



APPENDIX B

Acoustic Assessment



MARSHALL DAY
Acoustics 

WAITOA DAIRY FACTORY
PLAN CHANGE 55

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Project: WAITOA DAIRY FACTORY

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Cover Image Waitoa, Piako, including dairy factory. Ref: WA-06230-G. Alexander Turnbull Library, Wellington, NZ

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1.0 INTRODUCTION

Marshall Day Acoustics (MDA) has been engaged by Fonterra Limited (Fonterra) to support their application for a plan change (Plan Change 55) to amend the existing Noise Emission Control Boundary (NECB) for the Waitoa dairy manufacturing site (Waitoa site). This included a programme of works to mitigate adverse noise effects from the site's operations.

The Waitoa site layout and processes have changed over the previous 60 years. Some of these changes can and do occur quickly. However, other pieces of equipment such as boilers and dryers have remained static reflecting their typical lifespan of 30-50 years. One of the consequences of this unforeseen step-change of process technology is the resulting change and/or increase in off-site noise emissions.

This report provides a brief background of existing noise emissions at the Waitoa site in the context of the District Plan. It then discusses the proposed amendment to the planning framework i.e. a new NECB and noise mitigation measures required to address the residual noise effects on the surrounding community. The new NECB considers both the current operations and future development of the Waitoa site, and in doing so provides certainty to the community, Fonterra, and Matamata-Piako District Council (Council) about the level of noise that can be expected in the future.

The proposed wording in this report for Plan Change 55 has been discussed at length with Council staff and their consultants to ensure it provides a robust and workable framework.

Appendix A provides a glossary of acoustic terminology.

2.0 ACOUSTIC PARAMETERS – L_{A10} VS L_{Aeq}

The District Plan uses the L_{A10} acoustic parameter. As district plans are revised throughout New Zealand, the L_{Aeq} parameter is being implemented as required by National Planning Standards (Planning Standards).

This document uses both L_{A10} and L_{Aeq} noise levels where appropriate to reflect either the District Plan or proposed future planning mechanisms. There is a crossover of *existing* noise received within the community (L_{A10}) and the *after mitigation* proposed NECB being sought (L_{Aeq}).

Our detailed noise modelling and analysis of existing noise levels uses L_{Aeq} values to better inform discussion of future controls and to align with requirements of the Planning Standards. These L_{Aeq} values are representative of the upper range of historic measured noise levels in terms of the L_{10} acoustic parameter.

In some circumstances, the change to L_{Aeq} from L_{A10} is perceived to be a slight relaxation of noise limits in favour of the noise-maker. In this case there is no such relaxation is caused by using the L_{Aeq} vs L_{A10} acoustic parameter as the nature of the noise from the plant results in an insignificant change in noise level. This is discussed further in Section 4.

3.0 EXISTING NECB AND PLAN NOISE RULE

Noise, and other activities at the Waitoa site are specifically provided via a Development Concept Plan which is provided in Schedule 5 of the District Plan. More stringent rules apply to noise at the Waitoa site due to the specific NECB. The specific rule applicable to the Waitoa site is:

“a) For all new activities established after 10 June 1993.

For each new activity the night-time noise limit shall not exceed 40 dBA (L_{10}) provided that the cumulative noise level from the activities within the zone shall not exceed the following limits when measured at the emission control boundary {NECB} described on this concept plan:

	L_{10}	L_{max}
<i>Monday to Sunday (7.00am to 10.00pm)</i>	<i>50 dBA</i>	<i>-</i>
<i>All other times including Sundays and public holidays</i>	<i>45 dBA</i>	<i>75 dBA</i>

c) For any noise with the special audible characteristic as defined by NZS6802:1991 the L_{10} noise level standards shall be reduced by 5 dBA.”

The Development Concept Plan, which depicts the relevant NECB, is provided in Appendix B of this document.

Rule 5.2.1 (v) of the Development Concept Plan requires that noise shall be measured and assessed in accordance with NZS 6801:1991 “Measurement of Sound” and NZS 6802:1991 “Assessment of Environmental Sound”.

In addition to the use of L_{Aeq} vs L_{A10} as discussed in Section 2, the 2008 versions of NZS6801 and 6802 are being implemented in District Plan review processes as a matter of best practice and in accordance with the NES.

4.0 NOISE COMPLIANCE SURVEY

MDA has been assisting Fonterra by undertaking their annual compliance monitoring for over five years. Prior to that annual noise monitoring was undertaken by another company.

