



TE TUPU NGĀTAHI
SUPPORTING GROWTH

Pukekohe Transport Network Assessment of Construction Noise and Vibration Effects

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Document Status

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Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
AT	Auckland Transport
AUP:OP	Auckland Unitary Plan: Operative in Part
A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds. Sound levels using an “A” frequency weighting are expressed as dB LA. Alternative ways of expressing A-weighted decibels are dBA or dB(A).
BPO	Best Practicable Option as defined in Section 2 of the Resource Management Act 1991
CNVMP	Construction noise and Vibration Monitoring Plan
dB	Decibel. The unit of sound level.
FUZ	Future Urban Zone
LA90	The A-weighted sound level exceeded for 90 % of the measurement period, measured in dB. Commonly referred to as the background noise level.
LAeq	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
LAeq(24h)	The LAeq sound level averaged over a 24-hour period from midnight to midnight.
LAmx	The A-weighted maximum sound level. The highest sound level which occurs during the measurement period. Usually measured with a fast time-weighting i.e. LAFmax
Noise	A subjective term used to describe sound that is unwanted by, or distracting to, the receiver.
NIMT	North Island Main Trunk railway track
NoR	Notice of Requirement
NZS 6801	New Zealand Standard NZS 6801:2008 <i>Acoustics – Measurement of environmental sound</i>
NZS 6802	New Zealand Standard NZS 6802:2008 <i>Acoustics - Environmental Noise</i>
PPF	Protected Premises and Facilities
Pukekohe Transport Network	Comprising the following new or upgraded transport corridors: NoR 1: Drury West Arterial NoR 2: Drury – Pukekohe Link NoR 3: Paerata Connections NoR 4: Pukekohe North- East Arterial NoR 5: Pukekohe South-East Arterial NoR 6: Pukekohe South- West Upgrade NoR 7: Pukekohe North-West Arterial NoR 8 (AC) and (WD): Pukekohe East Road and Mill Road Upgrade

Acronym/Term	Description
RMA	Resource Management Act 1991
SH1	State Highway 1
SH22	State Highway 22
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth Alliance
Waka Kotahi	Waka Kotahi New Zealand Transport Agency

Executive Summary

NoR 1 Drury West Arterial

The Drury West Arterial is a new road connection extending south from the intersection of SH22 and Jesmond Road to the proposed South Drury interchange (located adjacent to Runciman Road). The alignment is located in a rural area bordered on both sides by Future Urban Zone (FUZ). The closest existing receivers are approximately 10m away from the construction boundary. With mitigation in place, the closest receivers could still receive intermittent noise levels of up to 77 dB L_{Aeq} when works are immediately adjacent. However, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works, mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

Compliance with the Category B vibration criteria is predicted at all existing receivers.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the Construction Noise and Vibration Management Plan (CNVMP).

NoR 2 Drury-Pukekohe Link

The Drury-Pukekohe Link is a new road connecting SH1 in the north with Pukekohe township in the south, as well as providing a link to SH22. The area is rural in character, but the alignment borders some FUZ that will be developed in the future.

A small number of houses are particularly close to the proposed works, so that even with mitigation in place, noise levels at individual buildings may be above 85 dB L_{Aeq} for brief periods when works are immediately adjacent. Where these noise levels are predicted, careful management and mitigation will be required through the CNVMP and Schedules. However, for most works and most of the overall construction duration, noise levels are predicted to comply with the 70 dB L_{Aeq} noise limit.

Where vibratory rolling is proposed to occur in close proximity to houses, the Category B vibration criteria are predicted to be exceeded. Mitigation should be investigated such as the use of alternative compaction methods. With mitigation, compliance with the Category B vibration criteria can be achieved at all existing buildings.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the CNVMP.

NoR 3 Paerata Connections

The Paerata Connections are new arterial connections from SH22 to Sim Rd. The arterials are located in both a rural area and the FUZ. The closest existing receivers are approximately 26m away from the construction boundary. With mitigation in place, noise levels are predicted to comply with the daytime noise criteria at all existing receivers.

Compliance with the Category B vibration criteria is predicted at all existing receivers.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the CNVMP.

NoR 4 Pukekohe North-East Arterial

The Pukekohe North-East Arterial is a new road extending from the tie in with Paerata Connection (at Cape Hill Road) to Pukekohe East Road. The closest existing receivers are approximately 3m away from the construction boundary. With mitigation in place, the most affected receivers could still receive intermittent noise levels over 85 dB L_{Aeq} when works are immediately adjacent. However, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works, mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

Four existing dwellings may experience vibration levels above 5mm/s PPV, exceeding the daytime Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. Mitigation, such as the use of non-vibratory compaction equipment within 8m of buildings, is recommended to avoid potential cosmetic damage.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the CNVMP.

NoR 5 Pukekohe South-East Arterial

The Pukekohe South-East Arterial is a new road from Royal Doulton Road through existing industrial development to Svendsen Road, the arterial includes a partial upgrade of Golding Rd. The road is located in the FUZ and extends into the business and special purpose areas. The closest existing receivers are approximately 2m away from the construction boundary. With mitigation in place, the most affected receivers could still receive intermittent noise levels over 85 dB L_{Aeq} if high noise generating activities occur on the construction boundary. However, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works, mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

Six existing dwellings and two commercial receivers may experience vibration levels above the daytime Category B criteria, if the roller compactor is used on the construction boundary in the closest position to them. Mitigation, such as the use of non-vibratory compaction equipment within 8m of residential structures and 4m of commercial structures, is recommended to avoid potential cosmetic damage.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the CNVMP.

NoR 6 Pukekohe South-West Upgrade

The Pukekohe South-West Upgrade is an upgrade to include walking and cycling. The arterial is predominantly located in the residential and business zones. The closest existing receivers are approximately 2m away from the construction boundary. With mitigation in place, the most affected receivers could still receive intermittent noise levels above 85 dB L_{Aeq} when works are immediately adjacent. However, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works, mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

19 existing dwellings, one commercial receiver and one historic/vibration sensitive structure (Nehru Hall) may experience vibration levels above the daytime Category B criteria, if the roller compactor is

used on the construction boundary in the closest position to them. Mitigation, such as the use of non-vibratory compaction equipment within 8m of residential structures and 4m of commercial structures, is recommended to avoid potential cosmetic damage.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the CNVMP.

NoR 7 Pukekohe North-West Arterial

The Pukekohe North-West Arterial is an upgrade to include walking and cycling. The arterial is located within the FUZ. The closest existing receivers are approximately 2m away from the construction boundary. With mitigation in place, the most affected receivers could still receive intermittently receive noise levels above 85 dB L_{Aeq} . However, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works, mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

Three existing dwellings may experience vibration levels above the daytime Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. Mitigation, such as the use of non-vibratory compaction equipment within 8m of residential structures, is recommended to avoid potential cosmetic damage.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the CNVMP.

NoR 8 (AC) and NoR 8 (WDC) - Mill Road and Pukekohe East Road Upgrades

NoR 8 - Mill Road and Pukekohe East Road Upgrade includes works within Auckland Council and Waikato District Council and is referred to as one transport project, despite being acknowledged as two separate NoRs.

NoR 8 involves the widening of Mill Road up to Harrisville Road. From Harrisville Road west, a shared use path is proposed. The road delineates the border of Auckland and the Waikato District. It traverses generally rural zoned land, with some FUZ at the western end.

A small number of houses are particularly close to the proposed works, so that even with mitigation in place, noise levels at individual buildings may be above 85 dB L_{Aeq} for brief periods when works are immediately adjacent. Where these noise levels are predicted, careful management and mitigation will be required through the CNVMP and Schedules. However, for most works and most of the overall construction duration, noise levels are predicted to comply with the 70 dB L_{Aeq} noise limit.

Where vibratory rolling is proposed to occur in close proximity to houses, the Category B vibration criteria are predicted to be exceeded. Mitigation should be investigated such as the use of alternative compaction methods. With mitigation, compliance with the Category B vibration criteria can be achieved at all existing buildings.

Any future buildings will need to be assessed at the time of construction and mitigation and management determined through the CNVMP.

Conclusion

Construction noise and vibration can be mitigated and managed through the CNVMP to generally comply with the applicable noise and vibration criteria. Exceedances of the criteria could occur intermittently over a short duration if high noise or vibration generating equipment are used adjacent to occupied buildings. Where an exceedance is predicted at any receiver that exists at the time of construction, the effects will be mitigated and managed through the CNVMP and Schedules.

1 Introduction

1.1 Purpose and scope of this Report

This noise and vibration assessment forms part of the suite of technical reports prepared to support the Assessment of Effects on the Environment (AEE) for nine Notices of Requirement (NoRs) being sought by Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT) for the Pukekohe Transport Network under the Resource Management Act 1991 (RMA).

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Pukekohe Transport Network on the existing and likely future environment as it relates to noise and vibration effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

The key matters addressed in this report are as follows:

1. Identify and describe the context of the Pukekohe Transport Network area;
2. Identify and describe the actual and potential noise and vibration effects of each Project corridor;
3. Recommend measures as appropriate to avoid, remedy or mitigate actual and potential noise and vibration effects (including any conditions/management plan required) for each Project corridor; and
4. Present an overall conclusion of the level of actual and potential noise and vibration effects for each Project corridor after recommended measures are implemented.

1.2 Report Structure

The report is structured as follows:

- Project overview with a summary of the Pukekohe Transport Network Projects in section 2;
- Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines in section 3;
- The assessment methodology used to determine the traffic noise effects and implement mitigation measures for the Pukekohe Transport Network in section **Error! Reference source not found.**;
- Identification and description of the existing and likely future environment in section **Error! Reference source not found.**;
- Description of the actual and potential adverse noise and vibration effects of construction of the Project, including recommended measures to avoid or mitigate potential adverse effects, in section 6;
- Overall conclusion of the level of potential adverse construction noise effects of the Pukekohe Transport Network after recommended measures are implemented in section 7.

This report should be read alongside the AEE, which contains further details on the history and context of the Projects. The AEE also contains a detailed description of works to be authorised for the Pukekohe Transport Network Projects as a whole and each NoR, and likely staging and the typical construction methodologies that will be used to implement this work. These have been reviewed by the author of this report and have been considered as part of this assessment of landscape and visual effects. As such, they are not repeated here, unless a description of an activity is necessary to understand the potential effects, then it has been included in this report for clarity.

1.3 Preparation for this Report

Work undertaken for this report commenced in March 2023. In summary, the preparation for this work has included:

- Reviews of and the project concept designs and Te Tupu Ngātahi GIS viewer and attendance at design review workshops.
- A review of the statutory setting of the Project and surrounding context
- A review of the other GIS data such as contours and aerial photography
- A preliminary site visit on 26 January 2023 with the Project Team
- A specialists' workshop held on 22 March 2023 to discuss initial findings following the first site visit
- Site visits were undertaken on the 30th of March and 28th of April 2023 to deploy noise loggers. Six noise loggers were deployed across all NoRs in total.

Alongside the preparation of this assessment, the author has reviewed the following documents:

- Construction Method Statement
- Revisions of concept design drawings
- Other Technical Assessments:
 - Historic Heritage

2 Pukekohe Transport Network Overview

The Pukekohe Transport Network comprises nine NoRs through Pukekohe, Paerata and Drury. A concept design has been undertaken for the NoRs. The design will be further refined through future phases of the Project and will be undertaken within the scope of the designation conditions and future resource consent conditions. The detailed design of the Project will be undertaken prior to construction and reflected in the Outline Plan(s) which will be submitted to Council as set out in s176A of the RMA.

The Pukekohe Transport Network encompasses eight transport projects for the Pukekohe, Paerata and Drury West areas. Auckland Transport has lodged six Notices of Requirement with Auckland Council and Waka Kotahi has lodged two Notices of Requirement with Auckland Council and one with Waikato District Council. The Pukekohe Transport Network includes provision for improved walking and cycling, public transport, and general traffic connections.

For the purposes of this assessment, Mill Road and Pukekohe East Road Upgrade (that includes works within Auckland Council and Waikato District Council) is referred to as one transport project, despite being submitted as two separate NoRs (NoR 8 AC and NoR 8 WDC). The matters relevant to each jurisdictional area are addressed through this assessment.

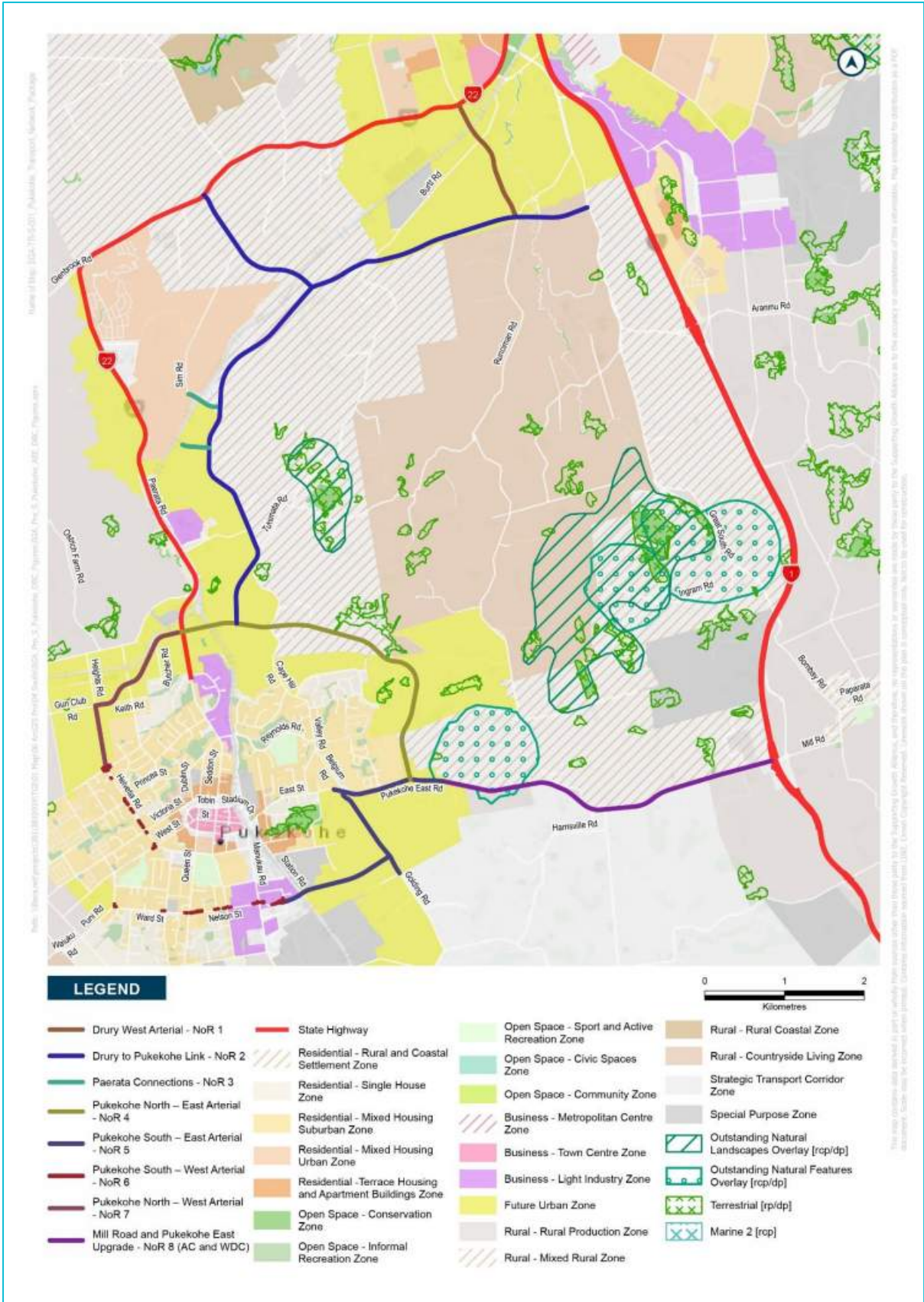


Figure 1-1: Pukekohe Transport Network

Table 2-1 Pukekohe Package Project Summary

NoR	Project	Requiring Authority	Description
1	Drury West Arterial	AT	<ul style="list-style-type: none"> NoR 1 is a 1.6km new transport corridor extending south from the intersection of SH22 and Jesmond Road to the proposed Drury to Pukekohe Link (NoR 2). It connects Drury West Town Centre, Drury West Rail Station and provides access to the strategic transport network including SH1 and SH22. It connects with Burt Road and to Runciman Road in the south. This new transport corridor improves local connectivity in Drury West and the wider area to centres, employment and rail stations. Between SH22 and Burt Road, the proposed cross section is a four lane arterial 30m wide. This includes two lanes for PT and walking and cycling facilities on both sides of the corridor. South of Burt Road a two lane arterial with a 24m wide cross section is proposed with two lanes for general traffic and walking and cycling facilities on both sides of the corridor. Three new bridges are proposed over existing NIMT rail line, and two tributaries of the Ngakoroa Stream. Three new stormwater wetlands are proposed and new culverts and swales.
2	Drury-Pukekohe Link	Waka Kotahi	<p>NoR 2 provides a north south strategic corridor with two general traffic lanes proposed and active transport facilities on one side of the corridor. The total length of the NoR is 10.6km.</p> <p>NoR 2 is split into the following four segments.</p>
	South Drury Connection segment		<ul style="list-style-type: none"> South Drury Connection segment provides a new connection extending from Great South Road in the east at the proposed SH1 Drury South Interchange (a proposed Waka Kotahi SH1 project). The alignment is along the edge of the FUZ to Burt Road in the west. It provides a strategic connection improving local access in Drury West, provides resilience in the transport network supporting SH22 and SH1, provides direct connectivity to the proposed Drury South Interchange and supports the proposed strategic active modes corridor. A 24m wide cross section is proposed with two lanes for general traffic, with walking and cycling on one side of the corridor. Three new bridges are proposed over tributaries of the Ngakoroa Stream. Three stormwater wetlands are proposed and new culverts and swales.

NoR	Project	Requiring Authority	Description
	SH22 Connection segment		<ul style="list-style-type: none"> Connecting with the South Drury Connection and Drury-Paerata Link segments, this connection provides a strategic connection between State Highway 1 and State Highway 22. It improves access between Drury West and Paerata, provides resilience in the transport network supporting SH22 and SH1, provides direct connectivity to the proposed Drury South Interchange and supports the proposed strategic active modes corridor. It includes new transport corridor and a partial upgrade of Sim Road (north). A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on one side of the corridor. Two new bridges are proposed over the Oria Creek and NIMT. Two stormwater wetlands are proposed and new culverts and swales.
	Drury-Paerata Link segment		<ul style="list-style-type: none"> Drury-Paerata Link segment is a new corridor connecting the segments of South Drury Connection, SH22 Connection and Paerata Arterial. This segment extends from an intersection with Burt Road in the north, to the Paerata Arterial segment in the south. It provides connectivity between Drury and Paerata providing a strategic connection between two areas of future urban development. A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on one side of the corridor. Two bridges are proposed over tributaries of the Oira Creek. Three stormwater wetlands are proposed and new culverts and swales.
	Paerata Arterial segment		<ul style="list-style-type: none"> Paerata Arterial segment is located along the eastern edge of Paerata FUZ. It connects with Paerata Connections NoR 3 at the northern extent and to the proposed Pukekohe North East Arterial NoR 4 at its southern extent. It includes an upgrade of part of Sim Road (south), Tuhimata Road and a new section of transport corridor. It increases connectivity to Paerata FUZ, Paerata Rail Station and Pukekohe Town Centre. A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on one or both sides of the corridor. No bridges are proposed. Six stormwater wetlands are proposed wetlands (one shared with NoR 4 and one shared with NoR 3) and new culverts.
3	Paerata Connections	AT	<ul style="list-style-type: none"> The Paerata Connections provide two connections from the existing Sim Road (south) proposed to be upgraded by NoR 2 to the Paerata Rail Station and Paerata Rise development. The connections provide the primary east-west connections for all modes in Paerata. NoR 3 has includes two segments:

NoR	Project	Requiring Authority	Description
			<ul style="list-style-type: none"> • Sim to Sim Connection segment provides a new connection of approximately 400m between the two extents of Sim Road over the railway (NIMT). • Paerata Rail Station Connection segment provides a new transport corridor approximately 330m in length between the Paerata Rail Station (KiwiRail designation 6311 currently under construction) and NoR 2. • A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on both sides of the corridor. • One bridge is proposed over the NIMT to connect the two extents of Sim Road for the Sim to Sim Connection segment. • One new stormwater wetland is proposed that is shared with NoR 2 and a new culvert.
4	Pukekohe North-East Arterial	AT	<ul style="list-style-type: none"> • The Pukekohe North-East Arterial is an approximately 4km new transport corridor from SH22 in the northwest connecting to Pukekohe East Road in the south east. • It connects the strategic corridors at SH22 (at the northern extent of the Pukekohe North West Arterial NoR 7), the Drury to Pukekohe Link NoR 2 and Pukekohe East Road proposed to be upgraded by NoR 5 and NoR 8. • Its primary function is for general traffic, freight, an active mode links between future neighbourhoods and alleviating traffic on existing roads at Cape Hill Road and Valley Road. • A 24m wide cross section is proposed with 2 lanes for general traffic and walking and cycling proposed on both or one side of the corridor. • Seven bridges are proposed over the Whangapouri Creek, the NIMT, and other unnamed streams and tributaries. • Six new stormwater wetlands are proposed and new culverts.
5	Pukekohe South-East Arterial	AT	<ul style="list-style-type: none"> • The Pukekohe South-East Arterial upgrades part of Pukekohe East Road, Golding Road and provides a new connection between Golding Road (from north of Royal Doulton Drive) and across Station Road and the NIMT to the existing industrial development on Crosbie Road to Svendsen Road. • It is a primary east-west connection to assist in redirecting general traffic and freight away from the Pukekohe town centre to provide additional resilience to the wider network. • A 24m wide cross section is proposed with two lanes for general traffic with walking and cycling on the southern side of the corridor on Pukekohe East Road and on both sides for the remainder of the corridor. • One bridge is proposed crossing Station Road and the NIMT. • Five new stormwater wetlands are proposed and new and upgraded culverts.

NoR	Project	Requiring Authority	Description
6	Pukekohe South-West Upgrade	AT	<ul style="list-style-type: none"> Pukekohe South West Upgrade involves the re-allocation of road space within the existing road corridor for a bi-directional cycle way and footpath upgrade. The proposed designation is limited to specific intersections and driveways to safely accommodate active mode facilities. The existing road reserve is to be utilised where possible retaining a 20m wide cross section with 2 lane general traffic, walking on both sides and a bi-directional cycleway on one side of the corridor. No bridges or stormwater wetlands are proposed.
7	Pukekohe North-West Arterial	AT	<ul style="list-style-type: none"> Pukekohe North-West Arterial provides a connection between Helvetia Road in the southwest and SH22 in the northeast. It upgrades part of Helvetia Road, utilises part of Keith Road (a paper road), and forms a new connection between Beatty Road and Butcher Road to SH22 – connecting to the Pukekohe North East Arterial NoR 4. It provides an alternative connection for all modes travelling north to south in west Pukekohe assisting in redirection of general traffic away from the town centre and provides additional resilience to the wider network. A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on both sides of the corridor. No bridges are proposed. Two new stormwater wetlands are proposed and new and upgraded culverts.
8 (AC) And 8 (WDC)	Mill Road and Pukekohe East Road Upgrade	Waka Kotahi	<ul style="list-style-type: none"> NoR 8 upgrades Mill Road (Bombay) in the east and Pukekohe East Road in the west. It provides an important strategic connection between Auckland and Waikato and from SH1 to Pukekohe urban areas for traffic and freight, with a major rural active mode connection. Harrisville Road plays a significant role in distributing traffic from further south into Waikato. Mill Road is proposed to be upgraded to four lanes (2.1 kms) from SH1 in the east to Harrisville Road in the west. It has a 30m wide cross section with four lanes for general traffic, with walking and cycling on the southern side. Pukekohe East Road is proposed to be upgraded (3.4 kms) for walking and cycling facilities on the southern side from Harrisville Road in the east to NoR 5 in the west. One new stormwater wetland is proposed, swales and new and upgraded culverts.

3 Assessment Criteria

3.1 Construction Noise

3.1.1 Guidelines and standards reviewed

The following guidelines and standards have been reviewed for the assessment of construction noise:

- AUP:OP, specifically rule E25.6.27, relating to construction noise in all zones except the City Centre and Metropolitan Centre zones, and E25.6.29 relating to construction noise in the road corridor
- Proposed Waikato District Plan Rule NOISE-R4, and AINF-R2, which reference NZS 6803:1999
- NZS 6803:1999 Acoustics – Construction Noise
- Waka Kotahi “State Highway Construction and Maintenance Noise and Vibration Guide” (**Guide**), V1.1, August 2019.

The Pukekohe Transport Network projects contain both AT and Waka Kotahi projects. Although the Guide is a Waka Kotahi document, the requirements have also been applied to AT projects. The Guide takes account of the intended application of NZS 6803 criteria and provides a solid management structure to achieve the best practicable outcome for construction noise. The Guide and AUP:OP contain the same construction noise criteria.

3.1.2 Recommended Construction Noise Criteria

Table 3-1 and **Table 3-2**: Table below set out the recommended construction noise criteria. These criteria align with the long duration (more than 20 weeks) noise criteria of NZS 6803 and the Guide, and largely reflect the AUP:OP criteria.

Table 3-1 Construction noise criteria for occupied sensitive receivers

Day of the week	Time period	Maximum noise level >20 weeks	
		dB LAeq	dB LAmax
Weekdays	6:30 – 7:30	55	75
	7:30 – 18:00	70	85
	18:00 – 20:00	65	80
	20:00 – 06:30	45	75
Saturdays	6:30 – 7:30	45	75
	7:30 – 18:00	70	85
	18:00 – 20:00	45	75
	20:00 – 06:30	45	75
	6:30 – 7:30	45	75

Day of the week	Time period	Maximum noise level >20 weeks	
		dB LAeq	dB LAmax
Sunday and public holidays	7:30 – 18:00	55	85
	18:00 – 20:00	45	75
	20:00 – 06:30	45	75

Table 3-2: Table Construction noise criteria for all other occupied receivers

Time period	Maximum noise level dB LAeq >20 weeks
07:30 – 18:00	70
18:00 – 07:30	75

3.1.3 Exceedance of criteria

During construction some activities will likely occur close to buildings. In some instances, there is the potential for noise levels to exceed the recommended construction noise standards. For most large-scale construction projects, exceedances of the construction noise standards for brief periods of time are common, and management will ensure that effects are reasonable.

