I hereby give notice that a hearing by commissioners will be held on:

| | |
|---|---|
| **Date:** | **Mondays through Thursdays from 18 September until 12 October 2023** |
| **Time:** | **9:30am** |
| **Meeting Room:** | **Council Chambers** |
| **Venue:** | **Level 2, Henderson Civic, 3 Smythe Road, Henderson, Auckland 0612** |

# NOTIFICATION MATERIAL

# VOLUME 08

# NORTH-WEST LOCAL PROJECTS

## TE TUPU NGĀTAHI SUPPORTING GROWTH

## AUCKLAND TRANSPORT & WAKA KOTAHI NZ TRANSPORT AGENCY

**COMMISSIONERS**

| | |
|---|---|
| **Chairperson** | **Richard Blakey (Chairperson)** |
| **Commissioners** | **Mark Farnsworth**<br>**Vaughan Smith** |

**Patrice Baillargeon**
**Kaitohutohu Mataamua Whakawā / Senior Hearings Advisor**

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**Note:** The reports contained within this agenda are for consideration and should not be construed as a decision of Council. Should Commissioners require further information relating to any reports, please contact the Team Leader Hearings.

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**North-West Local: Whenuapai and Redhills – Part 1**

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**North-West Local: Whenuapai and Redhills – Part 2**



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**North-West Local: Whenuapai and Redhills – Part 3**



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**North-West Local: Whenuapai and Redhills – Part 4**

# ATTACHMENT 56

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF TRANSPORT EFFECTS

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Redhills and Riverhead

# Assessment of Transport Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY



New Zealand Government

## Document Status

| **Responsibility** | **Andrew Murray** |
|---|---|
| Author | Rachel Gasson |
| Reviewer | Michelle Seymour |
| Approver | John Daly |

## Revision Status

| **Version** | **Date** | **Reason for Issue** |
|---|---|---|
| 1 | 16/12/2022 | Notice of Requirement Lodgement |

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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AEE** | Assessment of Effects on the Environment |
| **AC** | Auckland Council |
| **AT** | Auckland Transport |
| **ATAP** | Auckland Transport Alignment Project |
| **AUP:OP** | Auckland Unitary Plan Operative in Part |
| **FTN** | Frequent Transit Network |
| **FUZ** | Future Urban Zone |
| **LOS** | Level of service |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **PT** | Public transport |
| **RASF** | Auckland Transport Roads and Streets Framework |
| **RMA** | Resource Management Act 1991 |
| **SH16** | State Highway 16 |
| **SH18** | State Highway 18 |
| **Te Tupu Ngātahi** | Te Tupu Ngātahi Supporting Growth Programme |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |

# Glossary of Acronyms / Terms

| Acronym/Term | Description |
|---|---|
| **Auckland Council** | Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010. |
| **Redhills Riverhead Assessment Package** | Two Notices of Requirement (for Don Buck Road and Coatesville-Riverhead Road) and one alteration to an existing designation (Fred Taylor Drive) for the Redhills Riverhead Package of Projects for Auckland Transport. |

# 1 Executive Summary

## 1.1 Overview

This Transport assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "**Redhills Riverhead Assessment Package**"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the construction, operation and maintenance of transport infrastructure in the North West. This report is for the Redhills and Riverhead areas of Auckland and is referred to as the Redhills Riverhead Assessment Package.

The Redhills Riverhead Assessment Package comprises three separate projects which together form the North West Redhills and Riverhead Arterial Network. The network includes provision for general traffic, walking and cycling, and frequent public transport. Table 1-1 summarises these projects.

**Table 1-1: North West Redhills Riverhead Assessment Package – Notices of Requirement and Projects**

| Notice | Project |
|---|---|
| **NoR RE1** | Don Buck Road FTN Upgrade |
| **NoR RE2** | Fred Taylor Drive (alteration to existing designation 1433) |
| **NoR R1** | Coatesville-Riverhead Highway Upgrade |

## 1.2 Methodology

### 1.2.1 Approach to Assessment of Operational Transport Effects

Potential operational transport effects are assessed using: ·

- Transport planning assessment of expected outcomes and effects
- Transport modelling to inform demands and network performance
- Alignment with various policy documents

In respect to each individual NoR, a separate assessment has been undertaken, and the assessment criteria and methodology is summarised in Table 1-2 below.

**Table 1-2: Summary of Assessment Methodology**

| Network Component | Information Source | Assessment Method |
|---|---|---|
| Safety | Crash Analysis (CAS) Database<br>Project design drawings | Assessment to determine alignment with Vision Zero standards and design compliance with Transport Design Manual |
| Walking and Cycling | Walking and Cycling Network Plans<br>Proposed Cross Sections | Assessment to determine alignment with walking and cycling strategic documents and design |

| Network Component | Information Source | Assessment Method |
|---|---|---|
| | | compliance with Transport Design Manual |
| Public Transport | Transport Model tools (MSM, SATURN and SIDRA)<br>SGA Remix File[1] | Assessment to determine alignment with future network provisions and design compliance with the Transport Design Manual |
| General Traffic | Transport Model tools (MSM, SATURN and SIDRA)<br>Project design drawings | Assessment using key model outputs including traffic volumes, levels of service for corridor midblock performance and intersection performance. Assessment of surrounding network connections |
| Access | Engineering Standards | Assessment identifying where there is a potential effect on access in the existing environment |
| Wider Network Effects | Transport Model tools (MSM, SATURN and SIDRA) | Assessment to consider how the corridor interacts with the surrounding road network |
| Note: A Road Safety and Audit and Safe System assessment with be done as part of the implementation business case/detailed design stage prior to implementation. | | |

### 1.2.2 Approach to Assessment of Construction Effects

Based on the indicative construction methodology an assessment of construction effects has been completed for the package sufficient to support each Notice of Requirement. This assessment considers:

- An overview of key considerations including speed, potential impacts to pedestrians and cyclists and property access
- Identification of any works that should not occur at the same time
- Assessment of potential conflict areas with vulnerable road users that will need specific mitigation within a CTMP and / or SSTMP

Temporary effects from the construction activities on network can be adequately managed through the implementation of a CTMP during the construction phase of each Project. The purpose of the CTMP is to ensure the construction of each Project is managed in such a way that enables safe and efficient movement of local traffic throughout the construction period and to minimise disruption to road users, particularly the adjacent residential properties and local activities.

[1] SGA Remix file provided by Auckland Transport on the draft plan of the bus network to be implemented by 2048

## 1.3 NoR RE1: Don Buck Road FTN Upgrade

### 1.3.1 Road Environment Overview

The project proposes that the function of Don Buck Road will change from an existing two-lane urban arterial to a four-lane urban arterial.

The existing corridor includes two vehicle lanes, one per direction, as well as footpaths and on-street bicycle lanes on both sides. The indicative proposed design includes two additional vehicle lanes, as well as new and improved facilities for walking and cycling as shown in Figure 1-1.

**Figure 1-1: Indicative future Don Buck Road corridor design**

### 1.3.2 Overall Conclusion

Overall, the NoR RE1: Don Buck Road FTN Upgrade project has considerable positive transport effects, in particular improved safety, walking and cycling, and public transport effects. Access effects on several properties have been identified, and the inclusion of these within the designation boundary is recommended.

In terms of construction traffic effects, it is considered that there is sufficient network capacity to enable construction traffic, and that any potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

It is recommended that access and safety considerations relating to St Paul's Primary School and Massey Leisure Centre should be specifically considered within the CTMP prior to construction and implementation of the Project.

## 1.4 NoR RE2: Fred Taylor Drive FTD Upgrade

### 1.4.1 Road Environment Overview

The Project proposes that the function of Fred Taylor Drive will change from an existing two-lane road to a low-speed urban four-lane arterial.

The existing corridor includes two vehicle lanes, one per direction, as well as discontinuous segments of footpaths on both sides of the corridor.  The indicative proposed design includes two additional public transport lanes, as well as new facilities for walking and cycling as shown in Figure 1-2.

**Figure 1-2: Indicative future Fred Taylor Drive corridor design**

### 1.4.2 Overall Conclusion

Overall, the NoR RE2: Fred Taylor Drive FTN Upgrade project has considerable positive transport effects, in particular improved safety, walking and cycling, and public transport effects.  Access effects on two properties have been identified, with one property recommended to be included within the designation boundary and the second access recommended to be relocated.

In terms of construction traffic effects, it is considered that there is sufficient network capacity to enable construction traffic, and that any potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

## 1.5 NoR R1: Coatesville Riverhead Highway Upgrade

### 1.5.1 Road Environment Overview

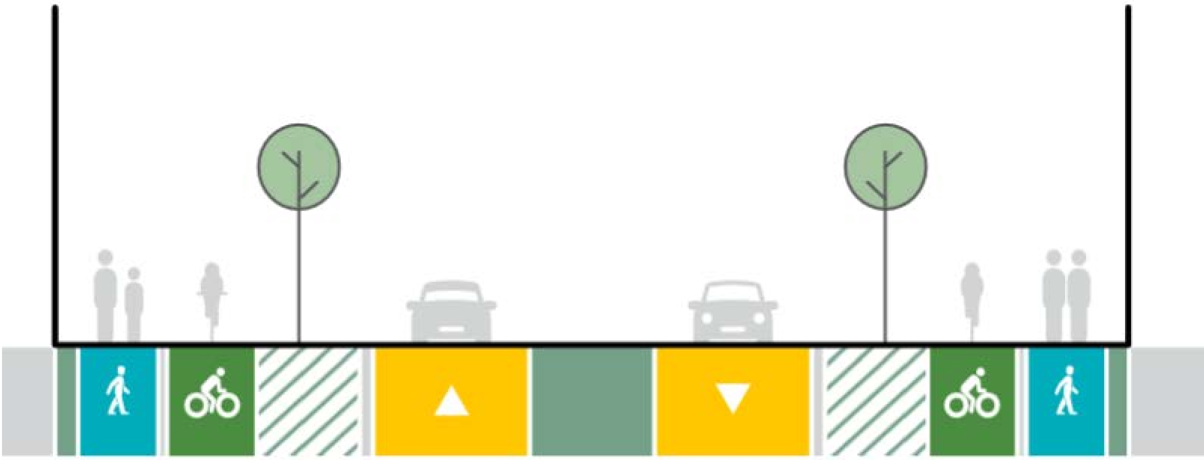
The Project proposes that the function of Coatesville Riverhead Highway will change from an existing rural two-lane road to a low-speed urban two-lane arterial in the urban section and an upgraded rural arterial in the rural section.

The existing corridor includes two vehicle lanes, one per direction, and a footpath on the western side adjacent to the Riverhead residential subdivision. There are no footpath facilities in the rural section of the corridor. The indicative proposed design includes two vehicle traffic lanes, as well as new facilities for walking and cycling as shown in Figure 1-3 and Figure 1-4.

The form and function of Coatesville Riverhead Highway will change slightly through various segments of the corridor, with the eastern segments being adjacent to residential development, and the western segment adjacent to greenfield land. As such, the cross section will change along the length of the Coatesville Riverhead Highway, to best accommodate vehicles, active modes and freight in relation to the adjacent land use.

**Figure 1-3: Indicative future Coatesville Riverhead Highway corridor design between SH16 and Short Road**

**Figure 1-4: Indicative future Coatesville Riverhead Highway corridor design between Short Road and Riverhead Road**



### 1.5.2 Overall Conclusion

Overall, the NoR R1: Coatesville Riverhead Highway Upgrade project provides considerable positive transport effects in particular improved safety, walking and cycling effects.

In terms of construction traffic effects, it is considered that there is sufficient network capacity to enable construction traffic, and that any potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

# 2 Introduction

This Transport assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "**Redhills Riverhead Assessment Package**"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

The North West growth area is approximatively 30 kilometres north west of Auckland's central city. It makes a significant contribution to the future growth of Auckland's population by providing for approximately 42,355 new dwellings and employment activities that will contribute 13,000 new jobs across the North West.

The Redhills Riverhead Assessment Package will provide route protection for the local arterials, which include walking, cycling and public transport (including the Frequent Transit Network (**FTN**)), needed to support the expected growth in Redhills and Riverhead.

This report assesses the transport effects of the North West Redhills Riverhead Assessment Package identified in Table 2-1 below.

**Table 2-1: North West Redhills Riverhead Assessment Package – Notices of Requirement and Projects**

| Notice | Project |
|---|---|
| **NoR R1** | Don Buck Road FTN Upgrade |
| **NoR RE2** | Fred Taylor Drive (alteration to existing designation 1433) |
| **NoR R1** | Coatesville-Riverhead Highway Upgrade |

The Redhills Riverhead Assessment Package comprises three separate projects which together form the North West Redhills and Riverhead Arterial Network. The network includes provision for general traffic, walking and cycling, and frequent public transport.

Refer to the main AEE for a more detailed project description.

## 2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Redhills Riverhead Assessment Package. Its purpose is to inform the AEE that accompanies the four NoRs and one alteration to an existing designation for the Redhills Riverhead Assessment Package sought by AT.

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Redhills Riverhead Assessment Package on the existing and likely future environment as it relates to Transport 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:

a) Identify and describe the transport context of the Redhills Riverhead Assessment Package area;

b) Identify and describe the actual and potential transport effects of each Project corridor within the Redhills Riverhead Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential transport effects (including any conditions/management plan required) for each Project corridor within the Redhills Riverhead Assessment Package; and
d) Present an overall conclusion of the level of actual and potential effects for each Project corridor within the Redhills Riverhead Assessment Package after recommended measures are implemented.

## 2.2 Report Structure

The report is structured as follows:

a) Overview of the Assessment Methodology used to undertake the assessment
b) An assessment of the positive effects related to the Redhills Riverhead projects as a network
c) An assessment of actual and potential adverse construction effects for the Redhills Riverhead projects
d) An assessment of operational transport effects for each project including:
   a. Description of each Project corridor and project features as it relates to transport;
   b. Identification and description of the existing and likely future transport environment;
   c. Description of the actual and potential adverse transport effects of operation of the Project;
   d. Recommended measures to avoid, remedy or mitigate potential adverse transport effects; and
   e. Overall conclusion of the level of potential adverse transport effects of the Project after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of each Project. The AEE also contains a detailed description of works to be authorised for each Project, 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 transport 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.

## 2.3 Preparation for this Report

In preparation for this report, several resources were used to support the assessment of transport effects. A Construction Method Statement has been provided by construction specialists for each NoR (summarised in the AEE), which was used to assess the actual and potential transport effects of the construction of each project. In terms of operational effects, the inputs used for modelling purposes are discussed in greater detail in the Assessment Methodology.

A series of Business Cases and public engagement exercises have been undertaken over the past four years as part of a wider programme of transport initiatives needed to support the growth in this north-western part of Auckland. These include:

- Transport for Future Urban Growth Programme Business Case (2016)
- North West Indicative Business Case (IBC) (2018)
- North West Detailed Business Case (DBC) (2020)

# 3 Assessment Methodology

Given the long-term nature of the designations being sought by the NoRs, this assessment does not assess the interim staging of individual projects and development staged over the next three decades but instead places a greater focus on the 'full build out' of the future urban area in 2048+ to support future communities. Therefore, this assessment focusses on the likely future environment (full build out 2048+) and wider infrastructure upgrades.

To ascertain the long-term effects of the projects, this assessment assesses the transport effects arising from each of the Projects that comprise the Redhills Riverhead Package in a future context.

The methodology for the operational and construction transport effects are applicable for each NoR specified within this document. Any nuances are specified throughout the assessment.

The Assessment of Transport Effects has two elements:

- Assessment of operational effects on the transport system
- Assessment of construction effects on the transport network

The assessment is targeted at route protection, rather than imminent implementation. As such, it:

- Makes greater use of generic cross-sections and design standards ·
- Focuses more on desired outcomes and footprints
- Takes a longer-term view, with its inherent uncertainties
- Assumes more use of recommended management plans and planning processes rather than specific design details to manage potential effects

A key element of the assessment is the definition of the 'existing/likely future environment', against which the effects are assessed. This is a complex issue as the proposed works are planned to support urban development and will be unlikely to occur without such development. Additionally, the source of the potential effects (such as people and vehicle movement), is generally from that urban development itself, rather than from the planned infrastructure.

To isolate the effects of the planned works, the 'Existing Environment' includes the likely future urban development but does not include the planned projects for which proposed designations are sought. The effects of the Projects are then assessed using the same land use assumptions. Given the long-term perspective of the assessment, the analysis is based on the estimated 'full build out' for the future urban area, including the already zoned Redhills area.

## 3.1 Approach to Assessment of Operational Transport Effects

Potential operational transport effects are assessed using: ·

- Transport planning assessment of expected outcomes and effects
- Transport modelling to inform demands and network performance
- Alignment with various policy documents

In respect to each individual NoR, a separate assessment has been undertaken that provides an assessment of:

- Each mode of transport, and

- Access for existing properties
- Wider network effects

This section will outline the methodology for these assessments.

### 3.1.1 Transport Modelling

Throughout the transport network analysis process, a range of different transport modelling tools have been used to undertake quantitative assessments of the transport system. These then inform decisions about planning the transport network, corridors, and intersections.

The impacts of the Projects on the future transport environment are assessed using forecasting transport models, owned by the Auckland Forecasting Centre (AFC). The models include:

- The regional multi-modal strategic model (MSM). This model creates estimates of car, truck and PT movements at a regional level based on land use, network and policy inputs. This model is the primary tool to estimate future PT usage. Generally, this model is run using regional assumptions as per recent ATAP planning, but with scenario-specific inputs in the growth areas.
- A local traffic model (SATURN). This uses the traffic demands from MSM on a more detailed representation of the road network.
- A strategic active model (walk/cycling) model (SAMM). This tool gives strategic-level estimates of walking and cycling demands.

The assessment of operational effects will therefore be informed by modelled estimates of travel and network performance for a future full-build-out scenario.

A SATURN (North West Area) and MSM (Regional) model with forecast year of '2048+' for the wider network was used. The '2048+' forecast includes the regional growth estimated for the year 2048 but with the addition of full build-out in the greenfield growth areas. The SATURN model uses the demand outputs from MSM, which includes inputs of the latest land use assumptions (in this instance, referred to as scenario i11.5). The modelling includes an overall network of infrastructure identified to support growth in the North West area. This means that the assessment assumes that all other North West Supporting Growth Programme projects are implemented and the growth up to 2048+ will progress as planned. All transport projects assumed in the modelling are outlined in Appendix 1.

In addition to the SATURN modelling, SIDRA modelling has been undertaken to assess the operational outputs of key intersections along the project corridors. The regional model (MSM) was used to inform assessment of the public transport network components.

In regard to traffic modelling analysis used in this report, a Level of Service (LOS) metric has been used. This refers to a qualitative measure used to assess the quality of motor vehicle traffic service. LOS is used to analyse roadways and intersections by categorising traffic flow and assigning quality levels of traffic based on a performance measure ranging from A to F and can be summarised as follows:

- **LOS A: free flow**. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes.
- **LOS B: reasonably free flow**. LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted.
- **LOS C: stable flow, at or near free flow**. Ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness.

- **LOS D: approaching unstable flow**. Speeds slightly decrease as traffic volume slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease.
- **LOS E: unstable flow, operating at capacity**. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream and speeds rarely reach the posted limit.
- **LOS F: forced or breakdown flow.** Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity

### 3.1.2 Transport Guidance and Documents

Assessment of the Projects against the relevant objectives and policies of the AUP:OP is contained in the AEE. Within this report, the Projects have also been considered against the outcomes and objectives of applicable transport design guidance and policy directives including:

- AT's Transport Design Manual, which sets out outcomes, engineering design and construction requirements for the Projects
- AT's Vision Zero, which adopts a "Safe System" approach to focus on road safety for all road users
- AT's Roads and Streets Framework (RASF) was also used to qualitatively assesses the typology (movement and place value) and modal priority for each corridor. A 'mandate' for each road corridor is developed and approved by the RASF Committee, comprising of senior officers from AT and AC.

### 3.1.3 Assessment Methodology - Transport Mode

Table 3-1 summarises how each mode/element of transport has been assessed in terms of operational effects as a result of the Projects.

**Table 3-1: Summary of Assessment Methodology**

| Network Component | Information Source | Assessment Method |
|---|---|---|
| Safety | Crash Analysis (CAS) Database<br>Project design drawings | Assessment to determine alignment with Vision Zero standards and design compliance with Transport Design Manual |
| Walking and Cycling | Walking and Cycling Network Plans<br>Proposed Cross Sections | Assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual |
| Public Transport | Transport Model tools (MSM, SATURN and SIDRA)<br>SGA 2048 Future Public Transport Network File[2] | Assessment to determine alignment with future network provisions and design compliance with the Transport Design Manual |
| General Traffic | Transport Model tools (MSM, SATURN and SIDRA) | Assessment using key model outputs including traffic volumes, levels of service for corridor |

[2] SGA Remix file provided by Auckland Transport on the draft plan of the bus network to be implemented by 2048

| Network Component | Information Source | Assessment Method |
|---|---|---|
| | Project design drawings | midblock performance and intersection performance. Assessment of surrounding network connections |
| Access | Engineering Standards | Assessment identifying where there is a potential effect on access in the existing environment |
| Wider Network Effects | Transport Model tools (MSM, SATURN and SIDRA) | Assessment to consider how the corridor interacts with the surrounding road network. |
| Note: A Road Safety and Audit and Safe System assessment with be done as part of the implementation business case/detailed design stage prior to implementation. | | |

### 3.1.4 Assessment of Project Objectives

Each project included in the Redhills Riverhead Assessment Package has an identified set of project objectives. From a transport perspective, these objectives are focused predominantly on the themes of supporting growth, safety, urban form, mode shift/choice and connectivity. The assessment of these, and how they align with the Project Objectives are included in the main AEE

## 3.2 Approach to Assessment of Construction Effects

### 3.2.1 Construction Traffic Effects

In order to assess the potential construction traffic effects, an indicative construction methodology has prepared.

Based on the indicative construction methodology an assessment of construction effects has been completed for the package sufficient to support each NoR. This assessment will consider:

- An overview of key considerations including speed, potential impacts to pedestrians and cyclists and property access
- Identification of any works that should not occur at the same time
- Assessment of potential conflict areas with vulnerable road users that will need specific mitigation within a Construction Traffic Management Plan (CTMP) and / or Site-Specific Traffic Management Plans (SSTMP)

The project specific construction effects will be managed via a CTMP and/or SSTMP which will be developed immediately prior to implementation when the greatest certainty is available.

### 3.2.2 Temporary Traffic Management

The impact of any temporary traffic management measures implemented to undertake the Projects will be confirmed as part of the CTMP prior to the construction phase of each project.

It is noted that as existing roads these Projects may need to be delivered ‘online’. Therefore, the CTMP should consider potential road closures, any capacity reductions on key corridors through lane closures, and any other ancillary effects such as shoulder closures.

# 4 Redhills Riverhead Assessment Package Overview

A brief summary of the Redhills Riverhead Assessment Package projects is provided in Table 4-1 below.

**Table 4-1: Redhills Riverhead Assessment Package Project Summary**

| Corridor | NOR | Description | Requiring Authority |
|---|---|---|---|
| **Don Buck Road FTN Upgrade** | RE1 | Upgrade of Don Buck Road corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Fred Taylor Drive FTN Upgrade** | RE2 | Upgrade of Fred Taylor Drive corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Coatesville-Riverhead Highway Upgrade** | R1 | Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial cross-section with active mode facilities on the western side; and<br><br>Upgrading the northern section of the corridor to a 24m two-lane urban arterial cross-section with active mode facilities on both sides of the corridor. | Auckland Transport |

Please refer to the AEE for further information on these projects, including a project description, key project features and the planning context.

# 5 Redhills Riverhead Construction Effects

### 5.1.1 Construction Traffic Effects Assessment

It is anticipated that the larger part of works required for this package of projects will likely be adjacent to or on the live carriageway, which means that temporary traffic management will be required. The scale of temporary traffic management to delineate live traffic away from the construction zones is largely dependent on the various stages and requirements of the construction activities. It is expected that short term temporary road closure for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches and gas relocation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work.

Final temporary traffic management methods should be confirmed in the future as part of the CTMP for each project on the basis of the traffic environment. . This will take into account the level of growth and activities that has occurred in Redhills and Riverhead, the availability of the alternative routes, and any additional sensitive land use activities.

The construction of the projects will each likely require significant earthworks. Final cut and fill volumes will be confirmed following detailed design prior to construction. The construction traffic movements to accommodate the earthworks will likely result in the increase of traffic volume on construction routes used during the construction period of each of the projects.

Given the construction timing and staging of the package has yet to be determined, there is a degree of uncertainty associated with any predicted construction methodology and associated traffic routes. This means:

- The routes that will be used by construction vehicles will depend on the location of quarries and disposal sites which are not yet certain
- The exact location and extent of compound sites/lay down areas has yet to be determined
- The timing of construction of other projects could impact on likely construction vehicle routes

Notwithstanding this, it is considered that given that connectivity to the strategic network and the available capacity in the network that construction traffic will be able to be readily accommodated.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points identified as part of future CTMPs.

Details of the routes and time restrictions will need to be updated and refined as part of the CTMP process. It is anticipated that the routes for construction traffic will likely be limited to arterial corridors and intersections with the provision of adequate vehicle tracking. With Fred Taylor Drive and Brigham Creek Road as a Level 1B freight routes, it is recommended that these corridors are used where practicable.

**Speed Limits**

In order to maintain the safety of all road users, it is recommended to implement a safe and appropriate temporary speed limit during the construction period on the network within the extent of works, and along the construction routes if needed. This should be in accordance with the latest traffic management standards at the time of construction. These recommended measures and other measures highlighted in the CTMP are expected to reduce the potential safety risks that may be associated with construction traffic.

**Pedestrians and cyclists**

The existing provision for pedestrian and cyclists is variable across the network. It is likely that the demand for these modes will increase if urbanisation occurs prior to construction, but future parallel collectors could also be used as an alternative route. Therefore, effects should be assessed again when a greater level of detail is available about surrounding facilities and land use activities prior to construction. However, it is recommended that residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity will be used to inform appropriate traffic management measures in the CTMP.

**Property access for residents and businesses**

During the time of construction, there will be temporary traffic management controls such as temporary concrete or steel barriers. Existing driveways that remain during construction will be required to have temporary access provision. It is anticipated that the contractor should undertake a property specific assessment of any affected driveways and provide temporary access arrangements if required. The temporary access should ensure the ability for residents to safely access and exit the property. These requirements should be captured in the CTMP or SSCTMP, if required.

**Land use activities that will need further consideration in the CTMP**

The following table provides a summary of the key land use or activities that are located adjacent to the corridors and will need consideration during the development of the CTMP. This could include restricted truck movements during school pick up and drop off, or additional controls at key access locations. The below is not a final or complete list, with land use changes likely, this list will change over time.

**Table 5-1: Sites for Consideration within future CTMP**

| Corridor | NoR | Sites for Consideration |
|---|---|---|
| **Don Buck Road FTN Upgrade** | NoR RE1 | • St Paul's Primary School<br>• Massey Leisure Centre |
| **Fred Taylor Drive FTN Upgrade** | NoR RE2 | • No specific sites |
| **Coatesville-Riverhead Highway Upgrade** | NoR R1 | • 1229 Coatesville Riverhead Highway |

### 5.1.2 Temporary Traffic Management Effects Assessment

It is considered that temporary effects from the construction activities on network can be adequately managed through the implementation of a CTMP during the construction phase of each Project. The purpose of the CTMP is to ensure the construction of each Project is managed in such a way that enables safe and efficient movement of local traffic throughout the construction period and to minimise disruption to road users, particularly the adjacent residential properties and local activities. If required, SSTMP should be developed to manage constraints on access to affected properties.

### 5.1.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

It is considered that the potential construction traffic effects can be accommodated and managed appropriately via a CTMP. Based on the assessment of transport construction effects, it is recommended:

1) A CTMP shall be prepared prior to the Start of Construction for a Stage of Work. Any potential construction traffic effects shall be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction.
2) The objective of the CTMP is to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP shall include:
    a) Methods to manage the effects of temporary traffic management activities on traffic;
    b) Measures to ensure the safety of all transport users;
    c) The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
    d) Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
    e) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
    f) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
    g) The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads;
    h) Method that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);
3) Auditing, monitoring and reporting requirements relating to traffic management activities shall be undertaken in accordance with Waka Kotahi's Code of Practice for Temporary Traffic Management.
4) Any CTMP prepared for a Stage of Work shall be submitted to Council for information ten (10) working days prior to the Start of Construction for a Stage of Work.

# 6 NoR RE1: Don Buck Road FTN Upgrade

## 6.1 Project Corridor Features

### 6.1.1 Project Overview

Don Buck Road is an existing two-lane arterial extending from Fred Taylor Drive in the north to Swanson Road and Universal Drive in the south. The extent of the indicative proposed upgrade is from Fred Taylor Drive in the north and Royal Road to the south. The corridor currently functions as a north-south arterial road running parallel to SH16 and is anticipated to facilitate future growth in Redhills, whilst also connecting people to rapid transit stations, regional active mode corridors and the SH16 motorway interchanges. The corridor is also intended to support active modes, freight, and public transport priority for the future FTN network.

This section of Don Buck Road is indicatively proposed to be upgraded from a corridor width of 27-35m to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor. Intersections located along the corridor are indicatively proposed to be signalised.

An overview of the indicative proposed design is provided in Figure 6-1.

**Figure 6-1: Overview of the Indicative Don Buck Road FTN Upgrade**

## 6.2 Network and Corridor Design

The Project was developed as part of network planning for the wider area. The wider networks were developed through the Te Tupu Ngātahi Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider integrated network planned for the North West.

The Project proposes that the function of Don Buck Road will change from an existing two-lane road to an urban four-lane arterial (using AT Transport Design Manual standards).

The existing corridor includes two vehicle lanes, one per direction, plus on-street bicycle lanes and footpaths on both sides. The indicative proposed design includes two additional vehicle lanes, as well as new and improved facilities for walking and cycling as shown in Figure 6-2.

**Figure 6-2: Indicative future Don Buck Road corridor design (Fred Taylor Drive to Royal Road)**

The development of the corridor design has included the use of AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority. The intent of RASF framework is to classify the expected movement and place functions from a consistent regional context and identify the likely priority applied to each mode.

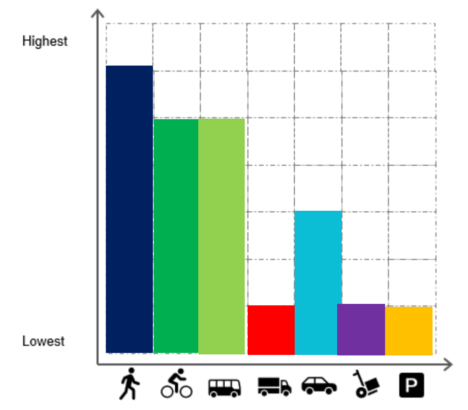
The framework itself does not directly dictate a specific corridor design but provides context and guidance regarding the intended function of the corridor, that will be used to inform future development and operation of the corridor. For integrated land use and transport classification purposes, land use context uses Place Value (ranking from P1 'low' to P3 'high' importance) and for transport context uses Movement Value (ranking from M1 'low' to M3 'high' importance).

The corridor is assessed to have the following RASF typology:

- Place function - transitioning from P1 (low/local) to P2 (medium) long term
- Movement function - transitioning from M2 (medium) to M3 (high/regional) long term

The following Figure 6-3 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to more active modes of travel.