Since then, MDA have been actively working with Fonterra on noise-related management and consenting at the Waitoa site. We have also, and on a nationwide basis, been working with Fonterra on a more uniform approach to noise mitigation and control including the use of NECB (or similar) to manage current and future noise emissions from its activities. The use of NECBs and the L_{Aeq} metric for Fonterra’s activities is now provided in 14 district plans.

Based on work carried out by MDA, it is clear there are parts of the current NECB that are not being complied with. Fonterra has undertaken two significant noise attenuation projects on the Waitoa site to achieve the proposed NECB and this is discussed in Section 5.

We also understand there is no history of noise complaints relating to the site’s operations. This absence of noise complaints may explain why there has been no enforcement action by Council. Community response to proposed Plan Change 55 is discussed in Section 8 of this report.

5.0 NOISE MITIGATION - SITE

MDA has been involved with developing a noise mitigation strategy to reduce the off-site noise emissions especially in areas where any exceedance occurs at dwellings. It should be noted the treatment of noise on a large and complicated processing plant takes time, as the design, planning, funding and actual implementation i.e. doing works during non-manufacturing window, must all be coordinated.

A detailed noise survey of the Waitoa site was undertaken and the sources of noise were ranked by their contribution at receiver locations. Two sources of noise in particular were identified as being significant. These are:

Item 1: Specialty Powders Exhaust Stack; and

Item 2: D1/D2 Cooling Towers.

Considerable on-site mitigation work to reduce noise emissions from the Speciality Powders Exhaust Stack and D1/D2 Cooling Towers was completed in January 2021. The completed works resulted in reduced noise levels significantly below those recorded through annual monitoring over previous years and achieved compliance with the proposed NECB.

Other noise sources have also been identified as contributing to the overall site noise emissions, but decisions regarding noise control of any equipment is also linked to wider issues such as the anticipated remaining lifespan of the asset, physical and locational limitations and financial implications both of the site performance and wider business.

While there remains potential for further reductions in noise from other sources on the site, this is a longer-term process that must weigh the costs and efficiencies of a particular project against the level of benefit accruing to the company and the community.

6.0 FUTURE DEVELOPMENT

Should there be any future development at the Waitoa site, it will be essential that Fonterra designs any new development to ensure compliance with the proposed NECB is maintained.

Prior to the writing of this document, and as Council are aware, MDA were tasked with evaluating the noise effects and conceptual noise mitigation for the construction of a new dehumidifier building. The dehumidifier building is an ancillary process to an existing item of equipment, and it was proposed for processing quality and engineering reasons.

The dehumidifier was designed to ensure it did not result in additional cumulative noise off-site that was greater than the current footprint, and was included in predicted noise levels shown in this document.

Fonterra are cognisant that the adoption of the proposed NECB represents a noise limit that applies to the Waitoa Dairy Factory in its totality including all existing and future noise sources.

7.0 PROPOSED CHANGE TO NECB

The proposed NECB is based on the noticeable noise reduction achieved through the implementation of the noise control measures discussed in Section 5. There are several competing influences to reducing noise from large complex processing sites.

Given the wide range of factors that require further consideration before any additional noise reduction measures can be confirmed, the proposed NECB is the only practicable response to the existing site noise emissions. Achieving full compliance within the existing NECB, or alternatively a more tightly defined NECB than currently proposed, could only be achieved through ceasing operation of plant and equipment that is critical to overall site viability.

Appendix D illustrates the location of the proposed NECB (45 dB L_{Aeq}) contour as we have calculated it for the purposes of determining noise reduction as a result of mitigation measures.

The proposed changes to the NECB seek to ensure the number of houses *outside* the 45dB_A contour is maximised with the noise mitigation on-site being implemented. It is not feasible in our opinion, and with the site's current configuration, to reduce the Waitoa site noise emissions to a level that ensures all existing houses are outside the 45dB L_{Aeq} contour.

Fonterra have, in addition to the on-site noise control, offered to provide noise mitigation package(s) to houses within the proposed 45dB L_{Aeq} NECB. MDA has prepared a framework based on noise levels received within potentially affected houses for determining what noise mitigation package may be required. Fonterra will confirm the noise mitigation package(s) based on the MDA framework.

