ 24\ hr}$

- ≤ 64
- 64 - 67
- ≥ 67
- Not Assessed
- Assessment Area

Roads

## Noise Level

dB $L_{Aeq\ 24\ hr}$

- 55 - 60
- 60 - 65
- 65 - 70
- ≥ 70





Map Scale @ A3:

N

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | Author | DRAFT | DRAFT | dd/mm/yyyy |

Title:

# Supporting Growth

## Trig Road - Mitigation 1 Scenario

*Working Plans of Te Tupu Ngatahi.*
*For the purpose of INTERNAL workshops (not for wider distribution)*

Client: **Supporting Growth**

Project: **North West HIF**

TE TUPU NGĀTAHI Supporting Growth

Discipline: **GIS**

Drawing No: **SGA-NV-NW-013**