**Figure 6-3: Future modal priority in 2048+ for Don Buck Road between Fred Taylor Drive and Royal Road**




| Legend | |
|---|---|
| | Pedestrians |
| | Cyclist |
| | Public Transport |
| | Freight |
| | Private Vehicles |
| | Loading |
| P | Parking and Access* |

* While the RASF modal priority indicates a low level of parking and access on this corridor, this is reflective of existing property access which will be maintained. New vehicle access to any arterial road is limited and assessed via the Unitary Plan Standard E27.6.4.1.

The RASF is a tool that also acknowledges surrounding land use and integrates the movement and place. As a future urban area, there remains a degree of uncertainty in regard to the future modal priority, and it is expected that the RASF assessment will be routinely reviewed to ensure that there is ongoing alignment with the transitional and final land use activities.

## 6.3 Existing and Likely Future Environment

### 6.3.1 Planning context

The land adjacent to Don Buck Road is comprised of various business, residential and open space zoning. The following outlines the key elements of the planning context for the Don Buck Road FTN Upgrade:

- The eastern side of Don Buck Road above Westgate Drive is zoned under the AUP:OP as Business – Light Industry. To the south of Westgate Drive, the eastern side of Don Buck Road contains an Open Space – Community Zone (occupied by Massey Leisure Centre), with the remaining land zoned as Residential – Mixed Housing Zone.
- The western side of Don Buck Road is within the I610 Redhills Precinct and is predominantly zoned Residential – Mixed Housing Urban, with a portion of land in the northern section of the corridor zoned Residential – Terraced Housing and Apartment Buildings Zone (**THAB**). Land further to the west of Don Buck Road forms part of the Redhills Precinct.

Table 6-1 below provides a summary of the existing and likely future environment as it relates to the Don Buck Road FTN Upgrade.

**Table 6-1: Don Buck Road FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[3] | Likely Future Environment[4] |
|---|---|---|---|
| **Business** | Business (Industrial) | Low | Business |
| **Residential** | Residential – Mixed Housing Urban Zone<br>Residential – Terraced Housing and Apartment Zone | Low | Residential |
| **Open Space** | Open Space – Community Zone | Low | Open Space |

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

### 6.3.2 Transport Environment

#### 6.3.2.1 Existing

The existing corridor is predominantly surrounded by mixed-use residential and commercial retail, with rural land to the west of the corridor. It is comprised of one vehicle lane in each direction, with footpaths and on-street bicycle lanes on both sides. **Error! Reference source not found.** shows the section of Don Buck Road that is included in this study, under existing conditions.

Table 6-2 summarises the existing transport features of the Don Buck Road corridor.

**Table 6-2: Don Buck Road: Existing Transport Features**

| | Existing Don Buck Road Transport Features |
|---|---|
| Corridor Characteristics | • 50kph speed limit.<br>• Semi-urban character with two vehicle lanes (one in each direction).<br>• Corridor form is relatively consistent with kerb and channels on both sides of the corridor, a flush median, and footpaths plus on-street cycle lanes on both sides. In some locations the on-street cycle lane converts to a separated shared path. |
| Key connections to the wider network | • Connects to Fred Taylor Drive in the north, linking to SH16 ramps at Hobsonville Road<br>• Connects to Triangle Road and Royal Road which connect on to SH16 |
| Traffic Volume | Recent traffic data for Don Buck Road was obtained from Auckland Transport[5]. The data was recorded in October 2020 and shows Don Buck Road (between Triangle Road and Royal Road) carried a 5 Day Average Daily Traffic of approximately 25,300 vehicles per day (vpd), and 2,100 vehicles per hour (vph) during both morning and afternoon peak hours. |

[3] Based on AUP:OP zoning/policy direction
[4] Based on AUP:OP zoning/policy direction
[5] Auckland Transport Traffic Counts, July 2012 to March 2020, https://at.govt.nz/about-us/reports-publications/traffic-counts/

| | Existing Don Buck Road Transport Features |
|---|---|
| Road Network / General Traffic | • Don Buck Road / Westgate Drive roundabout<br>• Don Buck Road / Rush Creek Drive give-way with right turns queuing in the median<br>• Don Buck Road / Beauchamp Drive give-way control with right turn bay<br>• Don Buck Road / Royal Road roundabout<br>• Don Buck Road / Triangle Road roundabout<br>• Don Buck Road / Redhills Road roundabout |
| Walking and Cycling | Generally narrow footpaths which are approximately 1.5 m wide, with the exception of the sections that have shared paths which are 3.0 m wide. |
| Public Transport | Current bus services on Don Buck Road:<br>• Bus service 14W between Westgate, Lincoln Rd, Henderson, New Lynn. Operates as a Frequent Service (at least every 15 minutes, 7am – 7pm, 7 days a week).<br>• Bus service 120 between Constellation Station, Greenhithe, Hobsonville Rd, Westgate, Don Buck Rd, Henderson. Operates as a Connector Service (At least every 30 minutes, 7am – 7pm, 7 days a week).<br>• Bus service 129 between Westgate, Don Buck Rd, Universal Dr, Northwestern Motorway, Great North Road, City. Operates as a peak service (predominantly offered during commuter periods). |

#### 6.3.2.2 Likely Future

Table 6-3 summarises the likely future transport features of the Don Buck Road corridor.

**Table 6-3: Don Buck Road: Likely Future Transport Features**

| Transport Features | Likely Future Don Buck Road Transport Features |
|---|---|
| Corridor Characteristics | • 50kph speed limit.<br>• Urban character with four vehicle lanes (two in each direction) and a central median.<br>• Consistent corridor form with kerb and channels on both sides and continuous footpaths and cycle facilities.<br>• Generic four-lane arterial with a 30m designation. |
| Traffic Volume | The forecast Average Daily Traffic (**ADT**) on Don Buck Road in 2048 is 25,500 - 27,000 vehicles. |
| Road Network / General Traffic | • Don Buck Road / Westgate Drive signals<br>• Don Buck Road / Rush Creek Drive signals<br>• Don Buck Road / Beauchamp Drive signals<br>• Don Buck Road / Royal Road signals<br>• Don Buck Road / Triangle Road signals<br>• Don Buck Road / Redhills Road signals |
| Walking and Cycling | Separated 2.0m cycle lanes and 1.8m footpaths on both sides. |

| Transport Features | Likely Future Don Buck Road Transport Features |
|---|---|
| Public Transport | 12-18 buses per hour under the indicative 2048 AT bus network, or approximately 1 bus every 5 minutes. |

Key features of the proposed new corridor include the following:

- Widening of Don Buck Road to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor.
- The upgrade to the intersections with Fred Taylor Drive, Westgate Drive, Rush Creek Drive and Beauchamp Road.
- The proposed upgrade is expected to remain within the existing corridor to the extent possible with localised widening occurring near intersections.
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts..
- Likely posted speed of 50kph, design speed of 60 kph
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

## 6.4 Assessment of Operational Transport Effects

### 6.4.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrade of Don Buck Road is expected to result in positive effects on safety when compared to the existing corridor, specifically

- Significantly improved walking and cycling facilities along Don Buck Road (including separation), resulting in improved protection for vulnerable road users.
- Significantly improved walking and cycling crossing facilities (crossing Don Buck Road) at Fred Taylor Drive, Westgate Drive, Rush Creek Drive and Beauchamp Road, resulting in a safer environment for all road users.

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding Don Buck Road is developed. The traffic volume on Don Buck Road will likely also increase over time and therefore the exposure between motorists and vulnerable road users will be higher than the existing road environment. However, the Project proposes to provide segregated walking and cycling facilities to reduce the likelihood and severity in the event of a crash.

Overall, the proposed design of the Project is well aligned with the transport safety principles from AT. It will provide a much safer transport system which will support a reduced number of deaths or serious injuries (DSI) and result in positive effects for all road users. It is noted that the detailed design will be completed in the future to further detail measures to achieve the anticipated safety outcomes.

### 6.4.2 Walking and Cycling

The Project proposes separated walking and cycling facilities on both sides of Don Buck Road. It also includes sufficient space to provide dedicated pedestrian and cycle crossing facilities which connects with the expected future adjacent facilities on Fred Taylor Drive (NoR RE2). The specific design of these crossing facilities will be developed further at detailed design prior to implementation.

The proposed walking and cycling facilities along the corridor have been designed in accordance with relevant AT standards and policies as summarised in Table 6-4.

**Table 6-4: Don Buck Road upgrade AT standards and policy assessment for walking and cycling facilities**

| Policy/Standard | Network Component | Assessment |
|---|---|---|
| Auckland Transport Vision Zero[6] | Segregated walking and cycling facilities | Segregated walking and cycling facilities are proposed to provide a safe modal choice in the future environment. Vision Zero specifies that proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on Don Buck Road are proposed to be 50km/hr, therefore the proposed design of the walking and cycling facilities is considered to be appropriate for these standards. |

[6] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

| Policy/Standard | Network Component | Assessment |
|---|---|---|
| AT Transport Design Manual[7] | Footpaths: 1.8m minimum | A 1.8m footpath and a 2.0m cycle path has been allowed for within the proposed cross section. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements. |

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by Vision Zero guidance and the Transport Design Manual.

The Project will have a number of significant positive effects on walking and cycling as it will:

- Significantly reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across Don Buck Road.
- Improve integration with the future walking and cycling network, resulting in improved east-west and north-south walking and cycling connectivity.
- Lead to significant environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
- Serve as a key enabler for greater use of active transport modes by providing safe connector route between Redhills and the future RTN at Westgate and alongside SH18 in the longer term. For more detail on future assumptions see Appendix 1.
- Support growth adjacent to Don Buck Road and significantly improve safety and access to employment and social amenities.

### 6.4.3 Public Transport

The cross-section will provide adequate space to facilitate public transport and associated bus stops. The exact location of bus stops will be identified as part of detailed design for the Project. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined, i.e. around centres and schools, for example.

The future public transport network has been developed by Auckland Transport. This proposed network will include between 8 to 12 buses an hour. These services combined will provide a bus every five to ten minutes. These services will connect commuters to Henderson, Westgate and the future RTN station via Westgate and an indicative station Royal Road.

The Project's potential operational effects on public transport are:

- Improved integration with the future public transport network and improved east-west and north-south connectivity, as well as improved access to employment and social amenities.
- Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.
- It will serve as a key enabler for greater use of public transport by providing a frequent connector route between urban areas and Westgate Metropolitan Centre.

[7] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streetsframework-and-the-transport-design-manual/

### 6.4.4 General Traffic

As identified above, the 2048 ADT for Don Buck Road is 25,500 - 27,000 vehicles. Given that the peak hour volume is approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 2,550-2,700 vehicles. No additional mid-block capacity is proposed in the project for private vehicles, and capacity will remain as is existing. By providing bus lanes, buses travelling in this corridor will avoid any resulting congestion due to private vehicles. It is noted that the proposed traffic volumes as reported here are projections based on the implementation of the full network in Redhills.

**Intersection Performance**

The performance of the road network within the Project has been assessed using inputs from SATURN to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 6-5.

**Table 6-5: Summary of Intersection Performance 2048**

| Intersection (Intersection Control) | Peak Period | Overall Level of Service | Degree of Saturation (worst movement) | Maximum Queue Distance (m) |
|---|---|---|---|---|
| Don Buck Road / Westgate Drive (Signals) | Morning Peak | E | 0.962 | 291.8 |
| | Evening Peak | D | 0.888 | 285.6 |
| Don Buck Road/ Fred Taylor Drive | Morning Peak | D | 0.858 | 204.1 |
| | Evening Peak | D | 0.917 | 201.2 |

The overall level of service at these two main intersections is expected to be near capacity by 2048. It is noted that while there are delays at this intersection, this is not unexpected for private vehicles in the peak period in close proximity to a town centre and a State Highway interchange. Given the proximity to the town centre it is considered that the provision of additional lanes for vehicle capacity would be detrimental to walking and cycling connectivity, as this would increase crossing times for pedestrians.

On balance, the intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario.

### 6.4.5 Access

As a future arterial corridor, the corridor is expected to be a limited access corridor. As the area develops, it is expected that future access to the network will be facilitated by collector road networks within the area to be urbanised to the east Don Buck Road.

In terms of existing properties, the overarching design philosophy for the project has been to maintain driveway access where practicable and minimise impacting land other than where necessary. Given the current level of urban development on this corridor and existing access, berm space has been rationalized at some points to maintain access and limit property impacts.

There are several existing properties where it has been identified that a replacement driveway will not be possible to implement with project in place, primarily due to changes to road levels and incursion of the corridor into the front of properties. These properties have been included within the proposed designation boundary.

The properties that have been included within the NoR boundary for this reason are:

- 453,455 and 457 Don Buck Road.

### 6.4.6 Freight

Don Buck is an existing corridor with two lane capacity for general vehicles and freight. The project proposes to provide walking and cycling facilities and dedicated bus lanes. Therefore it is considered that there will generally be no adverse effects on freight movements.

Over-dimension and overweight routes are expected to be further reviewed by AT/ Waka Kotahi and relevant stakeholder groups in alignment with the realisation/ implementation of individual corridor upgrades in the future. It is noted that Don Buck Road is not currently identified by Auckland Transport as a freight route.[8]

### 6.4.7 Wider Network Effects

The provision of dedicated and continuous bus lanes, footpaths and cycle paths on the Don Buck Road corridor will improve the network significantly for these modes. The ability to connect to the Westgate Metropolitan centre and the planned public transport facilities at this location will support a shift from private vehicles to other transport modes.

## 6.5 Project Interdependencies

The Don Buck Road project has been designed to integrate with Fred Taylor Drive. The key interface for the Don Buck Road project is the intersection with Fred Taylor Drive.

## 6.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the project provides positive benefits, particularly for walking, cycling and public transport. In terms of measures to mitigate operational effects, there are a number of properties identified in Section 6.4.5 that have been identified for inclusion within the designation boundary in response to access effects.

## 6.7 Summary of Operational Transport Effects (NoR RE1)

The assessment of transport effects for the Project is summarised in Table 6-6.

[8] https://mahere.at.govt.nz/portal/apps/webappviewer/index.html?id=53d7df8746c049a1a4f7872312190001

**Table 6-6: Assessment of Operational Effects Summary for NoR RE1 (Don Buck Road)**

| **Operational Transport Effects** | |
|---|---|
| Safety | In summary, the effects of the Project on safety are:<br>• A significantly improved environment for pedestrians and cyclists, commensurate with an urbanised environment. This includes upgraded cycle facilities and continuous walking and cycling linkages |
| Walking and Cycling | In summary, the effects of the Project on walking and cycling are:<br>• A significantly reduced likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across Don Buck Road.<br>• Improve integration with the future walking and cycling network, resulting in improved north-south walking, and cycling connectivity.<br>• Serve as a key enabler for greater use of active transport modes by providing a safe connector route between Redhills and the future RTN at Westgate and alongside SH18 in the longer term.<br>• Support growth adjacent to Don Buck Road and significantly improve safety and access to employment and social amenities. |
| Public Transport | In summary, the effects of the Project on public transport are:<br>• Good integration with the future public transport network and significantly improved north-south connectivity and improved access to employment and social amenities.<br>• Sufficient space to enable public transport facilities to operate within separated travel lanes.<br>• Sufficient space to enable safe and appropriate bus stops in locations to be determined when greater land use certainty is availability. |
| General Traffic | In summary, the effects of the Project on general transport are:<br>• Provision of sufficient corridor and intersection capacity to cater for future growth. |
| Access | In summary, there are a number of properties that have been identified as adversely effected by the project. This is largely due to the inability to provide access to the properties following the implementation of the project. These properties include:<br>• 453,455 and 457 Don Buck Road. |
| Freight | In summary, the project has no adverse effects on freight movements. |
| Wider Network Effects | In summary, the project improves the wider networks for public transport, walking and cycling in the surrounding area. |

## 6.8 Conclusions

Overall, the NoR RE1: Don Buck Road FTN Upgrade project provides positive transport effects. There are several properties where the reinstatement of a driveway will not be possible, and the inclusion of the properties with the designation is recommended. The project provides positive operational effects, in particular improved safety, public transport, walking and cycling effects.

In terms of construction traffic effects, it is considered that there is sufficient network capacity to enable construction traffic, and that any potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

It is recommended that access and safety considerations relating to the St Paul's Primary School and the Massey Leisure Centre should be specifically considered within the CTMP prior to construction and implementation of the Project.

# 7 NoR RE2: Fred Taylor Drive FTN Upgrade

## 7.1 Project Corridor Features

### 7.1.1 Project Overview

Fred Taylor Drive is an existing two-lane arterial corridor which extends from the existing Brigham Creek Interchange in the north to SH16 in the south (via an intersection with Don Buck Road). This corridor runs through a mix of residential and industrial land uses and forms an important connection as the spine of the Redhills network

It is proposed to upgrade the corridor between Hailes Road and Dunlop Road to accommodate a 30m wide four-lane FTN arterial with separated walking and cycling facilities[9]. The existing corridor designation is approximately 30m wide on average, with the proposed upgrade expected to remain within the existing designation 1433 to the extent possible with localised widening occurring at intersections. The Fred Taylor Drive FTN Upgrade also includes the upgrade of the intersections with Kakano Road and Northside Drive to signals.

The upgraded Fred Taylor Drive corridor will have multiple purposes. These are to provide access from Redhills to both a future rapid transit station and the strategic highway network; and the FTN facilities will provide a multimodal corridor into Westgate metropolitan centre. The proposed corridor will also support an active mode shift with separated cycle lanes and footpath on both side and public transport priority lanes.

An overview of the indicative proposed design is provided in Figure 7-1.

[9] The Fred Taylor Drive FTN Upgrade has an interdependency with the North West Strategic Transport Network, therefore the portion of Fred Taylor Drive north of Hailes Road forms part of the upgrade to Brigham Creek Interchange.

**Figure 7-1: Overview of the Fred Taylor Road Upgrade**


## 7.2 Network and Corridor Design

The Project was developed as part of network planning for the wider area. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider integrated network planned for the area.

The Project proposes that the function of Fred Taylor Drive will change from an existing two-lane road to a low-speed urban four-lane arterial (using AT standards) with mixed components for vehicles, PT, and active modes.

The existing corridor includes two vehicle lanes, one per direction, as well as discontinuous segments of footpaths on both sides of the corridor. The indicative proposed design includes two additional public transport lanes, as well as new facilities for walking and cycling as shown in Figure 7-2.

**Figure 7-2: Indicative future Fred Taylor Drive corridor design**

The development of the corridor design has included the use of AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority. The intent of that framework is to classify the expected movement and place functions from a consistent regional context and identify the likely priority applied to each mode.

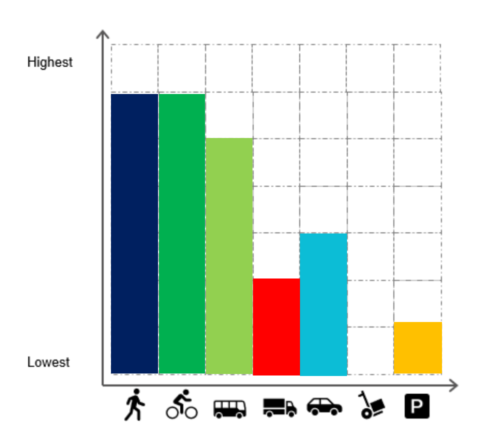
The framework itself does not directly dictate a specific corridor design but provides context and guidance regarding the intended function of the corridor, that will be used to inform future development and operation of the corridor. For integrated land use and transport classification purposes, land use context uses Place Value (ranking from P1 'low' to P3 'high' importance) and for transport context uses Movement Value (ranking from M1 'low' to M3 'high' importance).

The corridor is assessed to have the following RASF typology:

- Place function - transitioning from P1 (local/low) to P2 (medium/mixed urban) long term
- Movement function - transitioning from M2 (medium movement) to M3 (regional movement) long term

The following Figure 7-3 and Table 7-4 indicate the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to more sustainable modes of travel.

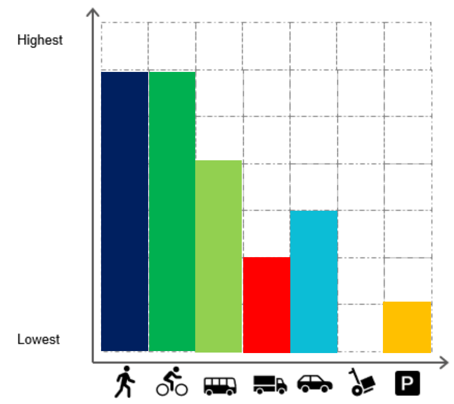
**Figure 7-3: Future modal priority in 2048+ for Fred Taylor Drive between Brigham Creek and Northside**




| Legend | |
|---|---|
| | Pedestrians |
| | Cyclist |
| | Public Transport |
| | Freight |
| | Private Vehicles |
| | Loading |
| | Parking and Access* |

* While the RASF modal priority indicates a low level of parking and access on this corridor, this is reflective of existing property access which will be maintained. New vehicle access to any arterial road is limited and assessed via the Unitary Plan Standard E27.6.4.1.

**Figure 7-4: Future modal priority in 2048+ for Fred Taylor Drive between Northside and Don Buck Road**




| Legend | |
|---|---|
| | Pedestrians |
| | Cyclist |
| | Public Transport |
| | Freight |
| | Private Vehicles |
| | Loading |
| P | Parking and Access* |

* While the RASF modal priority indicates a low level of parking and access on this corridor, this is reflective of existing property access which will be maintained. New vehicle access to any arterial road is limited and assessed via the Unitary Plan Standard E27.6.4.1.

## 7.3 Existing and Likely Future Environment

### 7.3.1 Planning context

The existing Fred Taylor Drive corridor runs through a mix of residential and industrial land uses.

The northern section of Fred Taylor Drive is within the Redhills North FUZ, with an area of land zoned under the AUP:OP as Open Space – Sport and Active Recreation Zone (Fred Taylor Park) adjacent the road corridor. The southern section of Fred Taylor Drive is zoned under the AUP:OP as THAB zone on the western side, and forms part of the I610 Redhills Precinct. The eastern side is zoned Business – Light Industry Zone and Business – Mixed Use Zone and forms part of the I615 Westgate Precinct.

Table 7-1 below provides a summary of the existing and likely future environment as it relates to the Fred Taylor Drive FTN Upgrade.

**Table 7-1: Fred Taylor Drive FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[10] | Likely Future Environment[11] |
|---|---|---|---|
| **Business** | Business (Light Industrial) | Low | Business |
| | Business (Mixed Use) | Low | |

[10] Based on AUP:OP zoning/policy direction
[11] Based on AUP:OP zoning/policy direction

| Environment today | Zoning | Likelihood of Change for the environment[10] | Likely Future Environment[11] |
|---|---|---|---|
| **Residential** | Residential – Terraced Housing and Apartment Zone | Low | Residential |
| **Open Space** | Open Space – Sport and Active Recreation | Low | Open Space |
| **Undeveloped greenfield areas** | Future Urban | **High** | Urban |

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

### 7.3.2 Transport Environment

#### 7.3.2.1 Existing

The existing corridor is surrounded by a mix of greenfield land, as well as residential and industrial land uses. Table 7-2 summarises the existing transport features of the Fred Taylor Drive corridor.

**Table 7-2: Fred Taylor Drive: Existing Transport Features**

| | Existing Fred Taylor Drive Transport Features |
|---|---|
| Corridor Characteristics | • Has an 80kph speed limit.<br>• Semi-urban character with two vehicle lanes (one in each direction).<br>• Corridor form is inconsistent with formal kerb and channel and footpaths in sections adjacent to recent development or recently upgraded intersections. |
| Traffic Volume | The latest traffic data for Fred Taylor Drive was obtained from Auckland Transport[12]. The data was recorded in October 2020 and shows Fred Taylor Drive (between Spring Garden Road and Matakohe Road) carried a 5 Day Average Daily Traffic of approximately 1,300 vehicles per day (vpd), and 930-1,140 vehicles per hour (vph) during the morning and afternoon peak hours. |
| Road Network / General Traffic | • Fred Taylor Drive / Kakano Road signal.<br>• Fred Taylor Drive / Northside Drive signal.<br>• Fred Taylor Drive / Hailes (/ Spedding Road) stop control. |
| Walking and Cycling | A footpath which is approximately 2.5 m wide is provided in limited sections on both sides of corridor.<br><br>A mix of on road cycle lanes, cycle paths, shared paths and no facilities are provided for cyclists. |
| Public Transport | The following services operate on the northern section of Fred Taylor Drive (north of Northside Drive):<br><br>• Bus service 122 between Huapai, Kumeu, and Westgate. This service operates every 2 hours 7 days a week. |

[12] Auckland Transport Traffic Counts, July 2012 to March 2020, https://at.govt.nz/about-us/reports-publications/traffic-counts/

| | Existing Fred Taylor Drive Transport Features |
|---|---|
| | • Bus service 125 between Helensville, Waimauku, Huapai, Kumeu, and Westgate. This service operates every 2 hours 7 days a week.<br>• Bus service 125X between Helensville, Waimauku, Huapai, Kumeu, Westgate, Northwest Motorway, and City.<br>• Bus service 126 between Westgate, Riverhead, Coatesville, and Albany Station. This service operates at least every 60 minutes 7 days a week. Lower frequencies early morning and evenings. |

#### 7.3.2.2 Likely Future

Table 7-3 summarises the likely future transport features of the Fred Taylor Drive corridor.

**Table 7-3: Fred Taylor Drive: Likely Future Transport Features**

| | Likely Future Fred Taylor Drive Transport Features |
|---|---|
| Corridor Characteristics | • 50kph speed limit.<br>• Urban character with four vehicle lanes (two in each direction) and a central median.<br>• Consistent corridor form with kerb and channels on both sides and continuous footpaths and cycle facilities.<br>• Generic two-lane arterial with a 30m designation. |
| Traffic Volume | The forecast Average Daily Traffic (**ADT**) on Fred Taylor Drive in 2048 is 15,000 to 22,000 vehicles. |
| Road Network / General Traffic | • Fred Taylor Drive / Kakano Road signal.<br>• Fred Taylor Drive / Northside Drive signal.<br>• Fred Taylor Drive/Spedding Road |
| Walking and Cycling | Separated 2.0m cycle lanes and 1.8m footpaths on both sides. |
| Public Transport | The indicative 2048 AT bus network forecasts 16 buses per hour on Fred Taylor Drive, or approximately 1 bus every 5 minutes. |

Key features of the proposed new corridor include the following:

- The upgrade of the existing corridor to a 30m wide four-lane FTN arterial with separated walking and cycling. This widening is expected to remain in the existing designation 1433 to the extent possible.
- Localised widening outside the existing designation 1433 occurring at intersections.
- The upgrade of the intersections with Kakano Road and Northside Drive to signalised intersections.
- Additional land for tie-ins with side streets and stormwater wetlands.
- Likely posted speed of 50kph, design speed of 60 kph.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities.
- Vegetation removal along the existing road corridor.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

## 7.4 Assessment of Operational Transport Effects

### 7.4.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrade of Fred Taylor Drive is expected to result in positive effects on safety when compared to the existing corridor, and these consist of:

- Significantly improved, and new, walking and cycling facilities along Fred Taylor Drive (including separation), resulting in improved protection for vulnerable road users.
- Significantly improved, and new, walking and cycling crossing facilities (crossing Fred Taylor Drive) at Kakano Road intersection, resulting in a significantly safer environment for all road users.
- A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 50km/h) with enhanced place function and consequential reductions in the risk of Death or Serious Injuries (DSIs).

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding Fred Taylor Drive is developed. The traffic volumes on Fred Taylor Drive will likely also increase over time and therefore the exposure between motorists and vulnerable road users will be higher than the existing road environment. However, the project has been designed to a lower speed limit of 50km/h and provides segregated walking and cycling facilities to reduce the likelihood and severity in the event of a crash.

Overall, the proposed design of the project is well aligned with the transport safety principles from AT. It will provide a much safer transport system which will likely reduce the number of deaths and serious injury crashes and result in positive effects for all road users. It is noted that the detailed design will be completed in the future to further detail measures to achieve the anticipated safety outcomes.

### 7.4.2 Walking and Cycling

The Project proposes separated walking and cycling facilities on both sides of Fred Taylor Drive. It also includes sufficient space to provide dedicated pedestrian and cycle crossing facilities at Don Buck Road (NoR RE1) and with the upgraded Brigham Creek Interchange which connects with the expected future adjacent facilities. The specific design of these crossing facilities will be developed further at detailed design prior to implementation.

The proposed walking and cycling facilities have been designed in accordance with relevant AT standards and policies as summarised in Table 7-4.

**Table 7-4: Māmari Road upgrade AT standards and policy assessment for walking and cycling facilities**

| Policy/Standard | Network Component | Assessment |
|---|---|---|
| Auckland Transport Vision Zero[13] | Segregated walking and cycling facilities | Segregated walking and cycling facilities are proposed to provide a safe modal choice in the future environment. Vision Zero specifies that proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on Fred Taylor Drive are proposed to be 50km/hr, therefore the proposed design of the |

[13] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

| Policy/Standard | Network Component | Assessment |
|---|---|---|
| | | walking and cycling facilities is considered to be appropriate for these standards. |
| AT Transport Design Manual[14] | Footpaths: 1.8m minimum | A 1.8m footpath is proposed on all corridors and a 2.0m cycle path with a 2.3m berm. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements. |

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by vision zero guidance. The Project will have a number of significant positive effects on walking and cycling as it will:

- Significantly reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across Fred Taylor Drive.
- Improve integration with the future walking and cycling network, resulting in improved east-west and north-south walking and cycling connectivity.
- Lead to significant environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
- Serve as a key enabler for greater use of active transport modes by providing safe connector route between Redhills and the future RTN at Westgate.
- Support growth surrounding Fred Taylor Drive and significantly improve safety and access to employment and social amenities.

### 7.4.3 Public Transport

The Fred Taylor Drive corridor will provide for dedicated bus lanes that connect to Westgate centre

For future public transport services, there is one core proposed frequent transport service which will use Fred Taylor Drive. This service is forecast to operate every five minutes in the peak commuter hours, and every 10 minutes outside of the peak. With this level of frequency, dedicated bus lanes will enable reliable and consistent travel times for buses.

The cross-section will provide adequate spacing to facilitate public transport and associated bus stops. The exact location of bus stops will be identified as part of detailed design for the Project. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined, i.e. around centres and schools for example.

The Project's potential operational effects on public transport are positive, and are:

- Reduced delays and improved reliability for future frequent public transport network on Fred Taylor Drive and the wider network.
- Improved integration with the future public transport network and improved north-south connectivity, as well as improved access to employment and social amenities.
- Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.

[14] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streetsframework-and-the-transport-design-manual/

### 7.4.4 General Traffic

As identified above, the 2048 ADT for Fred Taylor Drive is between 15,000 and 22,000 vehicles per day. Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 1,500 to 2,200 vehicles. A four-lane corridor can efficiently accommodate 2,200 vehicles and therefore the proposed corridor design meets the forecasted needs, with the additional lane provision to accommodate greater bus priority.

**Intersection Performance**

The performance of the road network within the Project has been assessed using inputs from SATURN to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 7-5.