8.0 NOISE MITIGATION WITHIN THE COMMUNITY

Fonterra proposes to undertake noise mitigation for existing qualifying dwellings in the form of upgraded glazing to habitable rooms and/or provision of mechanical services equipment to allow windows to be closed. We consider this an appropriate combination of measures to undertake where only modest noise mitigation is required.

The broad steps in providing noise mitigation to the community are as follows:

1. Determine if house is within the proposed 45dB L_{Aeq} NECB.
2. Measure noise level in habitable rooms (bedrooms and living areas) with windows open for typical ventilation.
3. If noise in bedroom(s) is greater than 35dB $L_{Aeq(15min)}$ and/or living area is greater than 40dB $L_{Aeq(15min)}$ then close windows and remeasure noise levels in those spaces.
4. If noise in bedroom(s) is less than 35dB $L_{Aeq(15mins)}$ and/or living room is less than 40dB $L_{Aeq(15mins)}$ with windows closed, install mechanical services equipment to provide ventilation.
5. If noise in bedroom(s) is greater than 35dB $L_{Aeq(15mins)}$ and/or living room is greater than 40dB $L_{Aeq(15mins)}$ with windows closed, install mechanical services equipment to provide ventilation **and** additionally review upgraded glazing alternatives.

We note that the above is for existing dwellings. If a new building accommodating a noise sensitive activity were to be constructed, or there is an extension to an existing building accommodating a noise sensitive activity, within the proposed plan change NECB, the owner would be required to ensure they provide adequate sound insulation to achieve 35dB $L_{Aeq(15min)}$ inside bedrooms and 40dB $L_{Aeq(15min)}$ inside all other habitable rooms.

In our experience, achieving 35dB L_{Aeq} in **all** habitable spaces of new build homes, and extensions to existing homes, is straightforward because of increased insulation requirements and use of double glazing as standard in modern homes.

9.0 PROPOSED PLAN CHANGE

The proposed plan change will include an updated NECB defining the 45dB L_{Aeq} noise contour which Fonterra must comply with at night.

The proposed plan change will also include the noise mitigation measures offered to existing houses within the proposed NECB.

The proposed plan change will also address the potential for either the construction of a new building accommodating a noise sensitive activity within the NECB, or the extension of an existing house, and what the expectation is regarding sound insulation.

Appendix D illustrates the proposed 45dB L_{Aeq} NECB. Proposed wording of new noise rules (*italics for ease of reference*) to accompany the proposed NECB is as follows and includes input from MPDC and their acoustic advisor Neil Savory (Savory Acoustics):

PROPOSED PRIVATE PLAN CHANGE 55 – WAITOA DAIRY FACTORY SITE

Schedule 5: Sites subject to a Development Concept Plan

Proposed Amendments

Development Concept Plan, Waitoa Dairy Factory Site

Delete existing provisions Noise (a), (b) and (c) and Noise Emission Control Boundary and replace with the following:

New Permitted Activity Standards

1. Noise levels associated with any activity or combination of activities within the Development Area defined on the Development Concept Plan must not exceed the following rating levels at the Noise Emission Control Boundary:
 - a. Monday to Sunday including Public Holidays 7am to 10pm: 50dB $L_{Aeq(15min)}$
 - b. All other times: 45dB $L_{Aeq(15min)}$ and 75dB L_{AFmax}
2. Noise levels must 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”.

Existing Buildings Accommodating Noise Sensitive Activities

3. Within six months of [date plan change becomes operative], the owners and operators of the Waitoa Dairy Factory Site must, in respect of any building that existed at [date plan change becomes operative] accommodating a noise sensitive activity that falls within the Noise Emission Control Boundary for the Waitoa Dairy Factory, make an offer to the owner(s) to assess the internal noise levels within any habitable rooms from the operation of the Waitoa Dairy Factory.
4. If the owner(s) accept the offer made by the owners and operators of the Waitoa Dairy Factory Site, the assessment of internal noise levels within habitable rooms must be undertaken by a suitably qualified and experienced acoustic consultant during the busiest period for the Waitoa Dairy Factory (August to November). The results of the internal noise assessment will be used to determine what noise mitigation is required (if any) to ensure internal noise levels from the operation of the Waitoa Dairy Factory are controlled to an appropriate level.
 - a. If the internal noise level in bedroom(s) is greater than 35dB $L_{Aeq(15min)}$ and/or greater than 40dB $L_{Aeq(15min)}$ in any other habitable room, then a further assessment must be undertaken with windows closed to determine what mitigation measures are required under b. and c. to achieve an internal noise level that does not exceed 35dB $L_{Aeq(15min)}$ (in bedrooms) and/or 40dB $L_{Aeq(15min)}$ (in all other habitable rooms).
 - b. If the internal noise level in bedroom(s) is less than 35dB $L_{Aeq(15min)}$ (with windows closed) and/or less than 40dB $L_{Aeq(15min)}$ in any other habitable rooms (with windows closed), a mechanical ventilation system must be offered to be installed to provide ventilation.
 - c. If the internal noise level in bedroom(s) is greater than 35dB $L_{Aeq(15min)}$ (with windows