NZS 6803 anticipates that at times construction noise cannot be made to comply with the recommended criteria. Statements such as “*construction noise from any site should not generally exceed the numerical noise limits*”¹ suggest that intermittent exceedances are not unreasonable, as long as the Best Practicable Option (BPO) has been applied to the management and mitigation of that construction noise.

The AUP:OP in its Objectives and Policies also appropriately anticipates exceedances from construction noise and states:

“(4) Construction activities that cannot meet the noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects.”

and

“(10) Avoid, remedy or mitigate the adverse effects of noise and vibration from construction, maintenance and demolition activities while having regard to:

[...]

The practicability of complying with permitted noise and vibration standards.”

Whether the duration of a construction activity that exceeds the standards can be considered reasonable, depends on site specific circumstances, and may vary from site to site and activity to

¹ NZS 6803:1999 Acoustics – Construction Noise, Section 7.1.2.

activity. For instance, where daytime noise standards are exceeded for several days, but neighbouring residents are not at home, no one would be affected and therefore mitigation may not be required beyond communication with the residents.

If night-time works occur, this would likely only happen for few nights in any one location. In that instance, this may be acceptable if residents have been informed and a clear timeframe has been provided. However, if night-time works are expected to be ongoing for several consecutive nights, and at a noise level that affects residents' ability to sleep, then alternative strategies may need to be implemented, such as offering temporary relocation for those affected residents.

3.2 Construction Vibration

The main objective of controlling construction vibration is to avoid vibration-related damage to buildings, structures, and services, in the vicinity of the works. Any adverse effects of construction vibration on human comfort would typically only be experienced for short durations, for most types of construction work.

The level of vibration perceived by humans, and the level of vibration that is likely to result in annoyance for some people, are magnitudes lower than the level of vibration capable of damaging structures. This means that vibration levels which readily comply with the building damage criteria will likely cause annoyance and adverse reaction from building occupants who mistakenly believe that their building is sustaining damage.

3.2.1 Guidelines and standards reviewed

The following guidelines and standards have been reviewed for the assessment of construction vibration:

- AUP:OP rule E25.6.30 relating to construction vibration, amenity and avoidance of any damage to buildings
- German Standard DIN4150-3 (1999) Structural vibration – Part 3 Effects of vibration on structures
- British Standard (BS) 5228-2: 2009 “Code of practice for noise and vibration control on construction and open sites”
- Waka Kotahi “State Highway Construction and Maintenance Noise and Vibration Guide” (**Guide**), V1.1, August 2019.

Rule E25.6.30 of the AUP:OP relates to construction vibration and contains criteria for both building damage and amenity. The building vibration criteria are based on the German Standard DIN 4150-3:1999 "Structural Vibration - Part 3: Effects of Vibration on Structures". This Standard is conservative and designed to avoid all (including cosmetic) damage to buildings. Significantly higher limits would be applied if damage to structural foundations was the only consideration.

The amenity criteria act as trigger levels for consultation and communication. The amenity criteria set out in the AUP:OP are slightly less stringent than those set out in the Waka Kotahi Guide (2mm/s PPV vs 1 mm/s PPV).

3.2.2 Recommended Construction Vibration Criteria

Table 3-3 below shows the recommended vibration criteria for all NoRs which are sought by AT (NoRs 1, 3 and 4 - 7). These criteria are based on the AUP:OP.

Table 3-4 below shows the recommended vibration criteria for all NoRs which are sought by Waka Kotahi (NoRs 2 and 8). These criteria are based on the Guide with the more stringent amenity criteria for occupied buildings.

Table 3-3: AT vibration limits at all buildings

Receiver	Details	Category A	Category B
Occupied activities sensitive to noise	Night-time 2000h-0630h	0.3 mm/s PPV	2mm/s PPV
	Daytime 0630h-2000h	2mm/s PPV	5mm/s PPV
Other occupied buildings	Daytime 0630h-2000h	2mm/s PPV	5mm/s PPV
All other buildings	At all times	Tables 1 and 3 of DIN4150-3:1999	

Table 3-4: Waka Kotahi vibration limits at all buildings

Receiver	Location	Details	Category A	Category B
Occupied PPFs*	Inside the building	Night-time 2000h-0630h	0.3 mm/s PPV	1mm/s PPV
		Daytime 0630h-2000h	1mm/s PPV	5mm/s PPV
Other occupied buildings	Inside the building	Daytime 0630h-2000h	2mm/s PPV	5mm/s PPV
All other buildings	Building foundation	Vibration – transient	5mm/s PPV	BS 5228-2 Table B.2
		Vibration – continuous		BS 5228-2 50% of Table B.2 values

* Protected Premises and Facilities

The two category criteria are to facilitate a progressive management response to the increasing risks and effects during construction.

Category A sets the criteria for the amenity effects where vibrations may be perceived by occupants within a building and is an indicator of when communication and consultations should be initiated to manage effects. The Category A criteria aim to avoid annoyance of building occupants.

If the Category A criteria cannot be practicably achieved, the focus shifts to avoiding building damage rather than avoiding annoyance by applying the Category B criteria. Building damage is unlikely to occur if the Category B criteria are complied with. If predictions indicate that the Category B criteria may be exceeded, building condition surveys must be carried out prior to works commencing and vibration monitoring must be carried out during the works. This allows an assessment of and response to any effects.

We note that one historic/vibration sensitive structure was identified in the Assessment of Effects on Historic Heritage, Nehru Hall at 59 Ward Street. Under the AT vibration limits set out in **Table 3-3**, this structure would be subject to the criteria for vibration sensitive structures set out in the German standard DIN 4150-3:1999. Vibration emission radii for the most stringent criteria set out in the standard for different plant items are set out in **Table 4-5**.

4 Assessment Methodology

A consistent approach has been adopted for the whole of the Pukekohe Transport Network as set out in this section. It has been assumed that no concurrent project works will occur across the multiple areas where receivers may be subjected to impacts from more than one designation. Any receivers that may be impacted by more than one Project would be reassessed closer to the time of construction. Any buildings within the proposed designation footprint are assumed to be removed, as confirmed by the Project Team, and are not assessed.

Construction noise setback distances and vibration emission radii have been determined based on assumptions of construction activities and equipment for each of the NoRs.

The construction boundary is assumed to be the edge of the indicative alignment.

The construction noise setback distances and vibration emission radii were used to determine where any potential construction noise and vibration exceedances of the relevant criteria could occur and identify affected receivers. Potential effects of construction noise and vibration have then been assessed and construction management and mitigation measures identified where appropriate. To avoid and/or minimise exceedances of the Project construction noise and vibration criteria, Best Practicable Option (BPO) mitigation and management measures should be utilised.

This report proposes a framework for construction noise and vibration management such that the most effective and practicable methods for mitigation will be planned and implemented, taking into account the extent of predicted effects. At the core of this framework is the Construction Noise and Vibration Management Plan (CNVMP) in Section 6.3.1, which will be developed prior to commencement of construction, and updated as necessary throughout the duration of construction.

4.1 Construction Methodology

An indicative construction methodology has been provided by the project team to inform the assessment of each of the NoR.

This is based on a generic transport construction project and has not taken into consideration any project specific scope of works, constraints or staging requirements that may be applicable for each project. The indicative construction programme assumes a linear construction sequence.

The indicative construction methodology for the projects is as follows:

Site establishment

- Site access construction;
- Tree removal and vegetation clearance;
- Remove footpath, streetlights, grass verge berm;
- Property/ building modification or demolition, including fencing, driveways and gates;
- Install environmental controls e.g. silt fencing, sediment retention ponds;
- Implement traffic management to establish the construction zones;
- Service protection works; and
- Construct access tracks/ haul roads (if any).

Advance works

- Relocation of utilities services; and
- Major earthworks to include the following:
 - Ground improvements, undercuts, embankment foundations;
 - Cut and fill works along the alignment to formation level, including preload if required; and
 - Remove preload upon settlement completion, and subgrade preparation.

Main works

- Minor earthworks (cut and fill);
- Remove verge and prepare subgrade formation;
- Construct new longitudinal drainage facilities;
- Construct new pavement and widening works in available areas;
- Move traffic to newly constructed pavement areas and continue with the remaining widening works;
- Pavement reconstruction or reconfiguration of existing road furniture;
- Complete tie in works, footpaths, cycleways, lighting and landscaping;
- Construct permanent stormwater wetlands;
- Construct new culverts including rip rap and headwalls;
- Install road safety barriers (if any); and
- Bridge construction works (if any) as follows:
 - Construct abutments;
 - Piling, pier, and headstock construction;
 - Install bridge beams and decking;
 - Install settlement slabs;
 - Retaining wall construction (if any);
 - Accommodation works; and
 - Install signage and lighting.

Finishing works and demobilisation

- Final road surfacing and road markings;
- Commission traffic signals (if any);
- Finishing works e.g. landscaping, street furniture, fencing and outstanding accommodation works;
- Move traffic to the final road configuration; and
- Practical completion and de-establishment.

4.2 Dwellings to be removed

We have assumed that all existing buildings inside the proposed designation boundaries will be removed or will not represent a dwelling (e.g. buildings may be repurposed to contain non-noise sensitive uses). We have therefore not assessed these buildings as dwellings. Should they be retained and be used for any uses identifying them as a dwelling, they will need to be assessed and mitigation will need to be determined where necessary, during detailed design.

Table 4-1 Dwellings inside designation areas (not assessed)

NoR	Address
1	584, 600 Burt Road 787, 791, 792 Runciman Road
2	375 Burt Road 301A and B Cape Hill Road 11 Crown Road 1238, 1242 Great South Road 21, 22 Ngakoroa Road 777, 785, 787, 791, 792 Runciman Road 77, 319 B-E, 42 Sim Road
3	319A, 325, 398 Sim Road
4	208, 219 Cape Hill Road 35 Grace James Road 1201 Paerata Road 81A, 81B, 87 Pukekohe East Road
5	10 Austen Place 1 Belgium Road 35 Crosbie Road 2, 97, 101, 107 Golding Road 3, 8 Pukekohe East Road, Pukekohe
6	N/A
7	157 Beatty Road 2 Birdwood Road 36 Butcher Road 130 Helvetia Road 224 Heights Road
8	28, 87, 155, 182 Mill Road 306 Pukekohe East Road

4.3 Plant and Equipment

Table 4-2 provides an indicative list of plant and equipment which may be required for construction across each proposed designation.

Table 4-2 Indicative construction equipment

Construction	Construction Activity
Typical across all works	<ul style="list-style-type: none"> • Site facility • Light vehicles • Hiab truck • Trucks
Earthworks	<ul style="list-style-type: none"> • 20-30T Excavator • Roller compactor • Water cart • Tippers • Stabilizers
Drainage	<ul style="list-style-type: none"> • 20T Excavator • Trench shields • Tandem tipper • Loader • Plate compactor • Trucks • Water cart
Pavement Construction	<ul style="list-style-type: none"> • Grader • Water cart • Smooth drum roller • Vibratory roller • Tandem tippers • Kerbing machine • Concrete truck • Plate compactor • Paver • Excavators
Bridge construction	<ul style="list-style-type: none"> • Concrete truck • Excavator • Tip trucks • Cranes • Delivery trucks • Pilling rig • Concrete pump • Elevated Work Platform (EWP)

4.4 Construction Noise

Construction phases for each of the Projects are expected to occur for a minimum of 12 months. Predictions have been assessed against the noise criteria for greater than 20 weeks “long-duration” under NZS 6803:1999 as presented in Table 3-1. It is expected that the majority of the works will be carried out between 7am – 6pm Monday to Saturday. There may be extended hours during summer earthworks season (e.g. 6am to 8pm, Monday to Sunday), there is also the possibility of night works for critical activities (culvert construction and road surfacing).

Various construction activities and pieces of equipment will act as noise sources on site during construction works. An indicative construction equipment list has been provided by the project team to assess the noise and vibration effects. Given construction will occur in the future, the current methodology may not be inclusive of all equipment used nearer the time of construction. Equipment tables will need to be updated to reflect selection at the development of the management plan. A minimum set back distance from receivers to comply with day-time noise criterion of 70 dB L_{Aeq} without mitigation has been calculated.

4.4.1 Equipment Noise Levels

Table 4-3 details the sound power levels from the likely significant noise sources and the various receiver setback distances required to achieve compliance with the 70 dB L_{Aeq} day-time noise criterion without mitigation. The noise data has been taken from British Standard 5228-1:2009 “Code of practice for noise and vibration control on construction and open sites”, manufacturer’s data or the AECOM database of noise measurements. Equipment selection at detailed design stage may include equipment with different sound power levels than those presented. The equipment list should be reassessed nearer the time at production of the CNVMP.

Table 4-3 Construction equipment sound levels and indicative compliance distance

Equipment	Sound power level (dB L_{WA})	Free field noise level at varying distances (dB L_{Aeq})				Minimum Setback distance to comply with day-time criteria without mitigation, metres
		5 m	10 m	20 m	50 m	
30T excavator	105	86	80	73	66	30
20T excavator	99	80	74	67	60	13
Roller compactor	101	82	76	69	62	20
Tipper Truck	107	88	82	75	68	36
Loader	105	86	80	73	66	30
Vibratory Plate Compactor	110	91	85	78	71	45
Smooth Drum Roller	103	84	78	71	64	25
Paver	103	84	78	71	64	25
Grader	99	80	74	67	60	13
Bridge Construction Only						
Concrete Truck	107	88	82	75	68	36

Equipment	Sound power level (dB L _{WA})	Free field noise level at varying distances (dB L _{Aeq})				Minimum Setback distance to comply with day-time criteria without mitigation, metres
		5 m	10 m	20 m	50 m	
Cranes	99	80	74	67	60	13
Bored Piling Rig	111	89	83	77	69	49

4.4.2 Activity noise levels

Table 4-4 details the sound power levels for key construction activities, combining the equipment sound power levels detailed in Table 4-3 where multiple items of equipment may be operating simultaneously. Table 4-4 also details the minimum setback distance at which compliance can be achieved for each activity.

Table 4-4 Activity Sound Power Levels and Compliance Distance

Construction Type	Activity Sound Power Level (dB L _{WA})	Minimum set back distance from receivers to comply with day-time limit (70 dB L _{Aeq}) without mitigation, metres
Typical across all works	110	48
Earthworks	111	52
Drainage works	113	56
Pavement Construction	115	76
Bridge Construction	113	55

4.5 Construction Vibration

Vibration generation and propagation is highly site specific. The generation of vibration is dependent on the local site geology, the equipment being used, the nature of the works, and even the operator.

To account for the inaccuracy in the prediction of vibration, the likely worst-case vibration has been calculated based on the equipment and hard ground geology.

Vibration from a source transmits in a spherical pattern and reduces with distance. There will be a particular distance from each source at which the vibration level equals the relevant vibration criteria. This distance is called the 'emission radius'. The vibration criteria and emission radii for high vibration generating equipment are detailed in Table 4-5.

Table 4-5 Vibration sources and indicative emission radii

Equipment	Night-time Occupied Buildings (Waka Kotahi and AT) (0.3 mm/s)	Daytime Occupied Buildings (Waka Kotahi) (1 mm/s)	Daytime Occupied Buildings (AT) (2 mm/s)	DIN 4150 emission radii		
				Historic and Sensitive (2.5 mm/s)	Residential (5 mm/s)	Commercial (10 mm/s)
Roller Compactor	140m	42m	21m	17m	8m	4m
Bored Piling Rig	17m	5m	4m	2m	1m	1m
Excavator	80m	24m	12m	10m	6m	2m
Tipper Truck	16m	5m	2m	2m	1m	0m
Vibratory Plate Compactor	20m	6m	3m	2m	1m	1m

We recommend that vibration measurements are undertaken at specific locations as identified through the CNVMP and schedules at the commencement of construction activities to establish vibration propagation site laws for vibration generating equipment. This approach will confirm the emission radii used in this assessment and ensure the applicable criteria are complied with. It has been found on other major construction projects, that the measured vibration levels for a particular activity are much lower than those predicted during the assessment stage.

5 Existing and Future Receiving Environment

5.1 Planning and Land Use Context

This assessment considers both the existing environment and the likely future receiving environment at the time at which effects will likely occur. It is anticipated the Pukekohe Projects will be constructed between 10 – 20+ years from now, meaning the receiving environment will differ significantly from what is present today. Many of the areas crossed by the NoRs are zoned Future Urban Zone (FUZ) and will change significantly in future. Generally, the projects will not be built until the area has been confirmed for development (through plan changes). For those corridors in the FUZ, construction activities are likely to be in a rural or transitioning to an urban environment.

Table 5-1 Land use likelihood of change based on current and potential future zoning

Land use today	Zoning type	Likelihood of Change for the environment ⁷	Likely Future Environment ⁸
Residential	Residential	Low	Urban
Business	Business	Low	Urban
Open Space	Open Space	Low	Open Space
Special Purpose	Special Purpose Zone	Low	Special Purpose
Rural	Countryside Living	Low	Rural
	Mixed Rural Use	Low	Rural
Greenfield / rural	Future Urban Zone	High	Urban
Greenfield/rural	Residential or Business	High	Urban

The Pukekohe Package covers a range of receiving environments including existing urban, FUZ (currently rural) and rural.

All areas of FUZ have a high likelihood of change in planning and land use context. Existing areas of zoning may see change with further intensification enabled by recent amendments to the National Policy Statement for Urban Development and introduction of Medium Density Residential Standards. No change is anticipated in existing Rural Zones.

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

5.2 Existing Noise Environment

The Pukekohe Transport Network projects cover a large area with a variety of ambient noise environments. Measurements of ambient noise levels were taken in a variety of these environments to inform the assessments as set out in the following sections.

5.2.1 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, 6802 and 6806. This meant the results could adequately inform both the operational and construction noise assessments.

Measurements were undertaken at the following six locations:

- 785 Runciman Road (NoRs 1, 2)
- 77 Sim Road (NoR 2)
- 319E Sim Road (NoRs 2, 3)
- 39 Grace James Road (NoR 4)
- 35-39 Crosbie Road (NoR 5)
- 257 Pukekohe East Road (NoR 8)

The measurement positions were chosen to avoid extraneous factors which could have influenced the sound levels, where practicable. Measurement and calibration details required by NZS 6801 are held on file.

5.2.2 Meteorological Conditions

During the surveys, meteorological data was obtained from Pukekohe Ews (2006) weather station operated by NIWA. This is the closest station where data was available at an hourly resolution or less.

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

5.2.3 Data Analysis

Road traffic and rail on the NIMT were the dominant noise source at all measurement locations. There is a natural variation in the noise environment throughout the day, and often variations for the weekends. 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 at each location was:

- 785 Runciman Road: 61 dB $L_{Aeq(24h)}$ (NoRs 1, 2)
- 77 Sim Road: 51 dB $L_{Aeq(24h)}$ (NoR 2)
- 319E Sim Road: 51 dB $L_{Aeq(24h)}$ (NoRs 2, 3)
- 39 Grace James Road: 41 dB $L_{Aeq(24h)}$ (NoR 4)
- 35-39 Crosbie Road: 56 dB $L_{Aeq(24h)}$ (NoR 5)
- 257 Pukekohe East Road: 65 dB $L_{Aeq(24h)}$ (NoR 8)

6 Assessment of Construction Effects

6.1 Construction effects description – relating to all NoRs

6.1.1 Construction noise

Table 6-1 gives examples of the potential effects on receivers at different noise levels based on NZS6803 with most exposed façades providing a 20 dB reduction. Depending on the construction of the house, facades may provide up to a 25 – 30 dB reduction, therefore assumptions and effects provided below are based on a conservative approach.

Table 6-1 Potential construction noise effects on receivers

External Noise Level	Potential Daytime Effects Outdoors	Corresponding Internal Noise Level	Potential Daytime Effects Indoors
65 dB L_{Aeq}	Conversation becomes strained, particularly over longer distances	45 dB L_{Aeq}	Noise levels would be noticeable but unlikely to interfere with residential or office daily activities.
65 to 70 dB L_{Aeq}	People would not want to spend any length of time outside, except when unavoidable through workplace requirements	45 to 50 dB L_{Aeq}	Concentration would start to be affected. TV and telephone conversations would begin to be affected.
70 to 75 dB L_{Aeq}	Businesses that involve substantial outdoor use (for example garden centres) would experience considerable disruption.	50 to 55 dB L_{Aeq}	Phone conversations would become difficult. Personal conversations would need slightly raised voices. Office work can generally continue, but 55 dB is considered by the experts to be a tipping point for offices. For residential activity, TV and radio sound levels would need to be raised.
75 to 80 dB L_{Aeq}	Some people may choose protection for long periods of exposure. Conversation would be very difficult, even with raised voices.	55 to 60 dB L_{Aeq}	Continuing office work would be extremely difficult and become unproductive. In a residential context, people would actively seek respite.
80 to 90 dB L_{Aeq}	Hearing protection would be required for prolonged exposure (8 hours at 85	60 to 70 dB L_{Aeq}	Untenable for both office and residential environments. Unlikely to

External Noise Level	Potential Daytime Effects Outdoors	Corresponding Internal Noise Level	Potential Daytime Effects Indoors
	dB) to prevent hearing loss.		be tolerated for any extent of time.

With effective management of construction activities, which includes consultation and communication with affected parties, and scheduling noisy works during the daytime rather than night-time period, noise levels can be controlled for each of the Projects so that the effects on the nearest residential receivers are reduced. Barriers will not be effective at all locations, particularly where receivers are more than one storey high. Where barriers are not going to be effective, the use of enclosures or local screening of equipment should be considered and implemented, where practicable. If noisy activities must take place during the night-time, and screening or other mitigation measures do not provide sufficient attenuation to meet the night-time noise criteria or are not practicable, it may be necessary to offer temporary relocation to affected residents. Temporary relocation should be considered on a case-by-case basis and as a last resort.

6.1.2 Construction Vibration

The vibration effects associated with construction of the Projects are considered in terms of human response and building damage. However, in our experience the main concern for building occupants during construction is damage to the building itself.

Humans can generally perceive vibrations at a much lower level than when building damage is likely to occur. The adverse effects of construction vibration on building occupants may be significant in some buildings adjacent to the areas of works. Adverse effects may range from annoyance to loss of amenity or inability to carry out work. Vibration effects will reduce with distance from the source, and the level of vibration transmission into a building will depend on a number of factors, such as the foundation type and building construction.

Potential effects and human perception of the vibration levels found within the AUP:OP / DIN criteria have been combined below and adopted for this assessment.

Table 6-2 Potential vibration effects on human perception summary against AUP:OP / DIN criteria

Vibration level (mm/s PPV)	Potential effects Indoors
0.14 mm/s	The threshold of perception for stationary people. Just perceptible in particularly sensitive environments.
0.3 mm/s	Can be just perceptible during normal residential activities, particularly for more sensitive receivers. Levels above may wake most people from their sleep. This is the AUP:OP limit for construction vibration generated at night-time for sensitive receivers.
1 mm/s	Is typically tolerable with prior notification. Complaint or adverse reaction is likely in office or residential environments, particularly if there is no prior warning. What people actually feel would be subject to the source but could include a steady vibration from

Vibration level (mm/s PPV)	Potential effects Indoors
	sources such as vibratory compaction, or a small jolt such as from the movement of a large digger either of which could rattle crockery and glassware. Sleep disturbance would be almost certain for most people.
2 mm/s	Vibration would clearly be felt. However, it can typically be tolerated in indoor environments such as offices, houses and retail if it occurs intermittently during the day and where there is effective prior engagement. Effects experienced would be somewhere between levels of 1 and 5 mm/s. This is the AUP:OP limit for large construction projects generating vibration.
5 mm/s	Unlikely to be tolerable in a workplace. Highly unsettling for both workplaces and dwellings. If exposure is prolonged, some people may want to leave the building. Computer screens would shake and items could fall off shelves if they are not level. This is the threshold below which no cosmetic damage will occur in the DIN standard.
10 mm/s	Likely to be intolerable for anything other than a very brief exposure.

The AUP:OP sets the criteria for amenity to 2 mm/s during the day, and the Guide sets the criteria for amenity to 1 mm/s during the day. Based on the worst-case source of a roller compactor, any receiver within a 21m radius of the construction area may experience vibration of 2 mm/s inside their property, and any receiver within a 42m radius of the construction area may experience vibration of 1 mm/s inside their property. Whilst at this level building damage is highly unlikely to occur, human perception may result in slight concerns but can generally be tolerated if activity occurs intermittently and with prior notice.

The AUP:OP and the Guide set the night-time vibration criterion at 0.3 mm/s. At this level, the emission radii could be up to 140m from construction areas, and at this level people could feel slight vibrations especially during the night-time, which may cause sleep disturbance. High vibratory activities should therefore be avoided, where practicable, during the night-time and careful management of the type of equipment used at night should be included within the CNVMP (refer Section 6.3.1).

Construction vibration effects generally have a short timeframe, typically a few days at a time. The use of high vibratory equipment, such as a roller compactor, should be managed through a CNVMP to limit potential vibration effects, and alternative equipment with lower vibratory effect should be used where practicable.

6.2 Construction noise and vibration effects – relating to specific NoRs

While the assessment focuses on existing receivers, it comments on potential future receivers also. Construction noise and vibration is assessed for all receivers present at the time of construction. Any management of effects will be set out in the CNVMP that will be produced at the time.

6.2.1 NoR 1 Drury West Arterial

6.2.1.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundary with the closest receivers being 10m from the potential works. High noise generating activities may not occur right on the construction boundary but if they do, around 6 existing receivers could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, noise levels of up to 77 dB L_{Aeq} could still occur intermittently at the closest receivers, if high noise generating activities occur on the construction boundary. At this level effects are likely to include loss of concentration, annoyance, and a reduction in speech intelligibility. We note that the existing receivers may not be present at the time of construction, particularly considering this Project is located within the FUZ.

Future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce. The worst-case situations are not expected to be frequent, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works. Mitigation in the form of barriers can achieve noise level reductions of about 10 decibels. It is therefore predicted that mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.1.2 Construction Vibration Effects

Existing receivers near the Drury West Arterial are predominately residential type structures. Vibration levels are predicted to meet the Category B criteria at the existing receivers. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

The daytime Category A vibration amenity criteria could be exceeded in existing or future buildings if they are occupied during the works and within 21 m of the roller compactor or within the emission radii

identified for the other vibration generating equipment in Table 4-5. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.2.2 NoR 2 Drury-Pukekohe Link

6.2.2.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundary with the closest receivers being less than 2m from the potential works. High noise generating activities may not occur right on the construction boundary but if they do, 39 existing receivers could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, a noise levels over 85 dB L_{Aeq} could still occur intermittently at the closest receiver at 491 Sim Road, which is approximately 1.5m from the closest earthworks. At this level effects are likely to include loss of concentration, annoyance, and a reduction in speech intelligibility, as well as seeking respite in rooms facing away from construction. Noise effects will need to be managed at this receiver during times when works are particularly close, through the CNVMP and Schedules.