**Table 7-5: Summary of Intersection Performance 2048**

| Intersection (Intersection Control) | Peak Period | Overall Level of Service | Degree of Saturation (worst movement) | Maximum Queue Distance (m) |
|---|---|---|---|---|
| Fred Taylor Drive / Kakano Road (Signal) | Morning Peak | C | 0.856 | 240.3 |
| | Evening Peak | C | 0.871 | 162.7 |
| Fred Taylor Drive / Northside Drive (Signal) | Morning Peak | D | 0.917 | 394.1 |
| | Evening Peak | C | 0.853 | 176.6 |
| Fred Taylor Drive/Spedding Road | Morning Peak | B | 0.956 | 161.8 |
| | Evening Peak | B | 0.639 | 44.0 |

The overall level of service for the intersections Fred Taylor Drive is LoS D or better. Bus priority movements for the through travelling buses will be facilitated from the kerb side lane during these periods. It is noted that there is some degree of queuing experienced on Fred Taylor Drive in the peak period for private vehicles, however this is not unexpected for a peak period.

Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario.

### 7.4.5 Access

As a future arterial corridor, Fred Taylor Drive is expected to be a limited access corridor. As the area develops, it is expected that future access to the network will be facilitated by collector road networks within the urbanised area to the east and west of Fred Taylor Drive.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land other than where necessary.

The intersection of Spedding Road and Fred Taylor Road as proposed impacts on the current location of the driveway of 121 Fred Taylor. It is proposed to relocate this access away from the intersection to the southern edge of the property.

### 7.4.6 Freight

Don Buck is an existing corridor with two lane capacity for general vehicles and freight. The project proposes to provide walking and cycling facilities and dedicated bus lanes. Therefore it is considered that there will generally be no effect on freight movements. There may be some benefit to freight movements should these lanes be available for freight movements in the interpeak periods.

Over-dimension and overweight routes are expected to be further reviewed by AT/ Waka Kotahi and relevant stakeholder groups in alignment with the realisation/ implementation of individual corridor upgrades in the future. It is noted that Fred Taylor Drive is currently identified by Auckland Transport as a Level 1B freight route.[15]

### 7.4.7 Wider Network Effects

The upgrade of Fred Taylor Drive to include dedicated bus priority lanes and walking and cycling facilities will support the wider connectivity for these modes within the Redhills area. These will have a wider positive network for public transport in particular providing reliable connections through to the Westgate Metropolitan centre and the proposed SH16 RTN.

## 7.5 Project Interdependencies

### 7.5.1 Northside Drive

The Fred Taylor Drive corridor connects to the Northside Drive corridor. Currently Northside Drive continues to Maki Street and terminates at the Westgate centre. In longer term this will connect through to an overbridge of SH16. The remainder of the Northside Drive corridor is provided for via Designation 1473, which enables a 2-lane corridor connection to Trig Road. The Northside Drive project has been investigated as part of the State Highway 16 to 18 Connections project undertaken by Waka Kotahi. This project considered Northside Drive and the provision of south facing ramps to State Highway 16. These proposed improvements have been included within the full 2048+ network.

This project currently is awaiting approval to proceed to the subsequent stage following investigations.

The Fred Taylor Drive corridor can be implemented prior to the delivery of the Northside Drive connection.

### 7.5.2 Spedding Road

The new Spedding Road connection as proposed in the Whenuapai network includes a strategic crossing from Whenuapai over SH16 to connect to Fred Taylor Drive. The Spedding Road project is a two-lane urban arterial with dedicated walking and cycling facilities. The corridor is expected to enable local trips from Whenuapai to Westgate without interfacing with the SH16 corridor.

As shown above, the intersection of Spedding Road and Fred Taylor Drive is provided for via a roundabout.

[15] https://mahere.at.govt.nz/portal/apps/webappviewer/index.html?id=53d7df8746c049a1a4f7872312190001

## 7.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects. The relocation of the driveway at 121 Spedding Road is recommended to provide safe access to the property, sufficiently distanced from the proposed roundabout.

## 7.7 Summary of Operational Transport Effects (NoR RE2)

The assessment of transport effects for the Project is summarised in Table 7-6.

**Table 7-6: Assessment of Operational Effects Summary for NoR RE2 (Fred Taylor Drive)**

| Operational Transport Effects | |
|---|---|
| Safety | In summary, the effects of the Project on safety are:<br>• A significantly improved speed environment by providing speed limits appropriate urban speeds (e.g. 50km/h) with enhanced place function and consequential reductions in the risk of Death or Serious Injuries (DSIs).<br>• A significantly improved environment for pedestrians and cyclists, commensurate with an urbanised environment. |
| Walking and Cycling | In summary, the effects of the Project on walking and cycling are:<br>• Significantly reduced the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across Fred Taylor Drive.<br>• Improve integration with the future walking and cycling network, resulting in improved north-south walking and cycling connectivity.<br>• Serve as a key enabler for greater use of active transport modes by providing safe connector route between Redhills and the future RTN at Westgate<br>• Support growth adjacent to Fred Taylor Drive and significantly improve safety and access to employment and social amenities. |
| Public Transport | In summary, the effects of the Project on public transport are:<br>• Improved reliability and travel time for frequent public transport services.<br>• Excellent integration with the future public transport network and significantly improved north-south connectivity and improved access to employment and social amenities.<br>• Sufficient space to enable safe and appropriate bus stops in locations to be determined when greater land use certainty is availability. |
| General Traffic | In summary, the effects of the Project on general transport are:<br>• Provision of sufficient corridor and intersection capacity to cater for future growth |
| Access | In summary, there are limited access effects related to the project.<br>• There is one property at 121 Fred Taylor Drive where a driveway is recommended to be relocated. |

| Operational Transport Effects | |
|---|---|
| Freight | In summary, it is considered that there will generally be no effect on freight movements |
| Wider Network Effects | In summary, there are considered to be positive effects for the wider public transport and walking cycling benefits.<br>No wider network effects for freight and private vehicle |

## 7.8 Conclusions

Overall, the NoR RE2: Fred Taylor Drive FTN Upgrade project provides positive transport effects, and there is one access relocation identified to address access effects. The project provides positive operational effects, in particular improved safety, public transport, walking and cycling effects.

In terms of construction traffic effects, it is considered that there is sufficient network capacity to enable construction traffic, and that any potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

# 8 NoR R1: Coatesville Riverhead Highway Upgrade

## 8.1 Project Corridor Features

### 8.1.1 Project Overview

The Coatesville-Riverhead Highway is an existing arterial extending from SH16 in the south to its intersection with Dairy Flat Highway in the north east, with the extents of the proposed upgrade from SH16 in the south to its intersection with Riverhead Road in the north. The southern section of the alignment from SH16 to Short Road runs through rural land uses which are expected to remain. The northern section (close to and within the Riverhead township) runs through low-medium density residential land uses on the east and future urban zoned land on the west.

The Coatesville-Riverhead Highway Upgrade Project involves:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side; and
- Upgrading the northern section of the corridor to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor.

The project includes upgrades to the intersections with Old Railway Road and Riverhead Road and is expected to tie in with a future roundabout at SH16 as part of the Waka Kotahi SH16 Safety Improvements Project.

The proposed upgrade will provide a key north-south connection from Riverhead to the strategic road network and proposed Rapid Transit Corridor[16] and City Centre to Westgate rapid transit services[17] at Westgate. Furthermore, the upgrades will support active mode use and reduce safety risks on the corridor.

An overview of the proposed design for the Coatesville Riverhead Highway Upgrade is provided in Figure 8-1 below.

[16] Other North West Strategic Package Project
[17] Other proposed transport project not being delivered by Te Tupu Ngatahi

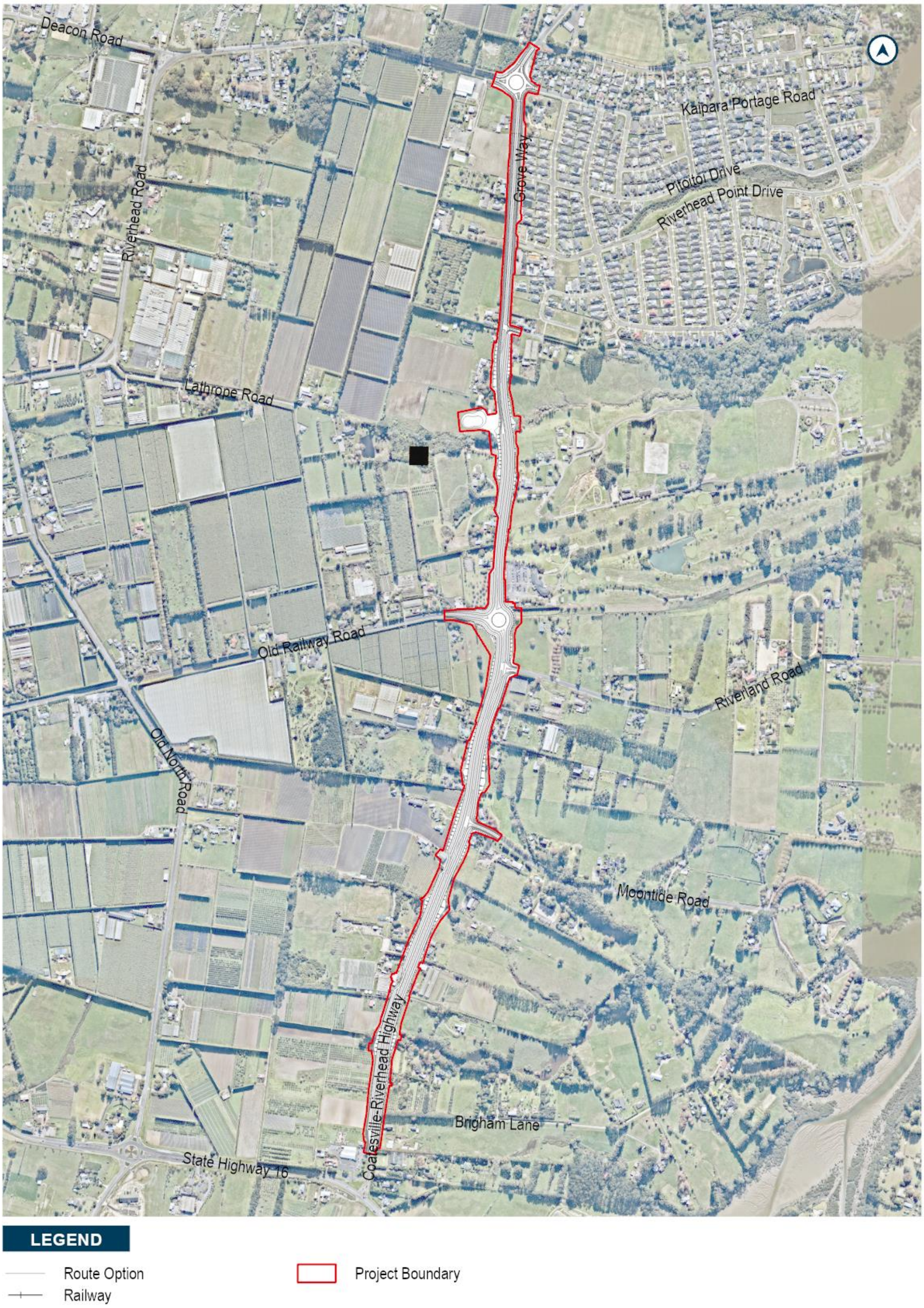



**Figure 8-1: Overview of the Extension of Coatesville Riverhead Highway Upgrade**

## 8.2 Network and Corridor Design

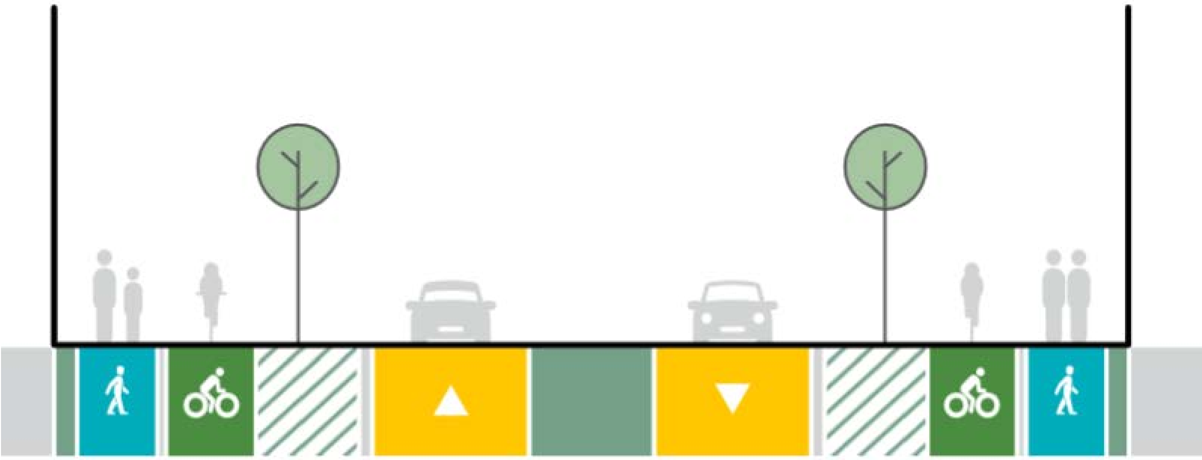
The Project was developed as part of network planning for the wider area and concurrently with the structure planning undertaken by the Council. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider integrated network planned for the area.

The Project proposes that the function of Coatesville Riverhead Highway will change from an existing rural two-lane road to a low-speed urban two-lane arterial (using AT Transport Design Manual standards) with mixed components for vehicles, and active modes.

The existing corridor includes two vehicle lanes, one per direction, and a footpath on the western side adjacent to the Riverhead residential subdivision. There is no footpath in the rural section. The indicative proposed design includes two vehicle traffic lanes, as well as new facilities for walking and cycling as shown in Figure 8-2 and Figure 8-3.

**Figure 8-2: Indicative future Coatesville Riverhead Highway corridor design between SH16 and Short Road**

**Figure 8-3: Indicative future Coatesville Riverhead Highway corridor design between Short Road and Riverhead Road**



The development of the corridor design has included the use of AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority. The intent of that framework is to classify the expected movement and place functions from a consistent regional context and identify the likely priority applied to each mode.

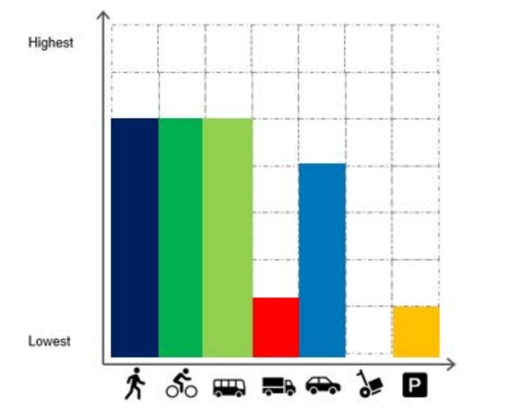
The framework itself does not directly dictate a specific corridor design but provides context and guidance regarding the intended function of the corridor, that will be used to inform future development and operation of the corridor. For integrated land use and transport classification purposes, land use context uses Place Value (ranking from P1 'low' to P3 'high' importance) and for transport context uses Movement Value (ranking from M1 'low' to M3 'high' importance).

The corridor is assessed to have the following RASF typology:

- Place function - retain P1 (low/rural)
- Movement function - retain M2 (medium)

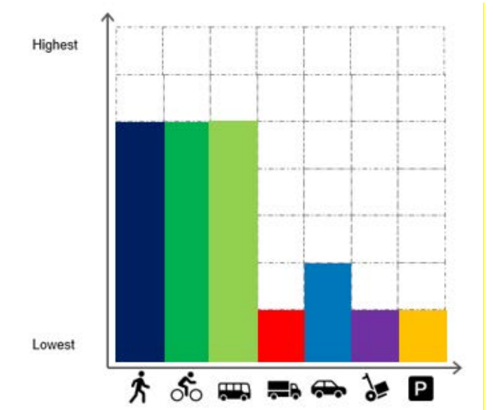
The following Figure 8-4 and Figure 8-5 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to more sustainable modes of travel.

**Figure 8-4: Future modal priority in 2048+ for Coatesville Riverhead Highway between SH16 and Short Road**




| | Legend |
|---|---|
| | Pedestrians |
| | Cyclist |
| | Public Transport |
| | Freight |
| | Private Vehicles |
| | Loading |
| P | Parking and Access |

**Figure 8-5: Future modal priority in 2048+ for Coatesville Riverhead Highway between Short Road and Riverhead Road**




| | Legend |
|---|---|
| | Pedestrians |
| | Cyclist |
| | Public Transport |
| | Freight |
| | Private Vehicles |
| | Loading |
| P | Parking and Access |

## 8.3 Existing and Likely Future Environment

### 8.3.1 Planning context

The southern section of Coatesville-Riverhead Highway from SH16 to Short Road runs through rural land uses predominantly zoned under the AUP:OP as Rural – Mixed Rural Zone on both sides of the existing corridor. The northern section (close to and within the Riverhead township) runs through land zoned as Residential – Single House Zone and to the east and future urban zoned land on the west.

Table 8-1 below provides a summary of the North West existing and likely future environment as it relates to the Coatesville-Riverhead Highway Upgrade.

**Table 8-1: Coatesville-Riverhead Highway Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[18] | Likely Future Environment[19] |
|---|---|---|---|
| **Rural** | Rural | Low | Rural |
| **Residential** | Residential | Low | Residential |
| **Future Urban Zone / Undeveloped greenfield areas** | Future Urban | **High** | Urban |

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

### 8.3.2 Transport Environment

#### 8.3.2.1 Existing

The existing corridor is predominantly surrounded by greenfields land to the south of Short Road, and residential on the north eastern side of Short Road. It is comprised of one vehicle lane in each direction as shown in Figure 8-6.

[18] Based on AUP:OP zoning/policy direction
[19] Based on AUP:OP zoning/policy direction

**Figure 8-6: Aerial of Existing Coatesville Riverhead Highway Corridor**


Table 8-2 summarises the existing transport features of the Coatesville Riverhead Highway corridor.

**Table 8-2: Coatesville Riverhead Highway: Existing Transport Features**

| | **Existing Coatesville Riverhead Highway Transport Features** |
|---|---|
| Corridor Characteristics | • Has an 60kph speed limit south of Short Road and a 50kph speed limit to the north<br>• Rural character with two vehicle lanes (one in each direction)<br>• Corridor form is inconsistent, with kerb and channel and a footpath on the eastern side of the corridor north of Short Road |
| Traffic Volume | The latest traffic data for Coatesville Riverhead Highway was obtained from Auckland Transport[20]. The data was recorded in March 2021 and shows Coatesville Riverhead Highway (near SH16) carried a 5 Day Average Daily Traffic of approximately 9,900 vehicles per day (vpd), and 890-1,040 vehicles per hour (vph) during the morning and afternoon peak hours. |

[20] Auckland Transport Traffic Counts, July 2012 to March 2020, https://at.govt.nz/about-us/reports-publications/traffic-counts/

| | Existing Coatesville Riverhead Highway Transport Features |
|---|---|
| Road Network / General Traffic | • Coatesville Riverhead Highway / SH16 stop control<br>• Coatesville Riverhead Highway / Moontide Road stop control<br>• Coatesville Riverhead Highway / Riverland Road stop control<br>• Coatesville Riverhead Highway / Old Railway Road stop control<br>• Coatesville Riverhead Highway / Riverhead Point Drive give-way<br>• Coatesville Riverhead Highway / Riverhead Road roundabout |
| Walking and Cycling | There is a 1.8m footpath on the eastern side of the corridor between Short Road and Riverhead Road. There are no footpaths through the rest of the corridor. |
| Public Transport | Bus service 126 operates on Coatesville Riverhead Highway and connects Westgate, Riverhead, Coatesville, and Albany Station. This service operates at least every 60 minutes 7 days a week. |

#### 8.3.2.2 Likely Future

Table 8-3 summarises the likely future transport features of the Coatesville Riverhead Highway corridor.

**Table 8-3: Coatesville Riverhead Highway: Likely Future Transport Features**

| | Likely Future Coatesville Riverhead Highway Transport Features |
|---|---|
| Corridor Characteristics | Between SH16 and Short Road:<br>• 60kph speed limit<br>• Rural character with two vehicle lanes (one in each direction) and a central median.<br>• Consistent corridor form with kerb and channels on both sides and a single shared path on one side of the corridor.<br><br>Between Short Road and Riverhead Road:<br>• 50kph speed limit<br>• Urban character with two vehicle lanes (one in each direction) and a central median.<br>• Consistent corridor form with kerb and channels on both sides and continuous footpaths and cycle facilities.<br>• Generic two-lane arterial with a 24m cross section. |
| Traffic Volume | The forecast Average Daily Traffic (**ADT**) in 2048 on Coatesville Riverhead Highway is 9,000 vehicles between SH16 and Short Road, and 7,000 vehicles between Short Road and Riverhead Road. |
| Road Network / General Traffic | • Coatesville Riverhead Highway / SH16 single lane roundabout<br>• Coatesville Riverhead Highway / Moontide Road right turn bay<br>• Coatesville Riverhead Highway / Riverland Road right turn bay<br>• Coatesville Riverhead Highway / Old Railway Road single lane roundabout<br>• Coatesville Riverhead Highway / Riverhead Point Drive single lane roundabout |

| | Likely Future Coatesville Riverhead Highway Transport Features |
|---|---|
| Walking and Cycling | A single shared path on one side between SH16 and Short Road, and separated 2.0m cycle lanes plus 1.8m footpaths on both sides between Short road and Riverhead Road. |
| Public Transport | The indicative 2048 AT bus network forecasts 5 buses per hour on Coatesville Riverhead Highway, or approximately 1 bus every 10-15 minutes. |

Key features of the proposed new corridor include the following:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side and upgrading the northern section of the alignment to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor.
- The upgrade of the Coatesville-Riverhead Highway / Old Railway Road intersection from unsignalised to a roundabout.
- The upgrade of the existing Coatesville-Riverhead Highway / Riverhead Road roundabout intersection.
- Likely posted speed of 50kph, design speed of 60 kph.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

## 8.4 Assessment of Operational Transport Effects

### 8.4.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrade of Spedding Road is expected to result in positive effects on safety when compared to the existing corridor, and these consist of:

- Significantly improved walking and cycling facilities along Coatesville Riverhead Highway (including separation), resulting in improved protection for vulnerable road users.
- Significantly improved walking and cycling crossing facilities crossing Coatesville Riverhead Highway and the side streets, resulting in a significantly safer environment for all road users.
- A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 50km/h) with enhanced place function and consequential reductions in the risk of Death or Serious Injuries (DSIs).

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding Coatesville Riverhead Highway is developed. The Project has been designed to a 60kph speed limit in the rural area and a 50km/h speed limited in the urban section and provides segregated walking and cycling facilities to reduce the likelihood and severity in the event of a crash.

Overall, the proposed design of the Project is well aligned with the transport safety principles from AT and Waka Kotahi. It will provide a much safer transport system which will likely reduce the number of DSIs and result in positive effects for all road users. It is noted that the detailed design will be completed in the future to further detail measures to achieve the anticipated safety outcomes.

### 8.4.2 Walking and Cycling

The Project proposes separated walking and cycling facilities on both sides of Coatesville Riverhead Highway between Short Road and Riverhead Road. For the rural section between SH16 and Short Road the project proposes a shared path for pedestrians and cyclists on one side of the road.

The proposed walking and cycling facilities have been designed in accordance with relevant AT standards and policies as summarised in Table 8-4.

**Table 8-4: Coatesville Riverhead Highway upgrade AT standards and policy assessment for walking and cycling facilities**

| Policy/Standard | Network Component | Assessment |
|---|---|---|
| Auckland Transport Vision Zero[21] | Segregated walking and cycling facilities | Segregated walking and cycling facilities are proposed to provide a safe modal choice in the future environment. Vision Zero specifies that proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on Coatesville Riverhead Highway are proposed to be 50-60km/hr, therefore the proposed design of the walking and cycling facilities is considered to be appropriate for these standards. |
| AT Transport Design Manual[22] | Footpaths: 1.8m minimum | Between Short Road and Riverhead Road a 1.8m footpath is proposed, as well as a 2.0m cycle path with a 2.3m berm. The total width of 6.8m is proposed from carriageway to road boundary. This is in accordance with the AT TDM requirements.<br>Between SH16 and Short Road a 4.0m shared path is proposed. This is in accordance with the AT TDM requirements. |

Exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by Vision Zero guidance. The Project will have a number of significant positive effects on walking and cycling as it will:

- Significantly reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across Coatesville Riverhead Highway.
- Improve integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity.
- Lead to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
- Serve as a key enabler for greater use of active transport modes by providing safe connector route between Riverhead and SH16.
- Support growth surrounding Coatesville Riverhead Highway and significantly improve safety and access to employment and social amenities.

### 8.4.3 Public Transport

The cross-section will provide spacing to facilitate public transport and associated bus stops. The exact location of bus stops will be identified as part of detailed design for the Project. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined, i.e. around centres and schools for example.

[21] Auckland Transport: Vision Zero: https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf
[22] Auckland Transport – Transport Design Manual: https://at.govt.nz/about-us/manuals-guidelines/roads-and-streetsframework-and-the-transport-design-manual/

For future public transport services, there is one proposed bus routes which will use Coatesville Riverhead Highway. This service is forecast to operate every 12 minutes in the peak periods.

This service will link in to the proposed Brigham Creek station for the future RTN connection[23] to Auckland CBD via State Highway 16.

While the Project is not specifically a public transport project, the provision of active mode facilities to connect to public transport supports good integration with the future public transport network and improved access to employment and social amenities in Westgate and Albany.

### 8.4.4 General Traffic

As identified above, the 2048 ADT for Coatesville Riverhead Highway is approximately 9,000 vehicles. Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 900 vehicles. A two-lane corridor with limited access can efficiently accommodate 900 vehicles and therefore the proposed corridor design meets the forecasted needs.

**Intersection Performance**

The performance of the road network within the Project has been assessed using inputs from SATURN to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. A summary of these key performance measures is shown below in Table 8-5.

**Table 8-5: Summary of Intersection Performance 2048**

| Intersection (Intersection Control) | Peak Period | Overall Level of Service | Degree of Saturation (worst movement) | Maximum Queue Distance (m) |
|---|---|---|---|---|
| Coatesville Riverhead Highway / Old Railway Road (Roundabout) | Morning Peak | A | 0.403 | 25.8 |
| | Evening Peak | A | 0.313 | 19.5 |
| Coatesville Riverhead Highway / Riverhead Road (Roundabout) | Morning Peak | A | 0.494 | 32.6 |
| | Evening Peak | A | 0.492 | 31.9 |

The overall LOS for all intersections is LOS A, and therefore all of the intersections operate within acceptable capacity performance by 2048. Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048 scenario.

[23] https://www.transport.govt.nz//assets/Uploads/Report/ATAP_2021-31_Publication.pdf

### 8.4.5 Access

As an arterial corridor, Coatesville Riverhead Highway is expected to be a limited access corridor. As the area develops, it is expected that future access to the network will be facilitated by collector road networks within the urbanised area to the east and west of Coatesville Riverhead Highway.

In terms of existing properties, the overarching design philosophy for the Project has been to maintain driveway access where practicable and minimise impacting land other than where necessary.

No adverse effects have been identified.

### 8.4.6 Freight

As an existing two-lane corridor, there is limited effects to freight movements. Proposed intersection upgrades will improve connections for turning movements and will improve reliability for the freight network.

Over-dimension and overweight routes are expected to be further reviewed by AT/Waka Kotahi and relevant stakeholder groups in alignment with the realisation/ implementation of individual corridor upgrades in the future.

### 8.4.7 Wider Network Effects

As an existing two-lane corridor, the upgrade of Coatesville Riverhead Highway to an urban standard and to have a shared path is considered to have no wider network effects in terms of traffic or freight. The provision of walking and cycling facilities will have a positive network effect on the walking and cycling connections, providing a strong connection within Riverhead and through to Westgate in the longer term.

## 8.5 Project Interdependencies

### 8.5.1 SH16 Brigham Creek to Waimauku

The Coatesville Riverhead Highway project has been designed to directly link to the SH16 Brigham Creek to Waimauku project which includes a roundabout and a shared path facility at SH16. While the project can be implemented independent of SH16 works, full network benefits would be achieved in particular for walking and cycling, if this project is implemented.

## 8.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Overall, the project provides positive benefits and there are no specific measures to avoid, remedy or mitigate operational effects identified.

## 8.7 Summary of Operational Transport Effects (NoR R1)

The assessment of transport effects for the Project is summarised in Table 8-6.

**Table 8-6: Assessment of Operational Effects Summary for NoR R1 (Coatesville Riverhead Highway)**

| **Operational Transport Effects** | |
|---|---|
| Safety | In summary, the positive effects of the Project on safety are:<br>• A significantly improved speed environment by designing for appropriate urban and rural speed limits (e.g. 50-60km/h) with enhanced place function and consequential reductions in the risk of Death or Serious Injuries (DSIs).<br>• A significantly improved environment for pedestrians and cyclists, commensurate with an urbanised environment. |
| Walking and Cycling | In summary, the positive effects of the Project on walking and cycling are:<br>• Significantly reduced the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and across Coatesville Riverhead Highway.<br>• Improve integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity.<br>• Support growth adjacent to Coatesville Riverhead Highway and significantly improve safety and access to employment and social amenities. |
| Public Transport | In summary, the positive effects of the Project on public transport are:<br>• Sufficient space to enable safe and appropriate bus stops in locations to be determined when greater land use certainty is availability<br>• Connectivity for active modes to public transport services |
| General Traffic | In summary, the effects of the Project on general transport are:<br>• Provision of sufficient corridor and intersection capacity to cater for future growth |
| Access | No specific access effects have been identified. |
| Freight | It is considered that there will be no effect on freight movements. |
| Wider Network Effects | In summary, there are considered to be positive effects for the wider public transport and walking cycling benefits.<br>No wider network effects for freight and private vehicle |

## 8.8 Conclusions

Overall, the NoR R1: Coatesville Riverhead Highway Upgrade project provides positive transport effects. The project provides positive operational effects, in particular improved safety, walking and cycling effects.

In terms of construction traffic effects, it is considered that there is sufficient network capacity to enable construction traffic, and that any potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

It is recommended that access and safety considerations relating to activities at 1229 Coatesville Riverhead Highway should be specifically considered within the CTMP prior to construction and implementation of the Project.

# 1 Specific Transport Modelling Background Information

The Macro Strategic Model (MSM) is a region-wide model which analyses the forecast land use and informs trip generation, trip distribution and mode choice at regional level. The MSM model responds to the network assumptions, forecasted land use and regional economic policy inputs to predict regional traffic patterns and PT patronages. The outputs from the MSM model are used as:

- Demand inputs for the traffic simulation model SATURN, which analyses them at a mesoscopic level
- PT Patronage inputs for the MPT model, which analyses these at a strategic level
- Active mode inputs for the SAMM model, which analyses these at a mesoscopic level

The MSM is a four-step multi-modal model. This model was originally developed based on extensive data collected in 2006. Using observed data, and a full model validation exercise it was recently updated to reflect 2016 inputs and data. The MSM produces demands for five periods of the day, and separate assignment models exist for the morning (AM) and evening (PM) peak and weekday interpeak (IP) periods.

The model itself comprises of the following key modules:

- Trip generation: This is where the number of person-trips are estimated as a function of the land use data (population, employment, school roll etc.)
- Mode Choice: This is where the choice of recommended travel mode is determined, based on the relative costs of the various modes. The MSM modes for mode choice are car (driver and passenger combined) and passenger transport. Trips by car are converted into vehicle trips later in the model. The model also estimates the number of active mode trips, such as walking and cycling, although these are not fully modelled through to link flows.
- Trip Distribution: This is where the trips produced in each zone (generally by households), are matched to a recommended destination. This distribution is predicted as a function of the relative attractiveness for each destination zone and the travel costs to reach each destination.
- Time of Day: This is where the proportion of daily trip making occurring in each period is calculated. These proportions change in response to changes in travel costs to represent peak spreading.
- Trip Assignment: This is where the resulting travel demand, in the form of origin to destination trip tables, are loaded to the road and public transport networks. For the road assignment, an iterative process is used to firstly identify the lowest-cost route between each origin and destination followed by an estimation of the speeds and delays on each route between origin and destination, followed by an estimation of speeds and delays on each route associated with the predicted traffic flows on the route.