closed) and/or other habitable room is greater than 40dB $L_{Aeq(15min)}$ (with windows closed), a mechanical ventilation system must be offered to be installed **and** other measures such as upgraded glazing alternatives must be offered to be installed.

5. *The noise mitigation measures must be installed within six months of the offer being accepted by the property owner, or such alternative timeframe agreed in writing by the property owner(s) and must be certified as achieving the required level of mitigation by a suitably qualified and experienced acoustic consultant.*
6. *The assessment, mitigation, and certification as outlined in Rules 4 – 5 above shall be undertaken at a cost in all matters of the owners and occupiers of the Waitoa Dairy Factory Site.*
7. *Rule 3 shall cease to have effect on MPDC receiving confirmation of any of the following:*
 - a. *The owner of a building containing a noise sensitive activity accepts the offer required by Rule 3;*
 - b. *The owner of a building containing a noise sensitive activity declines the offer required by Rule 3;*
 - c. *That the owners and operators of the Waitoa Dairy Factory site demonstrate to the satisfaction of the Matamata-Piako District Council that they have attempted to elicit a response from the owner of a building containing a noise sensitive activity on at least three separate occasions without any reply.*
8. *Within one month of the completion of any mitigation works, confirmation of the works being completed and performing at the required level of mitigation (as certified by a suitably qualified and experienced acoustic consultant), must be provided to the property owners and Matamata-Piako District Council.*
9. *Noise levels must 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”.*
10. *For the purposes of this rule, a mechanical ventilation system means:*
 - a) *An outdoor air system complying with the requirements of the Building Code (NZS 4303) for mechanical ventilation (refer Clause G4). This is to provide a minimum level of air quality; **and***
 - b) *A mechanical heating/cooling system (eg. heat pump) designed by a suitably qualified engineer. This is to provide thermal comfort. The heating/cooling system must:*
 - i. *be capable of maintaining an internal temperature of 18C° in all bedrooms at all times with all bedroom doors closed.*
 - ii. *be capable of maintaining a maximum internal temperature of 22°C in all other habitable rooms at all times with all bedroom doors closed.*
 - iii. *be designed to NIWA 2.5% design weather dataset.*
 - iv. *allow the on/off operation to be controlled by the occupant.*

- v. allow the set temperature of each heating/cooling unit to be controllable between 18°C to 25°C by the occupant.
- c) System noise must be designed so that the combined level from the outdoor air system (satisfying clause 10(a)) and heating/cooling system (satisfying clause 10(b)) does not exceed 35dB $L_{Aeq(30s)}$ in bedrooms and 40dB $L_{Aeq(30s)}$ in other habitable rooms.

Principal reason: The intent of Rule 10(b)(ii) is to ensure that heating/cooling from bedrooms cannot be used to satisfy the thermal comfort criteria in other rooms.

Performance Standards - all activities

New Rule 5.2.14 Noise Insulation: Noise Sensitive Activities within the Waitoa Dairy Factory Noise Emission Control Boundary

5.2.14 Noise Insulation: Noise Sensitive Activities within the Waitoa Dairy Factory Noise Emission Control Boundary

1. Any habitable room in a new building accommodating a noise sensitive activity or any alteration(s) to an existing building accommodating a noise sensitive activity constructed within the Noise Emission Control Boundary for the Waitoa Dairy Factory must be designed, constructed, and maintained to meet an internal noise level of 35dB $L_{Aeq(15min)}$ inside bedrooms and 40dB $L_{Aeq(15min)}$ inside all other habitable rooms. If windows and doors are required to be closed to satisfy this condition, then an adequate supply of outdoor air is to be provided by a 'mechanical ventilation system' to each bedroom and/or habitable room.