For the majority of receivers, highest noise levels would be around 70 to 75 dB L_{Aeq} . We note that the existing receivers may not be present at the time of construction, particularly considering this Project is located in part within the FUZ.

Future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce. The worst-case situations are not expected to be frequent, due to the setback distances to most of the proposed works. Mitigation in the form of barriers can achieve noise level reductions of about 10 decibels. It is therefore predicted that mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.2.2 Construction Vibration Effects

Existing receivers near the proposed Drury-Pukekohe Link are predominately residential type structures. Vibration levels are predicted to exceed the Category B criteria at two buildings prior to mitigation being implemented. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

The daytime Category A vibration amenity criteria is predicted to be exceeded at 17 buildings, and notification and management are required. The Category A criteria could be exceeded at future buildings if they are occupied during the works and within 21 m of the roller compactor or within the emission radii identified for the other vibration generating equipment in Table 4-5. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.2.3 NoR 3 Paerata Connections

6.2.3.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundary with the closest receivers being approximately 26m from the potential works. High noise generating activities may not occur right on the construction boundary but if they do, one existing receiver could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, noise levels are predicted to comply with the daytime noise criteria at all existing receivers.

Future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.3.2 Construction Vibration Effects

Existing receivers near the proposed Paerata Connections are predominately residential type structures. Vibration levels are predicted to meet the Category B criteria at the existing receivers. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

The daytime Category A vibration amenity criteria is predicted to be met at all existing receivers. The Category A criteria could be exceeded in future buildings if they are occupied during the works and within 21 m of the roller compactor or within the emission radii identified for the other vibration generating equipment in Table 4-5. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.2.4 NoR 4 Pukekohe North-East Arterial

6.2.4.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundary with the closest receivers being approximately 3m from the potential works. High noise generating activities may not occur right on the construction boundary but if they do, around 17 existing receivers could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, noise levels over 85 dB L_{Aeq} could still occur intermittently at the closest receivers, if high noise generating activities occur on the construction boundary. At this level effects are likely to include loss of concentration, annoyance, and a reduction in speech intelligibility. We note that the existing receivers may not be present at the time of construction, particularly considering this Project is located in part within the FUZ.

Future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce. The worst-case situations are not expected to be frequent, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works. Mitigation in the form of barriers can achieve noise level reductions of about 10 decibels. It is therefore predicted that mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.4.2 Construction Vibration Effects

Existing receivers near the Pukekohe North-East Arterial are predominately residential type structures. Three existing dwellings may experience vibration levels above 5mm/s PPV, exceeding the daytime Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. One commercial receiver is predicted to exceed the 10mm/s PPV daytime criteria. The addresses of receivers where the Category B criteria may be exceeded are listed in Appendix B. Once the compactor is 8m away from the dwellings the Category B criterion will be met. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

Without mitigation, at these receivers there is potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. Mitigation such as the use of non-vibratory compaction equipment within 8m of buildings is recommended to avoid potential cosmetic damage.

The daytime Category A vibration amenity criteria could be exceeded in existing or future buildings if they are occupied during the works and within 21m of the roller compactor or within the emission radii identified for the other vibration generating equipment in Table 4-5. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.2.5 NoR 5 Pukekohe South-East Arterial

6.2.5.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundary with the closest receivers being approximately 2m from the potential works. High noise generating activities may not occur right on the construction boundary but if they do, around 68 existing receivers could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, noise levels over 85 dB L_{Aeq} could still occur intermittently at the closest receivers, if high noise generating activities occur on the construction boundary. At this level effects are likely to include loss of concentration, annoyance, and a reduction

in speech intelligibility. We note that the existing receivers may not be present at the time of construction, particularly considering this Project is located in part within the FUZ.

Future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce. The worst-case situations are not expected to be frequent, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works. Mitigation in the form of barriers can achieve noise level reductions of about 10 decibels. It is therefore predicted that mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.5.2 Construction Vibration Effects

Existing receivers near Pukekohe South-East Arterial are mix between commercial and residential type structures. Eight existing dwellings may experience vibration levels above 5mm/s PPV, exceeding the daytime Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. Two existing commercial receivers may experience vibration levels above the 10mm/s PPV daytime criteria. The addresses of receivers where the Category B criteria may be exceeded are listed in Appendix B. Once the compactor is 8m away from the dwellings and 4m from the commercial receivers the Category B criteria will be met. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

Without mitigation, at these receivers there is potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. Mitigation such as the use of non-vibratory compaction equipment within 8m of buildings is recommended to avoid potential cosmetic damage.

The daytime Category A vibration amenity criteria could be exceeded in existing or future buildings if they are occupied during the works and within 21 m of the roller compactor or within the emission radii identified for the other vibration generating equipment in Table 4-5. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.2.6 NoR 6 Pukekohe South-West Upgrade

While works for this NoR will take place along the existing road corridor, construction noise and vibration effects were only assessed for the areas relevant to this assessment, i.e. within the proposed designation boundary.

6.2.6.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundaries with the closest receivers being less than 2m from the potential works. High noise generating activities may not occur right on the construction boundaries but if they do, around 216 existing receivers could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, noise levels of over 85 dB L_{Aeq} could still occur intermittently at the closest receivers, if high noise generating activities occur on the construction boundary. At this level effects are likely to include loss of concentration, annoyance, and a reduction in speech intelligibility. We note that the existing receivers may not be present at the time of construction, particularly considering this Project is located in part within the FUZ.

Future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce. The worst-case situations are not expected to be frequent, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works. Mitigation in the form of barriers can achieve noise level reductions of about 10 decibels. It is therefore predicted that mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.6.2 Construction Vibration Effects

Existing receivers near the Pukekohe South-West Upgrade are predominately residential type structures with a few commercial type structures. 19 existing dwellings may experience vibration levels above 5mm/s PPV, exceeding the daytime Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. One commercial receiver may experience vibration levels that exceeds the 10mm/s PPV daytime criteria. One historic/vibration sensitive structure (the Nehru Hall) may experience vibration levels that exceeds the 2.5 mm/s PPV long-term vibration criterion set out in DIN70 4150-3:1999. The addresses of receivers where the Category B criteria may be exceeded are listed in Appendix B. Once the compactor is 17m away from

the historic structure, 8m away from the dwellings and 4m from the commercial receivers the Category B criteria will be met. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

Without mitigation, at these receivers there is potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. Mitigation such as the use of non-vibratory compaction equipment within 8m of buildings is recommended to avoid potential cosmetic damage.

The daytime Category A vibration amenity criteria could be exceeded in existing or future buildings if they are occupied during the works and within 21 m of the roller compactor or within the emission radii identified for the other vibration generating equipment in Table 4-5. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.2.7 NoR 7 Pukekohe North-West Arterial

6.2.7.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundary with the closest receivers being less than 2m from the potential works. High noise generating activities may not occur right on the construction boundary but if they do, around 41 existing receivers could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, noise levels of over 85 dB L_{Aeq} could still occur intermittently at the closest receivers, if high noise generating activities occur on the construction boundary. At this level effects are likely to include loss of concentration, annoyance, and a reduction in speech intelligibility. We note that the existing receivers may not be present at the time of construction, particularly considering this Project is located in part within the FUZ.

Future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce. The worst-case situations are not expected to be frequent, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works. Mitigation in the form of barriers can achieve noise level reductions of about 10 decibels. It is therefore predicted that

mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.7.2 Construction Vibration Effects

Existing receivers near Pukekohe North-West Arterial are predominately residential type structures. Three existing dwellings may experience vibration levels above 5mm/s PPV, exceeding the daytime Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. No commercial receivers are predicted to exceed the 10mm/s PPV daytime criterion. The addresses of receivers where the Category B criterion may be exceeded are listed in Appendix B. Once the compactor is 8m away from the dwellings the Category B criteria will be met. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

Without mitigation, at these receivers there is potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. Mitigation such as the use of non-vibratory compaction equipment within 8m of buildings is recommended to avoid potential cosmetic damage.

The daytime Category A vibration amenity criteria could be exceeded in existing or future buildings if they are occupied during the works and within 21 m of the roller compactor or within the emission radii identified for the other vibration generating equipment in Table 4-5. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.2.8 NoR 8 Mill Road and Pukekohe East Road Upgrade

6.2.8.1 Construction Noise Effects

Existing receivers are located at varying distances from the construction boundary with the closest receivers being less than 2 m from the potential works. High noise generating activities may not occur right on the construction boundary but if they do, around 41 existing receivers could experience noise levels that exceed the daytime noise criterion without mitigation. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 6.3, a noise levels over 85 dB L_{Aeq} could still occur intermittently at the closest receivers, if high noise generating activities occur on the construction

boundary. At this level effects are likely to include loss of concentration, annoyance, and a reduction in speech intelligibility, as well as seeking respite in rooms facing away from construction. Noise effects will need to be managed at this receiver during times when works are particularly close, through the CNVMP and Schedules.

Should future receivers constructed within 76m of the works could experience noise levels that exceed the 70 dB L_{Aeq} noise criterion during high noise generating activities such as the pavement works, without mitigation implemented.

Operation of construction equipment will be intermittent in nature. Construction will likely be linear so as the equipment moves away from the receiver, noise levels will reduce. The worst-case situations are not expected to be frequent, due to the setback distances to most of the proposed works and the use of equipment with lower source noise levels for large portions of the works (i.e. where the active mode transport facilities are constructed). Mitigation in the form of barriers can achieve noise level reductions of about 10 decibels. It is therefore predicted that mitigated noise levels can comply with the 70 dB L_{Aeq} noise criterion for most of the construction works.

If a critical activity has to be carried out during the night-time in close proximity to residential receivers, consultation and mitigation measures will be essential. The use of noisy equipment should be avoided, where practicable, to prevent sleep disturbance. Any night-time works are likely to be limited in duration and will be managed through the CNVMP (as per Section 6.3.1) and a Schedule (as per Section 6.3.2).

6.2.8.2 Construction Vibration Effects

Existing receivers near the Mill Road and Pukekohe East Road upgrades are predominately residential type structures. Vibration levels are predicted to exceed the Category B criteria at nine existing receivers prior to mitigation being implemented. The Category B criteria would be met at future residential structures that are 8m or more from the proposed works and commercial structures that are 4m or more from the proposed works.

The daytime Category A vibration amenity criteria could be exceeded in existing or future buildings if they are occupied during the works and within 21m of the roller compactor or within the emission radii identified for the other vibration generating equipment in Table 4-6. The effect on receivers would be subject to their respective proximity to the works but could include steady vibration from the roller compactor or a small jolt from a digger which could rattle crockery and glassware.

Vibration can typically be tolerated inside buildings if it occurs intermittently during the day, is of limited duration and where there is effective prior engagement.

High vibration generating activities should not occur during the night-time in close proximity to residential receivers to avoid sleep disturbance, unless it is a critical activity and there is no alternative.

It should also be noted that the emission radii are conservative and vibration levels measured on site tend to be much lower than those predicted at the NoR stage of a project.

6.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

6.3.1 Construction Noise and Vibration Management Plan

Implementing noise management and mitigation measures via a CNVMP is the most effective way to control construction noise and vibration impacts. A CNVMP is recommended as a condition on all of the proposed designations (NoRs 1 – 8 (AC and WDC)). The objective of the CNVMP provides a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction. AUP:OP Rule E25.6.29(5) sets out the minimum level of information that must be provided in a CNVMP. The Guide also sets out information that should be included in a CNVMP. Accordingly, as a minimum, we recommend that the CNVMP includes the following content:

- Description of the works and anticipated equipment/processes;
- Hours of operation, including times and days when construction activities would occur;
- The construction noise and vibration standards for the Project;
- Identification of receivers where noise and vibration standards apply;
- Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved;
- Methods and frequency for monitoring and reporting on construction noise and vibration, including:
 - Updating the predicted noise and vibration levels based on the final methodology and construction activities;
 - Confirming which buildings will be included in a pre and post building condition survey;
 - Identifying appropriate monitoring locations for receivers of construction noise and vibration;
 - Procedures to respond to complaints received on construction noise and vibration, including methods to monitor and identify noise and vibration sources;
 - Procedure for responding to monitored exceedances; and
 - Procedures for monitoring construction noise and vibration and reporting to the Auckland Council Consent Monitoring officer.
- Procedures for maintaining contact with stakeholders, notifying of proposed construction activities, the period of construction activities, and handling noise and vibration complaints;
- Contact details of the site supervisor or Project manager and the Requiring Authority's Project Liaison Person (phone, postal address, email address);
- Procedures for the regular training of the operators of construction equipment to minimise noise and vibration as well as expected construction site behaviours for all workers;
- Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction Noise and/or Vibration Management Schedule will be required;
- Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys; and
- Procedures and timing of reviews of the CNVMP.

6.3.2 Schedules

In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules (“Schedules”) where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin. A schedule to the CNVMP provides a specific assessment of an activity and/or location and should include details such as:

- Activity location, start and finish dates;
- The nearest neighbours to the activity;
- A location plan;
- Predicted noise/vibration levels and BPO mitigation for the activity and/or location;
- Communication and consultation with the affected neighbours;
- Location, times and type of monitoring; and
- Any pre-condition survey of buildings predicted to receive vibration levels approaching the Category B vibration limits, which document their current condition and any existing damage.

6.3.3 Noise mitigation measures

A hierarchy of mitigation measures will be adopted through the CNVMP and Schedules (where produced), as follows:

- Managing times of activities to avoid night works and other sensitive times;
- Liaising with neighbours so they can work around specific activities;
- Selecting equipment and methodologies to restrict noise;
- Using screening/enclosures/barriers; and
- Offering neighbours temporary relocation.

By following this hierarchy, the BPO for mitigation will be implemented, whilst avoiding undue disruption to the community. In particular, temporary relocation of neighbours can cause significant inconvenience and should only be offered where other options have been exhausted and noise levels still require mitigation.

Some activities are likely to be set back a considerable distance from the nearest receivers and require very little or no mitigation to achieve compliance with the relevant Project noise limits. Alternative methodologies, such as careful equipment selection and use of noise barriers or localised screening (e.g. for concrete cutting) may be suitable management and mitigation measures and should be implemented where they are practicable and effective.

6.3.4 Vibration mitigation

Similarly to noise, a hierarchy of vibration mitigation measures will be adopted through the CNVMP and Schedules (where produced) as follows:

- Managing times of activities to avoid night works and other sensitive times (communicated through community liaison);
- Liaising with neighbours so they can work around specific activities;
- Operating vibration generating equipment as far from sensitive sites as possible;
- Selecting equipment and methodologies to minimise vibration;
- Offering neighbours temporary relocation; and

- In specific situations, a cut-off trench may be used as a vibration barrier if located close to the source.

In general, there are less options available to mitigate vibration propagation and insulate receiver buildings, compared to noise. Mitigation will therefore focus on scheduling of activities, effective communication with neighbours, and selection of appropriate equipment and methods, where practicable.

Appropriate vibration mitigation measures for each activity will be listed in the CNVMP and Schedules (where produced).

6.3.5 Building Condition Survey

A detailed building precondition survey should be undertaken by a suitably qualified engineer prior to the start of construction at all buildings where the daytime Category B vibration criteria may be exceeded. The survey shall include, but not be limited to, the following:

- Determination of building classification: commercial, industrial, residential or a historic or sensitive structure;
- Determination of building specific vibration damage risk thresholds; and
- Recording (including photographs) the major features of the buildings including location, type, construction (including foundation type), age and present condition, including existing levels of any aesthetic damage or structural damage.

A post-construction condition survey of the same buildings shall be conducted when construction is completed, and any damage shown to have been caused by the Project construction rectified by the Project Team.

6.3.6 Night Works

Night works have the potential to cause the greatest disturbance to residents and should be avoided where possible. However, it is possible that night works will be required during the construction period for critical activities. Before night works are programmed, it is important to determine if there are alternative options that would avoid working at night and, if so, whether those options are technically and practicably feasible.

Where there are no practicable alternative options to night works, it may be necessary to implement enhanced noise and vibration management measures, but this will depend on the location of the worksite and the proposed activities.

When work must be carried out at night, it may be necessary to:

- Increase the frequency of communications with stakeholders; and
- Carry out regular noise and vibration monitoring to confirm noise and vibration levels; or
- Offer temporary relocation to neighbours if unreasonable noise and/or vibration levels cannot be avoided.

7 Conclusion

An assessment of the construction noise and vibration effects due to the Pukekohe Transport Network has been undertaken considering a worst-case scenario. The predicted noise and vibration levels and effects are based on indicative information as provided by the Project team and any assessment conclusions will be confirmed during the detailed design stage, taking account of the final equipment selections, methodology and receivers as they exist at the time of construction.

Construction noise and vibration can be mitigated and managed, utilising the measures set out in Section 6.3, to comply with the applicable limits for the majority of the works. Exceedances of the criteria could occur intermittently across all NoRs, if high noise or vibration generating equipment is used near occupied buildings. The most impacted receivers are located within 10m of the construction boundary.

Night works will be limited to critical activities that cannot be carried out at any other time.

A CNVMP is recommended as a condition on the proposed designations and will be prepared prior to construction commencing in accordance with Section 6.3.1. The CNVMP will provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects of construction noise and vibration on receivers that exist at the time of construction. Communication and consultation will occur with the affected receivers and Schedules will be prepared if required.

Elevated noise levels should be avoided and mitigated where possible to reduce the likelihood of adverse effects such as loss of concentration, annoyance and sleep disturbance (for night works).

Whilst vibration levels at the daytime Category A criteria (2mm/s PPV for AT projects, 1mm/s PPV for Waka Kotahi projects) can generally be tolerated if activity occurs intermittently and with prior notice, communication and consultation will be the key management measure to avoid annoyance and concern. Where vibration levels are predicted to exceed the Category B criteria, and where the construction methodology cannot be changed to reduce vibration levels, building condition surveys are recommended.

Overall, construction noise and vibration can be controlled for all NoRs to reasonable levels with the implementation of appropriate mitigation and management measures.

Appendix A

Receivers predicted to receive noise levels
exceeding 70 dB LAeq

NoR 1 – Drury West Arterial

Address	Building Type/Structure
598 Burtt Road, Runciman	Residential
110 Karaka Road, Karaka	Residential
160 Karaka Road, Karaka	Residential
588 Burtt Road, Runciman	Residential
801 Runciman Road, Runciman	Residential
813 Runciman Road, Runciman	Residential



Assessment Area

NoR1 Construction Area

Buildings

- Activity sensitive to noise
- Other buildings

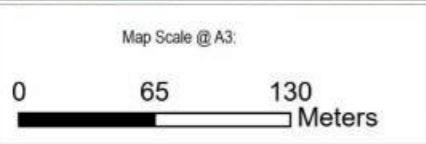
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Revision	Author	Verified	Approved	Date
1	Author	DRAFT	DRAFT	02/09/2022

Supporting Growth

NoR 1 - Pukekohe Construction Noise Envelopes

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

Client: **Supporting Growth**

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Discipline: **GIS**

Drawing No: **SGA-NOR-1-000**

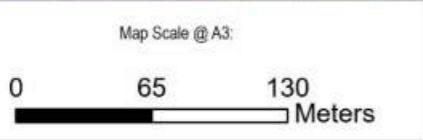


Map Scale @ A3: 0 65 130 Meters		Revision Author Verified Approved Date	Supporting Growth NoR 1 - Pukekohe Construction Noise Envelopes <small>Working Plans of Te Tupu Ngatahi For the purpose of INTERNAL workshops (not for wider distribution)</small>	Client: Supporting Growth		Discipline: GIS
		f Author DRAFT DRAFT aa/mm/yyyy		Project: Pukekohe Package		Drawing No: SGA-NOR-1-000



— Assessment Area
 NoR1 Construction Area
Buildings
 Activity sensitive to noise
 Other buildings

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1	Author	DRAFT	DRAFT	aa/mm/yyyy	

Supporting Growth
NoR 1 - Pukekohe Construction Noise Envelopes
Working Plans of Te Tupu Ngātahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client:	Supporting Growth
Project:	Pukekohe Package

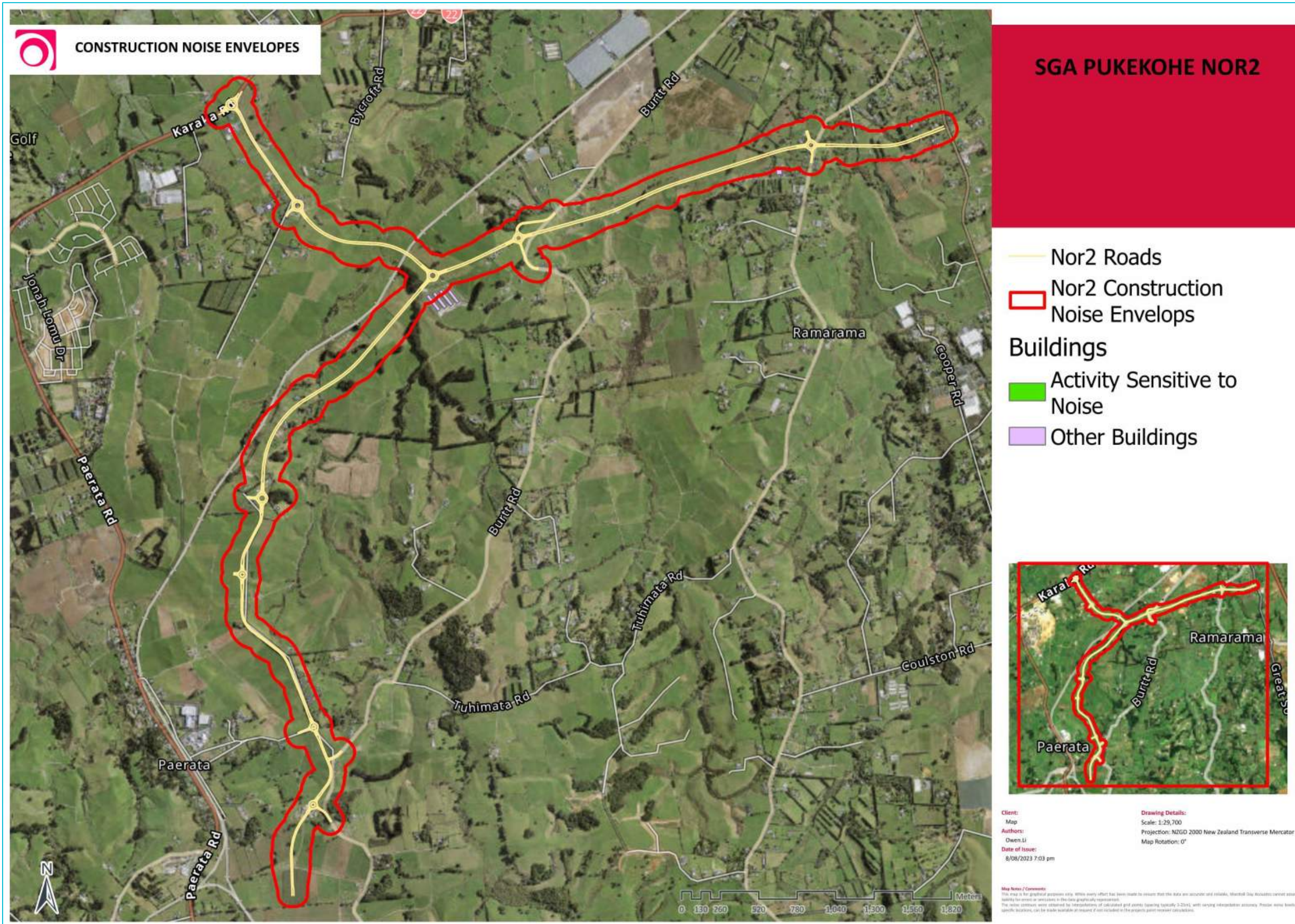


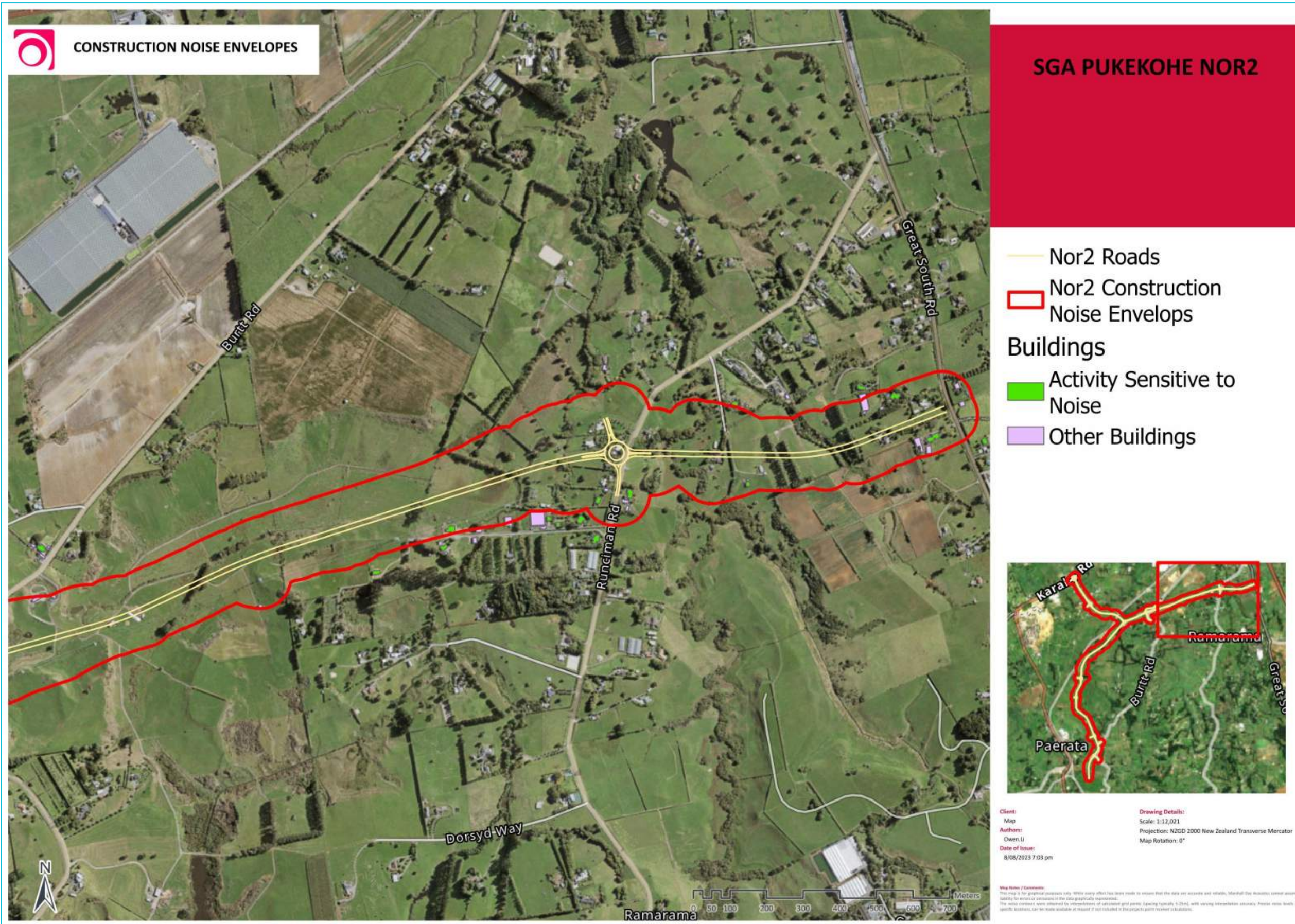
Discipline:	GIS
Drawing No:	SGA-NOR-1-000