### 1.1.1 General Network Assumptions

The following general network assumption have been made in the MSM model:

- All committed developments and respective infrastructure upgrades planned as outlined in the ATAP (Auckland Transport Alignment Project) 2.0 and RLTP (Regional Land Transport Plan) have been coded in the future MSM model

- The access points (MSM zone connectors) for each model option scenarios in the North West Detailed business case areas were reviewed and refined accordingly to reflect the future infrastructure upgrades
- The future local bus services for each model option scenarios, were updated based on inputs from the AT Metro, specifically related to routes, frequencies, bus capacities and bus speeds.

Following discussions with Waka Kotahi and Auckland Transport, the following strategic interventions have been included in the North West Do Minimum.

- SH16 Brigham Creek to Waimauku Project currently being delivered by Waka Kotahi.
- Full implementation of the NWRTN from the City Centre to a Brigham Creek station (City Centre to Westgate (CC2W) project). It was agreed with Waka Kotahi and Auckland Transport to use the station locations identified in the North West Rapid Transit IBC.
- SH18 Rapid transit corridor between Westgate and Constellation.
- SH16 to SH18 Connections improvements.

The inclusion of these key inter-dependent strategic projects in the Do-minimum network is to account for the fact that those projects are being developed separately by Waka Kotahi/Auckland Transport, so are not included as part of the Te Tupu Ngātahi improvements package. They are however a key part of the future transport network for the North West so are part of the overall North West response.

If these projects were not occur, the likely impact is greater demands on the projects identified in this assessment.

It is noted that the SH16 Brigham Creek to Waimauku project has funding and potential seed funding for the CC2W project has been included in the RLTP as part of the 10-year capital expenditure. All projects are subject to stand alone business case processes. To understand the overall North West response, it is therefore considered appropriate to include these projects in the modelling assessment.

### 1.1.2 MSM Outputs

There are a number of outputs from the transport modelling, including:

- Demand patterns (Origin-Destination travel) and facility usage (flows)
- Network performance
- Travel times and costs (real and perceived) for economic analysis
- Delays, queues and Level of Service (LoS) for design and assessment
- Aggregate travel statistics on travel such as Vehicle Kilometres Travelled (VKT), Passenger Kilometres Travelled (PKT) and total travel costs
- Flow and performance for environmental analysis
- Inputs to vehicle emissions models
- Inputs to noise analysis

## 1.2 SATURN

SATURN is a mesoscopic traffic simulation and assignment model used to undertake a variety of area wide strategic assessments through to more detailed local area assessments. It can be used as a conventional model for the analysis of traffic-management schemes over localised networks as well as for major investment improvements at a regional level. The SATURN model ensures factual representation of vehicle flow patterns and congestion on midblock sections and intersections in the form of ‘arrival’ flows rather than ‘demand’ flows. Additionally, it is used as a high-level junction simulation model that evaluates the traffic flow behaviour on junctions. It represents ‘congested assignment’ of multiple user classes modelled separately, including bus priority and high occupancy vehicle lanes.

### 1.2.1 SATURN Outputs

There are a number of outputs from the SATURN model, including:

- Vehicular flow pattern -Actual flow, Demand flow, Queued flow
- Network performance- Link and Node delays, Queue Statistics, V/C Ratios
- Mid-block capacities and speeds
- Aggregate travel statistics on travel such as Total Travel Time(hrs), Distance Travelled (kms)

## 1.3 SIDRA

Signalised (and unsignalised) Intersection Design and Research Aid (SIDRA) is a micro-analytical tool used for evaluating intersection performance. It has a comprehensive, lane-based network modelling approach applicable to all types on intersections-signal, priority or sign control and roundabouts. SIDRA allows the modelling of various movement classes (Light vehicle, Heavy vehicle, Buses, Bicycle, Large Trucks, Light Rail/ Trams) with distinctive vehicle features to be assigned to designated lanes, segments and signal phases.

The Te Tupu Ngātahi SIDRA model is used to analyse the form and function of proposed intersections along strategic corridors. Based on the demand flow outputs from the SATURN Model, the intersection turning flows are determined.

The performance measures of the intersection in terms of capacity, delay, Level of Service (LOS), queue length on approach lanes and optimum vehicle-pedestrian signal phasing is calculated.

It is noted that the SIDRA model is reliant on outputs from the SATURN model, with traffic distribution based on the network provided in SATURN. A finer grain network that includes all collectors and local roads is not provided in SATURN, and as such it can considered that intersection modelling in SIDRA results in a conservative assumption of performance.

# ATTACHMENT 57

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF CONSTRUCTION NOISE AND VIBRATION EFFECTS

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Redhills and Riverhead

# Assessment of Construction Noise and Vibration Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

## Document Status

| Responsibility | Name |
|---|---|
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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AEE** | Assessment of Effects on the Environment |
| **AT** | Auckland Transport |
| **AUP:OP** | Auckland Unitary Plan Operative in Part |
| **BCI** | Brigham Creek Interchange |
| **FUZ** | Future Urban Zone |
| **NAL** | North Auckland Line |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **RMA** | Resource Management Act 1991 |
| **SG** | Te Tupu Ngātahi Supporting Growth |
| **SH16** | State Highway 16 |
| **The Council** | Auckland Council |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |
| **PPV** | Peak Particle Velocity, measured in mm/s |

# Glossary of Acronyms / Terms

| Acronym/Term | Description |
|---|---|
| **Auckland Council** | Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010. |
| **Redhills Riverhead Assessment Package** | Two Notices of Requirement (for Don Buck Road and Coatesville-Riverhead Road) and one alteration to an existing designation (Fred Taylor Drive) for the Redhills Riverhead Package of Projects for Auckland Transport. |

# 1 Executive Summary

Construction noise levels have been assessed using the method recommended in NZS 6803 in accordance with the Auckland Unitary Plan Operative in Part (AUP:OP). As construction of each Project is expected to last for more than 20 weeks, the "long-duration" noise limits are applicable.

Noisy activities will typically be carried out between 7am – 6pm on weekdays. Night-time and weekend works will be limited and only occur for critical activities.

Construction vibration levels have been assessed against the requirements of the AUP:OP, which refer to the criteria in DIN 4150-3:1999 for the avoidance of cosmetic building damage (DIN criteria). The AUP:OP also details amenity criteria, which act as a trigger for consultation if predicted to be exceeded.

Construction noise setback distances and vibration emission radii have been determined (based on assumptions of construction activities and equipment) for each of the NoR sections. The construction boundary is assumed to be the edge of the proposed alignment. Affected receivers have been identified using construction noise setback distances and vibration emission radii. 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. 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.

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.

**NoR RE1 Don Buck Rd**

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

Don Buck Road is an existing busy road with commercial buildings and residential dwellings along the road corridor. The noise environment is dominated by road traffic noise from vehicles on Don Buck Road and industrial noise from businesses located in the Light Industrial Zone.

Receivers are located at varying distances from the construction boundary along the alignment with the closest existing receiver being 2m from the alignment. With mitigation in place, as set out in Section 5.2, noise levels of up to 90 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 could include loss of concentration, annoyance, and a reduction in speech intelligibility.

Operation of construction equipment will be intermittent in nature. Construction will be linear so as the equipment moves away from the receiver noise levels will reduce. The worst-case situations, where mitigated noise levels could reach 90 dB $L_{Aeq}$ at the closest receivers, are not expected to be frequent, due to the setback distances to the majority of the proposed works and the use of equipment with lower source noise levels for large portions of the works. It is therefore predicted that mitigated noise levels can comply with the 70 dB $L_{Aeq}$ noise criterion for most of the construction works.

Vibration levels could exceed the Category B criteria at 30 existing dwellings and three commercial buildings prior to mitigation being implemented, if high vibration generating equipment, such as the roller compactor, is used on the construction boundary at the closest position to the receivers. At these receivers there is potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. 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.

***Conclusion***

Construction noise and vibration can be mitigated and managed, utilising the measures set out in Section 5.2, to generally comply with the applicable limits as defined in the AUP:OP. Exceedances of the criteria could occur intermittently over a short duration if high noise or vibration generating equipment are used near 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.

A CNVMP is the most effective way to avoid, remedy or mitigate construction noise and vibration effects on receivers.

**NoR RE2 Fred Taylor Drive**

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

Fred Taylor Drive is located within a predominantly rural area with some dwellings and commercial receivers located close to the road corridor. The noise environment is dominated by road traffic noise from vehicles on Fred Taylor Drive and the surrounding road network.

Receivers are located at varying distances from the construction boundary along the alignment with the closest existing receiver at 2m. With mitigation in place as set out in Section 5.2, noise levels of up to 90 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 could include loss of concentration, annoyance, and a reduction in speech intelligibility.

Operation of construction equipment will be intermittent in nature. Construction will be linear so as the equipment moves away from the receiver noise levels will reduce. The worst-case situations, where mitigated noise levels could reach 90 dB $L_{Aeq}$ at the closest receivers, are not expected to be frequent, due to the setback distances to the majority of the proposed works and the use of equipment with lower source noise levels for large portions of the works. It is therefore predicted that mitigated noise levels can comply with the 70 dB $L_{Aeq}$ noise criterion for most of the construction works.

Vibration levels could exceed the Category B criteria at 15 existing dwellings and one commercial building prior to mitigation being implemented, if high vibration generating equipment, such as the roller compactor, is used on the construction boundary at the closest position to the receivers. At these receivers there is potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. 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.

***Conclusion***

Construction noise and vibration can be mitigated and managed, utilising the measures set out in Section 5.2, to generally comply with the applicable limits as defined in the AUP:OP. Exceedances of the criteria could occur intermittently over a short duration if high noise or vibration generating equipment are used near 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.

A CNVMP is the most effective way to avoid, remedy or mitigate construction noise and vibration effects on receivers.

**NoR R1 Coatesville-Riverhead Highway Upgrade**

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

Coatesville-Riverhead Highway currently runs through urban and rural environments. In the rural area there are few receivers near the road. The noise environment is dominated by road traffic noise from vehicles using the Coatesville-Riverhead Highway and the surrounding road network. Development is highly likely to occur in the Future Urban Zone, located on the western side of the corridor. An increase in ambient noise levels is expected as the area urbanises.

Receivers are located at varying distances from the construction boundary along the alignment with the closest existing receiver being 2m away. With mitigation in place, as set out in Section 5.2, noise levels of up to 90 dB $L_{Aeq}$ could occur intermittently at the closest receivers, if high noise generating activities occur on the construction boundary. At this level effects could include loss of concentration, annoyance, and a reduction in speech intelligibility.

Operation of construction equipment will be intermittent in nature. Construction will be linear so as the equipment moves away from the receiver noise levels will reduce. The worst-case situations, where mitigated noise levels could reach 90 dB $L_{Aeq}$ at the closest receivers, are not expected to be frequent, due to the setback distances to the majority of the proposed works and the use of equipment with lower source noise levels for large portions of the works. It is therefore predicted that mitigated noise levels can comply with the 70 dB $L_{Aeq}$ noise criterion for most of the construction works.

Vibration levels could exceed the Category B criteria at 27 existing dwellings prior to mitigation being implemented, if high vibration generating equipment such as the roller compactor is used on the construction boundary at the closest position to the receivers. At these receivers there is potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. 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.

***Conclusion***

Construction noise and vibration can be mitigated and managed, utilising the measures set out for each transport corridor, to generally comply with the applicable limits as defined in the AUP. Exceedances of the criteria could occur intermittently over a short duration if high noise or vibration generating equipment are used near 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.

A CNVMP is the most effective way to avoid, remedy or mitigate construction noise and vibration effects on receivers.

# 2 Introduction

This construction noise and vibration assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "**Redhills Riverhead Assessment Package**"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

This report assesses the construction noise and vibration effects of the North West Redhills Riverhead Assessment Package, refer to the AEE for project areas.

## 2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Redhills Riverhead Assessment Package. Its purpose is to inform the AEE that accompanies the Redhills Riverhead Assessment Package sought by AT.

This report considers the actual and potential effects associated with the construction of the Redhills Riverhead Assessment Package on the existing and likely future environment as it relates to the construction 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:

a) Identify and describe the noise and vibration context of the Redhills Riverhead Assessment Package area;
b) Identify and describe the actual and potential construction noise and vibration effects of each Project corridor within the Redhills Riverhead Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential construction noise and vibration effects (including any conditions/management plan required) for each Project corridor within the Redhills Riverhead Assessment Package; and
d) Present an overall conclusion of the level of actual and potential construction noise and vibration effects for each Project corridor within the Redhills Riverhead Assessment Package after recommended measures are implemented.

## 2.2 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each Project corridor and project features within the Redhills Riverhead Assessment Package as it relates to construction noise and vibration
c) Description of the existing and likely future noise environment;
d) Description of the actual and potential adverse construction noise and vibration effects of construction of the Projects;
e) Recommended measures to avoid, remedy or mitigate potential adverse construction noise and vibration effects; and
f) Overall conclusion of the level of potential adverse construction noise and vibration effects of the Projects after recommended measures are implemented.

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 Projects, 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 the construction noise and vibration 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.

## 2.3 Preparation for this Report

The construction methodology and construction drawings for each NoR was reviewed and reference to the AUP:OP, NZS 6803 and DIN 4150 was made (these documents are discussed further below).

# 3 Assessment Criteria

## 3.1 Construction Noise

Potential construction noise effects have been assessed in accordance with the applicable AUP:OP noise rules and standards. Standard E25.6.1(3) of the AUP:OP states that “The noise from any construction activity must be measured and assessed in accordance with the requirements of New Zealand Standard NZS6803:1999 Acoustics – Construction noise”. Standards E.25.6.27(1) and E.25.6.27(2) contain noise limits for sensitive and all other receivers.

Furthermore, Standard E25.6.29 specifies that construction noise levels for work within the road for construction, maintenance and demolition activities must meet the relevant noise levels in the relevant table E25.6.27(1) or E25.6.27(2). Noise levels from E25.6.27(1) and E25.6.27(2) have been adopted for the purpose of this assessment and are reproduced in Table 3-1 and Table 3-2.

In accordance with Standard 25.6.27(4) of the AUP:OP, since the works will take longer than 20 weeks a 5dB reduction has been applied in all cases to noise limits in E25.6.27(1) and E25.6.27(2) of the AUP:OP. The long duration limits are detailed in Table 3-1 and Table 3-2 below.

**Table 3-1 Construction noise criteria for sensitive receivers (outside of Business – City Centre Zone and the Business – Metropolitan Centre Zone)**

| Day of the week | Time period | Maximum noise level night-time >20 weeks | |
|---|---|---|---|
| | | dB $L_{Aeq}$ | dB $L_{Aeq}$ |
| **Weekdays** | 6:30 – 7:30 | 55 | 70 |
| | 7:30 – 18:00 | 70 | 85 |
| | 18:00 – 20:00 | 65 | 80 |
| | 20:00 – 6:30 | 40 | 70 |
| **Saturdays** | 6:30 – 7:30 | 40 | 70 |
| | 7:30 – 18:00 | 70 | 85 |
| | 18:00 – 20:00 | 40 | 70 |
| | 20:00 – 6:30 | 40 | 70 |
| **Sunday and public holidays** | 6:30 – 7:30 | 40 | 70 |
| | 7:30 – 18:00 | 50 | 80 |
| | 18:00 – 20:00 | 40 | 70 |
| | 20:00 – 6:30 | 40 | 70 |

**Table 3-2 Construction noise criteria for all other receivers (outside of Business – City Centre Zone and the Business – Metropolitan Centre Zone)**

| Time period | Maximum noise night-time >20 weeks dB $L_{Aeq}$ |
|---|---|
| 7:30 – 18:00 | 70 |
| 18:00 – 7:30 | 75 |

Exemptions to these levels are provided in Rule E25.6.29 (2) and E25.6.29 (3) where noise levels specified do not apply for planned works in the road between the hours of 10pm and 7am where:

- The number of nights where the noise generated by the works exceeds the relevant noise levels at any one receiver exceeds the relevant noise levels for 3 nights or less; and
- The works cannot practicably be carried out during the day or because the road controlling authority requires this work to be night-time; or
- Because of the nature of the works the noise produced cannot practicably be made to comply with the relevant noise levels.

Under E25.6.29(3) noise levels specified (as replicated above in Table 3-1) do not apply for planned works in the road between the hours of 7am and 10pm where:

- The number of days where the noise generated by the works exceeds the relevant noise levels at any one receiver is 10 days or less; or
- Because of the nature of the works and the proximity of receivers the noise generated cannot be practicably made to comply with the relevant noise levels.

If situations fall under the exemption rules, then a copy of the works access permit issued by Auckland Transport will be provided to the Council five days prior to work commencing; or a construction noise and vibration management plan will be provided to the Council no less than five days prior to the works commencing in accordance with the applicable provisions of Standard E25.6.29(5).

## 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.

It should be noted that 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.

Potential exceedances of the amenity criteria will be considered when assessing the construction vibration effect on nearby receivers. It is recommended that the limits relating to human comfort detailed in Table 3-3 should be used as a trigger for communication and consultation and should be included in the construction management plan(s) that will be prepared as part of the Projects.

### 3.2.1 Auckland Unitary Plan

The AUP:OP contains rules relating to construction vibration that cover both building damage and amenity. Rule E25.6.30 states that construction activities must be controlled to ensure any resulting vibration does not exceed:

a. The limits set out in German Industry Standard DIN 4150-3 (1999): Structural Vibration Part 3 Effects of vibration on structures when measured in accordance with that Standard on any structure not on the same site; and
b. The limits set out in Table 3-3 in any axis when measured in the corner of the floor of the storey of interest for multi-storey buildings, or within 500mm of ground level at the foundation of a single storey building.

**Table 3-3 AUP:OP Table E25.6.30.1 Vibration limits in buildings**

| Receiver | Period | Peak Particle Velocity (PPV mm/s) |
|---|---|---|
| Occupied activity sensitive to noise or vibration | Night-time 10pm to 7am | 0.3 |
| | Daytime 7am to 10pm | 2.0 |
| Other occupied buildings | At all times | 2.0 |

Works generating vibration for three days or less between the hours of 7am to 6pm may exceed the limits in Table E25.6.30.1 Vibration limits in buildings above, but must comply with a limit of 5mm/s peak particle velocity in any axis when measured in the corner of the floor of the storey of interest for multi-storey buildings, or within 500mm of ground level at the foundation of a single storey building, where:

(i) all occupied buildings within 50m of the extent of the works generating vibration are advised in writing no less than three days prior to the vibration-generating works commencing; and
(ii) the written advice must include details of the location of the works, the duration of the works, a phone number for complaints and the name of the site manager.

### 3.2.2 DIN 4150-3:1999 – Structural vibrations: Effects of vibrations on structures

DIN 4150 contains guidelines on the vibration limits for buildings which, when complied with "will not result in damage that will have an adverse effect on the structure's serviceability". These limits are reproduced in Table 3-4.

Different criteria are given for "short-term" (transient) vibration sources such as blasting and impact piling, and "long-term" sources such as vibrocompaction.  Note that the definition of "short-term" and "long-term" in DIN 4150-3:1999 differ from those in NZS 6803:1999 and do not strictly relate to the duration of the works, but rather how a building responds to the construction vibration. Short term vibration does not excite a structure (which would result in a significant increase in vibration), therefore vibration limits are higher than for long-term vibration.

**Table 3-4 Vibration velocity guideline values for structures (DIN 4150)**

| Type of structure | Short term vibration** | | | | Long Term Vibration |
|---|---|---|---|---|---|
| | PPV at foundation, frequency of: | | | Vibration at horizontal plane of highest floor at all frequencies (mm/s) | PPV at horizontal plane of highest floor (mm/s) |
| | 1 Hz to 10 Hz | 10 Hz to 50 Hz | 50 Hz to 100 Hz* | | |
| Buildings used for commercial purposes, industrial buildings, and buildings of similar design | 20 | 20 to 40 | 40 to 50 | 40 | 10 |
| Dwellings and buildings of similar design and/or use | 5 | 5 to 15 | 15 to 20 | 15 | 5 |
| Structures that because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value | 3 | 3 to 8 | 8 to 10 | 8 | 2.5 |

* At frequencies above 100 Hz, the values given in this column may be used as minimum values

** The Standard defines short-term vibration as "vibration which does not occur often enough to cause structural fatigue, and which does not produce resonance in the structure being evaluated". Long-term vibration is defined as all other vibration types not covered by the short-term vibration definition.

Clause 5.1 of DIN 4150-3 notes that a vibration level in excess of the DIN criterion does not necessarily result in building damage. The definition of 'damage' in DIN 4150-3 is: "any permanent effect of vibration that reduces serviceability of a structure or one of its components".

Examples of a ''reduction of serviceability' include.

- The impairment of stability of the building and its components; and
- A reduction in the bearing capacity of floors.

For dwelling type buildings and structures sensitive to vibration, the serviceability is considered to have been reduced if:

- Cracks form in plastered surfaces of walls;
- Existing cracks in the building are enlarged; and
- Partitions become detached from loadbearing walls or floors.

Clause 4.5 of DIN 4150-3 states that these effects are deemed 'minor damage'

### 3.2.3 Auckland Transport construction vibration criteria

The following criteria are the recommended Project construction vibration criteria for both building damage and amenity applicable for all NoRs.

The two category criteria, detailed in Table 3-5 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, as adopted from the AUP:OP, and is an indicator of when communication and consultations should be initiated to manage effects. Category B are based on DIN 4150 building damage criteria for daytime.

**Table 3-5 Auckland Transport Construction vibration criteria**

| Vibration Level | Effect | Category A | Category B |
|---|---|---|---|
| Occupied Activities sensitive to noise | Night-time 2000h – 0630 | 0.3mm/s ppv | 2mm/s ppv |
| | Daytime 0630h – 2000h | 2mm/s ppv | 5mm/s ppv |
| Other occupied buildings | Daytime 0630h – 200h. | 2mm/s ppv | 5mm/s ppv |
| All other buildings | All other times | Tables 1 and 3 of DIN4150-3:1999 | |

Where compliance with the vibration standards set out in Table 3-5 is not practicable, and unless otherwise provided for in the CNVMP (refer Section 1.1.1), a schedule (refer Section 1.1.2) will be required.

# 4 Assessment Methodology

A consistent approach has been adopted for the whole Redhills Riverhead Package 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 considered as part of the CNVMP closer to the time of construction. In most cases buildings within the current proposed designation footprint will be removed, as confirmed by the Project Team, and are not assessed. If the corridor footprint is redefined through the design process this should be considered in the CNVMP.

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

The construction boundary is assumed to be the edge of the proposed alignment. Affected receivers have been identified using construction noise setback distances and vibration emission radii. 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. 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 1.1.1 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 NoRs.

The outline is based on a generic 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 construction methodology for the projects is as follows:

### 4.1.1 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).

### 4.1.2 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.

### 4.1.3 Main works

- Minor earthworks (cut and fill);
- Remove verge and prepare subgrade formation;
- Construct new longitudinal drainage facilities;
- Construct new pavement, 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.

### 4.1.4 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.

### 4.1.5 Plant and Equipment

Table 4-1 provides an indicative list of plant and equipment which may be required for construction across each designation.

**Table 4-1 Indicative construction equipment**

| Construction | Construction Activity |
|---|---|
| **Typical across all works** | • Site facility<br>• Light Vehicles<br>• Hiab truck<br>• Trucks |
| **Earthworks** | • 20-30T Excavator<br>• Roller Compactor<br>• Water Cart<br>• Tippers<br>• Stabilizers |
| **Drainage** | • 20T Excavator<br>• Trench Shields<br>• Tandem Tipper<br>• Loader<br>• Plate compactor<br>• Trucks<br>• Water cart |
| **Pavement Construction** | • Grader<br>• Water Cart<br>• Smooth Drum Roller<br>• Vibratory Roller<br>• Tandem Tippers<br>• Kerbing Machine<br>• Concrete Truck<br>• Plate compactor<br>• Paver<br>• Excavators |

## 4.2 Construction Noise

Construction phases for each of the Projects are initially expected to occur for a minimum of 25 months, at the time of writing this report. Predictions have been assessed against the noise criteria for greater than 20 weeks “long-duration” under NZS6803:1999 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 will 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.

Table 4-2 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”, manufacturers data or the AECOM database of noise measurements[1]. 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 4-2 Construction Equipment Sound levels and indicative compliance distance**

| Equipment | Sound power level (dB $L_{Aeq}$) | Free field noise level at varying distances (dB $L_{Aeq}$) | | | | Minimum Setback distance to comply with day-time criteria without mitigation |
|---|---|---|---|---|---|---|
| | | 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 |

Table 4-3 details the sound power levels from key construction activities/types. The equipment sound power levels in Table 4-2 have been combined according to equipment that are likely to occur at the same time. From the combined level a minimum setback distance at which compliance can be achieved has been determined.

**Table 4-3 Activity Sound Power Levels and Compliance Distance**

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

[1] This is held on file. Details can be provided upon request.

## 4.3 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 4-4.

**Table 4-4 Vibration sources and indicative emission radii**

| Equipment | Daytime Occupied Buildings (2 mm/s) | DIN 4150 emission radii | | |
|---|---|---|---|---|
| | | Historic and Sensitive (2.5 mm/s) | Residential (5 mm/s) | Commercial (10 mm/s) |
| **Roller Compactor** | 21m | 17m | 8m | 4m |
| **Excavator** | 12m | 10m | 6m | 2m |
| **Tipper Truck** | 2m | 2m | 1m | 0m |
| **Vibratory Plate Compactor** | 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 Redhills Riverhead Construction Effects

## 5.1 Overview of Construction Effects

Potential construction noise and vibration effects are summarised in this section

### 5.1.1 Construction noise

Table 5-1 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 5-1 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 such as Bunnings) 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. |

| External Noise Level | Potential Daytime Effects Outdoors | Corresponding Internal Noise Level | Potential Daytime Effects Indoors |
|---|---|---|---|
| 80 to 90 dB $L_{Aeq}$ | Hearing protection would be required for prolonged exposure (8 hours at 85 dB) to prevent hearing loss. | 60 to 70 dB $L_{Aeq}$ | Untenable for both office and residential environments. Unlikely to 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 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. 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.

### 5.1.2 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 5-2 Potential vibration effects on human perception summary against AUP:OP/DIN criteria**

| External Noise Level | Potential Daytime Effects Outdoors |
|---|---|
| 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.<br><br>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 |

| External Noise Level | Potential Daytime Effects Outdoors |
|---|---|
| | people actually feel would be subject to the source but could include a steady vibration from 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.<br><br>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.<br><br>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 at 0.3mm/s for night time and 2 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. 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.

At 0.3 mm/s 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 1.1.1)

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 controlled through a CNVMP to limit potential vibration effects, and alternative equipment with lower vibratory effect should be used where practicable.

## 5.2 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

### 1.1.1 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. The objective of the CNVMP should provide 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.

E25.6.29(5) sets out the minimum level of information that must be provided in a CNVMP. Accordingly, as a minimum, we recommend that the CNVMP should include 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 Projects;
- 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.

### 1.1.2 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 exceeding the Category B criteria, which document their current condition and any existing damage.

### 1.1.3 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, careful equipment selection and use of noise barriers or localised screening (e.g. for concrete cutting) would be suitable management and mitigation measures and should be implemented where they are practicable and effective.

### 1.1.4 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).

### 1.1.5 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 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.

### 1.1.6 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;
- 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.

# 6 NoR RE1: Don Buck Road FTN Upgrade

## 6.1 Project Corridor Features

A section of Don Buck Road is proposed to be upgraded from a corridor width of 27-35m to a 30m wide four-lane local arterial with priority lanes for buses, separated cycle lanes and footpaths on both sides of the corridor. Intersections located along the corridor are proposed to be signalised. The project ties in with the proposed upgrades to the Royal Road intersection as part of the North West Housing Infrastructure Fund (NW HIF) package of work. The proposed upgrade is expected to remain within the existing corridor to the extent possible with localised widening occurring near intersections.

Key features of the proposed new corridor include the following:

- Widening of Don Buck Road to a 30m wide four-lane local arterial with priority lanes for buses and separated cycle lanes and footpaths on both sides of the corridor.
- Upgrades to the intersections with Fred Taylor Drive, Westgate Drive, Rush Creek Drive and Beauchamp Road.
- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor

An overview of the proposed design is provided in Figure 6-1.


**Figure 6-1 Overview of the Don Buck Road FTN Upgrade**

## 6.2 Existing and Likely Future Environment

### 6.2.1 Planning context

The land adjacent to Don Buck Road is comprised of various business, residential and open space zoning. The following outlines the key elements of the planning context for the Don Buck Road FTN Upgrade:

- The eastern side of Don Buck Road above Westgate Drive is zoned under the AUP:OP as Business – Light Industry. To the south of Westgate Drive, the eastern side of Don Buck Road contains an Open Space – Community Zone (occupied by Massey Leisure Centre), with the remaining land zoned as Residential – Mixed Housing Zone.
- The western side of Don Buck Road is within the I610 Redhills Precinct and is predominantly zoned Residential – Mixed Housing Urban, with a portion of land in the northern section of the corridor zoned Residential – Terraced Housing and Apartment Buildings Zone (**THAB**). Land further to the west of Don Buck Road forms part of the Redhills Precinct.

Table 6-1 below provides a summary of the existing and likely future environment as it relates to the Don Buck Road FTN Upgrade.

**Table 6-1: Don Buck Road FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[2] | Likely Future Environment[3] |
|---|---|---|---|
| **Business** | Business (Industrial) | Low | Business |
| **Residential** | Residential – Mixed Housing Urban Zone<br>Residential – Terraced Housing and Apartment Zone | Low | Residential |
| **Open Space** | Open Space – Community Zone | Low | Open Space |

### 6.2.2 Noise Environment

Don Buck Road is an existing busy road with commercial buildings and residential dwellings along the road corridor. The noise environment is dominated by road traffic noise from vehicles on Don Buck Road and industrial noise from businesses located in the Light Industrial Zone.

[2] Based on AUP:OP zoning/policy direction
[3] Based on AUP:OP zoning/policy direction

## 6.3 Assessment of Construction Noise and Vibration Effects

### 6.3.1 Construction Noise Effects

Receivers are located at varying distances from the construction boundary along the alignment with the closest existing receiver being 2m from the alignment. High noise generating activities may not occur right on the construction boundary but if they do, 152 existing receivers could experience unmitigated noise levels that exceed the daytime noise criterion. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 5.2, noise levels of up to 90 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 could 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.

Future receivers constructed within 76m of the works could experience unmitigated noise levels that exceed the 70 dB $L_{Aeq}$ noise criterion during high noise generating activities such as the pavement works.

Operation of construction equipment will be intermittent in nature. Construction will be linear so as the equipment moves away from the receiver noise levels will reduce. The worst-case situations, where mitigated noise levels could reach 90 dB $L_{Aeq}$ at the closest receivers, are not expected to be frequent, due to the setback distances to the majority of the proposed works and the use of equipment with lower source noise levels for large portions of the works. 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 1.1.1) and a Schedule (as per Section 1.1.2).

Provided that the works are mitigated and managed through the CNVMP and Schedules at the time of construction, we consider that noise effects from construction works as currently planned will be reasonable.