Compliance must be achieved by, prior to the construction of any noise sensitive activity, submission of an acoustic design certificate from a suitably qualified and experienced acoustician to Council demonstrating that the prescribed internal noise levels will be achieved. The building must be designed, constructed, and maintained in accordance with the design certificate.

It is preferable that a design certificate is based on a specific noise survey conducted at the location of the dwelling. Such a survey is to be conducted during the busiest period for the Waitoa Dairy Factory (August to November). If this is not feasible then external noise levels in Table 1 are to be used for the acoustic design of the building facade.

Table 1: Façade Noise Level for Design of Buildings Inside the Noise Emission Control Boundary

	Octave Band Centre Frequency (Hz)							dBA
	63	125	250	500	1000	2000	4000	
Façade incident sound pressure level (dB re 20uPa)	60	55	52	45	43	39	33	49

Noise levels must 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".

For the purposes of this rule, a mechanical ventilation system means:

- a) *An outdoor air system complying with the requirements of the Building Code (NZS 4303) for mechanical ventilation (refer Clause G4). This is to provide a minimum level of air quality; and*
 - b) *A mechanical heating/cooling system (eg. heat pump) designed by a suitably qualified engineer. This is to provide thermal comfort. The heating/cooling system must:*
 - i. *be capable of maintaining an internal temperature of 18°C in all bedrooms at all times with all bedroom doors closed.*
 - ii. *be capable of maintaining a maximum internal temperature of 22°C in all other habitable rooms at all times with all bedroom doors closed.*
 - iii. *be designed to NIWA 2.5% design weather dataset.*
 - iv. *allow the on/off operation to be controlled by the occupant.*
 - v. *allow the set temperature of each heating/cooling unit to be controllable between 18°C to 25°C by the occupant.*
 - c) *System noise must be designed so that the combined level from the outdoor air system (satisfying clause 1(a)) and heating/cooling system (satisfying clause 1(b)) does not exceed 35dB $L_{Aeq(30s)}$ in bedrooms and 40dB $L_{Aeq(30s)}$ in other habitable rooms.*
2. *All assessments, mitigation, and certification required to be undertaken under Rule 5.2.14(1) above shall be at a cost in all matters of the owner of the land on which the building is proposed to be erected/ altered.*

Principal reason: *The intent of Rule 5.2.14(1)(b)(ii) is to ensure that heating/cooling from bedrooms cannot be used to satisfy the thermal comfort criteria in other rooms.*

New Rule 5.2.15 Noise sensitive activities in the vicinity of the Waitoa Dairy Factory Noise Emission Control Boundary

5.2.15 Noise sensitive activities in the vicinity of the Waitoa Dairy Factory Noise Emission Control Boundary

Where there is conflict between the noise standards in Rules 5.2.6 and 5.2.11, and the Waitoa Dairy Factory DCP rules, the Waitoa Dairy Factory DCP rules shall apply.

Definition of Terms

The following terms are defined below for the purposes of implementing the above Development Concept Plan rules:

Habitable room means:

- a) *any room used for the purposes of teaching or used as a living room, dining room, sitting room, bedroom, office, or other room specified in the Plan to be a similarly occupied room.*

Bedroom means:

- a) *any habitable room used predominantly for sleeping.*

Noise sensitive activity means:

- a) any residential activity (including visitor accommodation and retirement accommodation)
- b) any educational activity
- c) any healthcare activity
- d) any congregations within places of worship or marae.