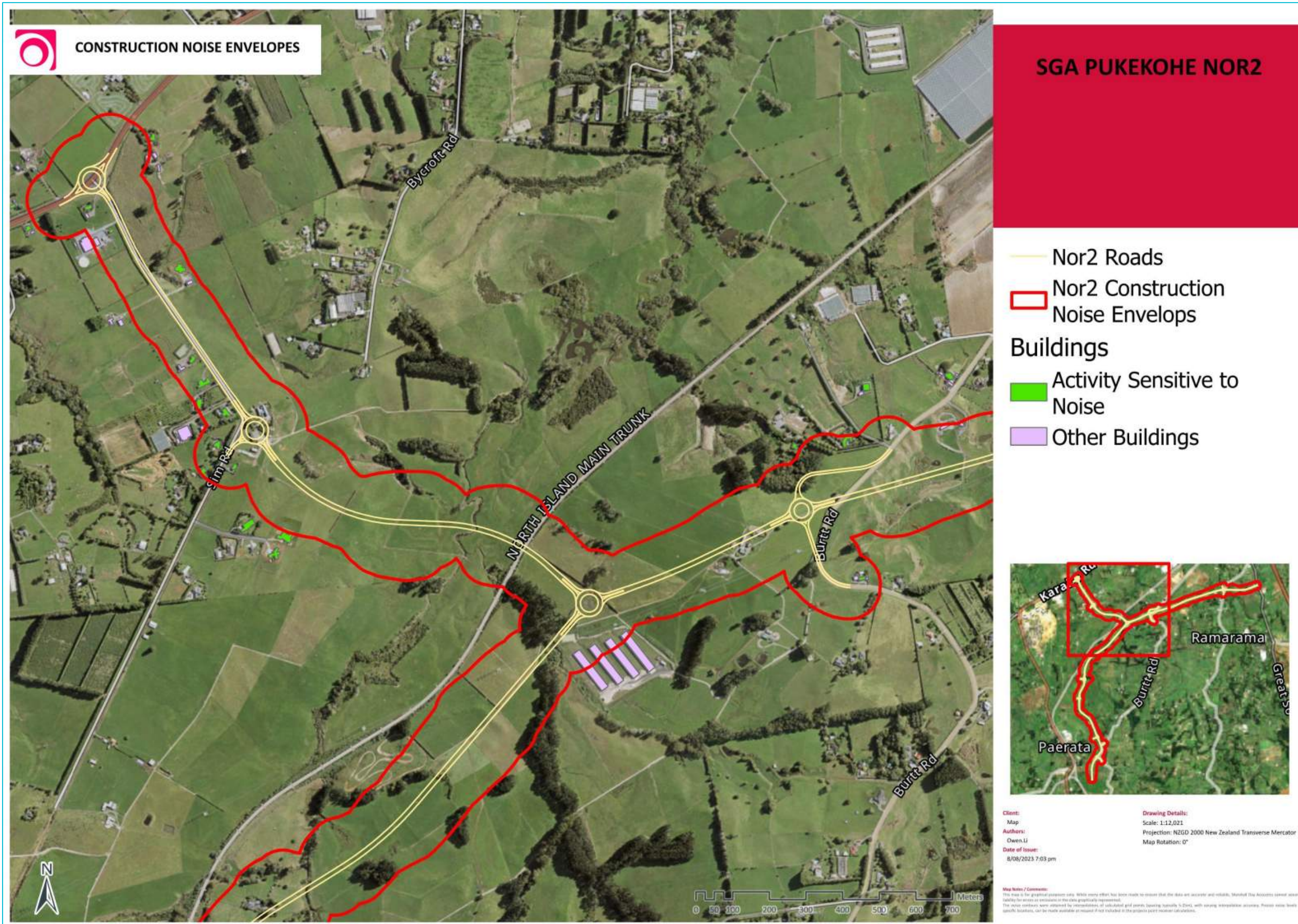
NoR 2 – Drury to Pukekohe Link

Address	Building Type/Structure
338 Burt Road, Runciman	Residential
375 Burt Road, Runciman	Commercial
414 Burt Road, Runciman	Garage/Storage
393A Burt Road, Runciman	Residential
393B Burt Road, Runciman	Residential
287 Cape Hill Road, Pukekohe	Residential
334 Cape Hill Road, Pukekohe	Residential
11 Crown Road, Paerata	Garage/Storage
1222 Great South Road, Runciman	Garage/Storage
1233 Great South Road, Runciman	Garage/Storage
1236 Great South Road, Runciman	Residential
1245 Great South Road, Runciman	Garage/Storage
1246 Great South Road, Runciman	Residential
501 Karaka Road, Karaka	Garage/Storage
5 Ngakoroa Road, Runciman	Garage/Storage
21A Ngakoroa Road, Runciman	Residential
744 Runciman Road, Runciman	Residential
767 Runciman Road, Runciman	Residential
775 Runciman Road, Runciman	Residential
12 Sim Road, Karaka	Residential
31 Sim Road, Karaka	Residential
54 Sim Road, Karaka	Residential
60 Sim Road, Karaka	Residential

Address	Building Type/Structure
68 Sim Road, Karaka	Residential
72 Sim Road, Karaka	Residential
83 Sim Road, Paerata	Residential
90 Sim Road, Paerata	Residential
94 Sim Road, Paerata	Residential
111 Sim Road, Paerata	Residential
325 Sim Road, Paerata	Garage/Storage
328 Sim Road, Paerata	Residential
393 Sim Road, Paerata	Residential
401 Sim Road, Paerata	Residential
447 Sim Road, Paerata	Residential
465 Sim Road, Paerata	Residential
469 Sim Road, Paerata	Residential
479 Sim Road, Paerata	Residential
481 Sim Road, Paerata	Residential
491 Sim Road, Paerata	Residential



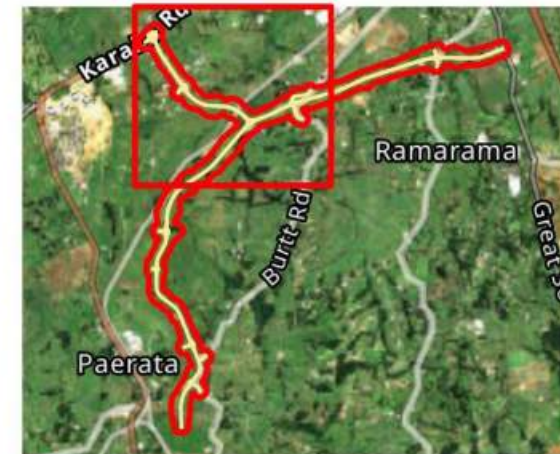




CONSTRUCTION NOISE ENVELOPES

SGA PUKEKOHE NOR2

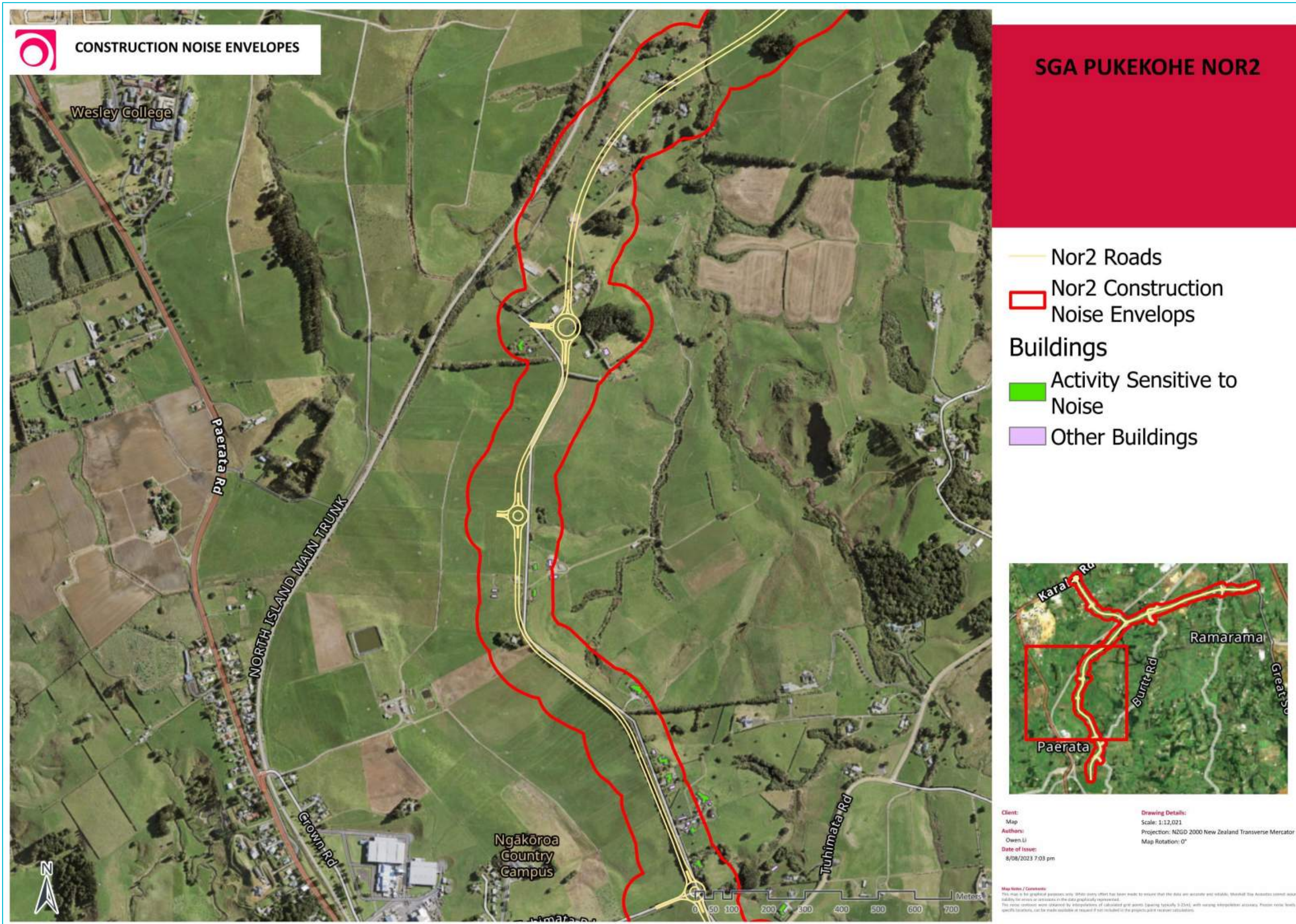
- Nor2 Roads
- Nor2 Construction Noise Envelopes
- Buildings**
- Activity Sensitive to Noise
- Other Buildings

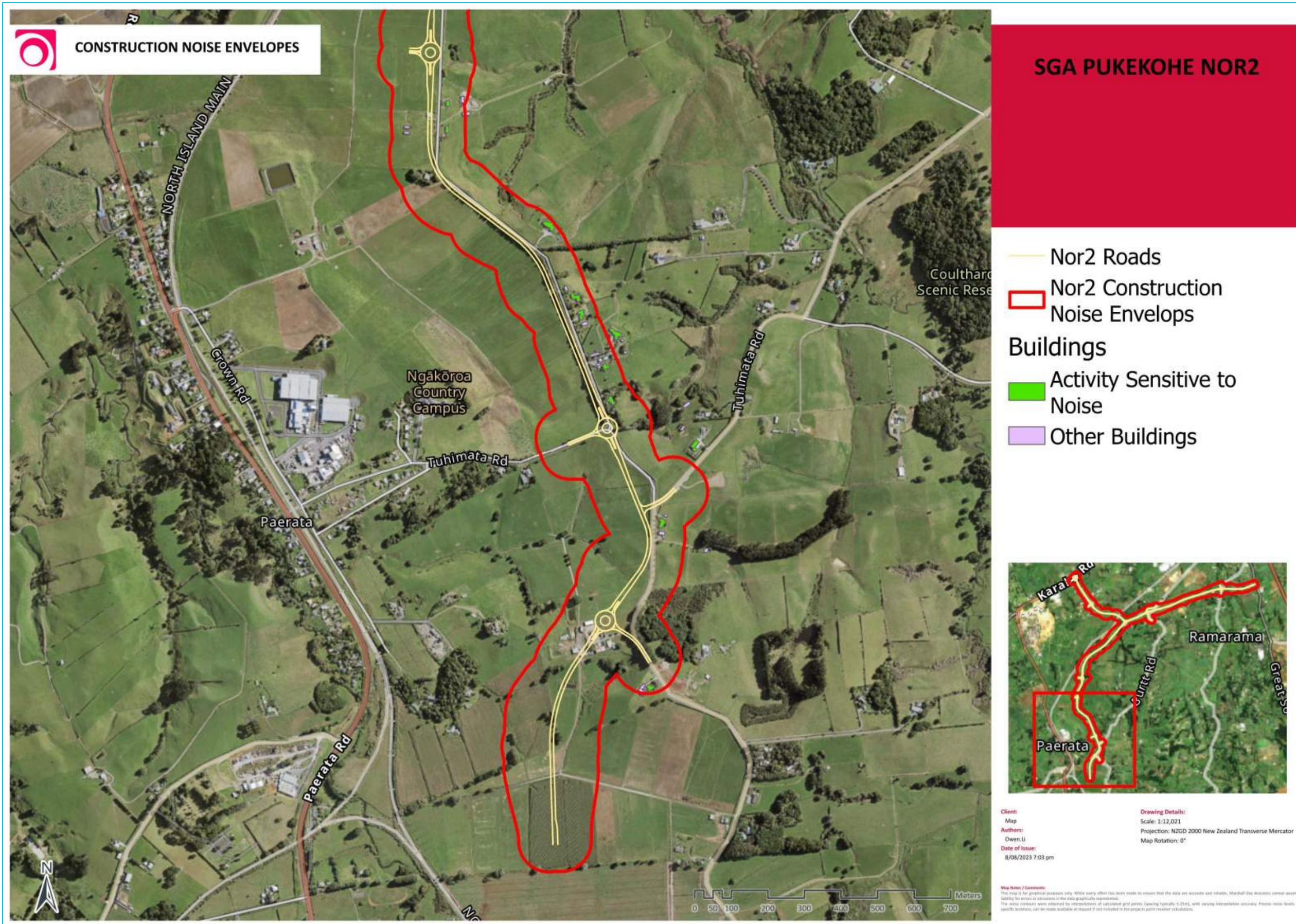


Client: Map
 Authors: Owen Li
 Date of Issue: 8/08/2023 7:03 pm

Drawing Details:
 Scale: 1:12,021
 Projection: NZGD 2000 New Zealand Transverse Mercator
 Map Rotation: 0°

Map Notes / Comments:
 This map is for general information only. While every effort has been made to ensure that the data are accurate and reliable, Manatū Ahu Matua cannot accept liability for errors or omissions in the data graphically represented. The noise contours were obtained by interpolation of calculated grid points, having a radius of 50m, with varying interpolation accuracy. Please note that at specific locations, can be made available as measured if not included in the project point receiver calculations.





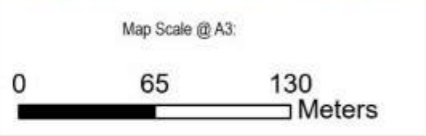
NoR 3 – Paerata Connections

Address	Building Type/Structure
328 Sim Road, Paerata	Residential



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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Supporting Growth
NoR 3 - Pukekohe Construction Noise Envelopes
Working Plans of Te Tupu Ngatahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**

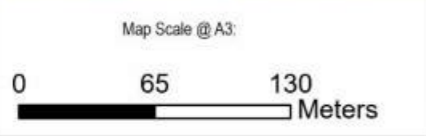


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 Drawing No: **SGA-NOR-P3-000**



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P3-000**

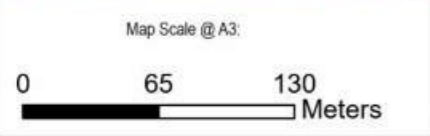
NoR 4 – Pukekohe North East Arterial

Address	Building Type/Structure
107 Pukekohe East Road, Pukekohe	Residential
230 Cape Hill Road, Pukekohe	Residential
1210 Paerata Road, Pukekohe	Residential
100 Pukekohe East Road, Pukekohe	Residential
1217 Paerata Road, Pukekohe	Residential
235A Cape Hill Road, Pukekohe	Residential
106 Pukekohe East Road, Pukekohe	Residential
131 Pukekohe East Road, Pukekohe	Commercial
112A Pukekohe East Road, Pukekohe	Residential
10 Butcher Road, Pukekohe	Residential
98B Pukekohe East Road, Pukekohe	Residential
1214 Paerata Road, Pukekohe	Residential
39 Grace James Road, Pukekohe	Residential
43 Grace James Road, Pukekohe	Residential
240 Cape Hill Road, Pukekohe	Residential
98A Pukekohe East Road, Pukekohe	Residential
1219 Paerata Road, Pukekohe	Commercial



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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 Project: **Pukekohe Package**

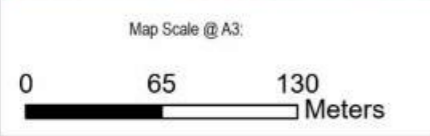


Discipline: **GIS**
 Drawing No: **SGA-NOR-P4-000**



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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1	Author	DRAFT	DRAFT	02/09/2022	

Supporting Growth
NoR 4 - Pukekohe Construction Noise Envelopes
 Working Plans of Te Tupu Ngatahi
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 Project: **Pukekohe Package**

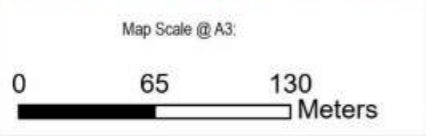


Discipline: **GIS**
 Drawing No: **SGA-NOR-P4-000**



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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 Project: **Pukekohe Package**



Discipline: **GIS**
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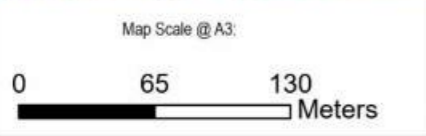


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		f Author DRAFT DRAFT 00/00/0000	Project: Pukekohe Package	Drawing No: SGA-NOR-P4-000		



Construction Area
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Buildings
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 Other buildings

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 Project: **Pukekohe Package**

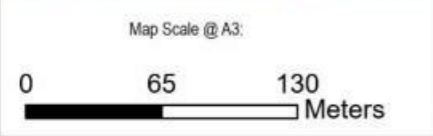


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Client:	Supporting Growth
Project:	Pukekohe Package



Discipline:	GIS
Drawing No:	SGA-NOR-P4-000

NoR 5 – Pukekohe South-East Arterial

Address	Building Type/Structure
78 Golding Road, Pukekohe	Residential
33 Crosbie Road, Pukekohe	Commercial
12 Pukekohe East Road, Pukekohe	Residential
7 Wrightson Way, Pukekohe East	Commercial
107A Golding Road, Pukekohe	Commercial
18 Pukekohe East Road, Pukekohe	Commercial
2 Austen Place, Pukekohe	Residential
16 Pukekohe East Road, Pukekohe	Commercial
3 Belgium Road, Pukekohe	Residential
4 Belgium Road, Pukekohe	Residential
186 Manukau Road, Pukekohe	Residential
8 Belgium Road, Pukekohe	Commercial
15 Crosbie Road, Pukekohe	Residential
4B Belgium Road, Pukekohe	Commercial
52 Golding Road, Pukekohe	Residential
7 Ambedkar Way, Pukekohe	Residential
120 Station Road, Pukekohe	Residential
16 Wrightson Way	Residential
15 Austen Place, Pukekohe	Residential
50 Pukekohe East Road, Pukekohe	Residential
4 Stockmans Lane, Pukekohe	Commercial
8 Stockmans Lane, Pukekohe	Residential
2 Svendsen Road, Pukekohe	Commercial
10 Belgium Road, Pukekohe	Residential
124 Station Road, Pukekohe	Residential
6A Belgium Road, Pukekohe	Residential
13 Ridge View Crescent, Pukekohe	Commercial
3 Ridge View Crescent, Pukekohe	Residential

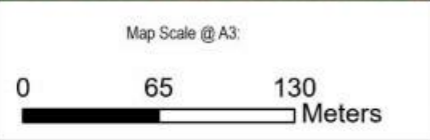
Address	Building Type/Structure
12 Wrightson Way	Residential
7A Pukekohe East Road, Pukekohe	Residential
49 Golding Road, Pukekohe	Residential
7 Ridge View Crescent, Pukekohe	Residential
31 Crosbie Road, Pukekohe	Commercial
9 Ridge View Crescent, Pukekohe	Residential
84 Golding Road, Pukekohe	Residential
25 Crosbie Road, Pukekohe	Residential
5 Ridge View Crescent, Pukekohe	Residential
17 Ridge View Crescent, Pukekohe	Commercial
2 Ambedkar Way, Pukekohe	Residential
11 Ridge View Crescent, Pukekohe	Residential
15 Ridge View Crescent, Pukekohe	Commercial
2 Stockmans Lane, Pukekohe	Residential
6 Stockmans Lane, Pukekohe	Residential
1 Ridge View Crescent, Pukekohe	Residential
4 Ambedkar Way, Pukekohe	Residential
29 Crosbie Road, Pukekohe	Residential
5 Ambedkar Way, Pukekohe	Residential
2A Ambedkar Way, Pukekohe	Residential
12 Belgium Road, Pukekohe	Residential
9 Ambedkar Way, Pukekohe	Residential
5 Crosbie Road, Pukekohe	Residential
42 Crosbie Road, Pukekohe	Residential
4A Ambedkar Way, Pukekohe	Residential
110 Golding Road, Pukekohe	Commercial
108A Golding Road, Pukekohe	Residential
6 Ambedkar Way, Pukekohe	Residential
43A Youngs Grove, Pukekohe	Residential
3 Pukekohe East Road, Pukekohe	Residential

Address	Building Type/Structure
3 Austen Place, Pukekohe	Residential
6 Ambedkar Way, Pukekohe	Commercial
40 Crosbie Road, Pukekohe	Commercial
12 Ambedkar Way, Pukekohe	Residential
14 Belgium Road, Pukekohe	Residential
10 Stockmans Lane, Pukekohe	Residential
27C Royal Doulton Drive, Pukekohe	Residential
26 Golding Road, Pukekohe	Residential
47 Golding Road, Pukekohe	Residential



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**

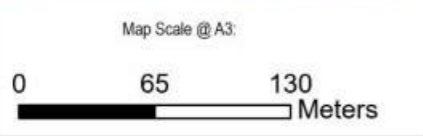


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Construction Area
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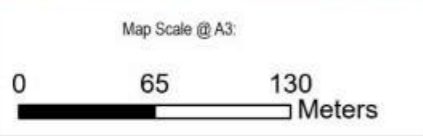


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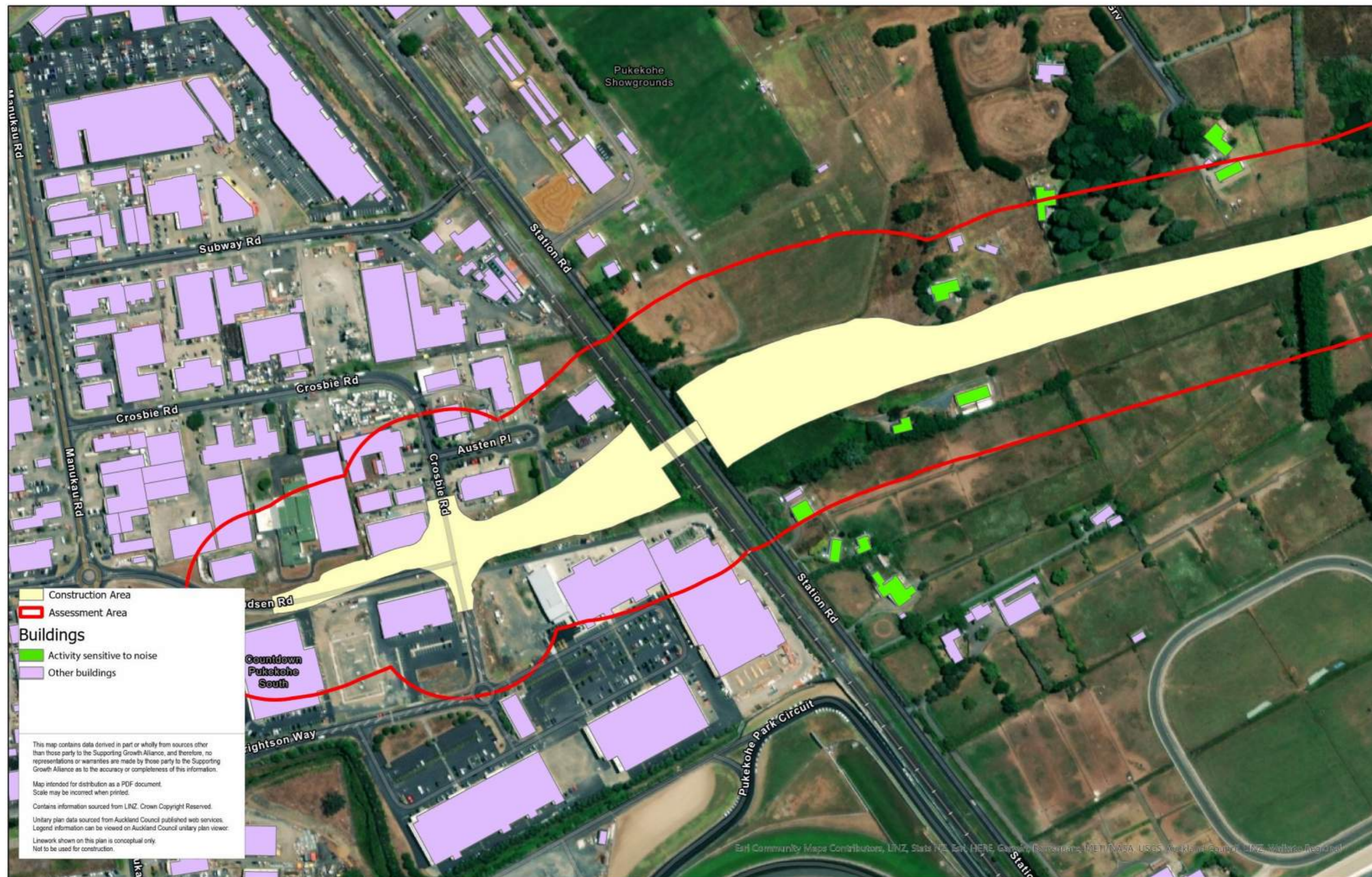
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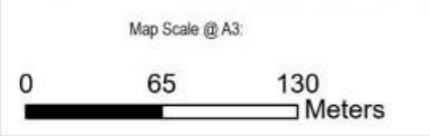