### 6.3.2 Construction Vibration Effects

Existing receivers near Don Buck Road are a mix of residential and commercial type structures. 30 existing dwellings may experience vibration levels above 5mm/s PPV and three existing commercial buildings may experience levels above 10mm/s PPV, exceeding the daytime Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. 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 commercial buildings the Category B criterion will be met. All the other vibration generating equipment identified in Table 4-4 can comply with the Category B criterion at all 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.

At buildings in close proximity to the proposed works, there is the potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. Buildings where the daytime Category B criteria may be exceeded will be identified at the time of construction, and pre-condition surveys will be carried out at these buildings.

The 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 4-4. 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. The Category A criteria should be used as a trigger to initiate consultations with affected parties to manage effects.

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. As discussed in Section 3.2.1, the AUP:OP allows exceedances of the vibration amenity criteria in occupied buildings for three days or less, between the hours of 7am to 6pm, where there has been appropriate communication and consultation with affected parties.

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.

## 6.4 Conclusions

The predicted construction noise and vibration levels are based on indicative information provided by the Project team, as set out in Section 4, and any conclusions in this assessment should be confirmed during the detailed design stage, taking account of the 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 5.2, to generally comply with the applicable limits as defined in the AUP:OP. Exceedances of the criteria could occur intermittently over a short duration if high noise or vibration generating equipment are used near 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.

A CNVMP is the most effective way to avoid, remedy or mitigate construction noise and vibration effects on receivers.

# 7 NoR RE2: Fred Taylor Drive FTN Upgrade

## 7.1 Project Corridor Features

The Fred Taylor Drive Upgrade involves the upgrade of the corridor between Hailes Road and Dunlop Road to accommodate a 30m wide four-lane FTN arterial with separated walking and cycling facilities.

Key features of the proposed upgrade include the following:

- The upgrade of the existing corridor to a 30m wide four-lane FTN arterial with separated walking and cycling. This widening is expected to remain in the existing designation 1433 to the extent possible.
- Localised widening outside the existing designation 1433 occurring at intersections.
- The upgrade of the intersections with Kakano Road and Northside Drive to signalised intersections.
- Additional land for tie-ins with side streets and stormwater wetlands
- Batter slopes to enable widening of the corridor, and associated cut and fill activities.
- Vegetation removal along the existing road corridor.
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas

An overview of the proposed design is provided in Figure 7-1


Figure 7-1 Overview of Fred Taylor Drive FTN Upgrade

## 7.2 Existing and Likely Future Environment

### 7.2.1 Planning context

The existing Fred Taylor Drive corridor runs through a mix of residential and industrial land uses.

The northern section of Fred Taylor Drive is within the Redhills North FUZ, with an area of land zoned under the AUP:OP as Open Space – Sport and Active Recreation Zone (Fred Taylor Park) adjacent the road corridor. The southern section of Fred Taylor Drive is zoned under the AUP:OP as THAB zone on the western side, and forms part of the I610 Redhills Precinct. The eastern side is zoned Business – Light Industry Zone and Business – Mixed Use Zone and forms part of the I615 Westgate Precinct.

Table 7-1 below provides a summary of the existing and likely future environment as it relates to the Fred Taylor Drive FTN Upgrade.

**Table 7-1: Fred Taylor Drive FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[4] | Likely Future Environment[5] |
|---|---|---|---|
| **Business** | Business (Light Industrial) | Low | Business |
| | Business (Mixed Use) | Low | |
| **Residential** | Residential – Terraced Housing and Apartment Zone | Low | Residential |
| **Open Space** | Open Space – Sport and Active Recreation | Low | Open Space |
| **Undeveloped greenfield areas** | Future Urban | **High** | Urban |

### 7.2.2 Noise Environment

Fred Taylor Drive is located within a predominantly rural area with some dwellings and commercial receivers located close to the road corridor. The noise environment is dominated by road traffic noise from vehicles on Fred Taylor Drive and the surrounding road network.

[4] Based on AUP:OP zoning/policy direction
[5] Based on AUP:OP zoning/policy direction

## 7.3 Assessment of Construction Noise and Vibration Effects

### 7.3.1 Construction Noise Effects

Receivers are located at varying distances from the construction boundary along the alignment with the closest existing receiver at 2m. High noise generating activities may not occur right on the construction boundary, but if they do, 59 existing properties could experience unmitigated noise levels that exceed the daytime noise criterion. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place as set out in Section 5.2, noise levels of up to 90 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 could include loss of concentration, annoyance, and a reduction in speech intelligibility. We note that the existing receivers on FUZ zoned land may not be present at the time of construction.

Future receivers constructed within 76m of the works could experience unmitigated noise levels that exceed the 70 dB $L_{Aeq}$ noise criterion during high noise generating activities such as the pavement works.

Operation of construction equipment will be intermittent in nature. Construction will be linear so as the equipment moves away from the receiver noise levels will reduce. The worst-case situations, where mitigated noise levels could reach 90 dB $L_{Aeq}$ at the closest receivers, are not expected to be frequent, due to the setback distances to the majority of the proposed works and the use of equipment with lower source noise levels for large portions of the works. 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 and a Schedule.

Provided that the works are mitigated and managed through the CNVMP and Schedules at the time of construction, we consider that noise effects from construction works as currently planned will be reasonable.

### 7.3.2 Construction Vibration Effects

Existing receivers near Fred Taylor Drive are a mix of residential and commercial type structures. 15 existing dwellings may experience vibration levels above 5mm/s PPV and one existing commercial receiver may experience vibration levels above 10mm/s PPV, exceeding the Category B criterion, if the roller compactor is used on the construction boundary in the closest position to them. Once the compactor is 8m away from the dwellings and 4m from commercial buildings the Category B criterion will be met. All the other vibration generating equipment identified in Table 4-4 can comply with the Category B criterion at all 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.

At buildings in close proximity to the proposed works, there is the potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. Buildings where the daytime

Category B criteria may be exceeded will be identified at the time of construction, and pre-condition surveys will be carried out at these buildings.

The 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 4-4. 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. The Category A criteria should be used as a trigger to initiate consultations with affected parties to manage effects.

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. As discussed in Section 3.2.1, the AUP:OP allows exceedances of the vibration amenity criteria in occupied buildings for three days or less, between the hours of 7am to 6pm, where there has been appropriate communication and consultation with affected parties.

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 in the early stages of a project.

## 7.4 Conclusions

The predicted construction noise and vibration levels are based on indicative information to support this NoR, as set out in Section 4, and any conclusions in this assessment should be confirmed during the detailed design stage, taking account of the 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 5.2, to generally comply with the applicable limits as defined in the AUP:OP. Exceedances of the criteria could occur intermittently over a short duration if high noise or vibration generating equipment are used near 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.

A CNVMP is the most effective way to avoid, remedy or mitigate construction noise and vibration effects on receivers.

# 8 NoR R1: Coatesville-Riverhead Highway Upgrade

## 8.1 Project Corridor Features

The Coatesville-Riverhead Highway is an existing arterial road extending from SH16 in the south to its intersection with Dairy Flat Highway in the north east, with the extents of the proposed upgrade from SH16 in the south to its intersection with Riverhead Road in the north. The southern section of the alignment from SH16 to Short Road runs through rural land uses which are expected to remain. The northern section (close to and within the Riverhead township) runs through low-medium density residential land uses on the east and future urban zoned land on the west.

Key features of the proposed new corridor include the following:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side and upgrading the northern section of the alignment to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor
- The upgrade of the Coatesville-Riverhead Highway / Old Railway Road intersection from un-signalised to a roundabout.
- The upgrade of the existing Coatesville-Riverhead Highway / Riverhead Road roundabout intersection.
- Tie-ins with existing roads, stormwater wetland and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor
- Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas

An overview of the proposed design is provided in

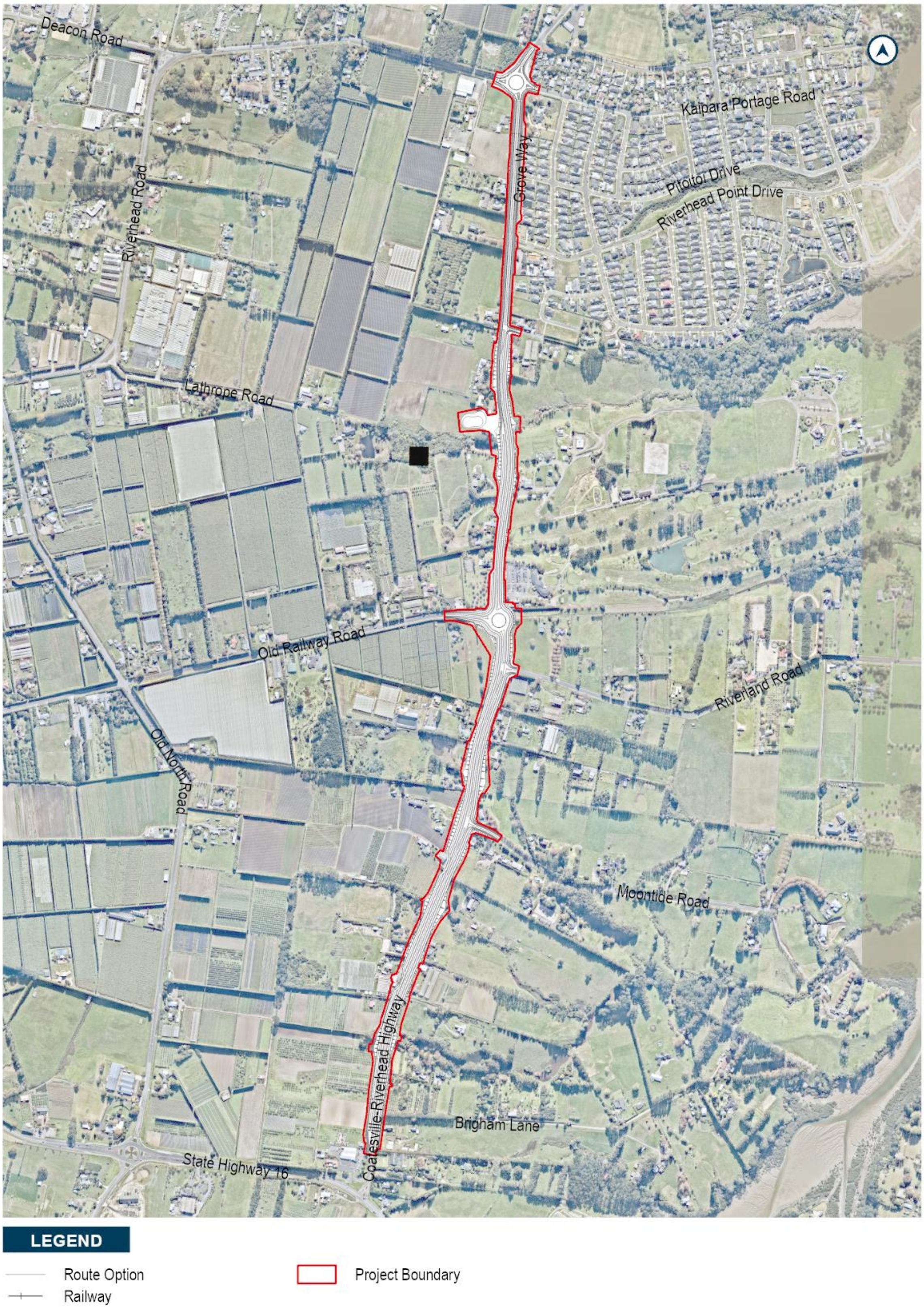


Figure 8-1.

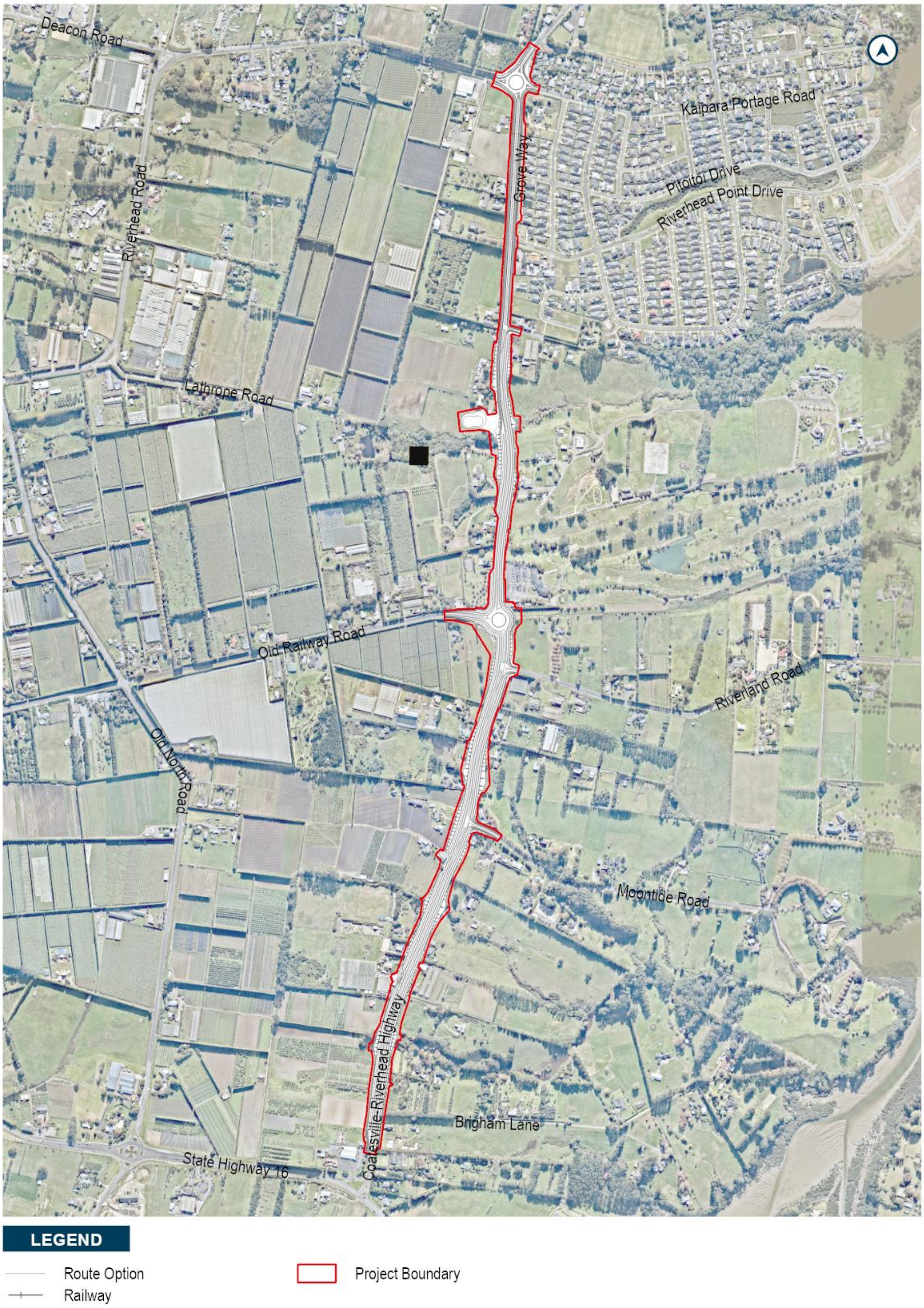


**Figure 8-1 Overview of the Coatesville-Riverhead Highway Upgrade**

## 8.2 Existing and Likely Future Environment

### 8.2.1 Planning context

The southern section of Coatesville-Riverhead Highway from SH16 to Short Road runs through rural land uses predominantly zoned under the AUP:OP as Rural – Mixed Rural Zone on both sides of the existing corridor. The northern section (close to and within the Riverhead township) runs through land zoned as Residential – Single House Zone and to the east and future urban zoned land on the west.

Table 8-1 below provides a summary of the North-West existing and likely future environment as it relates to the Coatesville-Riverhead Highway Upgrade.

**Table 8-1: Coatesville-Riverhead Highway Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[6] | Likely Future Environment[7] |
|---|---|---|---|
| **Rural** | Rural | Low | Rural |
| **Residential** | Residential | Low | Residential |
| **Future Urban Zone / Undeveloped greenfield areas** | Future Urban | High | Urban |

### 8.2.2 Noise Environment

Coatesville-Riverhead Highway currently runs through urban and rural environments. In the rural area there are few dwellings near the road. The noise environment is dominated by road traffic noise from vehicles using the Coatesville-Riverhead Highway and the surrounding road network.

In the urban section residential properties are located on the eastern side of the corridor. Development is highly likely to occur in the Future Urban Zone, located on the western side of the corridor. An increase in ambient noise levels is expected as the area urbanises.

## 8.3 Assessment of Construction Noise and Vibration Effects

### 8.3.1 Construction Noise Effects

Receivers are located at varying distances from the construction boundary along the alignment with the closest existing receiver being 2m away. High noise generating activities may not occur right on the construction boundary but if they do, 99 existing properties could experience unmitigated noise levels that exceed the daytime noise criterion. Details of all properties where the criteria could be exceeded are provided in Appendix A.

With mitigation in place, as set out in Section 5.2, noise levels of up to 90 dB $L_{Aeq}$ could occur intermittently at the closest receivers, if high noise generating activities occur on the construction

[6] Based on AUP:OP zoning/policy direction

[7] Based on AUP:OP zoning/policy direction

boundary. At this level effects could include loss of concentration, annoyance, and a reduction in speech intelligibility. We note that the existing receivers on FUZ zoned land may not be present at the time of construction.

Future receivers constructed within 76m of the works could experience unmitigated noise levels that exceed the 70 dB $L_{Aeq}$ noise criterion during high noise generating activities such as the pavement works.

Operation of construction equipment will be intermittent in nature. Construction will be linear so as the equipment moves away from the receiver noise levels will reduce. The worst-case situations, where mitigated noise levels could reach 90 dB $L_{Aeq}$ at the closest receivers, are not expected to be frequent, due to the setback distances to the majority of the proposed works and the use of equipment with lower source noise levels for large portions of the works. 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 and a Schedule.

Provided that the works are mitigated and managed through the CNVMP and Schedules at the time of construction, we consider that noise effects from construction works as currently planned will be reasonable.

### 8.3.2 Construction Vibration Effects

Existing receivers near Coatesville-Riverhead Highway are a mix of residential and commercial type structures. 27 existing dwellings may experience vibration levels above 5mm/s PPV, exceeding the Category B criterion for residential structures, if the roller compactor is used on the construction boundary in the closest position to them. Once the compactor is 8m away from the dwellings the Category B criterion will be met. All the other vibration generating equipment identified in Table 4-4 can comply with the Category B criterion at all existing residential receivers. The Category B criteria are predicted to be complied with at all existing commercial receivers, as they are sufficiently set back from the construction boundary. 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.

At buildings in close proximity to the proposed works, there is the potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. Buildings where the daytime Category B criteria may be exceeded will be identified at the time of construction, and pre-condition surveys will be carried out at these buildings.

The 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 4-4. 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. The Category A criteria should be used as a trigger to initiate consultations with affected parties to manage effects.

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. As discussed in Section 3.2.1, the AUP:OP allows exceedances of the vibration amenity criteria in occupied buildings for three days or less, between the hours of 7am to 6pm, where there has been appropriate communication and consultation with affected parties.

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 in the early stages of a project.

## 8.4 Conclusions

The predicted construction noise and vibration levels are based on indicative information to support this NoR, as set out in Section 4, and any conclusions in this assessment should be confirmed during the detailed design stage, taking account of the 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 5.2, to generally comply with the applicable limits as defined in the AUP:OP. Exceedances of the criteria could occur intermittently over a short duration if high noise or vibration generating equipment are used near 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.

A CNVMP is the most effective way to avoid, remedy or mitigate construction noise and vibration effects on receivers.

# 9 Conclusion

An assessment of the construction noise and vibration effects has been undertaken for the Projects considering a reasonable worst case scenario. The predicted noise levels and effects are based on indicative information as provided by the Project team and any assessment conclusions should 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 5.2, 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 will be prepared prior to construction commencing in accordance with Section 1.1.1 of this report. 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 a site specific schedule 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 Category A criterion of 2mm/s PPV 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 conditions surveys are recommended.

# Appendix A – Affected Receivers – Noise (Unmitigated)

**NoR R1**

| Address | | |
|---|---|---|
| 486 Don Buck Road | 545 Don Buck Road | 484 Don Buck Road |
| 2 Rush Creek Drive | 8 Westgate Drive | 4 Asti Lane |
| 538 Don Buck Road | 16 3 Kāpia Road | 554 Don Buck Road |
| 494 Don Buck Road | 465 Don Buck Road | 3 Rush Creek Drive |
| 1 Rush Creek Drive | 5 Rush Creek Drive | 7/485 Don Buck Road |
| 2/575 Don Buck Road | 26 Beauchamp Drive | 7-9 Westgate Drive |
| 490 Don Buck Road | 2 Stonegate Close | 7 Lazurite Drive |
| 532-534 Don Buck Road | 24 Cinnabar Place | 13 Lazurite Drive |
| 5/485 Don Buck Road | 7 Cinnabar Place | 11 Lazurite Drive |
| 12/485 Don Buck Road | 6 Rush Creek Drive | 15 Lazurite Drive |
| 9/485 Don Buck Road | 19 Lazurite Drive | 4 Rush Creek Drive |
| 560 Don Buck Road | 16 2 Kāpia Road | 27 Beauchamp Drive |
| 2/485 Don Buck Road | 9 Cinnabar Place | 545 Don Buck Road |
| 13/485 Don Buck Road | 545 Don Buck Road | 42 Regents Park Place |
| 583-585 Don Buck Road | 545 Don Buck Road | 17 Lazurite Drive |
| 31 Beauchamp Drive | 9 Arlose Place | 1-3 Fernhill Drive |
| 492A Don Buck Road | 11 Cinnabar Place | 496 Don Buck Road |
| 552A Don Buck Road | 545 Don Buck Road | 544 Don Buck Road |
| 477 Don Buck Road | 4 Stonegate Close | 5 Lazurite Drive |
| 15 Cinnabar Place | 1/28 Beauchamp Drive | 6 Westgate Drive |
| 475 Don Buck Road | 559-567 Don Buck Rd | 482 Don Buck Road |
| 6/485 Don Buck Road | 40-42 Fred Taylor Dr | 28 Beauchamp Drive |
| 542 Don Buck Road | 23 Beauchamp Drive | 25 Beauchamp Drive |
| 500 Don Buck Road | 7 Arlose Place | 554A Don Buck Road |
| 502 Don Buck Road | 4 Astil Lane | 13 Cinnabar Place |
| 540 Don Buck Road | 5 Cinnabar Place | 16 4 Kāpia Road |
| 546 Don Buck Road | 17-19 Fred Taylor Dr | 16 11 Kāpia Road |
| 547 Don Buck Road | 480 Don Buck Road | 559-567 Don Buck Rd |
| 559-567 Don Buck Road | 24 Beauchamp Drive | 6 Stonegate Close |
| 8/485 Don Buck Road | 463 Don Buck Road | 35 Regents Park Place |
| 508 Don Buck Road | 1 Stonegate Close | 1 Arlose Place |
| 504 Don Buck Road | 9 Lazurite Drive | 14 Kāpia Road |
| 510 Don Buck Road | 41 Regents Park Place | 37 Regents Park Place |
| 488 Don Buck Road | 31 Regents Park Place | 8 Rush Creek Drive |
| 545 Don Buck Road | 39 Regents Park Place | 3 Stonegate Close |
| 19 Cinnabar Place | 28 Maki Street | 16 6 Kāpia Road |
| 17 Cinnabar Place | 16 1 Kāpia Road | 1 Lazurite Drive |
| 21 Fred Taylor Drive | 33 Regents Park Place | 3 Arlose Place |
| 556 Don Buck Road | 16 12 Kāpia Road | 29 Regents Park Place |
| 510 Don Buck Road | 579 Don Buck Rd | 3B Reverie Place |
| 21 Cinnabar Place | 7 Rush Creek Drive | 3 Cinnabar Place |
| 23 Cinnabar Place | 22 Cinnabar Place | 22 Beauchamp Drive |
| 506 Don Buck Road | 17-19 Fred Taylor Dr | 461 Don Buck Road |
| 545 Don Buck Road | 10 Cinnabar Place | 16 10 Kāpia Road |
| 3/485 Don Buck Road | 21 Lazurite Drive | 1-5 Pinot Lane |
| 496 Don Buck Road | 545 Don Buck Rd | 12 Kāpia Road |
| 4/485 Don Buck Road | 16 7 Kāpia Road | 12 Cinnabar Place |
| 558 Don Buck Road | 43 Regents Park Place | 11 Arlose Place |
| 29 Beauchamp Drive | 16 Kāpia Road | 478 Don Buck Road |
| 579E Don Buck Road | 575 Don Buck Rd | 16 5 Kāpia Road |
| 5 Arlose Place | 8 Stonegate Close | |

**NoR R2**

| Address | | |
|---|---|---|
| 94 Fred Taylor Drive | 111 Fred Taylor Drive | 116 Fred Taylor Drive |
| 100 Fred Taylor Drive | 79 Rotu Drive | 109 Fred Taylor Drive |
| 1A Matakohe Road | 10 Heri Lane | 88 Fred Taylor Drive |
| 144 Fred Taylor Drive | 12 Heri Lane | 114 Fred Taylor Drive |
| 83 2 Fred Taylor Drive | 14 Heri Lane | 112 Fred Taylor Drive |
| 3 Northside Drive | 2 Heri Lane | 102 Fred Taylor Drive |
| 1B Matakohe Road | 105 Fred Taylor Drive | 110 Fred Taylor Drive |
| 166 Fred Taylor Drive | 8 Heri Lane | 3A Matakohe Road |
| 1C Matakohe Road | 5 Northside Drive | 3B Matakohe Road |
| 1D Matakohe Road | 5 Matakohe Road | 78 Fred Taylor Drive |
| 118 Fred Taylor Drive | 6 Heri Lane | 9 Heri Lane |
| 83 Fred Taylor Drive | 4 Heri Lane | 5 Heri Lane |
| 73 Fred Taylor Drive | 1 Kakano Road | 11 Heri Lane |
| 61 Fred Taylor Drive | 7 Matakohe Road | 11 Heri Lane |
| 164 Fred Taylor Drive | 81-83 Rotu Dr | 13 Matakohe Road |
| 98 Fred Taylor Drive | 9 Matakohe Road | 7 Heri Lane |
| 122 1 Fred Taylor Drive | 127 Fred Taylor Drive | 3 Heri Lane |
| 130 Fred Taylor Drive | 11 Matakohe Road | 1 Heri Lane |
| 122 2 Fred Taylor Drive | 13 Heri Lane | 124 Fred Taylor Drive |
| 77 Fred Taylor Drive | 121 Fred Taylor Drive | |

**NoR R1**

| Address | | |
|---|---|---|
| 1293 Coatesville-Riverhead Highway | 1308 B3 Coatesville-Riverhead Highway | 1 Pitoitoi Drive |
| 1197 Coatesville-Riverhead Highway | 1169 Coatesville-Riverhead Highway | 1156 B2 Coatesville-Riverhead Highway |
| 1156 Coatesville-Riverhead Highway | 3 Riverhead Point Drive | 1186 Coatesville-Riverhead Highway |
| 1351 1 Coatesville-Riverhead Highway | 4 Princes Street | 1169 Coatesville-Riverhead Highway |
| 1323 Coatesville-Riverhead Highway | 1230 Coatesville-Riverhead Highway | 3 Kaipara Portage Road |
| 1351 Coatesville-Riverhead Highway | 3 Pitoitoi Drive | 1328 Coatesville-Riverhead Highway |
| 1397 Coatesville-Riverhead Highway | 14 Leebank Crescent | 8 Jelas Drive |
| 1296 Coatesville-Riverhead Highway | 16 Leebank Crescent | 1352 Coatesville-Riverhead Highway |
| 1363 Coatesville-Riverhead Highway | 20 Jelas Drive | 1170 Coatesville-Riverhead Highway |
| 17 Grove Way | 14 Jelas Drive | 5 Kaipara Portage Road |
| 1175 Coatesville-Riverhead Highway | 1158 B2 Coatesville-Riverhead Highway | 3A Riverhead Point Drive |
| 1 Riverhead Point Drive | 12 Jelas Drive | 179 Old Railway Road |
| 15 Grove Way | 28 Jelas Drive | 7 Short Road |
| 9 Grove Way | 18 Leebank Crescent | 1368 Coatesville-Riverhead Highway |
| 1187 Coatesville-Riverhead Highway | 16 Jelas Drive | 1411 Coatesville-Riverhead Highway |
| 11 Grove Way | 22 Jelas Drive | 182 Old Railway Road |
| 21 Grove Way | 340 Riverhead Road | 1308 B2 Coatesville-Riverhead Highway |
| 1158 Coatesville-Riverhead Highway | 26 Jelas Drive | 1092 Coatesville-Riverhead Highway |
| 19 Grove Way | 7 Kaipara Portage Road | 1261 Coatesville-Riverhead Highway |
| 5 Grove Way | 1229 2 Coatesville-Riverhead Highway | 1196 Coatesville-Riverhead Highway |
| 7 Grove Way | 1335 Coatesville-Riverhead Highway | 315 State Highway 16 |
| 2 Pitoitoi Drive | 1194 Coatesville-Riverhead Highway | 340 Riverhead Road |
| 1095 Coatesville-Riverhead Highway | 24 Jelas Drive | 1229 3 Coatesville-Riverhead Highway |
| 1093 Coatesville-Riverhead Highway | 1156 B3 Coatesville-Riverhead Highway | 1409 Coatesville-Riverhead Highway |
| 1404 Coatesville-Riverhead Highway | 5 Riverhead Point Drive | 1196 Coatesville-Riverhead Highway |
| 2 Princes Street | 1288 Coatesville-Riverhead Highway | 9 Kaipara Portage Road |
| 1229 Coatesville-Riverhead Highway | 30 Jelas Drive | 11 Leebank Crescent |
| 1210 Coatesville-Riverhead Highway | 1404 Coatesville-Riverhead Highway | 28 Leebank Crescent |
| 1356 Coatesville-Riverhead Highway | 1335 2 Coatesville-Riverhead Highway | 1385 Coatesville-Riverhead Highway |
| 1295 Coatesville-Riverhead Highway | 1385 B2Coatesville-Riverhead Highway | 8 2 Riverland Road |
| 1140 Coatesville-Riverhead Highway | 6 Princes Street | 12 Short Road |
| 1171 Coatesville-Riverhead Highway | 1090 Coatesville-Riverhead Highway | 8 Princes Street |

| | | |
|---|---|---|
| 1320 Coatesville-Riverhead Highway | 181 Old Railway Road | 1293 2 Coatesville-Riverhead Highway |

# Appendix B – Affected Receivers – Vibration (unmitigated)

**NoR R1**

| Address | Building Type/Structure |
|---|---|
| 486 Don Buck Road | Residential |
| 2 Rush Creek Drive | Residential |
| 538 Don Buck Road | Residential |
| 494 Don Buck Road | Residential |
| 1 Rush Creek Drive | Residential |
| 490 Don Buck Road | Residential |
| 5/485 Don Buck Road | Residential |
| 12/485 Don Buck Road | Residential |
| 9/485 Don Buck Road | Residential |
| 560 Don Buck Road | Residential |
| 2/485 Don Buck Road | Residential |
| 13/485 Don Buck Road | Residential |
| 31 Beauchamp Drive | Residential |
| 492A Don Buck Road | Residential |
| 552A Don Buck Road | Residential |
| 477 Don Buck Road | Residential |
| 15 Cinnabar Place | Residential |
| 475 Don Buck Road | Residential |
| 6/485 Don Buck Road | Residential |
| 542 Don Buck Road | Residential |
| 500 Don Buck Road | Residential |
| 502 Don Buck Road | Residential |
| 540 Don Buck Road | Residential |
| 546 Don Buck Road | Residential |
| 8/485 Don Buck Road | Residential |
| 508 Don Buck Road | Residential |
| 504 Don Buck Road | Residential |
| 488 Don Buck Road | Residential |
| 19 Cinnabar Place | Residential |
| 17 Cinnabar Place | Residential |
| 2/575 Don Buck Road | Commercial |
| 532-534 Don Buck Road | Commercial |
| 583-585 Don Buck Road | Commercial |

## NoR R2

| Address | Building Type/Structure |
|---|---|
| 94 Fred Taylor Drive | Residential |
| 100 Fred Taylor Drive | Residential |
| 1A Matakohe Road | Residential |
| 144 Fred Taylor Drive | Residential |
| 83 2 Fred Taylor Drive | Residential |
| 1B Matakohe Road | Residential |
| 166 Fred Taylor Drive | Residential |
| 1C Matakohe Road | Residential |
| 1D Matakohe Road | Residential |
| 118 Fred Taylor Drive | Residential |
| 83 Fred Taylor Drive | Residential |
| 73 Fred Taylor Drive | Residential |
| 61 Fred Taylor Drive | Residential |
| 164 Fred Taylor Drive | Residential |
| 98 Fred Taylor Drive | Residential |
| 3 Northside Drive | Commercial |

**NoR R1**

| Address | Building Type/Structure |
| --- | --- |
| 1293 Coatesville-Riverhead Highway | Residential |
| 1197 Coatesville-Riverhead Highway | Residential |
| 1156 Coatesville-Riverhead Highway | Residential |
| 1351 1 Coatesville-Riverhead Highway | Residential |
| 1323 Coatesville-Riverhead Highway | Residential |
| 1351 Coatesville-Riverhead Highway | Residential |
| 1397 Coatesville-Riverhead Highway | Residential |
| 1296 Coatesville-Riverhead Highway | Residential |
| 1363 Coatesville-Riverhead Highway | Residential |
| 17 Grove Way | Residential |
| 1175 Coatesville-Riverhead Highway | Residential |
| 1 Riverhead Point Drive | Residential |
| 15 Grove Way | Residential |
| 9 Grove Way | Residential |
| 1187 Coatesville-Riverhead Highway | Residential |
| 11 Grove Way | Residential |
| 21 Grove Way | Residential |
| 1158 Coatesville-Riverhead Highway | Residential |
| 19 Grove Way | Residential |
| 5 Grove Way | Residential |
| 7 Grove Way | Residential |
| 2 Pitoitoi Drive | Residential |
| 1095 Coatesville-Riverhead Highway | Residential |
| 1093 Coatesville-Riverhead Highway | Residential |
| 2 Princes Street | Residential |
| 1229 Coatesville-Riverhead Highway | Residential |
| 1210 Coatesville-Riverhead Highway | Residential |

Overall, construction noise and vibration can be controlled for all NoRs (NoRs RE1, RE2 and R1) to reasonable levels with the implementation of appropriate mitigation and management measures.