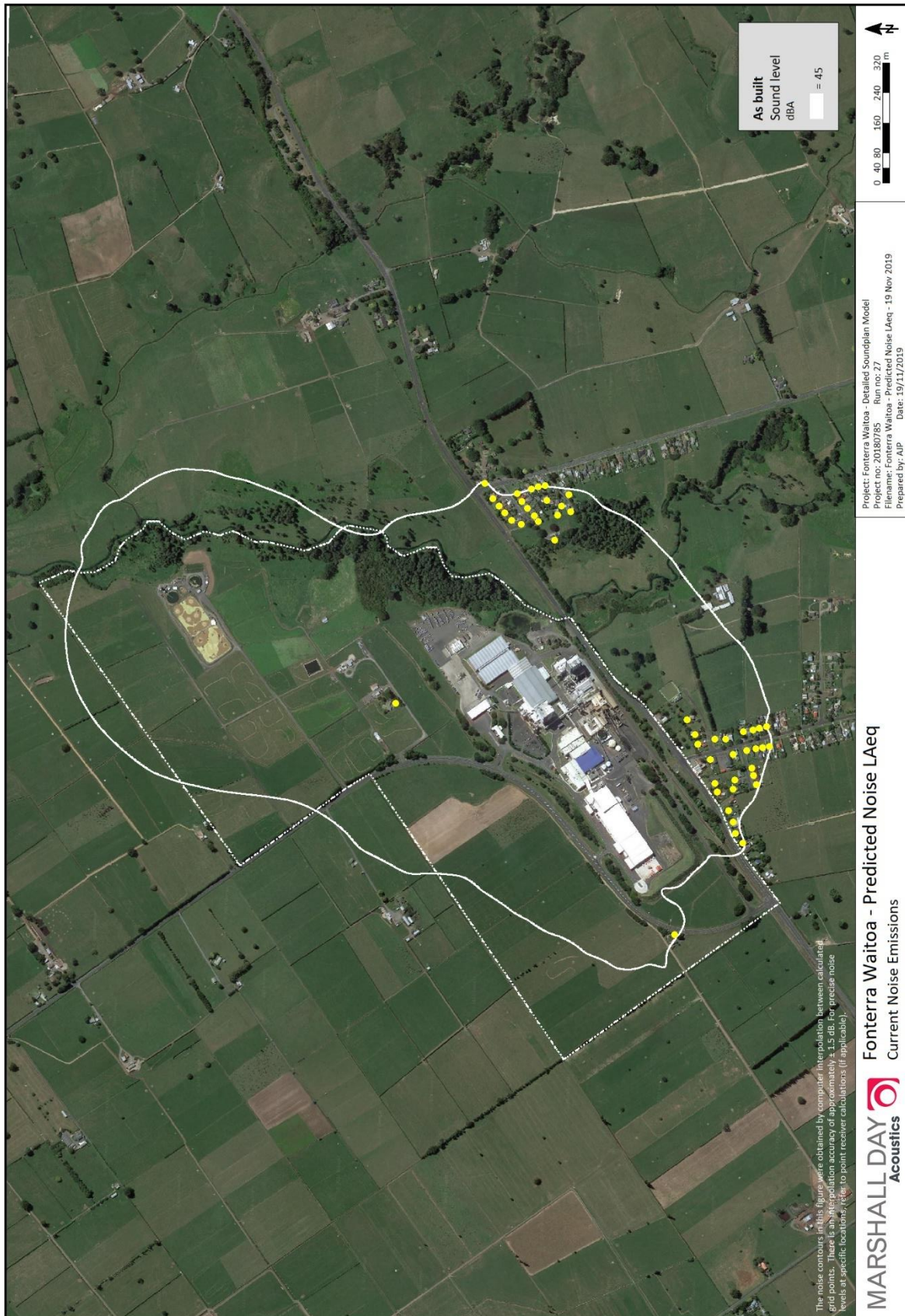
Planning Maps

Replace the existing Development Concept Plan diagram with a new Development Concept Plan diagram (which replaces the existing Noise Emission Control Boundary with the proposed Noise Emission Control Boundary).

APPENDIX A GLOSSARY OF TERMINOLOGY

SPL or L_p	<p><u>Sound Pressure Level</u> A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μPa RMS) and expressed in decibels.</p>
SWL or L_w	<p><u>Sound Power Level</u> A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.</p>
dB	<p><u>Decibel</u> The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu$Pa i.e. $dB = 20 \times \log(P/P_r)$</p>
dBA	<p>The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.</p>
A-weighting	<p>The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.</p>
$L_{Aeq}(t)$	<p>The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.</p>
$L_{A90}(t)$	<p>The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.</p>
L_{Amax}	<p>The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.</p>
NZS 6801:2008	<p>New Zealand Standard NZS 6801:2008 <i>"Acoustics – Measurement of environmental sound"</i></p>
NZS 6802:2008	<p>New Zealand Standard NZS 6802:2008 <i>"Acoustics – Environmental Noise"</i></p>
NZS 6803:1999	<p>New Zealand Standard NZS 6803: 1999 <i>"Acoustics - Construction Noise"</i></p>

APPENDIX C EXISTING WAITOA SITE NOISE EMISSION



APPENDIX D PROPOSED FONTERRA WAITOA NECB