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Construction Area
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 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P5-000**

NoR 6 – Pukekohe South-West Upgrade

Address	Building Type/Structure
179 Queen Street, Pukekohe	Residential
73 West Street, Pukekohe	Residential
43 Nelson Street, Pukekohe	Residential
46 John Street, Pukekohe	Residential
106 Harris Street, Pukekohe	Residential
64 Helvetia Road, Pukekohe	Residential
3 Ward Street, Pukekohe	Residential
118 Princes Street West, Pukekohe	Residential
2 Helvetia Road, Pukekohe	Residential
171-173 Manukau Road, Pukekohe	Commercial
26 Helvetia Road, Pukekohe	Residential
192 Queen Street, Pukekohe	Residential
60 Helvetia Road, Pukekohe	Residential
5 Ward Street, Pukekohe	Residential
32A-D Helvetia Road, Pukekohe	Residential
111 Nelson Street, Pukekohe	Residential
170 Manukau Road, Pukekohe	Commercial
54 Helvetia Road, Pukekohe	Residential
36 Helvetia Road, Pukekohe	Residential
34 Helvetia Road, Pukekohe	Residential
45 Nelson Street, Pukekohe	Residential
64A Helvetia Road, Pukekohe	Residential
59 Ward Street, Pukekohe	Residential
52 Helvetia Road, Pukekohe	Residential
29-39 Nelson Street, Pukekohe	Commercial
30 Helvetia Road, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
28 Helvetia Road, Pukekohe	Residential

Address	Building Type/Structure
3/107 Victoria Street West, Pukekohe	Residential
109 Nelson Street, Pukekohe	Residential
121 Princes Street West, Pukekohe	Residential
73A West Street, Pukekohe	Residential
44 John Street, Pukekohe	Residential
56 Helvetia Road, Pukekohe	Residential
120 Princes Street West, Pukekohe	Residential
38 Helvetia Road, Pukekohe	Residential
49 Nelson Street, Pukekohe	Residential
58 Helvetia Road, Pukekohe	Residential
177 Queen Street, Pukekohe	Residential
4A Helvetia Road, Pukekohe	Residential
2A Helvetia Road, Pukekohe	Residential
7 Ward Street, Pukekohe	Residential
1/107 Victoria Street West, Pukekohe	Residential
38 Nelson Street, Pukekohe	Commercial
3-5 Nelson Street, Pukekohe	Commercial
66 Helvetia Road, Pukekohe	Residential
70 West Street, Pukekohe	Residential
116B Princes Street, Pukekohe	Residential
71 West Street, Pukekohe	Residential
107 Nelson Street, Pukekohe	Residential
37 John Street, Pukekohe	Residential
60A Helvetia Road, Pukekohe	Residential
168 Manukau Road, Pukekohe	Commercial
116A Princes Street, Pukekohe	Residential
175 Manukau Road, Pukekohe	Commercial
46 Beresford Street, Pukekohe	Residential
4 Ward Street, Pukekohe	Residential
51B Helvetia Road, Pukekohe	Residential

Address	Building Type/Structure
55 Helvetia Road, Pukekohe	Residential
25B Helvetia Road, Pukekohe	Residential
12 Parsot Place, Pukekohe	Residential
1 Sunset Drive, Pukekohe	Residential
4B Helvetia Road, Pukekohe	Residential
61A Helvetia Road, Pukekohe	Residential
2 Ward Street, Pukekohe	Residential
42 John Street, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
28A Helvetia Road, Pukekohe	Residential
75A West Street, Pukekohe	Residential
190 Queen Street, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
59 Helvetia Road, Pukekohe	Residential
66 Ward Street, Pukekohe	Residential
36 Nelson Street, Pukekohe	Commercial
4/32 Helvetia Road, Pukekohe	Residential
1 Helvetia Road, Pukekohe	Residential
105 Victoria Street West, Pukekohe	Residential
27 Helvetia Road, Pukekohe	Residential
14 Parsot Place, Pukekohe	Residential
6 Ward Street, Pukekohe	Residential
31A Helvetia Road, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
40 Nelson Street, Pukekohe	Commercial
63A Helvetia Road, Pukekohe	Residential
68 Helvetia Road, Pukekohe	Residential
33 Helvetia Road, Pukekohe	Residential
167-169 Manukau Road, Pukekohe	Commercial
109A Victoria Street West, Pukekohe	Residential

Address	Building Type/Structure
31A Helvetia Road, Pukekohe	Residential
25A Helvetia Road, Pukekohe	Residential
51 Nelson Street, Pukekohe	Residential
175 Queen Street, Pukekohe	Residential
122 Princes Street West, Pukekohe	Residential
48 Helvetia Road, Pukekohe	Residential
6A Helvetia Road, Pukekohe	Residential
53 Helvetia Road, Pukekohe	Residential
72 West Street, Pukekohe	Residential
68A Ward Street, Pukekohe	Residential
4 George Arthur Place, Pukekohe	Residential
29 Helvetia Road, Pukekohe	Residential
109 Victoria Street West, Pukekohe	Residential
51A Helvetia Road, Pukekohe	Residential
6 George Arthur Place, Pukekohe	Residential
188B Queen Street, Pukekohe	Residential
40 Helvetia Road, Pukekohe	Residential
177 Manukau Road, Pukekohe	Commercial
4 Hooper Avenue, Pukekohe	Residential
125 Princes Street West, Pukekohe	Residential
105 Nelson Street, Pukekohe	Residential
69 West Street, Pukekohe	Residential
164 Manukau Road, Pukekohe	Commercial
25-27 Nelson Street, Pukekohe	Commercial
35 John Street, Pukekohe	Residential
37A Helvetia Road, Pukekohe	Residential
10 Parsot Place, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
9 Ward Street, Pukekohe	Residential
114B Princes Street, Pukekohe	Residential

Address	Building Type/Structure
6 Nelson Street, Pukekohe	Commercial
8 Ward Street, Pukekohe	Residential
32 McNally Road, Pukekohe	Residential
75 West Street, Pukekohe	Residential
114A Princes Street, Pukekohe	Residential
66A Helvetia Road, Pukekohe	Residential
63B Helvetia Road, Pukekohe	Residential
2 Svendsen Road, Pukekohe	Commercial
65 Helvetia Road, Pukekohe	Residential
40 John Street, Pukekohe	Residential
8 George Arthur Place, Pukekohe	Residential
189 Queen Street, Pukekohe	Residential
188 Queen Street, Pukekohe	Residential
2 Sunset Drive, Pukekohe	Residential
77 West Street, Pukekohe	Residential
3A Helvetia Road, Pukekohe	Residential
101 Victoria Street, Pukekohe	Residential
3 Hooper Avenue, Pukekohe	Residential
3 Sunset Drive, Pukekohe	Residential
8 Parsot Place, Pukekohe	Residential
7A Moloney Terrace, Pukekohe	Residential
53 Nelson Street, Pukekohe	Residential
61B Helvetia Road, Pukekohe	Residential
5A Moloney Terrace, Pukekohe	Residential
124 Princes Street West, Pukekohe	Residential
64 West Street, Pukekohe	Residential
8A Helvetia Road, Pukekohe	Residential
6B-C Helvetia Road, Pukekohe	Residential
111 Victoria Street West, Pukekohe	Residential
51A Nelson Street, Pukekohe	Residential

Address	Building Type/Structure
46 Beresford Street, Pukekohe	Residential
70 Helvetia Road, Pukekohe	Residential
16 Parsot Place, Pukekohe	Residential
39 Helvetia Road, Pukekohe	Residential
173 Queen Street, Pukekohe	Residential
188A Queen Street, Pukekohe	Residential
3B Crosbie Road, Pukekohe	Commercial
188D Queen Street, Pukekohe	Residential
127 Princes Street West, Pukekohe	Residential
117 Princes Street, Pukekohe	Residential
5 Crosbie Road, Pukekohe	Commercial
36 Puni Road, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
44 Helvetia Road, Pukekohe	Residential
191 Queen Street, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
3B Helvetia Road, Pukekohe	Residential
3 George Arthur Place, Pukekohe	Residential
8B Helvetia Road, Pukekohe	Residential
2 Cooper Street, Pukekohe	Residential
63C Helvetia Road, Pukekohe	Residential
6 Hooper Avenue, Pukekohe	Residential
43 Puni Road, Pukekohe	Residential
68B Ward Street, Pukekohe	Residential
11 Ward Street, Pukekohe	Residential
74 West Street, Pukekohe	Residential
A/100 Harris Street, Pukekohe	Residential
79 West Street, Pukekohe	Residential
27A Helvetia Road, Pukekohe	Residential
5 Hooper Avenue, Pukekohe	Residential

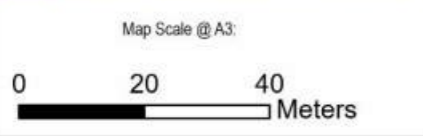
Address	Building Type/Structure
35A John Street, Pukekohe	Residential
17 Moloney Terrace, Pukekohe	Residential
100 Harris Street, Pukekohe	Residential
64 Ward Street, Pukekohe	Residential
26 Collie Road, Pukekohe	Residential
18 George Arthur Place, Pukekohe	Residential
67A West Street, Pukekohe	Residential
127A Princes Street West, Pukekohe	Residential
31B Helvetia Road, Pukekohe	Residential
22 Helvetia Road, Pukekohe	Residential
112 Princes Street, Pukekohe	Residential
99 Victoria Street, Pukekohe	Residential
124A Princes Street West, Pukekohe	Residential
4 Cooper Street, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
16 George Arthur Place, Pukekohe	Residential
67 Helvetia Road, Pukekohe	Residential
10 George Arthur Place, Pukekohe	Residential
67B West Street, Pukekohe	Residential
15 Moloney Terrace, Pukekohe	Residential
46 Beresford Street, Pukekohe	Residential
37B-C Helvetia Road, Pukekohe	Residential
33A Helvetia Road, Pukekohe	Residential
110 Princes Street, Pukekohe	Residential
99 Nelson Street, Pukekohe	Residential
113 Victoria Street West, Pukekohe	Residential
179 Manukau Road, Pukekohe	Commercial
7 Helvetia Road, Pukekohe	Residential
3 Moloney Terrace, Pukekohe	Residential
72A Helvetia Road, Pukekohe	Residential

Address	Building Type/Structure
4 Parsot Place, Pukekohe	Residential
43 Helvetia Road, Pukekohe	Residential
3A Crosbie Road, Pukekohe	Commercial
4 Sunset Drive, Pukekohe	Residential
188C Queen Street, Pukekohe	Residential
5 Moloney Terrace, Pukekohe	Residential
10A Helvetia Road, Pukekohe	Residential
159 Manukau Road, Pukekohe	Commercial



Assessment Area
 Calculation Area
Buildings
 Activity sensitive to noise
 Other buildings

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1	Author	DRAFT	DRAFT	aa/mm/yyyy

Supporting Growth
NoR 6 - Pukekohe Construction Noise Envelopes
 Working Plans of Te Tupu Ngātahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**



Assessment Area
 [Red line symbol]

Calculation Area
 [Yellow outline symbol]

Buildings

- [Green symbol] Activity sensitive to noise
- [Purple symbol] Other buildings

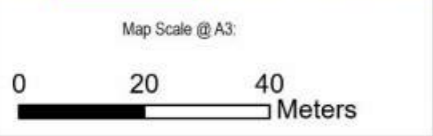
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Supporting Growth
NoR 6 - Pukekohe Construction Noise Envelopes

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

Client: Supporting Growth

Project: Pukekohe Package



Discipline: GIS

Drawing No: SGA-NOR-P6-000

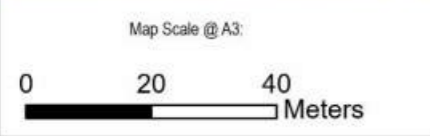
Esri, Corel, Mapbox, Contributors, LINZ, Stats NZ, Esri, HERE, DeLorme, Foursquare, METI/NASA, USGS, Auckland Council, LINZ, Waikato Regional



Assessment Area
 Calculation Area
Buildings
 Activity sensitive to noise
 Other buildings

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Client: **Supporting Growth**
 Project: **Pukekohe Package**



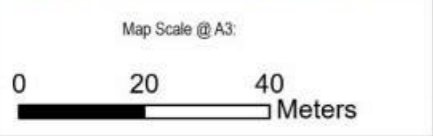
Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**



Assessment Area
 [Red Circle] Assessment Area
 [Yellow Arrow] Calculation Area

Buildings
 [Green Box] Activity sensitive to noise
 [Purple Box] Other buildings

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 Project: **Pukekohe Package**



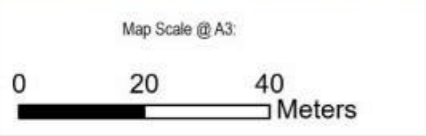
Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**



Assessment Area
 [Red outline] Assessment Area
 [Yellow outline] Calculation Area

Buildings
 [Green fill] Activity sensitive to noise
 [Purple fill] Other buildings

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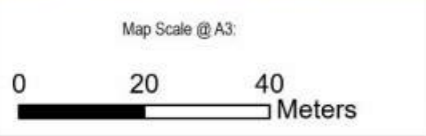
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 Drawing No: **SGA-NOR-P6-000**



Assessment Area
Calculation Area

Buildings
 Activity sensitive to noise
 Other buildings

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 Project: **Pukekohe Package**



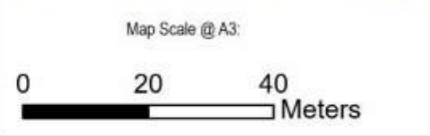
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 Drawing No: **SGA-NOR-P6-000**



Assessment Area
Calculation Area

Buildings
 Activity sensitive to noise
 Other buildings

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NoR 6 - Pukekohe Construction Noise Envelopes
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Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**

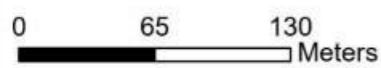
NoR 7 – Pukekohe North-West Arterial

Address	Building Type/Structure
107 Helvetia Road, Pukekohe	Residential
128 Helvetia Road, Pukekohe	Residential
3B Birdwood Road, Pukekohe	Residential
222 Heights Road, Pukekohe	Residential
4 Birdwood Road, Pukekohe	Residential
157A Beatty Road, Pukekohe	Residential
105 Helvetia Road, Pukekohe	Residential
126 Helvetia Road, Pukekohe	Residential
3A Birdwood Road, Pukekohe	Residential
10 Butcher Road, Pukekohe	Residential
6 Birdwood Road, Pukekohe	Residential
124 Helvetia Road, Pukekohe	Residential
248 Helvetia Road, Pukekohe	Residential
126A Helvetia Road, Pukekohe	Residential
103 Helvetia Road, Pukekohe	Residential
6A Birdwood Road, Pukekohe	Residential
10 Kauri Road, Pukekohe	Residential
57 Butcher Road, Pukekohe	Residential
8 Birdwood Road, Pukekohe	Residential
122 Helvetia Road, Pukekohe	Residential
7 Birdwood Road, Pukekohe	Residential
12 Kauri Road, Pukekohe	Residential
270 Helvetia Road, Pukekohe	Residential
101 Helvetia Road, Pukekohe	Residential
5 Birdwood Road, Pukekohe	Residential
9 Birdwood Road, Pukekohe	Residential
8A Birdwood Road, Pukekohe	Residential
64 Butcher Road, Pukekohe	Residential

Address	Building Type/Structure
120 Helvetia Road, Pukekohe	Residential
101A Helvetia Road, Pukekohe	Residential
10 Birdwood Road, Pukekohe	Residential
14 Kauri Road, Pukekohe	Residential
99A Helvetia Road, Pukekohe	Residential
24 Kauri Road, Pukekohe	Residential
256 Helvetia Road, Pukekohe	Residential
118 Helvetia Road, Pukekohe	Residential
120A Helvetia Road, Pukekohe	Residential
222 Helvetia Road, Pukekohe	Residential
11 Birdwood Road, Pukekohe	Residential
12 Birdwood Road, Pukekohe	Residential
17 Butcher Road, Pukekohe	Residential



Map Scale @ A3:



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Supporting Growth
NoR 7 - Pukekohe Construction Noise Envelopes

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

Client:	Supporting Growth
Project:	North West Package

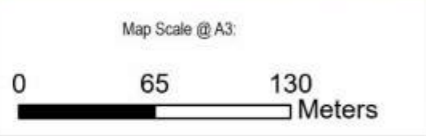


Discipline:	GIS
Drawing No:	SGA-NOR-W1-000



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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

Client: **Supporting Growth**
 Project: **North West Package**

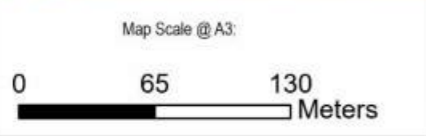


Discipline: **GIS**
 Drawing No: **SGA-NOR-W1-000**



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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 Working Plans of Te Tupu Ngatahi
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 Project: **North West Package**

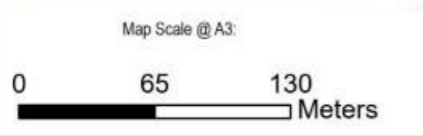


Discipline: **GIS**
 Drawing No: **SGA-NOR-W1-000**



Construction Area
 Assessment Area
Buildings
 Activity sensitive to noise
 Other buildings

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Supporting Growth
NoR 7 - Pukekohe Construction Noise Envelopes
Working Plans of Te Tupu Ngatahi
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 Project: **North West Package**

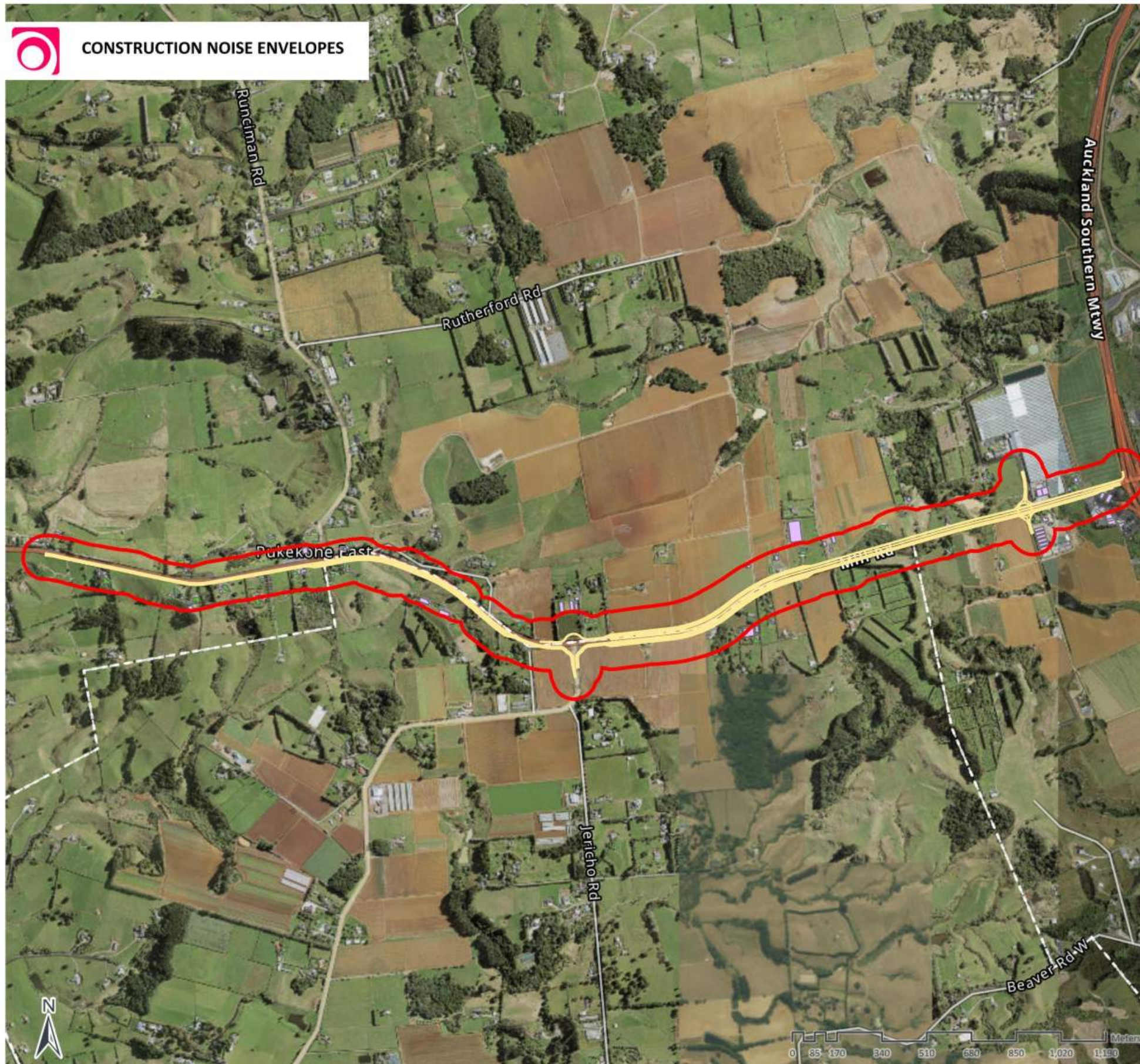


Discipline: **GIS**
 Drawing No: **SGA-NOR-W1-000**

NoR 8 (AC) – Mill Road and Pukekohe East Road Upgrade

Address	Building Type/Structure
5 Mill Road, Pukekohe East	Residential
15 Mill Road, Pukekohe East	Garage/Storage
28 Mill Road, Pukekohe East	Garage/Storage
64 Mill Road, Pukekohe East	Residential
80 Mill Road, Pukekohe East	Residential
87 Mill Road, Pukekohe East	Residential
90 Mill Road, Pukekohe East	Residential
93 Mill Road, Pukekohe East	Residential
105 Mill Road, Pukekohe East	Residential
144 Mill Road, Bombay	Residential
182 Mill Road, Bombay	Residential
187 Mill Road, Bombay	Commercial
188 Mill Road, Bombay	Commercial
203 Mill Road, Bombay	Residential
216 Mill Road, Bombay	Commercial
139A Mill Road, Pukekohe East	Residential
52A Mill Road, Pukekohe East	Commercial
4 Morgan Road, Pukekohe East	Residential
34 Morgan Road, Pukekohe East	Residential
60 Morgan Road, Pukekohe East	Residential
131 Pukekohe East Road, Pukekohe	Garage/Storage
133 Pukekohe East Road, Pukekohe East	Residential
156 Pukekohe East Road, Pukekohe East	Residential

Address	Building Type/Structure
190 Pukekohe East Road, Pukekohe East	Residential
192 Pukekohe East Road, Pukekohe East	Garage/Storage
196 Pukekohe East Road, Pukekohe East	Residential
200 Pukekohe East Road, Pukekohe East	Residential
216 Pukekohe East Road, Pukekohe East	Residential
218 Pukekohe East Road, Pukekohe East	Residential
220 Pukekohe East Road, Pukekohe East	Residential
232 Pukekohe East Road, Pukekohe East	Residential
233 Pukekohe East Road, Pukekohe East	Commercial
240 Pukekohe East Road, Pukekohe East	Residential
248 Pukekohe East Road, Pukekohe East	Residential
250 Pukekohe East Road, Pukekohe East	Garage/Storage
257 Pukekohe East Road, Pukekohe East	Residential
311 Pukekohe East Road, Pukekohe East	Residential
197A Pukekohe East Road, Pukekohe East	Residential
300A Pukekohe East Road, Pukekohe East	Residential
7 Runciman Road, Pukekohe East	Garage/Storage
21 Turbott Road, Pukekohe East	Residential



CONSTRUCTION NOISE ENVELOPES

SGA PUKEKOHE NOR8 (AC)

- Nor8 (AC) Roads
- Nor8 (AC) Construction Noise Envelopes
- Buildings**
- Activity Sensitive to Noise
- Other Buildings



Client: Map Authors: Owen Li Date of Issue: 16/08/2023 4:12 pm

Drawing Details: Scale: 1:19,517 Projection: NZGD 2000 New Zealand Transverse Mercator Map Rotation: 0°

Map Notes / Comments: This map is for graphical purposes only. While every effort has been made to ensure that the data are accurate and reliable, Marshall Day Acoustics does not assume liability for errors or omissions in the data graphically represented. The noise contours were obtained by interpolation of calculated grid points (spacing typically 5-20m), with varying interpolation distances. Noise noise levels at specific locations, can be made available at request if not included in the project post receiver calculations.