# ATTACHMENT 58

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF ROAD TRAFFIC NOISE AND VIBRATION EFFECTS PART 1 OF 3

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Redhills Riverhead

## Assessment of Road Traffic Noise and Vibration Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY



New Zealand Government

## Document Status

| Responsibility | Name |
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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AADT** | Annual Average Daily Traffic |
| **AEE** | Assessment of Effects on the Environment |
| **ASH** | Alternative State Highway |
| **AT** | Auckland Transport |
| **AUP:OP** | Auckland Unitary Plan Operative in Part |
| **BCI** | Brigham Creek Interchange |
| **CC2W** | City Centre to Westgate |
| **FTN** | Frequent Transit Network |
| **FULSS** | Future Urban Land Supply Strategy |
| **FUZ** | Future Urban Zone |
| **NAL** | North Auckland Line |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **RMA** | Resource Management Act 1991 |
| **RTC** | Rapid Transit Corridor |
| **RAMC** | Regional Active Mode Corridor |
| **RUB** | Rural Urban Boundary |
| **SG** | Te Tupu Ngātahi Supporting Growth |
| **SH16** | State Highway 16 |
| **The Council** | Auckland Council |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |

# Glossary of Acronyms / Terms

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

# 1 Executive Summary

This report provides an assessment of road traffic noise effects for the Redhills Riverhead Package covering three projects.

The report contains a review of the relevant traffic noise criteria, discussion of the criteria and assessment methodology for the Projects. Predictions of road traffic noise were carried out using the method recommended in New Zealand Standard 6806:2010 in accordance with rule E25.6.33 of the Auckland Unitary Plan – Operative in Part (AUP:OP).

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

As required by NZS 6806, the assessment methodology included the prediction of existing and future traffic noise levels, both without (Existing and Do Nothing scenarios) and with the Projects (Do Minimum scenario).

The Existing scenario represents the current road network with current traffic volumes, i.e. the existing environment as it is experienced at the time of writing of this report. The Do Nothing scenario represents the existing road network with future traffic volumes, assuming a full build out of the area. The Do Minimum scenario represents the proposed future road network, incorporating NoRs R1 to R3.

Noise effects of road traffic on existing noise sensitive locations, referred to as Protected Premises and Facilities (PPFs) in NZS 6806, have been assessed. The Projects falls within an urban area (as defined in Statistics New Zealand 2004) and all PPFs within a 100m radius of the urban area have been included. As all project areas for Redhills Riverhead are considered Altered Roads, they have been assessed by comparing the predicted noise levels in the design year without the Projects (Do Nothing) with the predicted noise levels in the design year with the Projects (Do Minimum).

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

Mitigation options have been considered for the Projects where required under NZS 6806. The Best Practicable Option (BPO) mitigation has been determined separately for each project and is a combination of road surface material and barriers. The BPO mitigation formed the basis of determining the relevant Noise Criteria Category for each PPF. Since the projects will be built in the more distant future, this BPO will be confirmed for all current PPFs at the time of construction. The review, confirmation and refinement of the BPO will aim to achieve the same noise criteria categories as determined with the current BPO as presented in Appendix 2.

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

Residences or noise sensitive activities that are not yet built or do not have building consent are not included in the modelling, however noise levels at the currently vacant land are provided in the noise contour maps within the Appendices and are indicative of the potential noise environment for that land.

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

***Assessment assumptions***

All predictions are based on traffic flow along New and Altered roads a significant time in the future (in the Design Year 2048). These traffic volumes rely on the urbanisation of the area and implementation of surrounding transport projects.

The traffic noise effects from the Projects assume that all NoRs are operational together, i.e. when the design year of NoR RE1 is reached, NoRs R2 and R3 are also operational. No allowance was made for individual NoRs being implemented, or some NoRs not being implemented at all. This is for two reasons; the transport models did not allow for these options, and the individual or combined assessment of NoRs would lead to a large number of combinations that could not all be assessed. Therefore, the decision was made to assess the furthest point in time, when all surrounding areas were developed to capacity and the associated roading network. A full list of assumptions is included in Appendix 1.

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

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

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

## NoR RE1

The Project involves the widening of Don Buck Road to a 30m wide four-lane local arterial with bus priority lanes and separated cycle lanes and footpaths on both sides of the corridor

For the Do Minimum scenario, 95 PPFs are predicted to fall within Category A, 11 PPFs are predicted to fall within Category B and 26 in Category C. Predicted noise levels range from 50 dB $L_{Aeq(24h)}$ to 72 dB $L_{Aeq(24h)}$.

Two mitigation options have been considered to reduce noise levels at PPFs. The options comprise of low noise road surface and localised barriers.

The recommended mitigation is the installation of AC-14 or an equivalent low noise road surface for the whole road alignment, which would reinstate the current low noise road surface, with localised noise barriers at 1 Rush Creek, 538, 540, 546 and 492 Don Buck Road. With the recommended mitigation option in place the majority of PPFs are predicted to experience a negligible change in noise level. Upon implementation of the recommended mitigation, all PPFs will be in Category A, with the exception of eleven PPFs in Category B.

### NoR RE2

The Project involves the upgrade of the Fred Taylor Drive to a 30m wide four-lane FTN arterial with separated walking and cycling lanes.

For the Do Minimum scenario, 58 PPFs are predicted to fall within Category A, 14 PPFs are predicted to fall into Category B and one PPF is predicted to fall into Category C. Predicted noise levels range from 40 dB $L_{Aeq(24h)}$ to 69 dB $L_{Aeq(24h)}$.

A mitigation option of installing AC-14 along the Altered Roads, which would reinstate the current low noise road surface, has been considered. This option results in all PPFs in Category A and is the recommended mitigation option for NoR RE2.

When comparing the Do Nothing and Mitigated scenarios six PPFs are predicted to experience a negligible change in noise level of 1 to 2 dB, 28 PPFs are predicted to experience a reduction in noise level of 3-4 dB resulting in slight positive effects. 38 PPFs are predicted to experience a 5-8 dB reduction in noise level resulting in moderate positive effects. One PPF is predicted to experience a 9-11 dB reduction in noise resulting in significant positive effects.

### NoR R1

The Project includes upgrading the southern section of the Coatesville-Riverhead Highway to a 33m two-lane low speed rural arterial with active mode space on the western side and upgrading the northern section of the alignment to a 24m two-lane urban arterial with walking and cycling facilities on both sides.

For the Do Minimum scenario, 85 PPFs are predicted to fall within Category A, six PPFs are predicted to fall into Category B and one in Category C. Predicted noise levels range from 46 dB $L_{Aeq(24h)}$ to 69 dB $L_{Aeq(24h)}$.

A mitigation option of installing AC-14 along the Altered Roads has been considered. This option results in all PPFs in Category A and is the recommended mitigation option for NoR R1.

When comparing the Do Nothing and Mitigated scenario 47 PPFs are predicted to experience a negligible change in noise level, 28 PPFs are predicted to experience a reduction in noise level of 3-4 dB resulting in slight positive effects and 17 PPFs are predicted to experience a 5-8 dB reduction in noise level resulting in moderate positive effects.

# 2 Introduction

This road traffic assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "**Redhills Riverhead Assessment Package**"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

The North West growth area is approximatively 30 kilometres north west of Auckland's central city. It makes a significant contribution to the future growth of Auckland's population by providing for approximately 42,000 new dwellings and employment activities that will contribute 13,000 new jobs across the North West. Redhills Riverhead is one of these growth areas, Redhills is a largely rural area located to the east of Don Buck Road. The area is largely rural with low density countryside living type residential development. The area is live zoned for development with a Precinct overlay. Riverhead is located to the north of SH16, via Riverhead Road or the Coatesville-Riverhead Highway. The existing developed area is largely Residential Single House Zoned with areas of business (Town Centre and Business – Mixed Use zoning). Open Space zoning is found within Riverhead and the Coastal Marine Zone is located to the east.

This report assesses the road traffic noise effects of the North West Redhill Riverhead Assessment Package identified in Section 5 and Table 2-1 below.

The Riverhead Assessment package comprises three separate projects which together form the North-West Redhills Riverhead Arterial Network. The network includes provision for general traffic, walking and cycling, and frequent public transport.

Refer to the main Assessment of Effects on the Environment (AEE) for a more detailed project description.

**Table 2-1: North West Redhills Riverhead Assessment Package – Notices of Requirement and Projects**

| Notice | Project |
| --- | --- |
| **NoR RE1** | Don Buck Road FTN Upgrade |
| **NoR RE2** | Fred Taylor Drive (alteration to existing designation 1433) |
| **NoR R1** | Coatesville-Riverhead Highway Upgrade |

## 2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Redhills Riverhead Assessment Package. Its purpose is to inform the AEE that accompanies the Redhills Riverhead Assessment Package sought by Waka Kotahi and AT.

This report considers the actual and potential effects associated with the operation of the Redhills Riverhead Assessment Package on the existing and likely future environment as it relates to road traffic noise 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:

a) Identify and describe the road traffic noise context of the Redhills Riverhead Assessment Package area;
b) Identify and describe the actual and potential road traffic noise effects of each Project corridor within the Redhills Riverhead Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential road traffic noise effects (including any conditions/management plan required) for each Project corridor within the Redhills Riverhead Assessment Package; and
d) Present an overall conclusion of the level of actual and potential road traffic noise effects for each Project corridor within the Redhills Riverhead Assessment Package after recommended measures are implemented.

## 2.2 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each Project corridor and Project features within the Redhills Riverhead Assessment Package as it relates to road traffic noise
c) Identification and description of the existing and likely future road traffic noise environment;
d) Description of the actual and potential adverse road traffic noise effects of the Project;
e) Description of the actual and potential adverse road traffic noise effects of operation of the Project;
f) Recommended measures to avoid, remedy or mitigate potential adverse road traffic noise effects; and
g) Overall conclusion of the level of potential adverse road traffic noise effects of the Project after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised for the Project. These have been reviewed by the author of this report and have been considered as part of this assessment of road traffic 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.

## 2.3 Preparation for this Report

A meeting was held with the Project Transport Planners, who authored the Assessment of Transport Effects, to determine the most practicable road traffic data for use within the assessment. The agreed methodology is in line with the wider Te Tupu Ngātahi work.

# 3 Assessment Criteria

## 3.1 Road Traffic Noise

Rule E25.6.33 of the Auckland Unitary Plan (AUP:OP) requires that New roads and Altered roads which are within the scope of NZS 6806:2010 comply with the requirements of that standard. The assessment of all NoRs has used NZS 6806.

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

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

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

- The Do Minimum (refer Section 3.1.4) noise environment would be greater than or equal to 64 dB $L_{Aeq(24h)}$ and, if no specific noise mitigation was undertaken, the alterations would increase road-traffic noise at the assessment position by 3 dB $L_{Aeq(24h)}$ or more at the design year, when compared with the Do Nothing noise environment; or

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

Where the definition is not met and the road is not a new road, NZS 6806 does not apply, and mitigation is not required.

### 3.1.1 Protected Premises and facilities

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

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

- Urban Areas (A main urban area, a satellite urban community, or an independent urban community as per Statistics New Zealand 2004) – 100 metres from the edge of the nearside traffic lane.
- Rural Areas (defined as areas not considered Urban areas in NZS 6806) – 200 metres from the edge of the nearside traffic lane

These distances ensure the assessment is made at the most relevant receivers. Potential noise effects are still controlled at receivers further away by virtue of noise criteria applying at receivers nearest to the road.

### 3.1.2 NZS 6806 Noise Criteria

For each of the Projects the noise criteria as summarised below are applicable

| Category | Criterion | Altered road | New Roads |
|---|---|---|---|
| **A** | Primary | 64 dB $L_{Aeq(24h)}$ | 57 dB $L_{Aeq(24h)}$ |
| **B** | Secondary | 67 dB $L_{Aeq(24h)}$ | 64 dB $L_{Aeq(24h)}$ |
| **C** | Internal | 40 dB $L_{Aeq(24h)}$ | 40 dB $L_{Aeq(24h)}$ |

The Projects within the Redhills Riverhead Assessment Package only have "Altered roads" as defined by NZS 6806:2010. Definitions have been included in the Glossary of this report.

### 3.1.3 Design Year

The criteria apply to a design year 10 to 20 years after the completion of the Project road. In this case, the opening year has not yet been determined. For these Projects, traffic modelling data for the year 2048 has been selected as the design year for assessment purposes for the following reasons:

- The design year traffic data incorporates and assumes all other projects (funded and otherwise) in the North West Auckland area have been constructed; these projects directly influence traffic flow through the Whenuapai Project areas.
- The 2048 design year, whilst not the most conservative scenario in terms of the traffic volume for every Project road, provides the most complete overview reflective of the development intended for the areas. If some projects do not go ahead then traffic flows within the Project alignment will likely change.

The decision to use 2048 as the design year was made in conjunction with the Project team and further discussed in Section 4. A full list of assumptions included within the design year has been included in Appendix 1.

### 3.1.4 Noise Predicted Scenarios

NZS 6806 specifies scenarios to be undertaken which include the following:

- The "Existing" noise environment, which is the ambient noise levels at the date of assessment.
- A "Do Nothing" scenario, which represents the traffic noise levels at the PPFs at the design year assuming no alterations are made to the existing road.

- A “Do Minimum” scenario, which represents the traffic noise levels at the PPFs at the design year with the Project implemented, but without any specific noise mitigation. Road surfaces, safety barriers and other structures which are required for non-acoustic purposes may provide incidental noise mitigation and are included in this scenario.
- “Mitigation” scenarios, which represent the traffic noise levels at the PPFs at the design year with various specific noise mitigation options implemented with the aim of achieving the noise criteria categories.

The Do Nothing scenario includes the growth of the surrounding area without the Project but with other projects planned to be implemented by 2048. In practice, this would be an unrealistic scenario as the future growth at full build out at the design year (2048) could not occur without the existing rural transport network being upgraded to urban standards. We also understand that the current road network could not cope with the future traffic volumes, as these volumes would lead to link and intersection delays. Therefore, while the predictions suggest a significant increase in noise level in the Do Nothing scenario compared with the Existing scenario, this would not be a feasible option.

The Do Minimum scenario represents the proposed future road network, incorporating NoRs R1 to R3 and other transport projects in the area (refer to the discussion on Assessment Assumptions below). This scenario assumes a full build out of the area, and the transport infrastructure to enable the development. This is a realistic scenario at a point in time when all NoRs are operational. Considering the wider distribution of future traffic over an increased road network enabled by the NoRs, traffic volumes appear to reduce on individual roads when compared with the (theoretical) Do Nothing scenario.

Network assumptions that are included or excluded from each scenario are summarised in Appendix 1.

### 3.1.5 Noise Mitigation

NZS 6806 requires that noise mitigation options are assessed, and if practicable, noise levels within Category A should be achieved. If this is not practicable then mitigation should be assessed against Category B. However, if it is still not practicable to comply with Categories A or B then mitigation should be implemented to ensure the internal criterion in Category C is achieved. Depending on the external noise level, building modification mitigation to achieve Category C could include ventilation and/or noise insulation improvements ranging from upgraded glazing through to new wall and ceiling linings. Building modification mitigation of Category C should only be implemented after the lowest practicable external noise level has been achieved. This means that structural mitigation such as road surface or barriers may also be implemented.

Where a requirement to consider mitigation measures is identified, NZS 6806 states that structural mitigation should only be implemented if it achieves the following:

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

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

## 3.2 Road Traffic Vibration

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

# 4 Assessment Methodology

Road traffic data provided for the Redhills Riverhead package relies on the development and urbanisation of the local areas, as well as other funded projects going ahead throughout the North West area, as it forms part of the wider strategic transport network. Some projects will have a direct impact on the traffic flow.

The purpose of this assessment is to determine the future potential impacts to support the future growth within the Redhills Riverhead area. Therefore, it has been assumed all transport infrastructure developments will be constructed by the design year 2048. It should be noted an urban speed reduction is expected within the transport model at the time of growth and at the Do Nothing scenario (design year without Project). This differs from the NZS 6806 standard where the Do Nothing scenario should include no alterations to the roads assessed. Therefore, in accordance with the standard, speed change has been applied at the Do Minimum scenario only. As noted previously, the Do Nothing scenario is a theoretical scenario for these Projects as the existing road network would not be able to accommodate the traffic volume expected from the full future development of the area.

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

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

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

Although the NZS 6806 assessment does not consider sites unless they contain, or have building consent for, a PPF, the predicted noise levels shown in the grid noise maps in Appendix 3 are considered indicative of the noise environment at adjacent sites without a PPF, including the future urbanisation areas.

## 4.1 Road Traffic Noise Model

A computer noise modelling software SoundPLAN (Version 8.2) has been used to predict road traffic noise impacts. The road traffic noise modelling employs the “Calculation of Road Traffic Noise” (CoRTN) algorithm, as recommended in NZS 6806. The CoRTN methodology has been adjusted for New Zealand Road Surfaces in accordance with LTNZ Report No. 326 and the Waka Kotahi Guide to state highway road surface noise. The model settings are described in Table 4-1

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

| Parameter | Setting/source |
|---|---|
| Software | Sound Plan 8.2 |
| Algorithm | CoRTN |
| Reflection | CoRTN |
| Ground absorption | 0.6 for urban areas; 1 for grassed areas |

| | |
|---|---|
| Receiver height | 1.5 m above height of each floor |
| Noise contour grid | 1.5 m height, 5 m resolution |
| Receivers and grid position | Free-field |

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

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

### 4.1.1 Traffic data

All traffic data including AADT, percentage of heavy vehicles and posted speed limit has been sourced from the Project team based on the Saturn Model. The Existing scenario has been based on 2015 data as provided. Traffic modelling methodology and results are described in the Redhills Riverhead Arterial Network Transport Assessment.

The CoRTN model has been developed based on 18-hour traffic data. However, in accordance with the requirements of NZS 6806, traffic data has been entered as the 24-hour daily traffic (AADT), which results in noise levels in the order of +0.2 dB higher than would have been calculated by CoRTN based on the 18-hour AADT. The CoRTN model assumes that traffic is free-flowing, it does not apply to interrupted vehicle flows, such as at intersection, and for low volume roads under 5,000 AADT.

### 4.1.2 Topography

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

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

### 4.1.3 Buildings

The footprints and heights for all buildings, building usage and all other structures within 200 metres of the roads have been obtained from the Project Team. The number of floors was determined assuming 2.8 m height per floor.

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

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

### 4.1.4 Road alignments

Road alignments for existing roads were provided by the Project team as centrelines and widths for each carriageway section. Gradients have been calculated by SoundPLAN.

### 4.1.5 Road Surfaces

Surfaces of existing roads have been modelled as the current surfaces which is two-coat chipseal for the majority of Coatesville-Riverhead with the top section being Asphalt Concrete (AC-14). Fred Taylor Dr and Don Buck Rd were modelled as AC-14. For the Do Minimum scenario, the road surfaces have been modelled assuming all surface to be two-coat chipseal, as advised by Auckland Transport.

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

- In accordance with Transit Research Report 28, a minus 2 dB adjustment has been made for an asphaltic concrete road surface compared to CoRTN.
- Surface corrections relative to Asphaltic Concrete (AC-14) have been made in accordance with LTNZ Research Report 326 and the Waka Kotahi Guide to state highway road surface noise. The combination of surface corrections for cars and heavy vehicles has been made using the equation in the Waka Kotahi Guide to state highway road surface noise.
- The combined correction, including the adjustment from $L_{A10(18h)}$ to $L_{Aeq(24h)}$, has been entered in the modelling software as a total road surface correction.

### 4.1.6 Existing noise barriers

There are no existing noise barriers in the Project areas covered by the Redhills Riverhead Assessment Package.

Existing boundary fences on private properties have not been included in the noise model as their condition is unknown and they may not provide effective acoustic shielding.

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

## 4.2 Uncertainties and Limitations

The predicted road traffic noise levels presented in the following sections are based on a road traffic noise model developed in accordance with NZS 6806 and relevant guidance. The accuracy of the model is largely dependent upon the limitations of the available input data as detailed above. Uncertainties in the modelled noise levels can occur for a number of reasons. Uncertainties are typically related to the effects of topographical screening, appropriateness of the traffic data in terms of volumes of light and heavy vehicles, speeds (observed vs posted) and road surface type.

As stated, the terrain model has been developed by the Project GIS team based on 1m vertical terrain resolution, which provides sufficient detail to accurately account for any acoustic shielding from localised topographical features.

The traffic data has been sourced from the Project Transport team and it is accepted that the forecasting of future traffic flows may not necessarily reflect the actual flows when the Design Year is reached. The sensitivity of the noise predictions to changes in traffic data is not as significant as the effects of topographical screening. For example, if all other factors of the traffic data remain unchanged (speed and % of heavy vehicles), then a doubling or halving of the traffic data will only result in a 3 dB change which is only just perceptible by most people. A change in traffic volume data by +25 % or -25% will result in a 1 dB change in predicted noise level, which would be imperceptible.

Nevertheless, an uncertainty remains which of the Projects will be implemented, at which time and in which combination. The assessment assumes that all NoRs are implemented and operational in the design year 2048. In the interim, some NoRs may be implemented earlier than others, which would have an effect on the traffic distribution across the network, and therefore affect the noise generation.

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

Noise monitoring could not be undertaken at the time of the assessment due to Covid-19 related restrictions which means current traffic flows are not representative of the typical traffic flows. However, from experience we consider that the predicted noise levels are in line with similar projects and are as expected for the traffic volume, speed and road surface for these Projects.

## 4.3 Potential Traffic Noise Mitigation Options

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

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

### 4.3.1 Road surfaces

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

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

### 4.3.2 Noise barriers

If low-noise road surfaces do not provide the required level of noise mitigation, traffic noise barriers may be considered alongside road surfaces. Generally, barriers will only mitigate noise if they block the line-of-sight between the noise source and receiver. They are most effective and provide the widest area of mitigation when placed immediately adjacent to traffic lanes. In order to provide the most effective noise level reduction, an acoustic barrier must be of solid material (i.e. have no gaps) and have a minimum surface weight of 15 kg/m2 (e.g. 17mm ply sheeting, 9 mm fibre cement, concrete, earth bunds etc.).

### 4.3.3 Building modification

NZS 6806 requires that structural mitigation, such as noise barriers and low-noise road surfaces, should be implemented in preference to building modification mitigation. Building modification can potentially inconvenience residents and does not provide any protection to outdoor amenity.

However, if low-noise road surfaces and noise barriers are not practicable or do not provide the required level of noise reduction, building modification to PPFs, in addition to road surfaces and noise barriers, may be considered.

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

### 4.3.4 Maintenance of structural mitigation measures

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

This means that any barrier proposed for the Projects should not develop gaps or other openings or material failure. Any damage and vandalism to the barrier will need to be repaired, and asphalt surfaces should be maintained to be smooth and even, in order to achieve the same noise reducing qualities as following initial installation.

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

## 4.4 Overview of Traffic Noise Effects

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

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

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

**Table 4-2 Noise level change compared with general subjective perception**

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

| | |
|---|---|
| **> 11 decibels** | More than halving/doubling of loudness |

# 5 Redhills Riverhead Assessment Package Overview

A brief summary of the Redhills Riverhead Assessment Package projects is provided in Table 5-1 below.

**Table 5-1: Redhills Riverhead Assessment Package Project Summary**

| Corridor | NOR | Description | Requiring Authority |
|---|---|---|---|
| **Don Buck Road FTN Upgrade** | RE1 | Upgrade of Don Buck Road corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Fred Taylor Drive FTN Upgrade** | RE2 | Upgrade of Fred Taylor Drive corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Coatesville-Riverhead Highway Upgrade** | R1 | Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial cross-section with active mode facilities on the western side; and<br>Upgrading the northern section of the corridor to a 24m two-lane urban arterial cross-section with active mode facilities on both sides of the corridor. | Auckland Transport |

# 6 Existing Ambient Noise Environment

The criteria in NZS 6806 to assess road-traffic noise are not dependent on the existing noise levels. Measurements of existing levels are therefore not required for the assessment against that standard. Nevertheless, an appreciation of the existing environment is required to judge the potential noise effects, regardless of compliance with any particular noise criteria. However, due to Covid-19 restrictions impacting typical traffic volumes it has not been possible to carry out noise measurements.

Based on the predicted existing noise levels , the rural environment in the Redhills Riverhead region, currently zoned as Future Urban Zone, will typically have low noise levels of 40 dB $L_{Aeq(24h)}$ to 50 dB $L_{Aeq(24h)}$. In areas near the busier sections of Don Buck existing noise levels are between 55 dB $L_{Aeq(24h)}$ and 65 dB $L_{Aeq(24h)}$.

# 7 NoR RE1: Don Buck Road FTN Upgrade

## 7.1 Project Corridor Features

Don Buck Road is an existing two-lane arterial extending from Fred Taylor Drive in the north to Swanson Road and Universal Drive in the south. The extent of the proposed upgrade is from Fred Taylor Drive in the north to Royal Road to the south

This section of Don Buck Road is proposed to be upgraded from a corridor width of 27-35m to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor.


**Figure 7-1 Overview of Don Buck Road**

Key features of the proposed new corridor include the following:

- Widening of Don Buck Road to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor
- The upgrade to the intersections with Fred Taylor Drive, Westgate Drive, Rush Creek Drive and Beauchamp Road.

## 7.2 Existing and Likely Future Environment

### 7.2.1 Planning context

The land adjacent to Don Buck Road is comprised of various business, residential and open space zoning. The following outlines the key elements of the planning context for the Don Buck Road FTN Upgrade:

- The eastern side of Don Buck Road above Westgate Drive is zoned under the AUP:OP as Business – Light Industry. To the south of Westgate Drive, the eastern side of Don Buck Road contains an Open Space – Community Zone (occupied by Massey Leisure Centre), with the remaining land zoned as Residential – Mixed Housing Zone.
- The western side of Don Buck Road is within the I610 Redhills Precinct and is predominantly zoned Residential – Mixed Housing Urban, with a portion of land in the northern section of the corridor zoned Residential – Terraced Housing and Apartment Buildings Zone (**THAB**). Land further to the west of Don Buck Road forms part of the Redhills Precinct.

Table 7-1 below provides a summary of the existing and likely future environment as it relates to the Don Buck Road FTN Upgrade.

**Table 7-1: Don Buck Road FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[1] | Likely Future Environment[2] |
|---|---|---|---|
| **Business** | Business (Industrial) | Low | Business |
| **Residential** | Residential – Mixed Housing Urban Zone<br>Residential – Terraced Housing and Apartment Zone | Low | Residential |
| **Open Space** | Open Space – Community Zone | Low | Open Space |

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

### 7.2.2 Noise Environment

Don Buck Road is an existing busy road with commercial buildings and residential dwellings along the road corridor. The noise environment is dominated by road traffic noise from vehicles on Don Buck Road and industrial noise from businesses located in the Light Industrial Zone.

[1] Based on AUP:OP zoning/policy direction
[2] Based on AUP:OP zoning/policy direction

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

Predicted road traffic noise levels at all PPFs for the Existing, Do Nothing and Do Minimum scenarios are shown in Appendix 2. The cells are colour coded according to the NZS 6806 Category: Category A – green, Category B – orange, and Category C – red.

Grid noise maps showing indicative noise levels across the assessment area (100m radius from the alignment) are provided in Appendix 3. Specific noise level values should not be taken directly from the contours as they are interpolated from a grid resulting in some localised inaccuracies.

Based on the indicative designation boundary maps, the buildings in Table 7-2 will be removed to make room for the Project alignment and have not been considered in the assessment.

**Table 7-2 Buildings within designation boundary**

| Buildings Within Designation Boundary | |
|---|---|
| 453 Don Buck Road | 2/520 Don Buck Road |
| 455 Don Buck Road | 3/520 Don Buck Road |
| 457 Don Buck Road | 4/520 Don Buck Road |
| 469 Don Buck Road | 5/520 Don Buck Road |
| 471 Don Buck Road | 6/520 Don Buck Road |
| 473 Don Buck Road | 7/520 Don Buck Road |
| 479 Don Buck Road | 552 Don Buck Road |
| 1/485 Don Buck Road | 562 Don Buck Road |
| 11/148 Don Buck Road | |
| 10/148 Don Buck Road | |
| 14/148 Don Buck Road | |
| 1/520 Don Buck Road | |

### 7.3.1 Road Traffic Noise Model Results Analysis

The Project meets the definition of an Altered Road in accordance with NZS 6806 because the Do Minimum noise environment is predicted to be greater than or equal to 64 dB $L_{Aeq(24h)}$ at some PPFs and, if no specific noise mitigation is undertaken, the alterations are predicted to increase road-traffic noise at these PPFs by 3 dB $L_{Aeq(24h)}$ or more at the design year, when compared with the Do Nothing noise environment as per Section 3.1. A summary of the results of the NZS 6806 assessment is shown in Table 7-3.

**Table 7-3 NZS 6806 Assessment Summary - Altered Roads - NoR RE1**

| Category | Criteria | Number of PPFs | | | | |
|---|---|---|---|---|---|---|
| | | Existing | Do Nothing | Do Minimum | Mitigation Option 1 | Mitigation Option 2 |
| **Cat A** | 64 dB $L_{Aeq(24h)}$ | 127 | 126 | 95 | 116 | 121 |
| **Cat B** | 67 dB $L_{Aeq(24h)}$ | 5 | 6 | 11 | 16 | 11 |
| **Cat C** | 40 dB Internal $L_{Aeq(24h)}$ | 0 | 0 | 26 | 0 | 0 |
| **Total** | | 132 | 132 | 132 | 132 | 132 |

Existing scenario predictions show that noise levels within the Project area are between 43 – 67 dB $L_{Aeq(24h)}$ with five PPFs in Category B and the remainder within Category A.

Under the Do Nothing scenario, predictions show similar noise levels to the Existing scenario. Noise levels range between 44 – 67 dB $L_{Aeq(24h)}$ with six PPFs in Category B and the remainder within Category A.

Under the Do Minimum scenario, predictions show a higher traffic noise level range of 50 – 72 dB $L_{Aeq(24h)}$ with 26 PPFs in Category C and 11 PPFs in Category B. The increase in traffic noise level is due to a louder road surface (chipseal) being used compared to the Existing and Do Nothing scenarios that have AC-14 as the road surface finish across all roads. In accordance with NZS 6806, mitigation options should be considered for the 37 PPFs that are predicted to receive noise levels within Category B and C. The Category B and Category C PPFs are presented in Table 7-4.

**Table 7-4 Category B and C PPFs - NoR RE1**

| Category B PPFs | Category C PPFs |
|---|---|
| 1/14 Royal Road | 7/14 Royal Road |
| 2 Royal Road | 9/14 Royal Road |
| 501 Don Buck Road | 538 Don Buck Road |
| 490 Don Buck Road | 552A Don Buck Road |
| 8/520 Don Buck Road | 1 Rush Creek Drive |
| 513 Royal Road | 540 Don Buck Road |
| 480 Don Buck Road | 546 Don Buck Road |
| 2/14 Don Buck Road | 10/14 Royal Road |
| 556 Don Buck Road | 461 Don Buck Road |
| 8/14 Royal Road | 510 Don Buck Road |
| 466 Don Buck Road | 463 Don Buck Road |
| | 2 Rush Creek Drive |
| | 11/14 Royal Road |
| | 492 Don Buck Road |
| | 459 Don Buck Road |
| | 508 Don Buck Road |
| | 6/14 Royal Road |
| | 12/14 Royal Road |
| | 560 Don Buck Road |

| | |
|---|---|
| | 504 Don Buck Road |
| | 502 Don Buck Road |
| | 500 Don Buck Road |
| | 506 Don Buck Road |
| | 494 Don Buck Road |
| | 465 Don Buck Road |
| | 496 Don Buck Road |

Two mitigation options have been considered to reduce noise levels at PPFs. The options comprise of low noise road surface and localised barriers.

Mitigation option 1 is applying AC-14 to the Altered Roads, which would reinstate the current road surface, resulting in all but sixteen PPFs falling within Category A. The sixteen Category B PPFs are:

- 1 Rush Creek Drive
- 2 Rush Creek Drive
- 6/14 Royal Road
- 9/14 Royal Road
- 10/14 Royal Road
- 11/14 Royal Road
- 12/14 Royal Road
- 459 Don Buck Road
- 461 Don Buck Road
- 463 Don Buck Road
- 492 Don Buck Road
- 508 Don Buck Road
- 510 Don Buck Road
- 538 Don Buck Road
- 540 Don Buck Road
- 546 Don Buck Road

Mitigation option 2 involves applying AC-14 to the Altered Roads, which would reinstate the current road surface as per the first mitigation option, and installing two metre high noise barriers at the sixteen Category B PPFs. Predictions indicate that the noise barriers would only achieve the required reduction (5 dB noise reduction at a single PPF and 3 dB noise reduction at a cluster of PPFs) at 1 Rush Creek, 538, 540, 546 and 492 Don Buck Road. At all other locations the noise barrier performance was affected by the gaps required for driveways/entrances.

The second mitigation option is recommended for Altered Roads within NoR RE1 as it achieves the Category A criteria at the highest number of PPFs, i.e. low-noise road surface AC-14 installed along the entire project alignment, with localised noise barriers at 1 Rush Creek, 538, 540 546 and 492 Don Buck Road NoR RE1.

### 7.3.2 Assessment of Road Traffic Noise Effects

The effects associated with a change in noise level have been considered in addition to the NZS 6806 assessment. The Do Nothing scenario and Mitigation Option 2 scenario can be compared to determine the predicted noise level increase or decrease at PPFs as a result of the Project.

Figure 7-2 shows the predicted change in noise levels at PPFs when comparing the Do Nothing and Mitigation Option 2 scenarios.

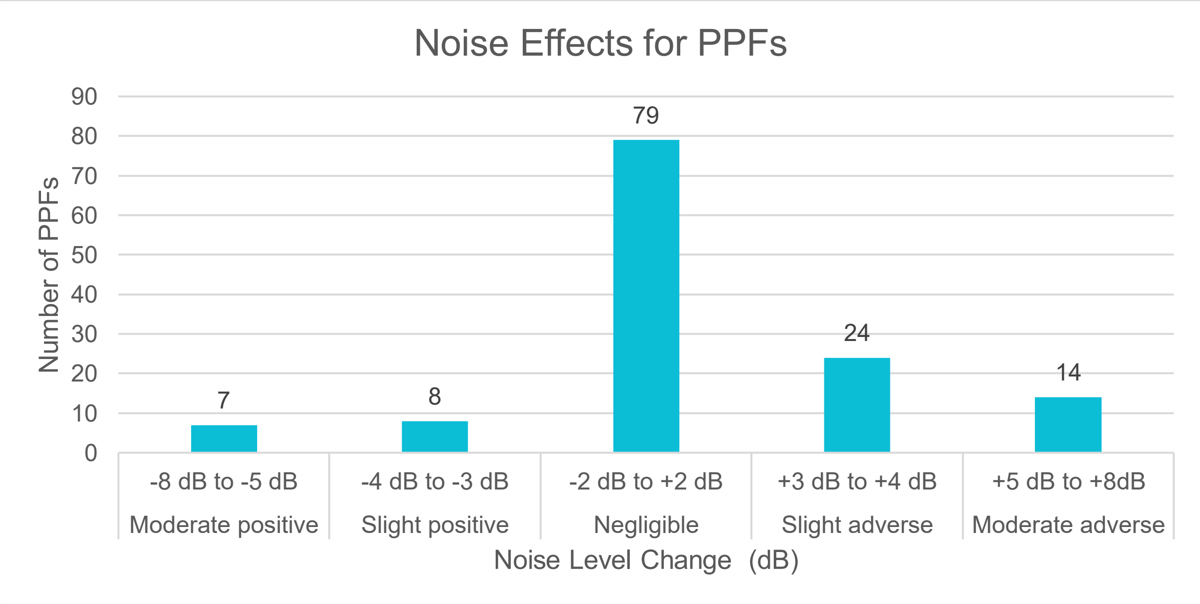



**Figure 7-2 Change in Noise Level - Do Nothing Vs Mitigation Option 2 - NoR RE1**

Predictions indicate that the vast majority of PPFs will experience a negligible change in noise levels due to the Project when comparing the Do Nothing and Mitigation Option 2 scenarios.

24 PPFs are predicted to experience a 3-4 dB increase in noise levels, resulting in slight adverse noise effects. 14 PPFs are predicted to experience at 5-8 dB increase in noise levels, resulting in moderate adverse noise effects. The increase in noise levels is due to the road alignment moving closer to some PPFs and/ or the removal of buildings that were providing shielding from road traffic noise.

15 PPFs are predicted to experience a 3 dB to 8 dB decrease in noise levels resulting in slight to moderate positive noise effects. This is due to the recommended noise barriers providing mitigation at some PPFs, along with the movement of the alignment away from some PPFs.

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

## 7.4 Conclusions

An assessment of traffic noise has been carried out for Altered Road for the Don Buck Road upgrade based on NZS 6806 and the predicted change in noise levels.

The recommended mitigation for the Altered Roads within NoR RE1 is the installation of AC-14, which would reinstate the current road surface, or an equivalent low noise road surface for the whole road alignment and localised two metre high barriers at five PPFs. After implementation of the recommended mitigation option the majority of PPFs are predicted to receive noise levels within Category A with 11 in Category B.

A comparison of the predicted road traffic noise levels in the Do Nothing scenario (representative of the design year without the Project) and the Mitigation Option 2 scenario indicates that the vast majority of PPFs are predicted to experience a negligible change in noise level of +/- 2 dB which would be imperceptible.

24 PPFs are predicted to experience an increase in noise level of 3-4 dB, resulting in slight adverse noise effects. 14 PPFs are predicted to experience at 5-8 dB increase in noise levels, resulting in moderate adverse noise effects. However, 15 PPFs are predicted to experience a 3 dB to 8 dB decrease in noise levels resulting in slight to moderate positive noise effects.

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

# 8 NoR RE2: Fred Taylor Drive FTN Upgrade

Fred Taylor Drive is an existing two-lane arterial corridor which extends from the existing Brigham Creek Interchange in the north to SH16 in the south (via an intersection with Don Buck Road). This corridor runs through a mix of residential and industrial land uses and forms an important connection as the spine of the Redhills network.

It is proposed to upgrade the corridor between Hailes Road and Dunlop Road to accommodate a 30m wide four-lane FTN arterial with separated walking and cycling facilities.


**Figure 8-1 Overview of Fred Taylor Drive Upgrade**

Key features of the proposed upgrade include the following:

- The upgrade of the existing corridor to a 30m wide four-lane FTN arterial with separated walking and cycling. This widening is expected to remain in the existing designation 1433 to the extent possible.
- Localised widening outside the existing designation 1433 occurring at intersections.
- The upgrade of the intersections with Kakano Road and Northside Drive to signalised intersections.

## 8.1 Existing and Likely Future Environment

### 8.1.1 Planning context

The existing Fred Taylor Drive corridor runs through a mix of residential and industrial land uses.

The northern section of Fred Taylor Drive is within the Redhills North FUZ, with an area of land zoned under the AUP:OP as Open Space – Sport and Active Recreation Zone (Fred Taylor Park) adjacent the road corridor. The southern section of Fred Taylor Drive is zoned under the AUP:OP as THAB zone on the western side, and forms part of the I610 Redhills Precinct. The eastern side is zoned Business – Light Industry Zone and Business – Mixed Use Zone and forms part of the I615 Westgate Precinct.

Table 8-1 below provides a summary of the existing and likely future environment as it relates to the Fred Taylor Drive FTN Upgrade.

**Table 8-1: Fred Taylor Drive FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[3] | Likely Future Environment[4] |
|---|---|---|---|
| **Business** | Business (Light Industrial) | Low | Business |
| | Business (Mixed Use) | Low | |
| **Residential** | Residential – Terraced Housing and Apartment Zone | Low | Residential |
| **Open Space** | Open Space – Sport and Active Recreation | Low | Open Space |
| **Undeveloped greenfield areas** | Future Urban | High | Urban |

### 8.1.2 Noise Environment

Fred Taylor Drive is located within a predominantly rural area with some PPFs and commercial receivers located close to the road corridor. The noise environment is dominated by road traffic noise from vehicles on Fred Taylor Drive and the surrounding road network.

[3] Based on AUP:OP zoning/policy direction
[4] Based on AUP:OP zoning/policy direction

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

Predicted road traffic noise levels at all PPFs for the Existing, Do Nothing and Do Minimum are shown in Appendix 2. The cells are colour coded according to the NZS 6806 Category: Category A – green, Category B – orange, and Category C – red.

Grid noise maps showing indicative noise levels across the assessment area (100m radius from the alignment) are provided in Appendix 3. Specific noise level values should not be taken directly from the contours as they are interpolated from a grid resulting in some localised inaccuracies.

### 8.2.1 Road Traffic Noise Model Results Analysis

The Project meets the definition of an Altered Road in accordance with NZS 6806 because the Do Minimum noise environment is predicted to be greater than or equal to 64 dB $L_{Aeq(24h)}$ at some PPFs and, if no specific noise mitigation is undertaken, the alterations are predicted to increase road-traffic noise at these PPFs by 3 dB $L_{Aeq(24h)}$ or more at the design year, when compared with the Do Nothing noise environment as per Section 3.1. A summary of the results of the assessment is presented in Table 8-2.

**Table 8-2 NZS 6806 Assessment Summary - Altered Roads - NoR RE2**

| Category | Criteria | Number of PPFs | | | |
|---|---|---|---|---|---|
| | | Existing | Do Nothing | Do Minimum | Mitigation |
| **Cat A** | 64 dB $L_{Aeq(24h)}$ | 70 | 63 | 58 | 73 |
| **Cat B** | 67 dB $L_{Aeq(24h)}$ | 3 | 10 | 14 | 0 |
| **Cat C** | 40 dB Internal $L_{Aeq(24h)}$ | 0 | 0 | 1 | 0 |
| **Total** | | **73** | **73** | **73** | **73** |

Existing scenario predictions show the noise level within the Project area is between 40 – 65 dB $L_{Aeq(24h)}$ with three PPFs in Category B and the remainder in Category A.

Under the Do Nothing scenario, predictions show a higher traffic noise level range of between 41 – 66 dB $L_{Aeq(24h)}$ with ten PPFs in Category B due to an increase in traffic volumes.

The Do Minimum scenario shows a higher traffic noise level range compared to the Do Nothing scenario of 40 – 69 dB $L_{Aeq(24h)}$ with 14 PPFs in Category B and one PPF in Category C. The increase in traffic noise level is due to a louder road surface (chipseal) being used compared to the Do Nothing scenario that has a low noise road surface finish across all roads. In accordance with NZS 6806, mitigation options must be considered for the PPFs that are predicted to receive noise levels within Categories B and C.

For the Do Minimum Scenario, the 14 PPFs in Category B and one PPF in Category C are presented in Table 8-3.

**Table 8-3 Category B and C PPFs - NoR RE2**

| Category B Addresses | Category C Addresses |
|---|---|
| 122 Fred Taylor Drive | 89 Fred Taylor Dr |
| 127 Fred Taylor Drive | |
| 1A Matakohe Road | |
| 1B Matakohe Road | |
| 1C Matakohe Road | |
| 1D Matakohe Road | |
| 166 Fred Taylor Drive | |
| 73-2 Fred Taylor Drive | |
| 61 Fred Taylor Dive | |
| 100 Fred Taylor Drive | |
| 129 Fred Taylor Drive | |
| 144 Fred Taylor Drive | |
| 75 Fred Taylor Drive | |
| 75B Fred Taylor Drive | |

A mitigation option of installing AC-14 along the whole road alignment, which would reinstate the current low noise road surface, has been considered which results in all PPFs being in Category A. This is the recommended mitigation option for NoR RE2.

### 8.2.2 Assessment of Road Traffic Noise Effects

In addition to assessing effects due to absolute noise levels, the effect of road noise changes has also been addressed. The Do Nothing scenario (Project design year traffic flow without Project) and Mitigated scenario (project design year traffic flow with Project and mitigation applied) can be compared to determine the predicted noise level increase or decrease as a result of the Project.

Figure 8-2 shows the noise level change in the Design year for all the PPFs.

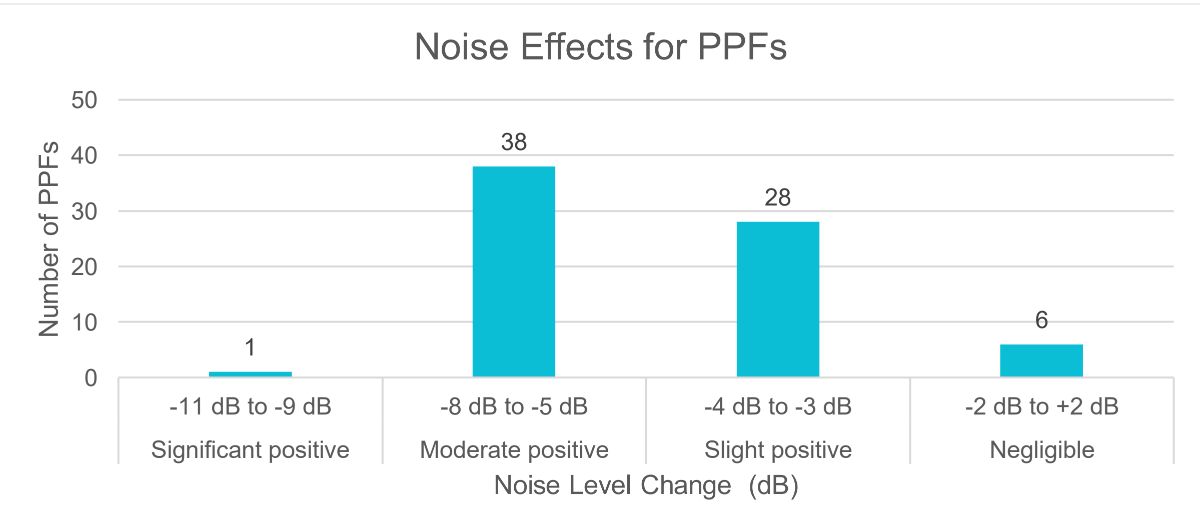


**Figure 8-2 Change in Noise Level - Do Nothing Vs Mitigated - NoR RE2**

Predictions indicate that noise levels will decrease at almost all PPFs when comparing the Do Nothing and Mitigated scenarios. This is primarily due to the application of AC-14 low noise road surface, along with a reduction in traffic volumes along Don Buck Rd and a planned decrease in speed limit upon implementation of the project.

Six PPFs are predicted to experience a change in road traffic noise levels of +/- 2 dB compared to the Do Nothing scenario, which would be imperceptible. 28 PPFs are predicted to experience a reduction in noise levels of 3-4 dB, resulting in slight positive noise effects. 38 PPFs are predicted to experience a reduction in noise levels of 5-8 dB, resulting in moderate positive noise effects. The PPF at 77 Fred Taylor Dr is predicted to experience a 9 dB decrease in noise levels, resulting in significant positive noise effects.

Some PPFs may not exist anymore at the time of road construction, particularly given the proposed zone change in the area allowing for urban development. Therefore, the predicted effects may not be experienced by current residents.

## 8.3 Conclusions

An assessment of traffic noise has been carried out for Altered Roads for the Fred Taylor Drive Upgrade based on NZS 6806 and the predicted change in noise levels.

The recommended mitigation for the Altered Roads within NoR RE2 is the installation of AC-14, which would reinstate the current low noise road surface or an equivalent low noise road surface along the whole road alignment. After implementation of the recommended mitigation option, noise levels are predicted to decrease at the vast majority of PPFs resulting in slight to moderate positive noise effects. 6 PPFs are predicted to experience an imperceptible change in noise levels, and the PPF at 77 Fred Taylor Drive is predicted to experience a reduction in noise levels resulting in significant positive noise effects.

All PPFs are predicted to receive noise levels within Category A after implementation of the recommended mitigation option.

# 9 NoR R1: Coatesville-Riverhead Highway Upgrade

## 9.1 Project Corridor Features

The Coatesville-Riverhead Highway is an existing arterial extending from SH16 in the south to its intersection with Dairy Flat Highway in the north east, with the extents of the proposed upgrade from SH16 in the south to its intersection with Riverhead Road in the north. The southern section of the alignment from SH16 to Short Road runs through rural land uses which are expected to remain.

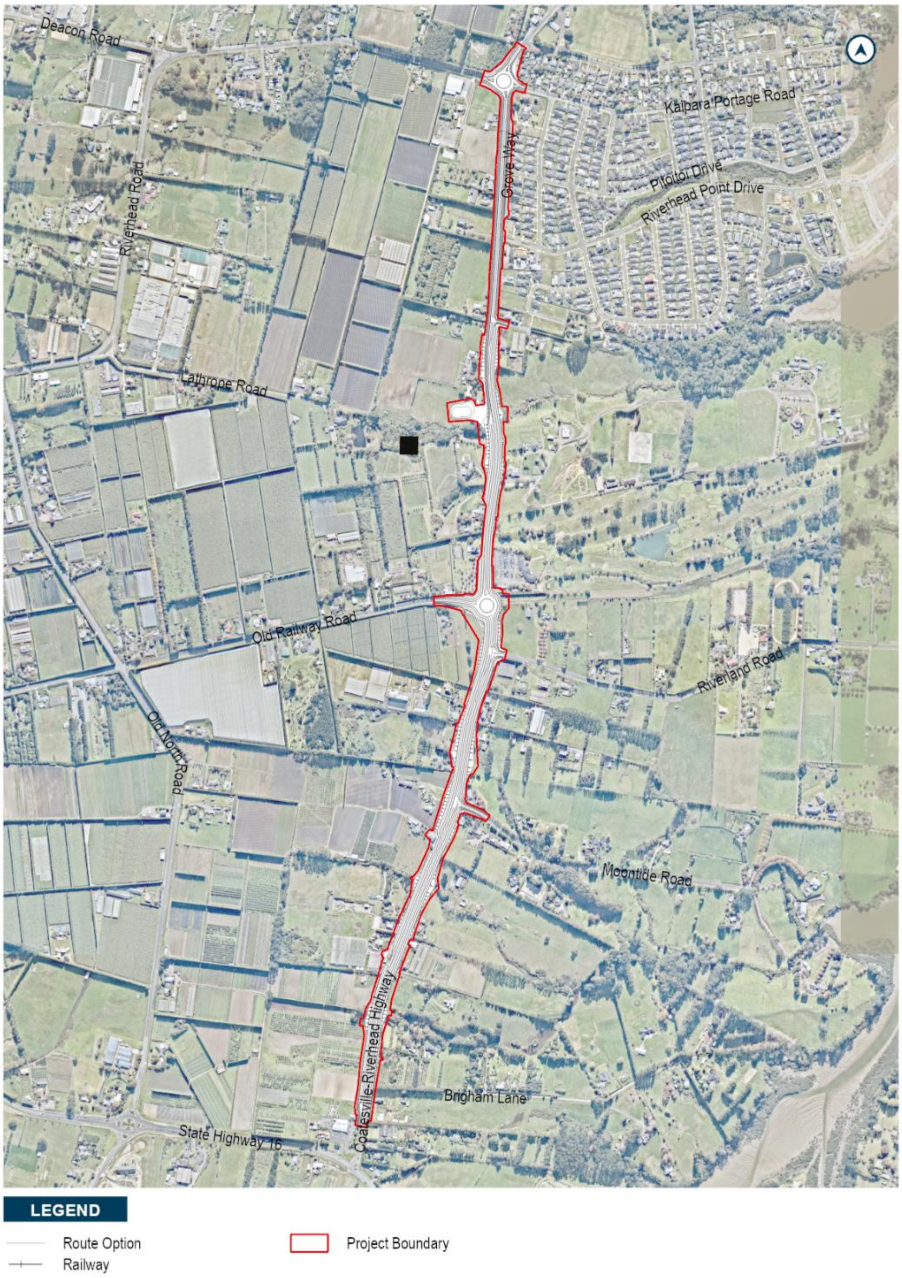



**Figure 9-1 Overview of Coatesville-Riverhead Highway Upgrade**

Key features of the proposed new corridor include the following:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side and upgrading the northern section of the alignment to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor
- The upgrade of the Coatesville-Riverhead Highway / Old Railway Road unsignalised intersection to a roundabout.
- The upgrade of the existing Coatesville-Riverhead Highway / Riverhead Road roundabout intersection.

## 9.2 Existing and Likely Future Environment

### 9.2.1 Planning context

The southern section of Coatesville-Riverhead Highway from SH16 to Short Road runs through rural land uses predominantly zoned under the AUP:OP as Rural – Mixed Rural Zone on both sides of the existing corridor. The northern section (close to and within the Riverhead township) runs through land zoned as Residential – Single House Zone and to the east and future urban zoned land on the west.

Table 9-1 below provides a summary of the existing and likely future environment as it relates to the Coatesville-Riverhead Highway Upgrade.

**Table 9-1: Coatesville-Riverhead Highway Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[5] | Likely Future Environment[6] |
|---|---|---|---|
| **Rural** | Rural | Low | Rural |
| **Residential** | Residential | Low | Residential |
| **Future Urban Zone / Undeveloped greenfield areas** | Future Urban | **High** | Urban |

### 9.2.2 Noise Environment

The Coatesville-Riverhead Highway currently runs through a rural area with few dwellings near the road. The noise environment is dominated by road traffic noise from vehicles using the Coatesville-Riverhead Highway and the surrounding road network.

Development is highly likely to occur in the Future Urban Zone. An increase in ambient noise levels is expected as the area urbanises.

[5] Based on AUP:OP zoning/policy direction
[6] Based on AUP:OP zoning/policy direction

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

Predicted road traffic noise levels at all PPFs for the Existing, Do Nothing and Do Minimum are shown in Appendix 2. The cells are colour coded according to the NZS 6806 Category: Category A – green, Category B – orange, and Category C – red.

Grid noise maps showing indicative levels across the assessment area (100m radius from the alignment) are provided in Appendix 3. Specific noise level values should not be taken directly from the contours as they are interpolated from a grid resulting in some localised inaccuracies.

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

- 5 Moontide Road
- 1302 Coatesville-Riverhead Highway
- 1308 Coatesville-Riverhead Highway
- 1385 B3 Coatesville-Riverhead Highway

### 9.3.1 Road Traffic Noise Model Result Analysis

The Coatesville-Riverhead Road Upgrade meets the definition of an Altered road in accordance with NZS 6806 because the Do Minimum noise environment is predicted to be greater than or equal to 64 dB $L_{Aeq(24h)}$ at some PPFs and, if no specific noise mitigation is undertaken, the alterations are predicted to increase road-traffic noise at these PPFs by 3 dB $L_{Aeq(24h)}$ or more at the design year, when compared with the Do Nothing noise environment as per Section 3.1. A summary of the results of the assessment is presented in Table 9-2.

**Table 9-2 NZS 6806 Assessment Summary - Altered Roads NoR R1**

| Category | | Number of PPFs | | | |
|---|---|---|---|---|---|
| | Criteria | Existing | Do Nothing | Do Minimum | Mitigation |
| **Cat A** | 64 dB $L_{Aeq(24h)}$ | 90 | 91 | 85 | 92 |
| **Cat B** | 67 dB $L_{Aeq(24h)}$ | 2 | 1 | 6 | 0 |
| **Cat C** | 40 dB Internal $L_{Aeq(24h)}$ | 0 | 0 | 1 | 0 |
| **Total** | | **92** | **92** | **92** | **92** |

Existing scenario predictions indicate that the noise level within the Project area is between 43 – 66 dB $L_{Aeq(24h)}$ with two PPFs in Category B and the remaining in Category A.

Under the Do Nothing scenario, predictions show a slightly higher traffic noise level range between 45 – 67 dB $L_{Aeq(24h)}$, with one PPF in Category B and the remaining in Category A.

Under the Do Minimum scenario predictions indicate a higher traffic noise level range between 46 – 69 dB $L_{Aeq(24h)}$, with one PPF in Category C, six PPFs in Category B and the remaining PPFs in Category A. The increase in traffic noise level is due to a louder road surface (chipseal) being used compared to the Do Nothing scenario that has AC-14 as the road surface finish across most roads.

For the Do Minimum scenario, the six PPFs in Category B and one PPF in Category C are presented in Table 9-3.

**Table 9-3 Category B and C PPFs - NoR R1**

| Category B Addresses | Category C Addresses |
|---|---|
| 1293 Coatesville-Riverhead Highway | 1090 Coatesville-Riverhead Highway |
| 1323 Coatesville-Riverhead Highway | |
| 1351 Coatesville-Riverhead Highway | |
| 1363 Coatesville-Riverhead Highway | |
| 1397 Coatesville-Riverhead Highway | |
| 1404 Coatesville-Riverhead Highway | |

A mitigation option of installing AC-14 along the whole road alignment has been considered which results in all PPFs falling within Category A. This is the mitigation option recommended for NoR R1.

### 9.3.2 Assessment of Road Traffic Noise Effects

The effects associated with a change in noise level have been considered in addition to the NZS 6806 assessment. The Do Nothing scenario and Mitigated scenario can be compared to determine the predicted noise level increase or decrease at PPFs. Figure 9-2 shows the predicted change in noise level at PPFs when comparing the Do Nothing and Mitigation scenarios.

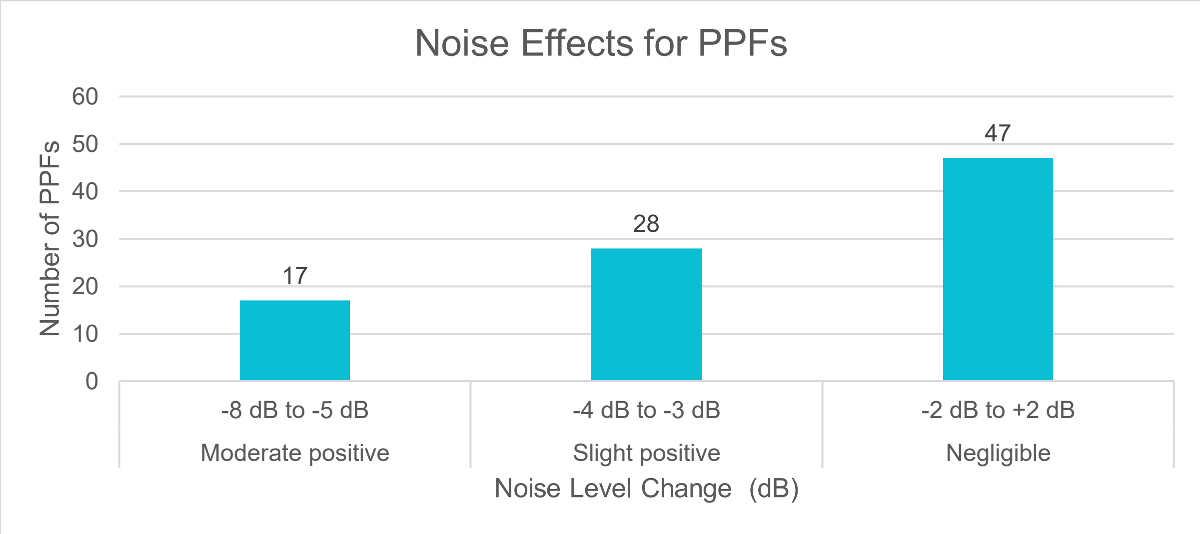



**Figure 9-2 Change in Noise Level - Do Nothing Vs Mitigated - NoR R1**

Predictions indicate that noise levels will change by a negligible margin or decrease at all PPFs when comparing the Do Nothing and Mitigation scenarios. This is due to the application of the AC-14 low-noise road surface, along with a reduction in traffic volumes along the Coatesville-Riverhead Highway upon implementation of the project.

47 PPFs are predicted to experience a change in noise level of +/- 2 dB, which would be imperceptible. 28 PPFs are predicted to experience a reduction in noise levels of 3-4 dB, resulting in slight positive noise effects. 17 PPFs are predicted to experience a reduction in noise levels of 5-8 dB, resulting in moderate positive noise effects.