CONSTRUCTION NOISE ENVELOPES

SGA PUKEKOHE NOR8 (AC)

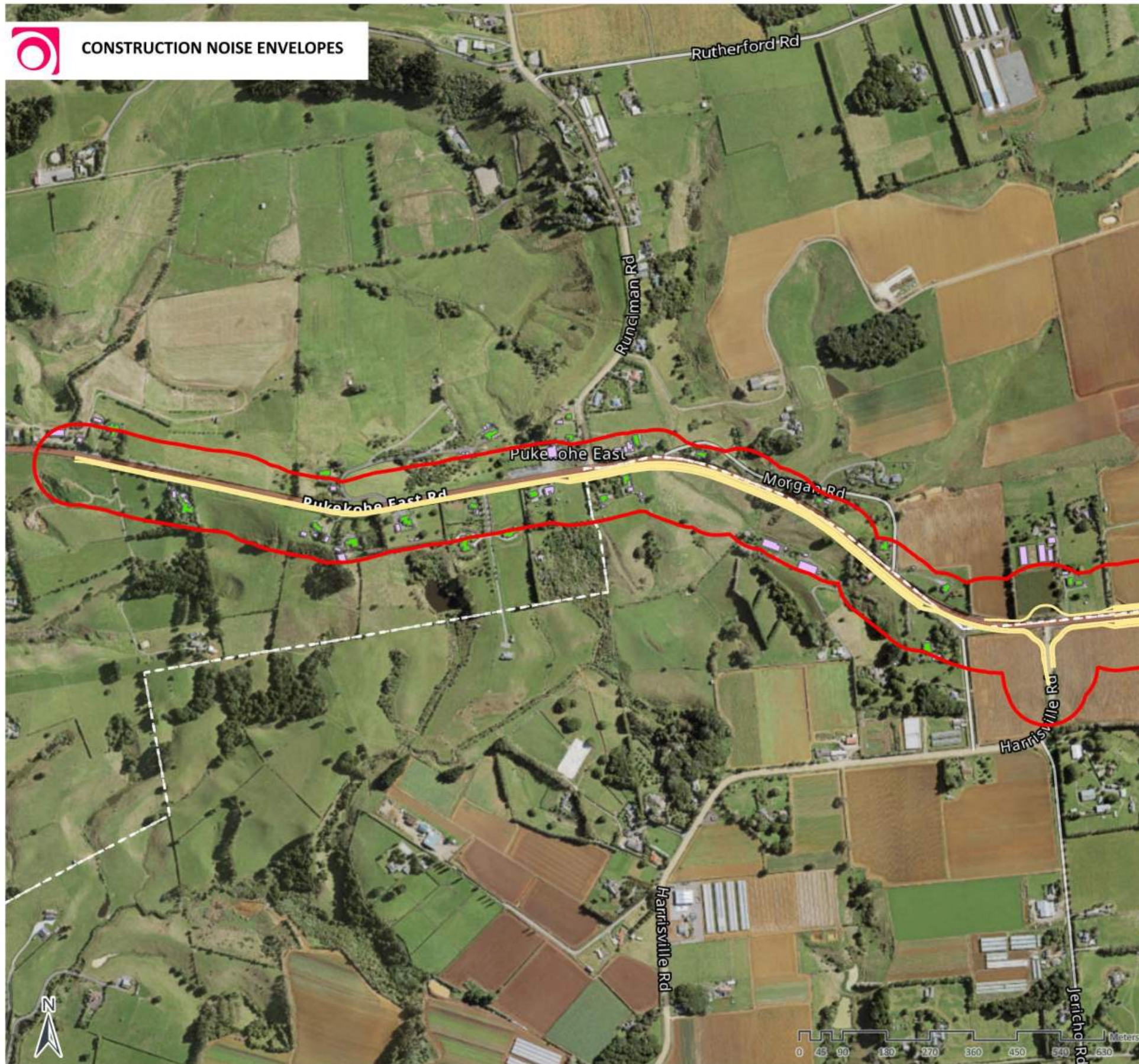
- Nor8 (AC) Roads
- Nor8 (AC) Construction Noise Envelopes
- Buildings**
- Activity Sensitive to Noise
- Other Buildings



Client:
Map
Authors:
Owen.Li
Date of Issue:
16/08/2023 4:12 pm

Drawing Details:
Scale: 1:10,607
Projection: NZGD 2000 New Zealand Transverse Mercator
Map Rotation: 0°

Map Users / Comments:
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The noise contours were obtained by interpolation of calculated grid points. Spacing: typically 0.25m, with varying interpolation accuracy. Please note levels at specific locations, can be made available at request if not included in the project noise receiver calculations.



SGA PUKEKOHE NOR8 (AC)

- Nor8 (AC) Roads
- Nor8 (AC) Construction Noise Envelops
- Buildings**
- Activity Sensitive to Noise
- Other Buildings



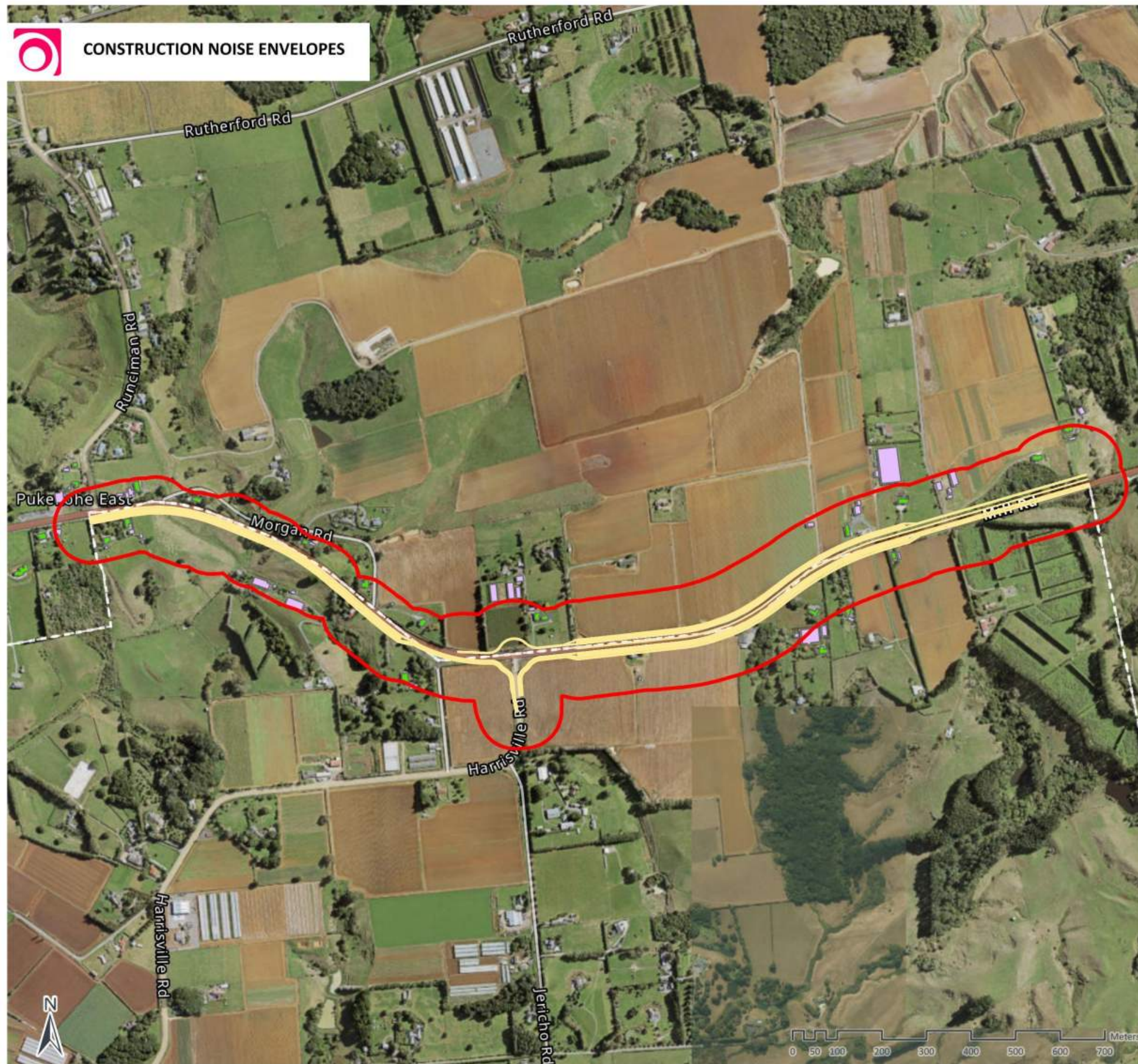
Client:
Map:
Authors: Owen.Li
Date of Issue: 16/08/2023 4:12 pm

Drawing Details:
Scale: 1:10,607
Projection: NZGD 2000 New Zealand Transverse Mercator
Map Rotation: 0°

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NoR 8 (WDC) – Mill Road and Pukekohe East Road Upgrade

Address	Building Type/Structure
5 Mill Road, Pukekohe East	Residential
64 Mill Road, Pukekohe East	Residential
80 Mill Road, Pukekohe East	Residential
87 Mill Road, Pukekohe East	Residential
90 Mill Road, Pukekohe East	Residential
93 Mill Road, Pukekohe East	Residential
105 Mill Road, Pukekohe East	Residential
139A Mill Road, Pukekohe East	Residential
4 Morgan Road, Pukekohe East	Residential
34 Morgan Road, Pukekohe East	Residential
60 Morgan Road, Pukekohe East	Residential
240 Pukekohe East Road, Pukekohe East	Residential
248 Pukekohe East Road, Pukekohe East	Residential
257 Pukekohe East Road, Pukekohe East	Residential
311 Pukekohe East Road, Pukekohe East	Residential
300A Pukekohe East Road, Pukekohe East	Residential
21 Turbott Road, Pukekohe East	Residential
15 Mill Road, Bombay	Garage/Storage
28 Mill Road, Pukekohe East	Garage/Storage
52A Mill Road, Pukekohe East	Commercial
232 Pukekohe East Road, Pukekohe East	Commercial
233 Pukekohe East Road, Pukekohe East	Commercial
250 Pukekohe East Road, Pukekohe East	Garage/Storage



SGA PUKEKOHE NOR8 (WDC)

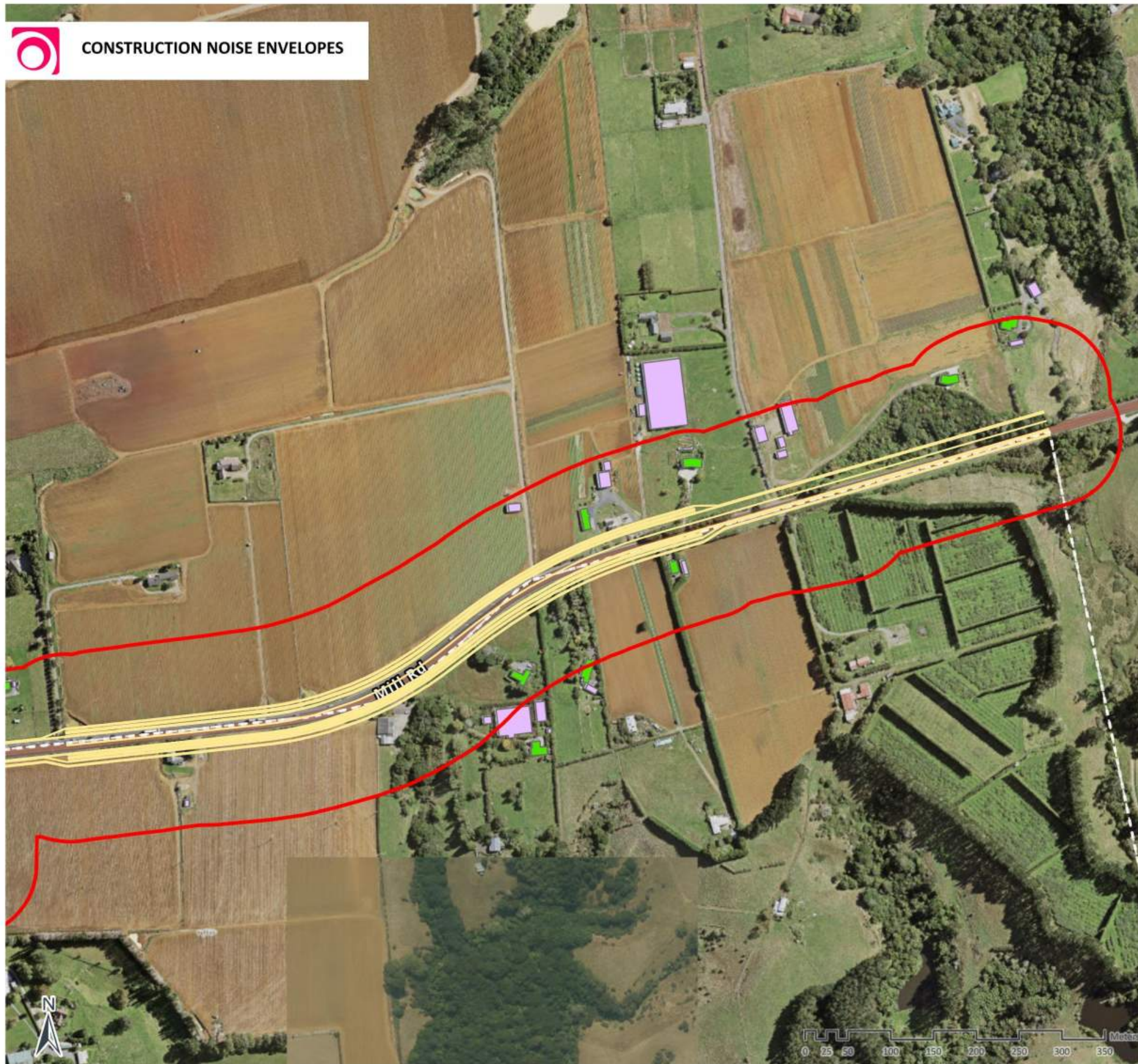
- Nor8 (WDC) Roads
- Nor8 (WDC)
- Construction Noise Envelops
- Buildings**
- Activity Sensitive to Noise
- Other Buildings



Client: Map
Authors: Owen LJ
Date of Issue: 16/08/2023 4:12 pm

Drawing Details:
 Scale: 1:11,500
 Projection: NZGD 2000 New Zealand Transverse Mercator
 Map Rotation: 0°

Map Notes / Comments:
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CONSTRUCTION NOISE ENVELOPES

SGA PUKEKOHE NOR8 (WDC)

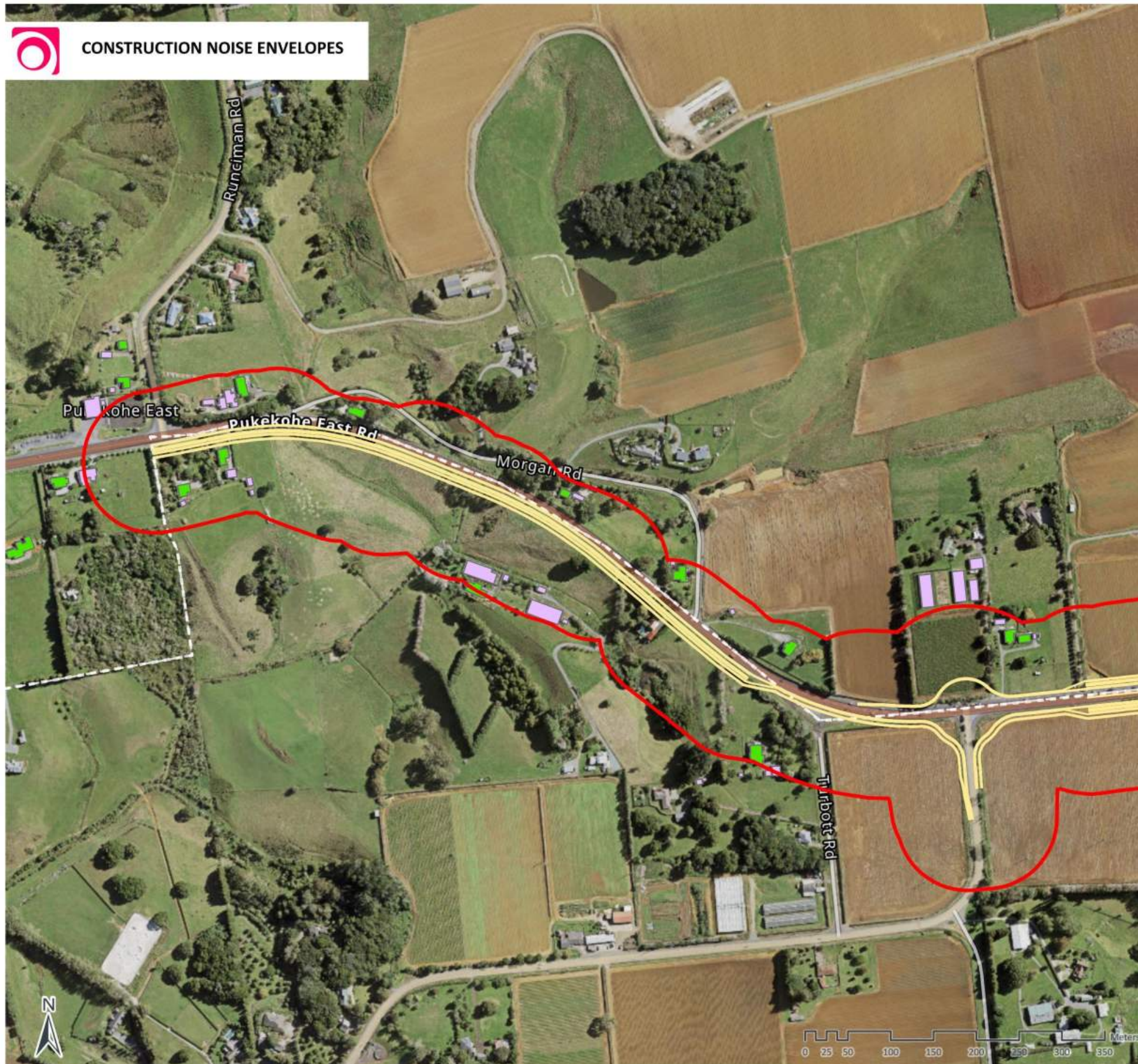
- Nor8 (WDC) Roads
- Nor8 (WDC)
- ▭ Construction Noise Envelops
- Buildings**
- ▭ Activity Sensitive to Noise
- ▭ Other Buildings








Client: Map
Authors: Owen LJ
Date of Issue: 16/08/2023 4:12 pm

Drawing Details:
 Scale: 1:6,000
 Projection: NZGD 2000 New Zealand Transverse Mercator
 Map Rotation: 0°

Map Notes / Comments:
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SGA PUKEKOHE NOR8 (WDC)

-  Nor8 (WDC) Roads
-  Nor8 (WDC)
-  Construction Noise Envelops
- Buildings**
-  Activity Sensitive to Noise
-  Other Buildings



Client:
 Map:
 Authors:
 Owen Li
 Date of Issue:
 16/08/2023 4:12 pm

Drawing Details:
 Scale: 1:6,000
 Projection: NZGD 2000 New Zealand Transverse Mercator
 Map Rotation: 0°

Map Note / Comments:
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Appendix B

Receivers predicted to receive vibration levels exceeding 5 mm/s PPV

NoR 1 – Drury West Arterial

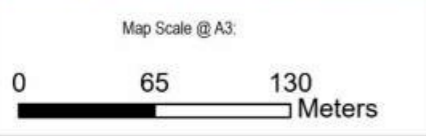


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Supporting Growth

NoR 1 - Pukekohe Construction Vibration Envelope

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

Client: **Supporting Growth**

Project: **Pukekohe Package**



Discipline: **GIS**

Drawing No: **SGA-NOR-1-000**

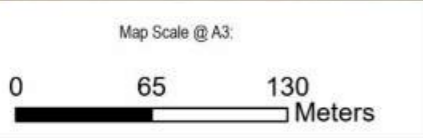


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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NoR 1 - Pukekohe Construction Vibration Envelope
Working Plans of Te Tupu Ngatahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-1-000**

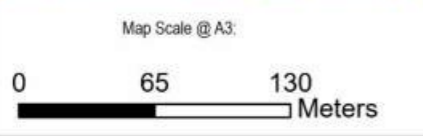


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Supporting Growth

NoR 1 - Pukekohe Construction Vibration Envelope

Working Plans of Te Tupu Ngātahi
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Project: **Pukekohe Package**

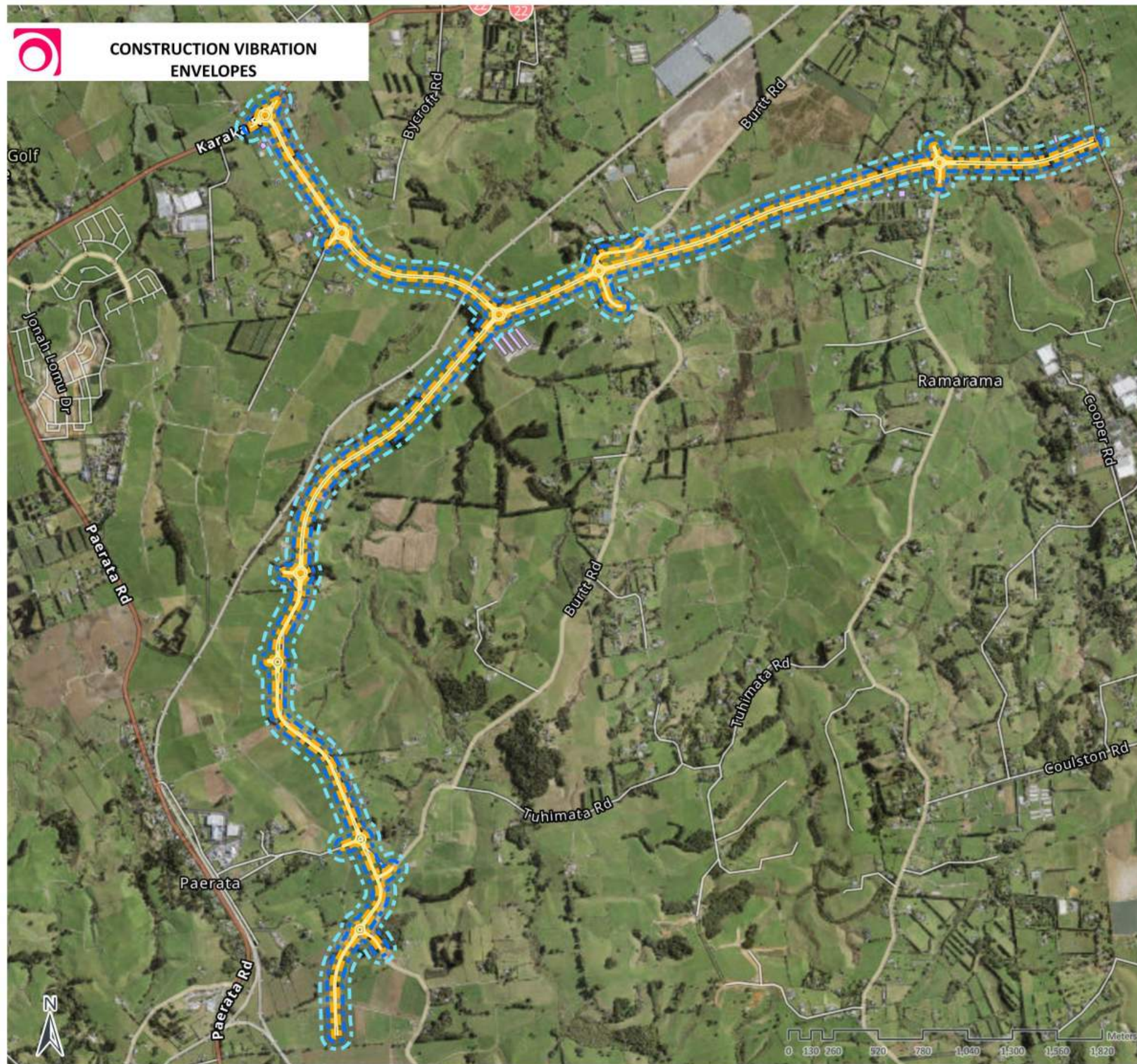


Discipline: **GIS**

Drawing No: **SGA-NOR-1-000**

NoR 2 – Drury to Pukekohe Link

Address	Building Type/Structure
744 Runciman Road, Runciman	Garage/Storage
54 Sim Road, Karaka	Residential



SGA PUKEKOHE NOR2

- Nor2 Roads
- Nor2 CatA PPF
- Nor2 CatA nonPPF
- Nor2 CatB PPF
- Buildings**
- Activity Sensitive to Noise
- Other Buildings



Client:
Map
Authors:
Owen.Li
Date of Issue:
8/08/2023 7:03 pm

Drawing Details:
Scale: 1:29,700
Projection: NZGD 2000 New Zealand Transverse Mercator
Map Rotation: 0°

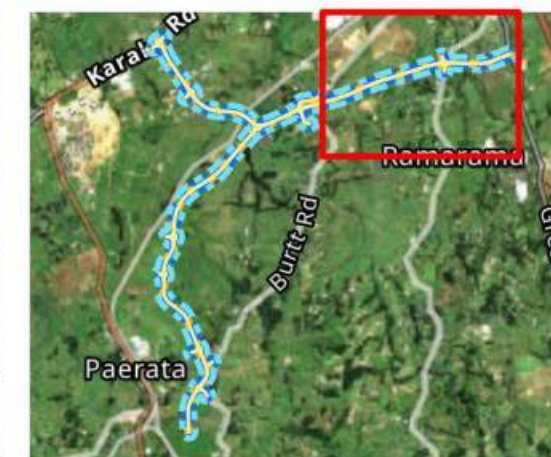
Map Notes / Comments:
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CONSTRUCTION VIBRATION ENVELOPES

SGA PUKEKOHE NOR2

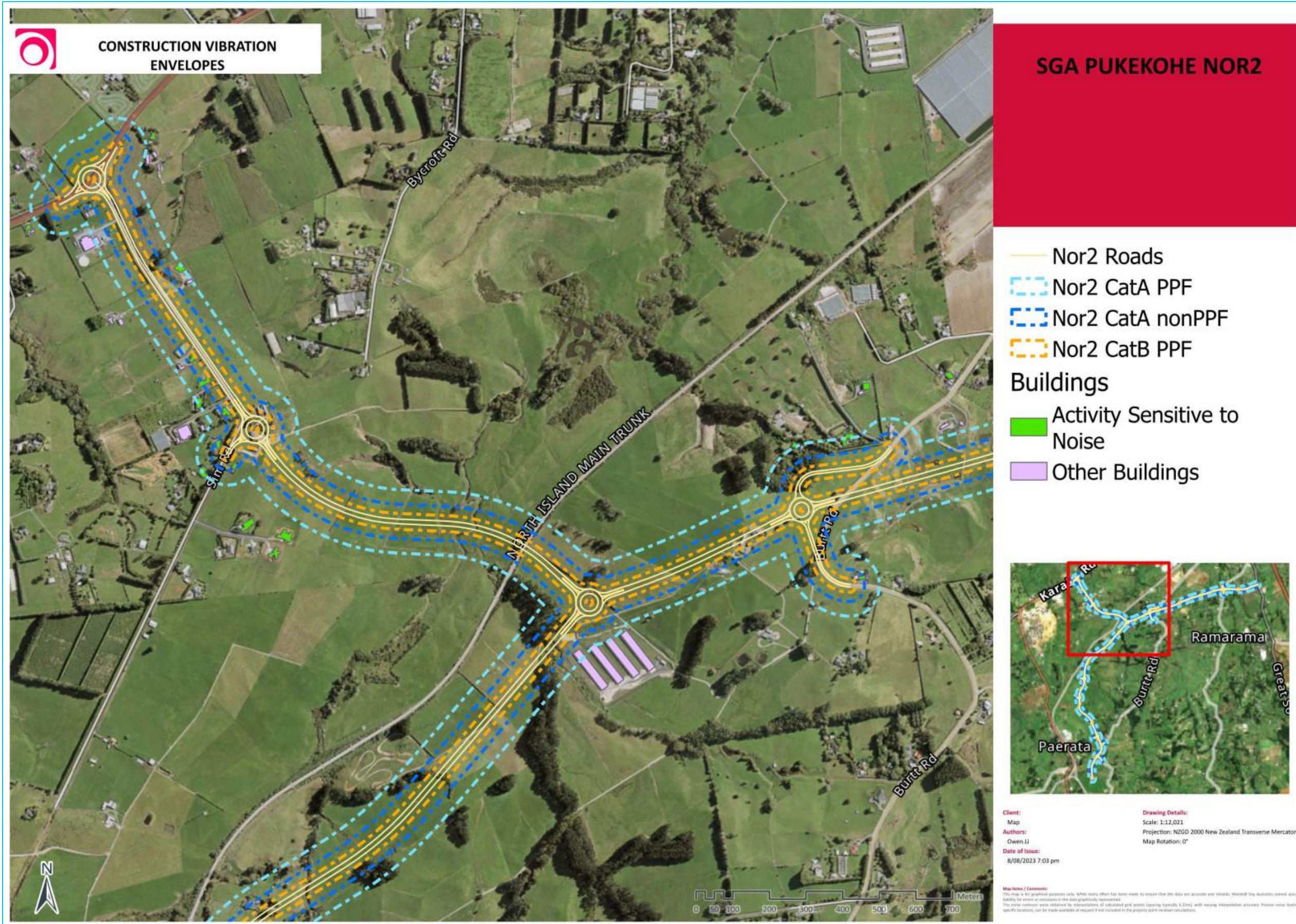
- Nor2 Roads
- Nor2 CatA PPF
- Nor2 CatA nonPPF
- Nor2 CatB PPF
- Buildings**
- Activity Sensitive to Noise
- Other Buildings

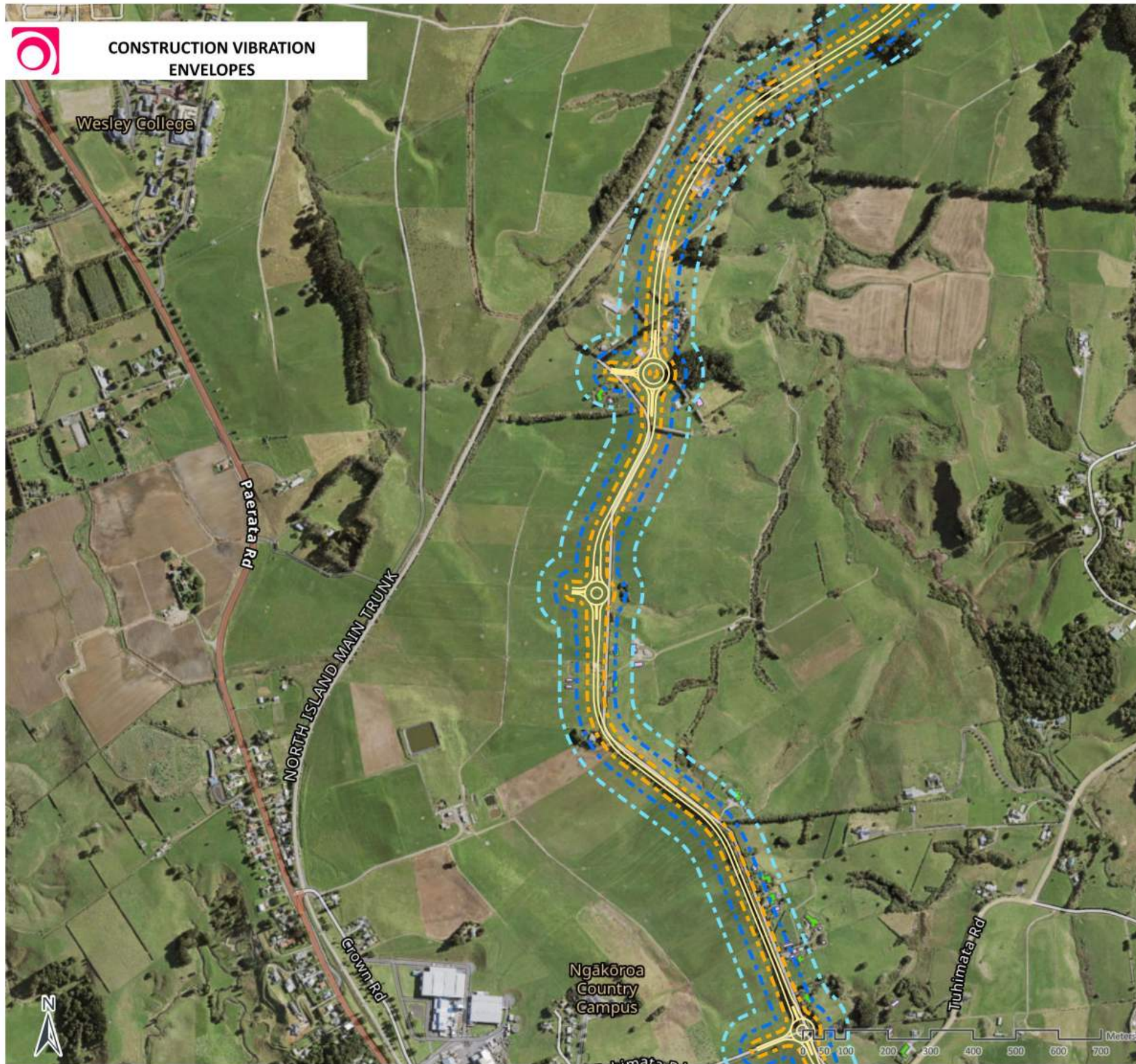


Client:
Map
Authors:
Owen.Li
Date of Issue:
8/08/2023 7:03 pm

Drawing Details:
Scale: 1:12,021
Projection: NZGD 2000 New Zealand Transverse Mercator
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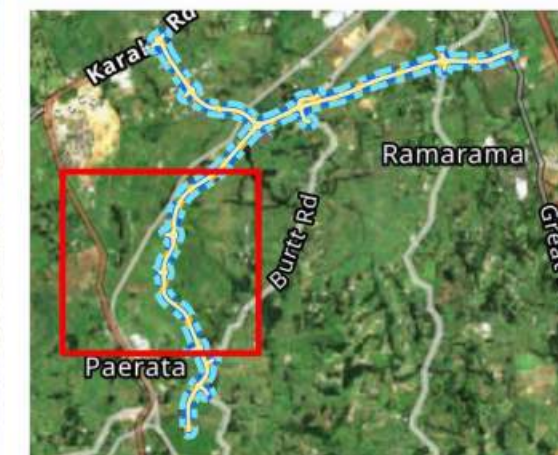


SGA PUKEKOHE NOR2

- Nor2 Roads
- - - Nor2 CatA PPF
- - - Nor2 CatA nonPPF
- - - Nor2 CatB PPF

Buildings

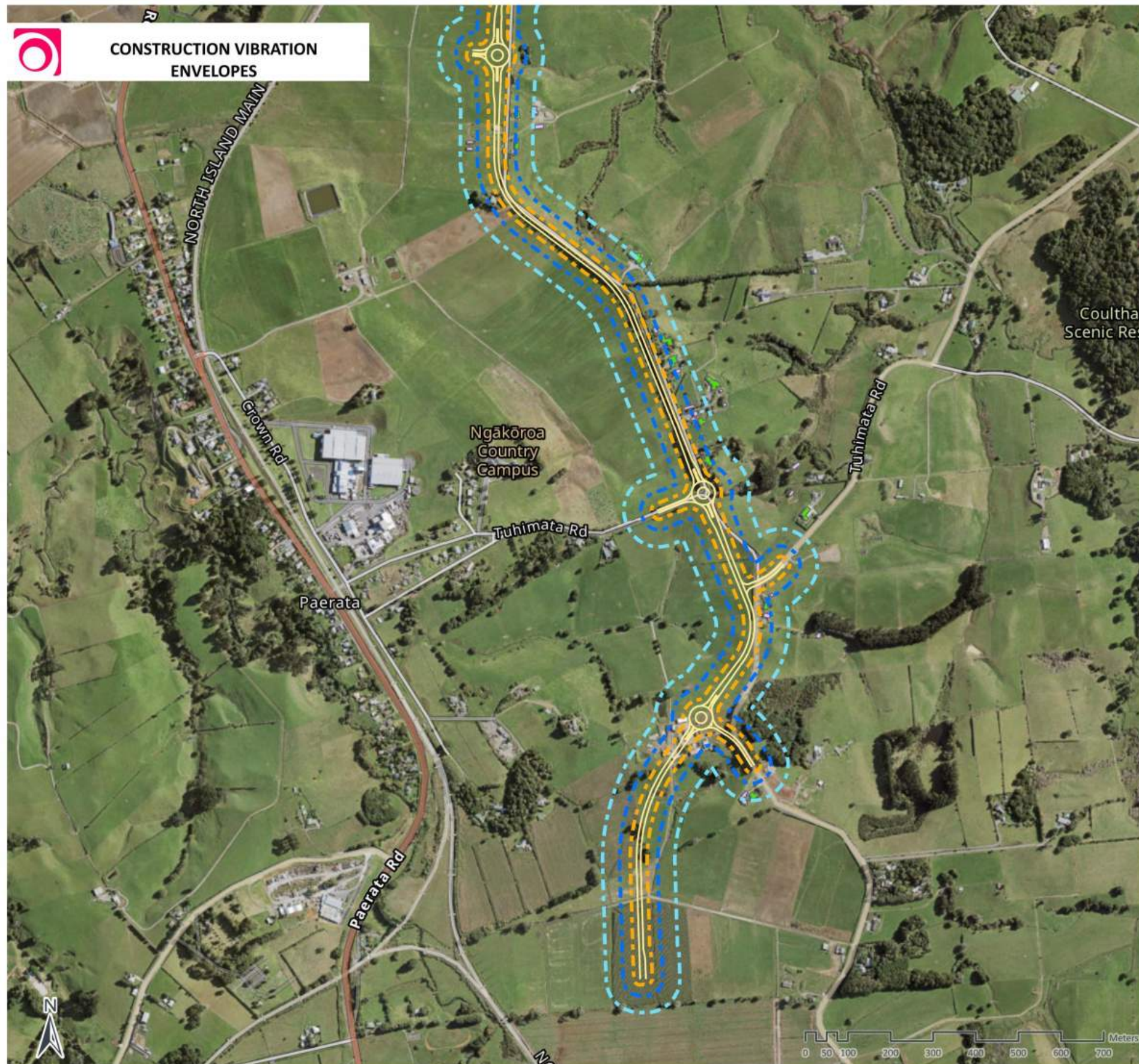
- Activity Sensitive to Noise
- Other Buildings



Client:
Map
Authors:
Owen.Li
Date of Issue:
8/08/2023 7:03 pm

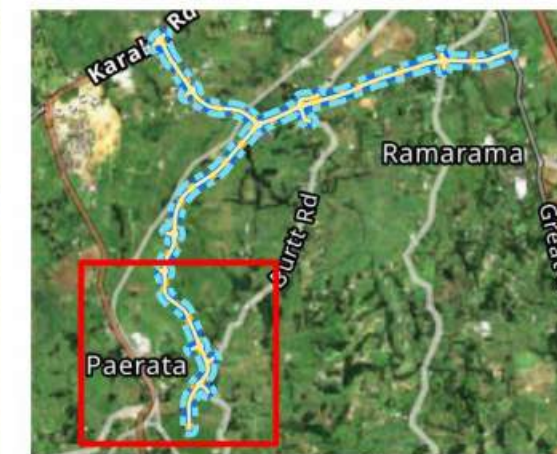
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SGA PUKEKOHE NOR2

- Nor2 Roads
- - - Nor2 CatA PPF
- - - Nor2 CatA nonPPF
- - - Nor2 CatB PPF
- Buildings**
- Activity Sensitive to Noise
- Other Buildings



Client: Map Authors: Owen.LJ
Date of Issue: 8/08/2023 7:03 pm

Drawing Details:
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 Projection: NZGD 2000 New Zealand Transverse Mercator
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NoR 3 – Paerata Connections

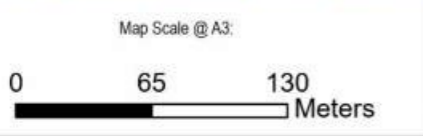


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Supporting Growth

NoR 3 - Pukekohe Construction Vibration Envelopes

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

Client: **Supporting Growth**

Project: **Pukekohe Package**



Discipline: **GIS**

Drawing No: **SGA-NOR-P3-000**

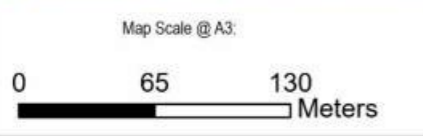


- - - Cat A
- - - Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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NoR 3 - Pukekohe Construction Vibration Envelopes

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Client:	Supporting Growth
Project:	Pukekohe Package



Discipline:	GIS
Drawing No:	SGA-NOR-P3-000

NoR 4 – Pukekohe North-East Arterial

Address	Building Type/Structure
10 Stockmans Lane, Pukekohe	Residential
1213 Paerata Road, Pukekohe	Residential
1226 Paerata Road, Pukekohe	Commercial
133 Pukekohe East Road, Pukekohe East	Residential

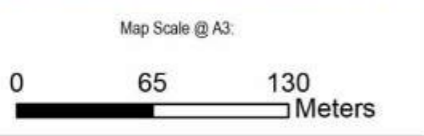


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Supporting Growth

NoR 4 - Pukekohe Construction Vibration Envelopes

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

Client: **Supporting Growth**

Project: **Pukekohe Package**



Discipline: **GIS**

Drawing No: **SGA-NOR-P4-000**



--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Map Scale @ A3: 0 65 130 Meters		Revision Author Verified Approved Date	Supporting Growth NoR 4 - Pukekohe Construction Vibration Envelopes <small>Working Plans of Te Tupu Ngatahi. For the purpose of INTERNAL workshops (not for wider distribution)</small>	Client: Supporting Growth		Discipline: GIS
		1 Author DRAFT DRAFT dd/mm/yyyy		Project: Pukekohe Package		Drawing No: SGA-NOR-P4-000

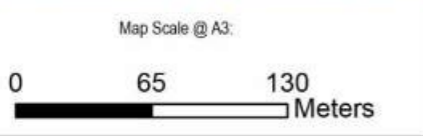


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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1	Author	DRAFT	DRAFT	dd/mm/yyyy	

Supporting Growth
NoR 4 - Pukekohe Construction Vibration Envelopes
Working Plans of Te Tupu Ngātahi.
For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**

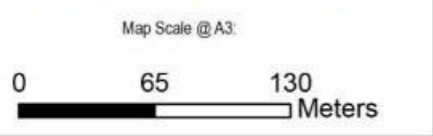


Discipline: **GIS**
 Drawing No: **SGA-NOR-P4-000**



--- Cat A
--- Cat B
 Construction Area
Buildings
 Activity sensitive to noise
 Other buildings

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1	Author	DRAFT	DRAFT	01/01/2022

Supporting Growth
NoR 4 - Pukekohe Construction Vibration Envelopes
Working Plans of Te Tupu Ngātahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P4-000**



Revision	Author	Verified	Approved	Date
1	Author	DRAFT	DRAFT	03/03/2023

Supporting Growth
NoR 4 - Pukekohe Construction Vibration Envelopes
 Working Plans of Te Tupu Ngātahi
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Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P4-000**

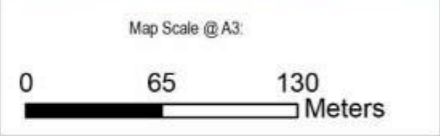


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Supporting Growth

NoR 4 - Pukekohe Construction Vibration Envelopes

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

Client: **Supporting Growth**

Project: **Pukekohe Package**



Discipline: **GIS**

Drawing No: **SGA-NOR-P4-000**

NoR 5 – Pukekohe South-East Arterial

Address	Building Type/Structure
78 Golding Road, Pukekohe	Residential
33 Crosbie Road, Pukekohe	Commercial
12 Pukekohe East Road, Pukekohe	Residential
7 Wrightson Way, Pukekohe East	Commercial
18 Pukekohe East Road, Pukekohe	Residential
16 Pukekohe East Road, Pukekohe	Residential
3 Belgium Road, Pukekohe	Residential
4 Belgium Road, Pukekohe	Residential
186 Manukau Road, Pukekohe	Residential
3 Pukekohe East Road, Pukekohe	Residential

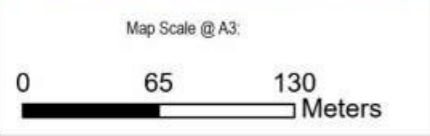


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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1	Author	DRAFT	DRAFT	dd/mm/yyyy	

Supporting Growth

NoR 5 - Pukekohe Construction Vibration Envelopes

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

Client: **Supporting Growth**

Project: **Pukekohe Package**



Discipline: **GIS**

Drawing No: **SGA-NOR-P5-000**

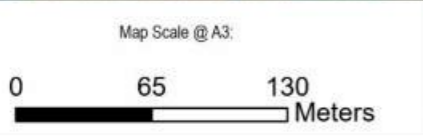


--- Cat A
--- Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Supporting Growth

NoR 5 - Pukekohe Construction Vibration Envelopes

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

Client: **Supporting Growth**

Project: **Pukekohe Package**



Discipline: **GIS**

Drawing No: **SGA-NOR-P5-000**

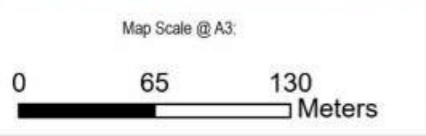


- - - Cat A
- - - Cat B
 Construction Area

Buildings

Activity sensitive to noise
 Other buildings

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Revision	Author	Verified	Approved	Date	Title
1	Author	DRAFT	DRAFT	dd/mm/yyyy	

Supporting Growth

NoR 5 - Pukekohe Construction Vibration Envelopes

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

Client: **Supporting Growth**

Project: **Pukekohe Package**



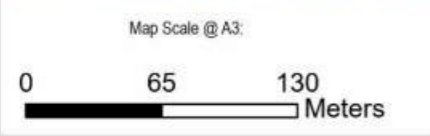
Discipline: **GIS**

Drawing No: **SGA-NOR-P5-000**



--- Cat A
--- Cat B
 Construction Area
Buildings
 Activity sensitive to noise
 Other buildings

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Supporting Growth
NoR 5 - Pukekohe Construction Vibration Envelopes
 Working Plans of Te Tupu Ngātahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P5-000**

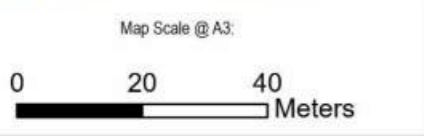
NoR 6 – Pukekohe South-West Upgrade

Address	Building Type/Structure
73 West Street, Pukekohe	Residential
179 Queen Street, Pukekohe	Residential
43 Nelson Street, Pukekohe	Residential
46 John Street, Pukekohe	Residential
106 Harris Street, Pukekohe	Residential
64 Helvetia Road, Pukekohe	Residential
3 Ward Street, Pukekohe	Residential
118 Princes Street West, Pukekohe	Residential
2 Helvetia Road, Pukekohe	Residential
171-173 Manukau Road, Pukekohe	Commercial
26 Helvetia Road, Pukekohe	Residential
192 Queen Street, Pukekohe	Residential
60 Helvetia Road, Pukekohe	Residential
5 Ward Street, Pukekohe	Residential
32A-D Helvetia Road, Pukekohe	Residential
111 Nelson Street, Pukekohe	Residential
54 Helvetia Road, Pukekohe	Residential
36 Helvetia Road, Pukekohe	Residential
34 Helvetia Road, Pukekohe	Residential
45 Nelson Street, Pukekohe	Residential
59 Ward Street, Pukekohe	Historic/Vibration sensitive



--- Cat A
--- Cat B
Buildings
 Activity sensitive to noise
 Other buildings

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1	Author	DRAFT	DRAFT	dd/mm/yyyy	

Supporting Growth
NoR 6 - Pukekohe Construction Vibration Envelopes
Working Plans of Te Tupu Ngātahi.
For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **Pukekohe Package**

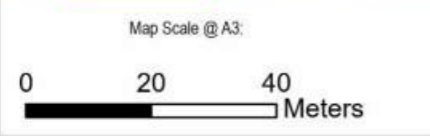


Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**



--- Cat A
--- Cat B
Buildings
■ Activity sensitive to noise
■ Other buildings

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

Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**

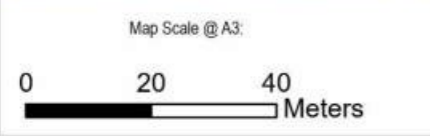
Esri Contributor Maps, Contributors, LINZ, Stats NZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Auckland Council, LINZ, Waikato Regional



--- Cat A
--- Cat B
Buildings
■ Activity sensitive to noise
■ Other buildings

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Client: **Supporting Growth**
 Project: **Pukekohe Package**

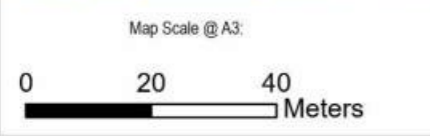


Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**



■ Cat A
■ Cat B
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 Project: **Pukekohe Package**

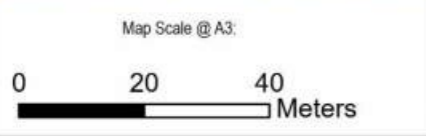


Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**



--- Cat A
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Buildings
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Working Plans of Te Tupu Ngātahi
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Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**

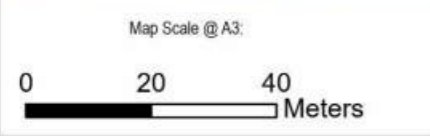


— Cat A
— Cat B

Buildings

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■ Other buildings

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NoR 6 - Pukekohe Construction Vibration Envelopes
Working Plans of Te Tupu Ngātahi
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Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**

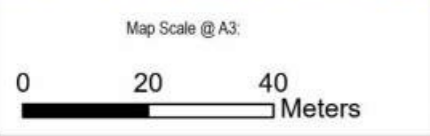


— Cat A
— Cat B

Buildings

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■ Other buildings

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Working Plans of Te Tupu Ngātahi
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Client: **Supporting Growth**
 Project: **Pukekohe Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-P6-000**

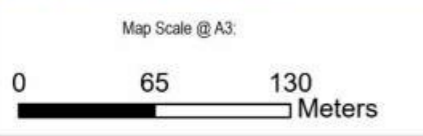
NoR 7 – Pukekohe North-West Arterial

Address	Building Type/Structure
107 Helvetia Road, Pukekohe	Residential
128 Helvetia Road, Pukekohe	Residential
3B Birdwood Road, Pukekohe	Residential



— Cat A
— Cat B
Buildings
■ Activity sensitive to noise
■ Other buildings

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Supporting Growth
NoR 7 - Pukekohe Construction Vibration Envelopes
Working Plans of Te Tupu Ngātahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **North West Package**

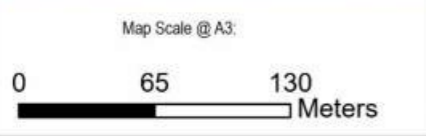


Discipline: **GIS**
 Drawing No: **SGA-NOR-W1-000**



--- Cat A
--- Cat B
Buildings
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■ Other buildings

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Supporting Growth
NoR 7 - Pukekohe Construction Vibration Envelopes
 Working Plans of Te Tupu Ngātahi
 For the purpose of INTERNAL workshops (not for wider distribution)

Client: **Supporting Growth**
 Project: **North West Package**



Discipline: **GIS**
 Drawing No: **SGA-NOR-W1-000**

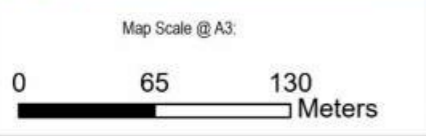


--- Cat A
--- Cat B

Buildings

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Supporting Growth

NoR 7 - Pukekohe Construction Vibration Envelopes

Working Plans of Te Tupu Ngātahi
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Client: **Supporting Growth**

Project: **North West Package**



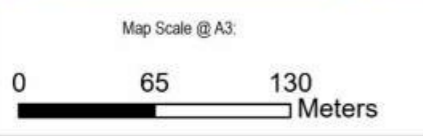
Discipline: **GIS**

Drawing No: **SGA-NOR-W1-000**



--- Cat A
--- Cat B
Buildings
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■ Other buildings

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Supporting Growth
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Client: **Supporting Growth**

Project: **North West Package**



Discipline: **GIS**

Drawing No: **SGA-NOR-W1-000**

NoR 8 (AC) – Mill Road and Pukekohe East Road Upgrade

Address	Building Type/Structure
87 Mill Road, Pukekohe East	Residential
90 Mill Road, Pukekohe East	Residential
90 Mill Road, Pukekohe East	Garage/Storage
188 Mill Road, Bombay (1)	Commercial
188 Mill Road, Bombay (2)	Commercial
203 Mill Road, Bombay	Residential
203 Mill Road, Bombay	Garage/Storage
216 Mill Road, Bombay	Commercial
156 Pukekohe East Road, Pukekohe East	Garage/Storage
216 Pukekohe East Road, Pukekohe East	Residential
232 Pukekohe East Road, Pukekohe East	Residential
232 Pukekohe East Road, Pukekohe East	Commercial
248 Pukekohe East Road, Pukekohe East	Residential



SGA PUKEKOHE NOR8 (AC)

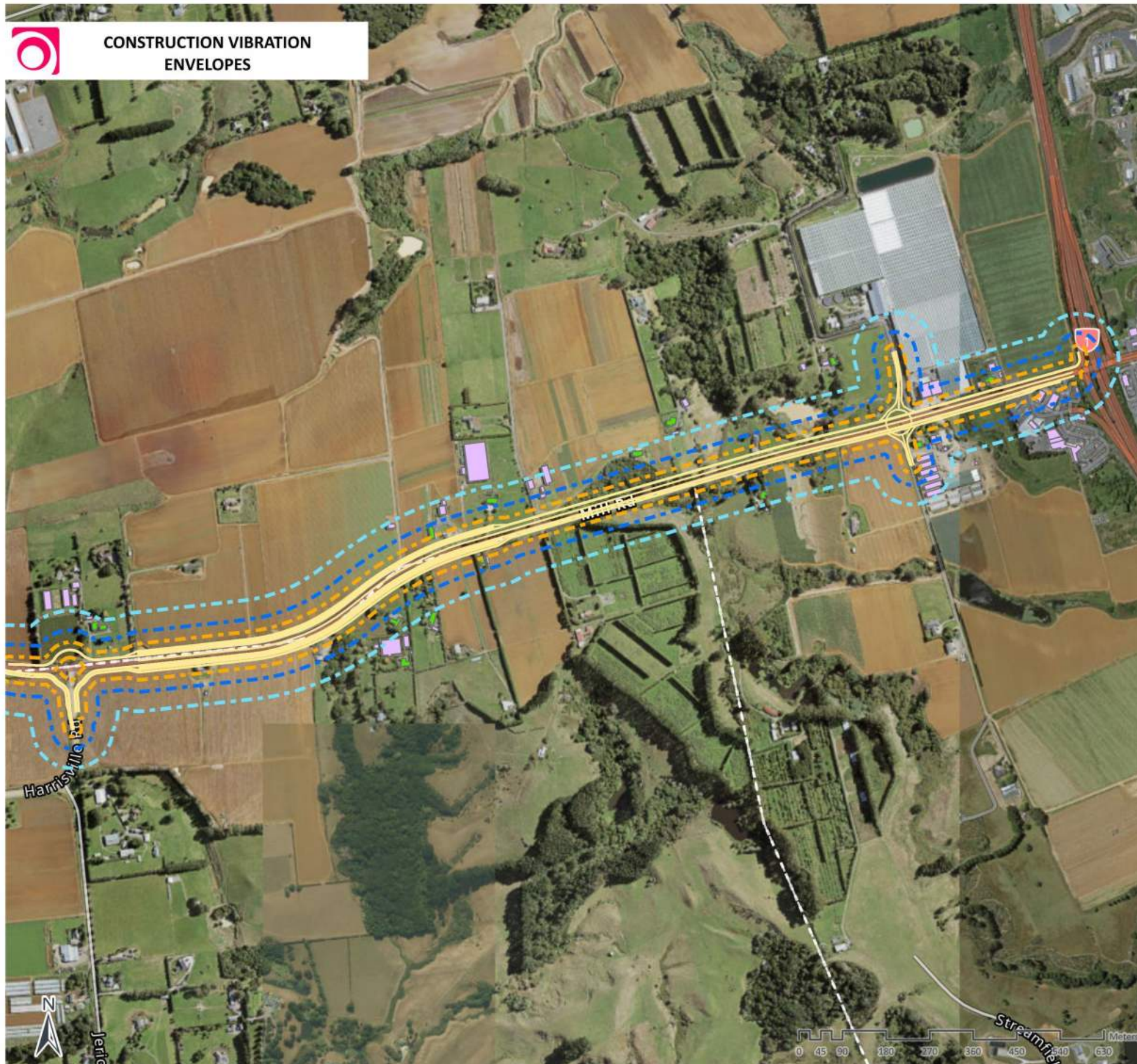
- Nor8 (AC) Roads
 - - - Nor8 (AC) CatA PPF
 - - - Nor8 (AC) CatA nonPPF
 - - - Nor8 (AC) CatB PPF
- Buildings**
- Activity Sensitive to Noise
 - Other Buildings



Client:
Map:
Authors: Owen Li
Date of Issue: 16/08/2023 4:12 pm

Drawing Details:
Scale: 1:19,517
Projection: NZGD 2000 New Zealand Transverse Mercator
Map Rotation: 0°

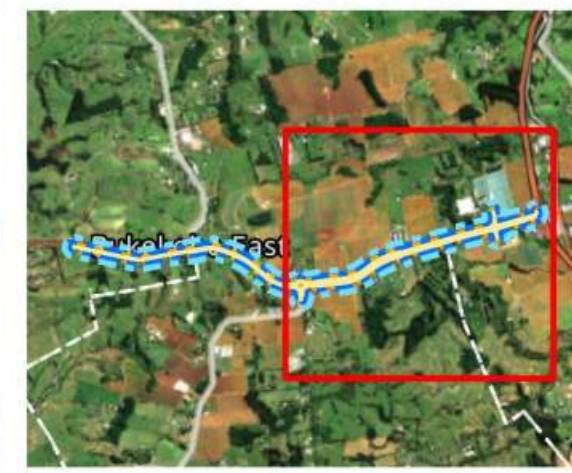
Map Notes / Comments:
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 The noise contours were obtained by interpolation of calculated grid points (spacing roughly 0.25m), with varying interpolation accuracy. Please note levels at specific locations, can be made available at request if not included in the project point measure calculations.



CONSTRUCTION VIBRATION ENVELOPES

SGA PUKEKOHE NOR8 (AC)

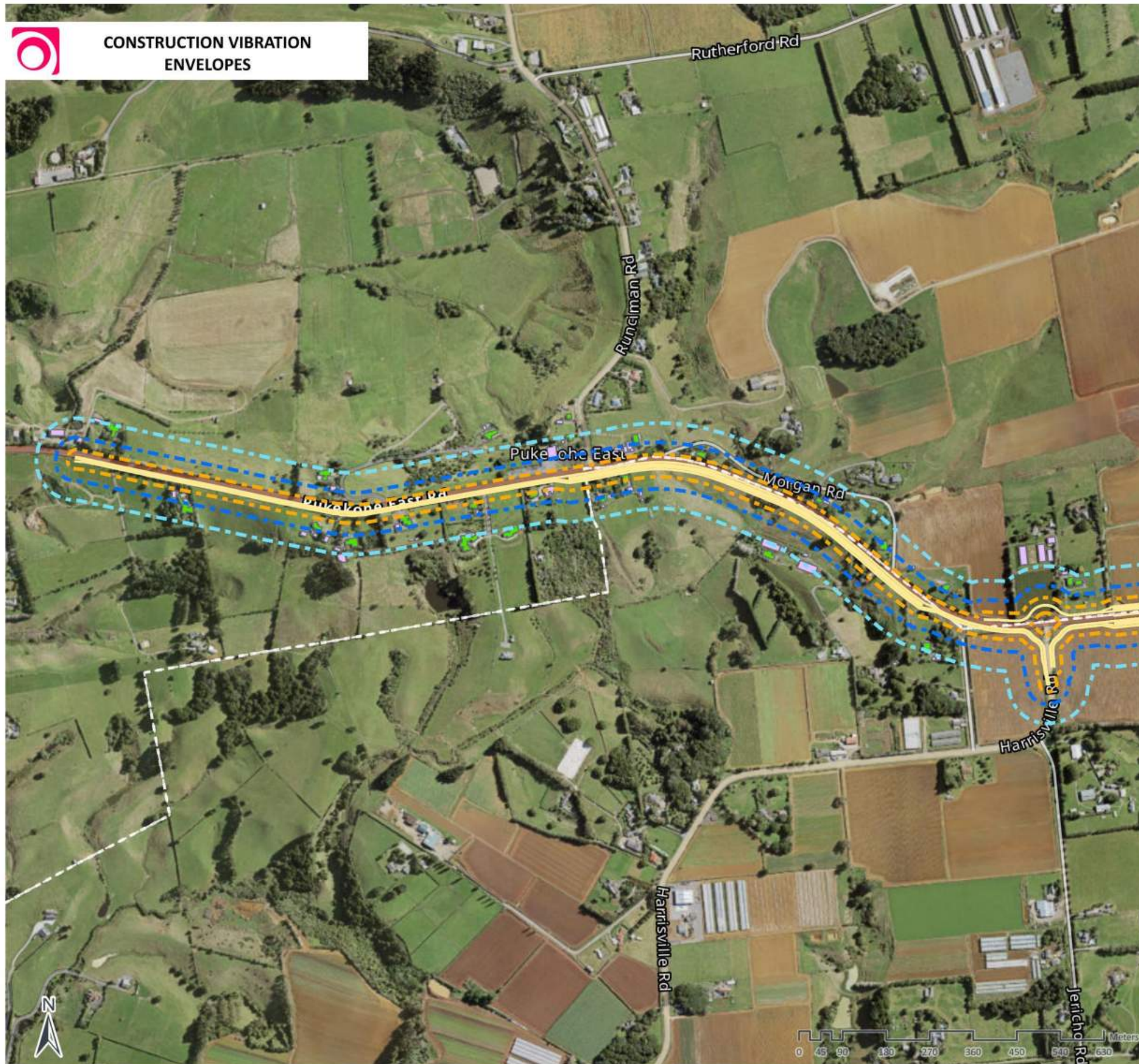
- Nor8 (AC) Roads
 - - - Nor8 (AC) CatA PPF
 - - - Nor8 (AC) CatA nonPPF
 - - - Nor8 (AC) CatB PPF
- Buildings**
- Activity Sensitive to Noise
 - Other Buildings



Client: Map
Authors: Owen.Li
Date of Issue: 16/08/2023 4:12 pm

Drawing Details:
 Scale: 1:10,607
 Projection: NZGD 2000 New Zealand Transverse Mercator
 Map Rotation: 0°

Map Notes / Comments:
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SGA PUKEKOHE NOR8 (AC)

- Nor8 (AC) Roads
 - - - Nor8 (AC) CatA PPF
 - - - Nor8 (AC) CatA nonPPF
 - - - Nor8 (AC) CatB PPF
- Buildings**
- Activity Sensitive to Noise
 - Other Buildings



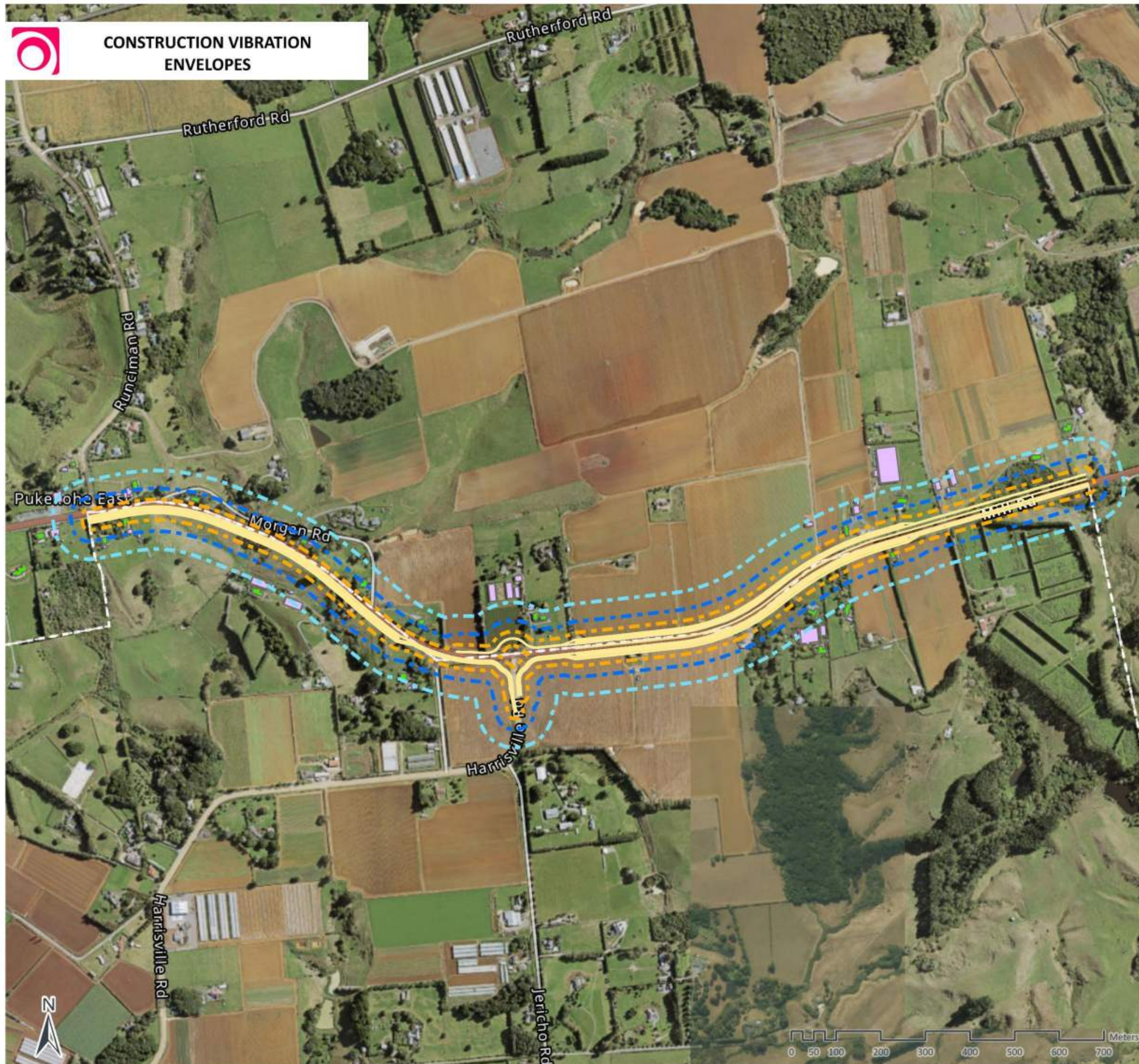
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Authors: Owen.Li
Date of Issue: 16/08/2023 4:12 pm

Drawing Details:
 Scale: 1:10,607
 Projection: NZGD 2000 New Zealand Transverse Mercator
 Map Rotation: 0°

Map Notes / Comments:
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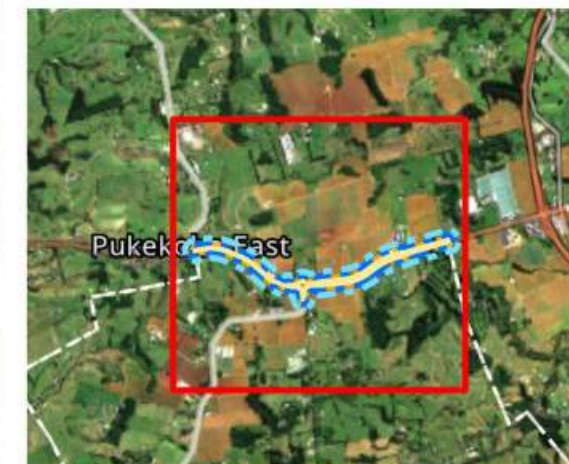
NoR 8 (WDC) – Mill Road and Pukekohe East Road Upgrade

Address	Building Type/Structure
87 Mill Road, Pukekohe East	Residential
90 Mill Road, Pukekohe East	Residential
90 Mill Road, Pukekohe East	Garage/Storage
248 Pukekohe East Road, Pukekohe East	Residential



SGA PUKEKOHE NOR8 (WDC)

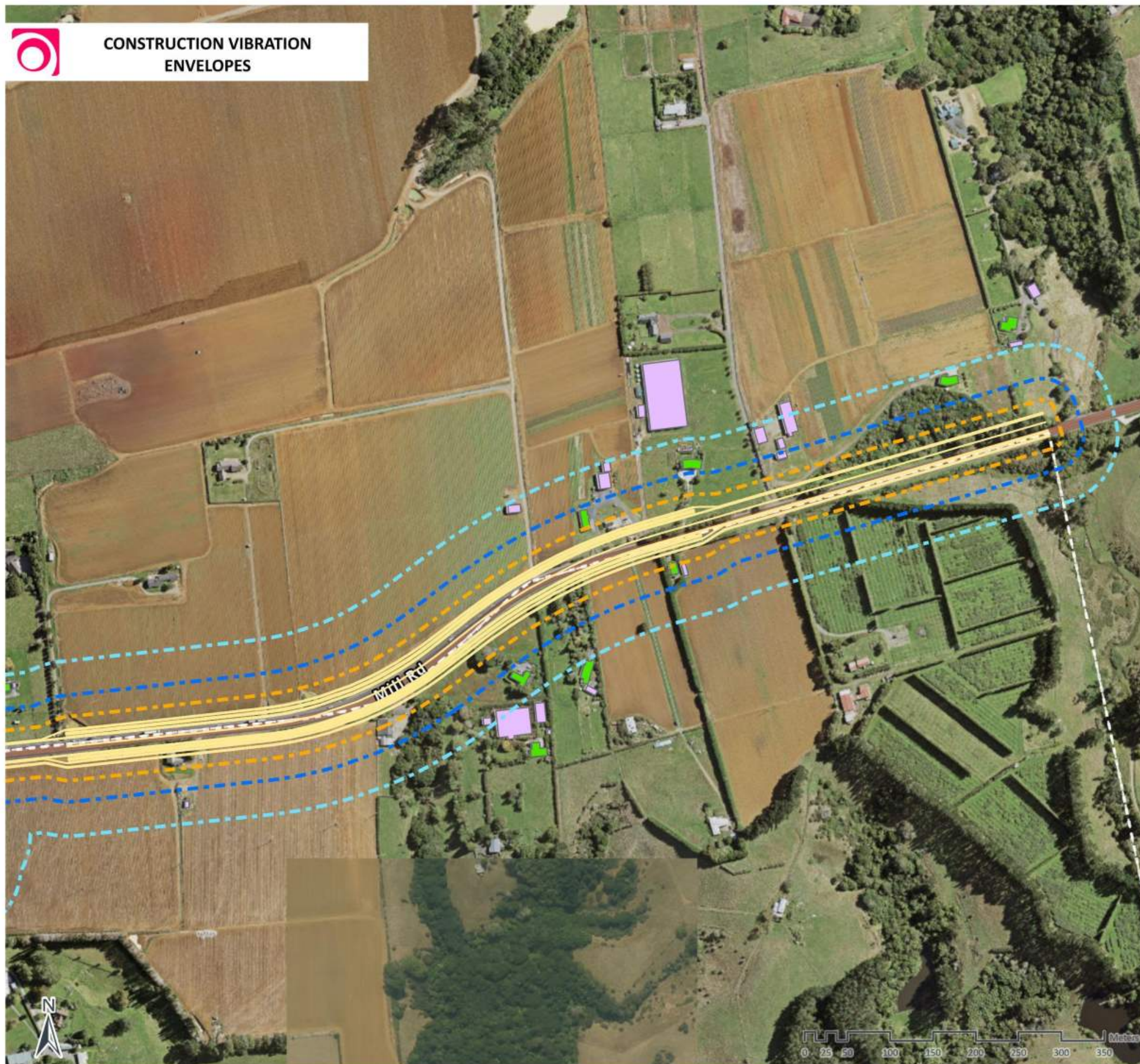
- Nor8 (WDC) Roads
 - - - Nor8 (WDC) CatA PPF
 - - - Nor8 (WDC) CatA nonPPF
 - - - Nor8 (WDC) CatB PPF
- Buildings**
- Activity Sensitive to Noise
 - Other Buildings



Client:
Map:
Authors: Owen.Li
Date of Issue: 16/08/2023 4:12 pm

Drawing Details:
Scale: 1:11,500
Projection: NZGD 2000 New Zealand Transverse Mercator
Map Rotation: 0°

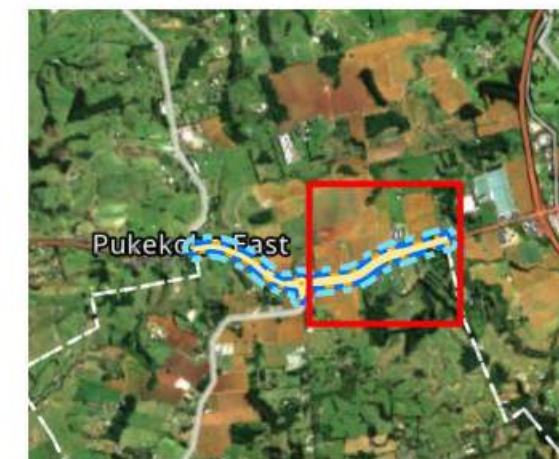
Map Notes / Comments:
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CONSTRUCTION VIBRATION ENVELOPES

SGA PUKEKOHE NOR8 (WDC)

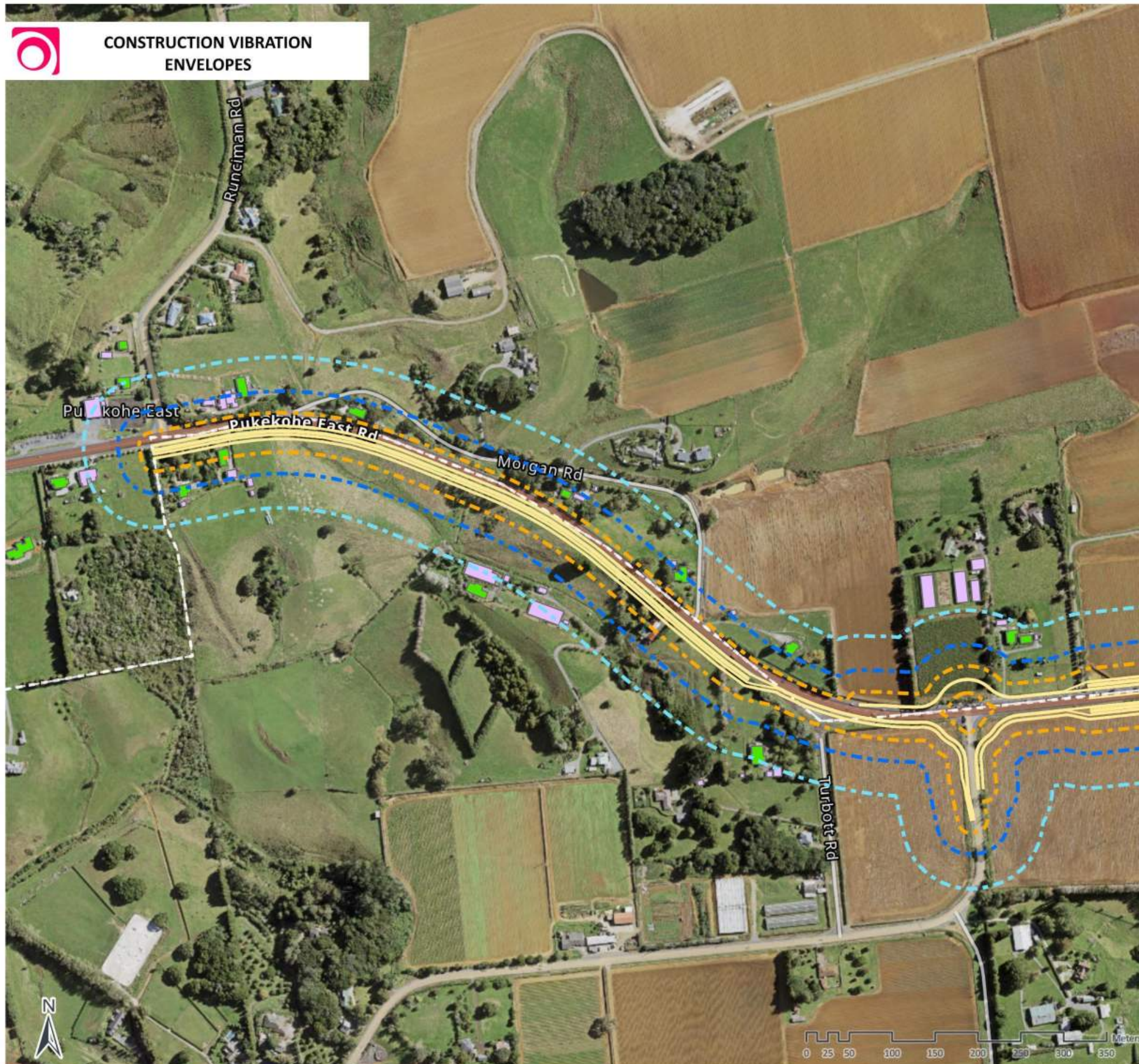
- Nor8 (WDC) Roads
- - - Nor8 (WDC) CatA PPF
- - - Nor8 (WDC) CatA nonPPF
- - - Nor8 (WDC) CatB PPF
- Buildings**
- Activity Sensitive to Noise
- Other Buildings



Client:
Map:
Authors:
Owen Li
Date of Issue:
16/08/2023 4:12 pm

Drawing Details:
Scale: 1:6,000
Projection: NZGD 2000 New Zealand Transverse Mercator
Map Rotation: 0°

Map Notes / Comments:
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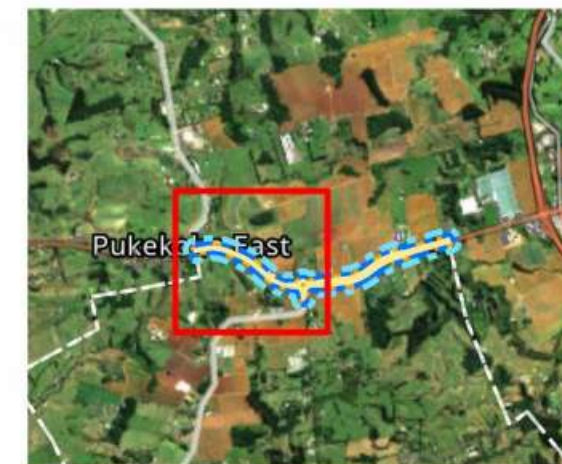


SGA PUKEKOHE NOR8 (WDC)

- Nor8 (WDC) Roads
- - - Nor8 (WDC) CatA PPF
- - - Nor8 (WDC) CatA nonPPF
- - - Nor8 (WDC) CatB PPF

Buildings

- Activity Sensitive to Noise
- Other Buildings



Client: Map Authors: Owen Li Date of Issue: 16/08/2023 4:12 pm

Drawing Details: Scale: 1:5,000 Projection: NZGD 2000 New Zealand Transverse Mercator Map Rotation: 0°

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