It is noted that some PPFs may not exist anymore at the time of road construction particularly given the proposed zone change in the area allowing for urban development. Therefore, the predicted effects may not be experienced by current residents.

## 9.4 Conclusions

An assessment of traffic noise has been carried out for Altered Roads for the Coatesville-Riverhead Highway Upgrade based on NZS 6806 and the predicted change in noise levels.

The recommended mitigation for the Altered Roads within NoR R1 is the installation of AC-14 or an equivalent low noise road surface for the whole road alignment. After implementation of the recommended mitigation option, noise levels are predicted to decrease at 45 PPFs, resulting in slight to moderate positive noise effects. Changes in noise level are predicted to be imperceptible at all other PPFs.

All PPFs are predicted to receive noise levels within Category A after implementation of the recommended mitigation option.

# 10 Conclusion

An assessment of traffic noise has been carried out for the Redhills Riverhead Assessment Package for Altered Roads based on NZS 6806 and the predicted change in noise level. To determine the change in noise level, comparisons were made between the predicted road traffic noise levels in the Do Nothing scenarios (representative of the design year without the Project, assuming traffic from full area development on the existing road network) and Mitigated scenarios (with the Project and all other North West Package projects implemented along with BPO mitigation where applicable).

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

For NoR RE1, noise levels are predicted to remain unchanged at the vast majority (79 of 132) of PPFs after implementation of the recommended mitigation option of low-noise road surface and two metre high barriers at five PPFs. Eleven PPFs will be in Category B with the remaining PPFs in Category A. Changes in noise level at PPFs are due to the movement of the road alignment and the removal of buildings that were providing shielding from road traffic noise.

For NoR RE2 and NoR R1, noise levels are predicted to change by a negligible margin or decrease at all PPFs after implementation of the recommended mitigation option of a low-noise road surface. This will result in no noise effects where noise levels will change by a negligible margin, or positive noise effects where noise levels are predicted to decrease. All PPFs are predicted to receive noise levels within Category A after implementation of the recommended mitigation option.

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

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

Nevertheless, the predictions show that most PPFs (with the exception of eleven Category B PPFs in NoR RE1) will receive levels within the Category A criteria, which is the most stringent Category and represents the lowest design noise levels. Therefore, resulting noise levels will be reasonable in a residential context at the majority of PPFs assessed.

Traffic vibration from new or upgraded roading projects is not generally expected to create any vibration issues. Therefore, traffic vibration has not been assessed for the Projects.

# 1 Appendix 1: Assumptions

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

| Package | Project(s) | Existing | Do Nothing | Do Minimum |
|---|---|---|---|---|
| | Station Road upgrade | x | √ | √ |
| **Growth** | Land Use Assumptions | up to 2015 | up to 2048+ | up to 2048+ |
| | | | | |
| | | **Key** | | |
| | | | √ | Included |
| | | | x | Excluded |
| | | | * | Minimal Network Change |

# 2 Appendix 2: Predicted Traffic Noise Levels

**KEY**

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

## NoR RE1

| NoR RE1 - Altered Roads | | | | | |
|---|---|---|---|---|---|
| Address | Existing, dB LAeq(24hr) | Do Nothing, dB LAeq(24hr) | Do Minimum, LAeq(24hr) | Mitigation Option 1, LAeq(24hr) | Mitigation Option 2, LAeq(24hr) |
| 9/14 Royal Road | 64 | 64 | 71 | 67 | 67 |
| 538 Don Buck Road | 60 | 63 | 72 | 67 | 62 |
| 1 Rush Creek Drive | 67 | 67 | 71 | 66 | 59 |
| 540 Don Buck Road | 61 | 64 | 71 | 66 | 61 |
| 546 Don Buck Road | 61 | 64 | 71 | 66 | 63 |
| 10/14 Royal Road | 62 | 62 | 70 | 66 | 66 |
| 461 Don Buck Road | 62 | 63 | 71 | 65 | 65 |
| 510 Don Buck Road | 62 | 63 | 70 | 65 | 65 |
| 463 Don Buck Road | 62 | 62 | 71 | 65 | 65 |
| 11/14 Royal Road | 61 | 61 | 70 | 65 | 65 |
| 6/14 Royal Road | 62 | 61 | 70 | 65 | 65 |
| 492 Don Buck Road | 66 | 67 | 70 | 65 | 59 |
| 2 Rush Creek Drive | 65 | 65 | 70 | 65 | 65 |
| 459 Don Buck Road | 62 | 63 | 70 | 65 | 65 |
| 508 Don Buck Road | 63 | 63 | 70 | 65 | 65 |
| 12/14 Royal Road | 61 | 62 | 69 | 65 | 65 |
| 504 Don Buck Road | 63 | 63 | 69 | 64 | 64 |
| 560 Don Buck Road | 60 | 63 | 69 | 64 | 64 |
| 502 Don Buck Road | 63 | 63 | 69 | 64 | 64 |
| 506 Don Buck Road | 62 | 63 | 69 | 64 | 64 |
| 500 Don Buck Road | 63 | 63 | 69 | 64 | 64 |
| 494 Don Buck Road | 64 | 64 | 69 | 64 | 64 |
| 465 Don Buck Road | 60 | 60 | 68 | 63 | 63 |
| 552A Don Buck Road | 57 | 60 | 68 | 63 | 63 |
| 7/14 Royal Road | 58 | 57 | 68 | 63 | 63 |
| 496 Don Buck Road | 62 | 62 | 68 | 63 | 63 |
| 501 Don Buck Road | 65 | 66 | 67 | 62 | 62 |
| 1/14 Royal Road | 61 | 60 | 67 | 62 | 62 |
| 490 Don Buck Road | 64 | 65 | 67 | 62 | 62 |
| 2/14 Royal Road | 58 | 57 | 66 | 61 | 61 |
| 8/520 Don Buck Road | 59 | 59 | 66 | 61 | 61 |
| 480 Don Buck Road | 66 | 66 | 65 | 61 | 61 |

| | | | | | |
|---|---|---|---|---|---|
| 513 Don Buck Road | 62 | 62 | 66 | 61 | 61 |
| 8/14 Royal Road | 55 | 54 | 65 | 60 | 60 |
| 556 Don Buck Road | 51 | 54 | 65 | 60 | 60 |
| 13/14 Royal Road | 55 | 56 | 64 | 59 | 59 |
| 466 Don Buck Road | 60 | 60 | 65 | 59 | 59 |
| 2 Royal Road | 59 | 60 | 66 | 59 | 59 |
| 12/520 Don Buck Road | 52 | 52 | 64 | 59 | 59 |
| 486 Don Buck Road | 64 | 64 | 64 | 59 | 59 |
| 464 Don Buck Road | 58 | 58 | 64 | 59 | 59 |
| 478 Don Buck Road | 63 | 63 | 63 | 59 | 59 |
| 558 Don Buck Road | 52 | 55 | 63 | 58 | 58 |
| 3/14 Royal Road | 54 | 53 | 63 | 58 | 58 |
| 11/520 Don Buck Road | 50 | 50 | 63 | 58 | 58 |
| 554 Don Buck Road | 53 | 56 | 63 | 58 | 58 |
| 28 Beauchamp Drive | 55 | 55 | 63 | 58 | 58 |
| 14/14 Royal Road | 51 | 52 | 62 | 58 | 58 |
| 4 Rush Creek Drive | 57 | 57 | 62 | 57 | 57 |
| 3 Rush Creek Drive | 57 | 58 | 62 | 57 | 57 |
| 4 Royal Road | 57 | 57 | 63 | 57 | 57 |
| 462 Don Buck Road | 56 | 56 | 63 | 57 | 57 |
| 10/520 Don Buck Road | 51 | 52 | 62 | 57 | 57 |
| 488 Don Buck Road | 61 | 62 | 62 | 57 | 57 |
| 451 Don Buck Road | 52 | 52 | 62 | 57 | 57 |
| 31 Beauchamp Drive | 56 | 56 | 62 | 57 | 57 |
| 476 Don Buck Road | 60 | 60 | 61 | 57 | 57 |
| 9/520 Don Buck Road | 56 | 56 | 62 | 57 | 57 |
| 482 Don Buck Road | 60 | 60 | 61 | 57 | 57 |
| 9/485 Don Buck Road | 54 | 54 | 62 | 57 | 57 |
| 484 Don Buck Road | 61 | 62 | 61 | 56 | 56 |
| 554A Don Buck Road | 53 | 56 | 61 | 56 | 56 |
| 12/485 Don Buck Road | 51 | 52 | 60 | 55 | 55 |
| 542 Don Buck Road | 48 | 50 | 60 | 55 | 55 |
| 13/485 Don Buck Road | 50 | 50 | 60 | 55 | 55 |
| 470 Don Buck Road | 59 | 60 | 61 | 55 | 55 |
| 544 Don Buck Road | 51 | 54 | 60 | 55 | 55 |
| 17/14 Royal Road | 50 | 50 | 60 | 55 | 55 |
| 460 Don Buck Road | 54 | 53 | 60 | 55 | 55 |
| 5 Rush Creek Drive | 53 | 54 | 59 | 54 | 54 |
| 496 2 Don Buck Road | 53 | 54 | 59 | 54 | 54 |
| 472 Don Buck Road | 57 | 57 | 59 | 54 | 54 |
| 475 Don Buck Road | 49 | 49 | 59 | 54 | 54 |
| 26 Beauchamp Drive | 51 | 52 | 59 | 54 | 54 |
| 29 Beauchamp Drive | 49 | 49 | 59 | 54 | 54 |
| 2/485 Don Buck Road | 48 | 49 | 58 | 53 | 53 |

| | | | | | |
|---|---|---|---|---|---|
| 4/14 Royal Road | 51 | 50 | 58 | 53 | 53 |
| 16/14 Royal Road | 49 | 50 | 58 | 53 | 53 |
| 477 Don Buck Road | 48 | 48 | 57 | 53 | 53 |
| 474 Don Buck Road | 56 | 56 | 57 | 52 | 52 |
| 492A Don Buck Road | 53 | 53 | 57 | 52 | 52 |
| 6 Rush Creek Drive | 50 | 51 | 57 | 52 | 52 |
| 5/14 Royal Road | 50 | 50 | 57 | 52 | 52 |
| 468 Don Buck Road | 53 | 53 | 57 | 51 | 51 |
| 7 Rush Creek Drive | 50 | 50 | 56 | 51 | 51 |
| 3B Reverie Place | 48 | 49 | 56 | 51 | 51 |
| 24 Beauchamp Drive | 48 | 48 | 56 | 51 | 51 |
| 25 Beauchamp Drive | 46 | 46 | 55 | 50 | 50 |
| 15/14 Royal Road | 48 | 49 | 55 | 50 | 50 |
| 10 Royal Road | 49 | 49 | 55 | 50 | 50 |
| 28 Beauchamp Drive | 47 | 48 | 55 | 50 | 50 |
| 6 Royal Road | 49 | 49 | 55 | 50 | 50 |
| 8 Royal Road | 49 | 49 | 55 | 50 | 50 |
| 31 Regents Park Place | 48 | 48 | 55 | 50 | 50 |
| 13 Reverie Place | 45 | 46 | 55 | 50 | 50 |
| 11 Reverie Place | 45 | 46 | 54 | 49 | 49 |
| 24 Reverie Place | 47 | 48 | 54 | 49 | 49 |
| 8 Rush Creek Drive | 48 | 48 | 54 | 49 | 49 |
| 26 Reverie Place | 47 | 47 | 54 | 49 | 49 |
| 8/485 Don Buck Road | 49 | 49 | 54 | 49 | 49 |
| 19/14 Royal Road | 47 | 47 | 54 | 49 | 49 |
| 5/485 Don Buck Road | 46 | 47 | 54 | 49 | 49 |
| 9 Rush Creek Drive | 48 | 48 | 54 | 49 | 49 |
| 41 Regents Park Place | 46 | 47 | 53 | 48 | 48 |
| 43 Regents Park Place | 46 | 47 | 53 | 48 | 48 |
| 27 Beauchamp Drive | 45 | 45 | 53 | 48 | 48 |
| 3/485 Don Buck Road | 45 | 46 | 53 | 48 | 48 |
| 7/485 Don Buck Road | 47 | 47 | 53 | 48 | 48 |
| 6/485 Don Buck Road | 46 | 46 | 53 | 48 | 48 |
| 20A Princes Street | 46 | 47 | 53 | 48 | 48 |
| 22 Beauchamp Drive | 45 | 46 | 53 | 48 | 48 |
| 33 Regents Park Place | 46 | 47 | 53 | 48 | 48 |
| 12 Royal Road | 46 | 47 | 53 | 48 | 48 |
| 4/485 Don Buck Road | 45 | 45 | 53 | 48 | 48 |
| 15 Reverie Place | 44 | 44 | 52 | 47 | 47 |
| 23 Beauchamp Drive | 45 | 45 | 52 | 47 | 47 |
| 476A Don Buck Road | 48 | 48 | 52 | 47 | 47 |
| 29 Regents Park Place | 45 | 46 | 52 | 47 | 47 |
| 42 Regents Park Place | 45 | 46 | 52 | 47 | 47 |
| 10 Rush Creek Drive | 46 | 46 | 52 | 47 | 47 |

| | | | | | |
|---|---|---|---|---|---|
| 39 Regents Park Place | 45 | 46 | 51 | 46 | 46 |
| 37 Regents Park Place | 45 | 46 | 51 | 46 | 46 |
| 16 Royal Road | 45 | 45 | 51 | 46 | 46 |
| 18 Royal Road | 44 | 45 | 51 | 46 | 46 |
| 35 Regents Park Place | 45 | 46 | 51 | 46 | 46 |
| 7 Reverie Place | 44 | 45 | 51 | 46 | 46 |
| 22 Reverie Place | 43 | 44 | 51 | 46 | 46 |
| 3A Reverie Place | 45 | 45 | 51 | 46 | 46 |
| 27 Regents Park Place | 44 | 45 | 51 | 46 | 46 |
| 9 Reverie Place | 44 | 45 | 50 | 46 | 46 |
| 5 Reverie Place | 44 | 44 | 50 | 45 | 45 |
| 20 Royal Road | 43 | 44 | 50 | 45 | 45 |

## NoR RE2

| NoR RE2 - Altered Roads | | | | |
|---|---|---|---|---|
| **Address** | **Existing, dB LAeq(24hr)** | **Do Nothing, dB LAeq(24hr)** | **Do Minimum, dB LAeq(24hr)** | **Mitigation, dB LAeq(24hr)** |
| 89 Fred Taylor Drive | 63 | 66 | 69 | 64 |
| 122 Fred Taylor Drive | 61 | 64 | 67 | 62 |
| 1A Matakohe Road | 65 | 66 | 67 | 62 |
| 127 Fred Taylor Drive | 62 | 65 | 67 | 62 |
| 1B Matakohe Road | 65 | 66 | 67 | 62 |
| 1C Matakohe Road | 65 | 66 | 67 | 62 |
| 1D Matakohe Road | 64 | 66 | 66 | 61 |
| 73 2 Fred Taylor Drive | 61 | 65 | 66 | 61 |
| 166 Fred Taylor Drive | 61 | 64 | 66 | 61 |
| 61 Fred Taylor Drive | 62 | 64 | 66 | 61 |
| 100 Fred Taylor Drive | 61 | 64 | 66 | 61 |
| 144 Fred Taylor Drive | 59 | 62 | 65 | 61 |
| 129 Fred Taylor Drive | 61 | 63 | 65 | 61 |
| 75 Fred Taylor Drive | 63 | 66 | 65 | 60 |
| 75B Fred Taylor Drive | 62 | 66 | 65 | 60 |
| 164 Fred Taylor Drive | 61 | 63 | 64 | 60 |
| 96 Fred Taylor Drive | 56 | 59 | 63 | 59 |
| 130 Fred Taylor Drive | 58 | 61 | 63 | 59 |
| 116 Fred Taylor Drive | 58 | 61 | 63 | 58 |
| 114 Fred Taylor Drive | 58 | 61 | 63 | 58 |
| 83 2 Fred Taylor Drive | 61 | 65 | 62 | 58 |
| 112 Fred Taylor Drive | 57 | 61 | 62 | 58 |
| 83 Fred Taylor Drive | 60 | 64 | 62 | 58 |
| 94 Fred Taylor Drive | 60 | 63 | 62 | 58 |
| 109 Fred Taylor Drive | 58 | 60 | 62 | 57 |
| 110 Fred Taylor Drive | 56 | 60 | 61 | 57 |

| | | | | |
|---|---|---|---|---|
| 10 Heri Lane | 59 | 61 | 60 | 56 |
| 8 Heri Lane | 59 | 60 | 60 | 56 |
| 12 Heri Lane | 59 | 61 | 60 | 56 |
| 14 Heri Lane | 59 | 60 | 60 | 56 |
| 102 Fred Taylor Drive | 56 | 59 | 60 | 56 |
| 88 Fred Taylor Drive | 58 | 60 | 60 | 55 |
| 6 Heri Lane | 59 | 60 | 60 | 55 |
| 98 Fred Taylor Drive | 56 | 58 | 60 | 55 |
| 2 Heri Lane | 59 | 60 | 60 | 55 |
| 4 Heri Lane | 59 | 60 | 60 | 55 |
| 77 Fred Taylor Drive | 60 | 64 | 60 | 55 |
| 77 Fred Taylor Drive | 57 | 59 | 59 | 54 |
| 3A Matakohe Road | 58 | 59 | 58 | 54 |
| 3B Matakohe Road | 57 | 58 | 58 | 53 |
| 118 Fred Taylor Drive | 52 | 56 | 57 | 53 |
| 5 Matakohe Road | 56 | 57 | 57 | 52 |
| 111 Fred Taylor Drive | 52 | 55 | 56 | 52 |
| 121 Fred Taylor Drive | 52 | 54 | 56 | 51 |
| 1 Dunlop Road | 53 | 54 | 56 | 51 |
| 78 Fred Taylor Drive | 54 | 55 | 56 | 51 |
| 122 2 Fred Taylor Drive | 51 | 54 | 56 | 51 |
| 122 3 Fred Taylor Drive | 48 | 51 | 55 | 50 |
| 7 Matakohe Road | 55 | 56 | 55 | 50 |
| 106 Fred Taylor Drive | 50 | 53 | 54 | 50 |
| 123 Fred Taylor Drive | 50 | 52 | 54 | 49 |
| 108 Fred Taylor Drive | 49 | 52 | 54 | 49 |
| 13 Heri Lane | 53 | 54 | 53 | 49 |
| 105 Fred Taylor Drive | 49 | 51 | 53 | 48 |
| 9 Matakohe Road | 52 | 53 | 52 | 47 |
| 15 Heri Lane | 51 | 52 | 51 | 47 |
| 11 Matakohe Road | 50 | 51 | 50 | 46 |
| 13 Matakohe Road | 49 | 51 | 50 | 45 |
| 15 Matakohe Road | 48 | 50 | 50 | 45 |
| 17 Matakohe Road | 48 | 50 | 50 | 45 |
| 11 Heri Lane | 48 | 49 | 48 | 44 |
| 1 Heri Lane | 47 | 48 | 47 | 43 |
| 9 Heri Lane | 46 | 47 | 47 | 42 |
| 7 Heri Lane | 43 | 45 | 45 | 40 |
| 63 Tahetoka Street | 43 | 44 | 44 | 40 |
| 3 Heri Lane | 43 | 44 | 44 | 40 |
| 5 Heri Lane | 43 | 45 | 44 | 39 |
| 75 Tahetoka Street | 41 | 42 | 41 | 36 |
| 71 Tahetoka Street | 41 | 42 | 41 | 36 |
| 69 Tahetoka Street | 40 | 42 | 41 | 36 |

| | | | | |
|---|---|---|---|---|
| 73 Tahetoka Street | 40 | 42 | 40 | 36 |
| 65 Tahetoka Street | 40 | 41 | 40 | 36 |
| 67 Tahetoka Street | 40 | 41 | 40 | 36 |

## NoR R1

| NoR R1 - Altered Roads | | | | |
|---|---|---|---|---|
| Address | Exisiting, dB LAeq(24hr) | Do Nothing, dB LAeq(24hr) | Do Minimum, dB LAeq(24hr) | Mitigated dB, LAeq(24hr) |
| 1090 Coatesville-Riverhead Highway | 65 | 64 | 69 | 64 |
| 315 State Highway 16 | 66 | 67 | 64 | 64 |
| 1404 Coatesville-Riverhead Highway | 63 | 64 | 67 | 63 |
| 1293 Coatesville-Riverhead Highway | 62 | 63 | 66 | 61 |
| 1397 Coatesville-Riverhead Highway | 60 | 61 | 66 | 61 |
| 1363 Coatesville-Riverhead Highway | 61 | 62 | 65 | 61 |
| 1323 Coatesville-Riverhead Highway | 59 | 61 | 65 | 60 |
| 1351 Coatesville-Riverhead Highway | 60 | 61 | 65 | 60 |
| 1404 Coatesville-Riverhead Highway | 63 | 63 | 60 | 60 |
| 2 Princes Street | 60 | 60 | 63 | 60 |
| 1351 2 Coatesville-Riverhead Highway | 59 | 61 | 64 | 60 |
| 1197 Coatesville-Riverhead Highway | 59 | 62 | 63 | 59 |
| 1175 Coatesville-Riverhead Highway | 62 | 64 | 63 | 59 |
| 1 Riverhead Point Drive | 62 | 64 | 63 | 59 |
| 2 Pitoitoi Drive | 61 | 64 | 63 | 59 |
| 1156 Coatesville-Riverhead Highway | 60 | 62 | 62 | 58 |
| 1411 Coatesville-Riverhead Highway | 60 | 60 | 58 | 58 |
| 15 Grove Way | 60 | 63 | 62 | 58 |
| 1356 Coatesville-Riverhead Highway | 56 | 57 | 62 | 58 |
| 5 Grove Way | 60 | 62 | 62 | 58 |
| 1088 Coatesville-Riverhead Highway | 58 | 57 | 62 | 58 |

| | | | | |
|---|---|---|---|---|
| 1187 Coatesville-Riverhead Highway | 60 | 63 | 62 | 58 |
| 1320 Coatesville-Riverhead Highway | 57 | 58 | 62 | 58 |
| 1200 Coatesville-Riverhead Highway | 56 | 59 | 62 | 58 |
| 1295 Coatesville-Riverhead Highway | 58 | 60 | 62 | 57 |
| 19 Grove Way | 59 | 62 | 61 | 57 |
| 1093 Coatesville-Riverhead Highway | 60 | 60 | 61 | 57 |
| 1158 Coatesville-Riverhead Highway | 59 | 61 | 61 | 57 |
| 1229 Coatesville-Riverhead Highway | 56 | 60 | 60 | 57 |
| 1352 Coatesville-Riverhead Highway | 57 | 58 | 61 | 57 |
| 21 Grove Way | 59 | 61 | 61 | 57 |
| 7 Grove Way | 59 | 62 | 61 | 57 |
| 1296 Coatesville-Riverhead Highway | 57 | 58 | 61 | 56 |
| 1368 Coatesville-Riverhead Highway | 57 | 58 | 60 | 56 |
| 9 Grove Way | 59 | 61 | 60 | 56 |
| 11 Grove Way | 58 | 61 | 60 | 56 |
| 1186 Coatesville-Riverhead Highway | 56 | 59 | 60 | 56 |
| 1095 Coatesville-Riverhead Highway | 60 | 59 | 60 | 56 |
| 1210 Coatesville-Riverhead Highway | 55 | 59 | 59 | 56 |
| 1140 Coatesville-Riverhead Highway | 54 | 56 | 59 | 55 |
| 1308 B3 Coatesville-Riverhead Highway | 53 | 55 | 60 | 55 |
| 1328 Coatesville-Riverhead Highway | 55 | 56 | 60 | 55 |
| 8 Jelas Drive | 56 | 57 | 59 | 55 |
| 1308 B2 Coatesville-Riverhead Highway | 52 | 54 | 59 | 54 |
| 1156 B2 Coatesville-Riverhead Highway | 54 | 56 | 56 | 54 |
| 1230 Coatesville-Riverhead Highway | 54 | 58 | 58 | 54 |
| 4 Princes Street | 53 | 53 | 57 | 54 |
| 1385 B2Coatesville-Riverhead Highway | 53 | 54 | 58 | 53 |
| 1288 Coatesville-Riverhead Highway | 53 | 55 | 58 | 53 |

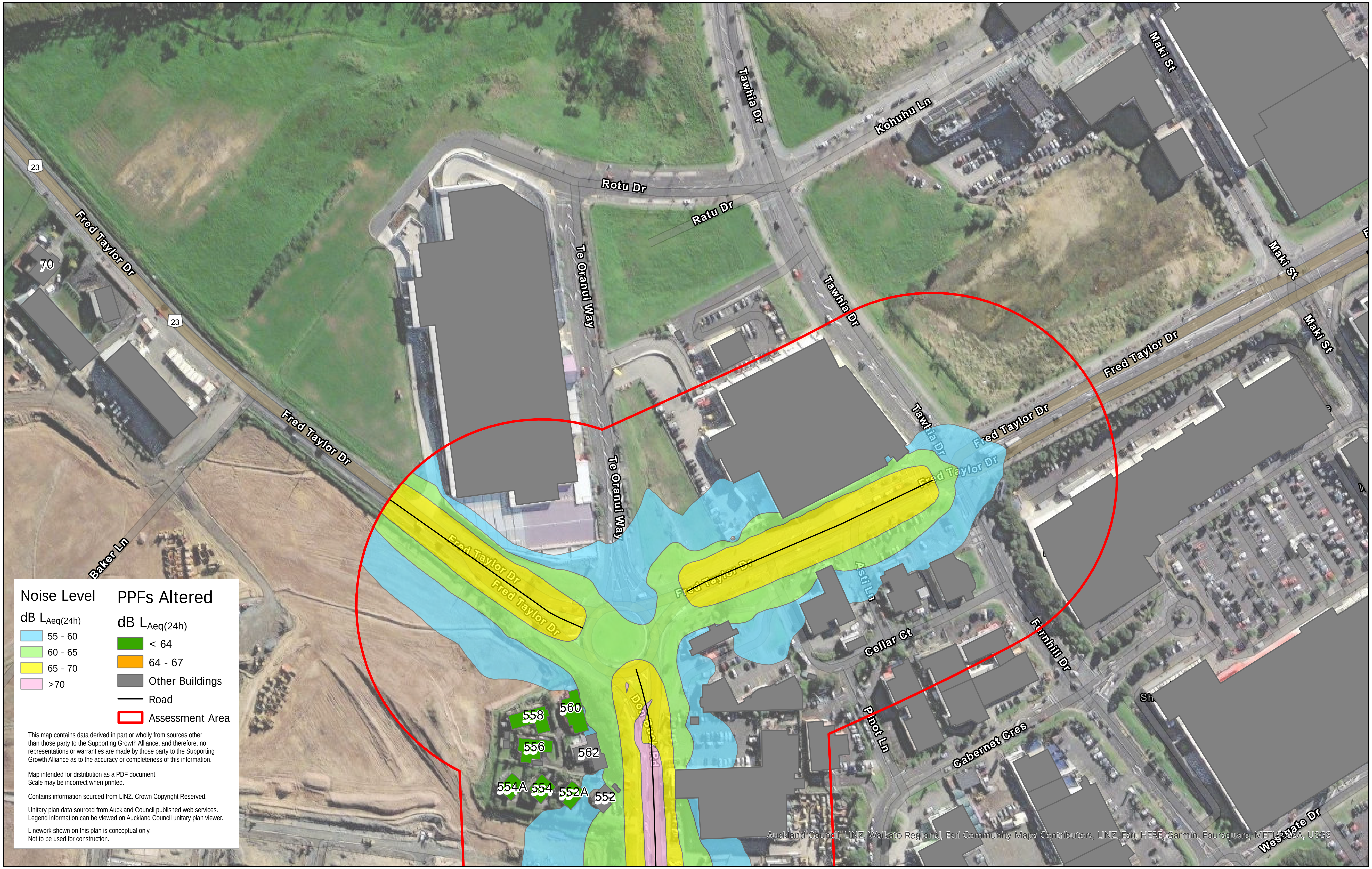
| | | | | |
|---|---|---|---|---|
| 1335 Coatesville-Riverhead Highway | 54 | 55 | 58 | 53 |
| 1229 2 Coatesville-Riverhead Highway | 54 | 58 | 57 | 53 |
| 6 Princes Street | 52 | 52 | 56 | 53 |
| 1 Pitoitoi Drive | 54 | 57 | 56 | 52 |
| 1409 Coatesville-Riverhead Highway | 53 | 53 | 53 | 52 |
| 1335 2 Coatesville-Riverhead Highway | 53 | 54 | 57 | 52 |
| 14 Leebank Crescent | 52 | 55 | 54 | 52 |
| 8 2 Riverland Road | 51 | 52 | 54 | 52 |
| 3 Riverhead Point Drive | 54 | 56 | 55 | 52 |
| 1293 2 Coatesville-Riverhead Highway | 50 | 51 | 54 | 52 |
| 7 Short Road | 51 | 53 | 53 | 51 |
| 18 Leebank Crescent | 53 | 56 | 55 | 51 |
| 8 Princes Street | 50 | 49 | 54 | 51 |
| 5 Riverhead Point Drive | 52 | 55 | 54 | 51 |
| 1385 Coatesville-Riverhead Highway | 50 | 51 | 55 | 50 |
| 1092 Coatesville-Riverhead Highway | 51 | 51 | 54 | 50 |
| 1194 Coatesville-Riverhead Highway | 49 | 52 | 54 | 50 |
| 10 Princes Street | 49 | 49 | 53 | 50 |
| 16 Leebank Crescent | 50 | 53 | 52 | 50 |
| 3A Riverhead Point Drive | 52 | 54 | 53 | 49 |
| 1170 Coatesville-Riverhead Highway | 51 | 53 | 53 | 49 |
| 12 Short Road | 47 | 50 | 50 | 49 |
| 182 Old Railway Road | 51 | 53 | 54 | 49 |
| 3 Kaipara Portage Road | 49 | 50 | 52 | 49 |
| 1158 B2 Coatesville-Riverhead Highway | 50 | 53 | 52 | 49 |
| 5 Kaipara Portage Road | 48 | 49 | 52 | 48 |
| 1156 B3 Coatesville-Riverhead Highway | 48 | 51 | 51 | 48 |
| 12 Jelas Drive | 46 | 48 | 52 | 48 |
| 11 Leebank Crescent | 50 | 52 | 51 | 48 |
| 3 Pitoitoi Drive | 49 | 51 | 52 | 48 |
| 1229 3 Coatesville-Riverhead Highway | 49 | 52 | 52 | 48 |
| 9 Leebank Crescent | 49 | 51 | 50 | 47 |
| 12 Leebank Crescent | 43 | 46 | 46 | 46 |
| 7 Kaipara Portage Road | 45 | 46 | 49 | 46 |
| 20 Jelas Drive | 46 | 49 | 49 | 45 |

| | | | | |
|---|---|---|---|---|
| 26 Jelas Drive | 47 | 49 | 49 | 45 |
| 30 Jelas Drive | 45 | 47 | 46 | 44 |
| 28 Jelas Drive | 45 | 48 | 48 | 44 |
| 24 Jelas Drive | 45 | 48 | 48 | 44 |
| 16 Jelas Drive | 45 | 47 | 47 | 43 |
| 14 Jelas Drive | 45 | 47 | 47 | 43 |
| 22 Jelas Drive | 45 | 47 | 47 | 43 |
| 13 Jelas Drive | 43 | 45 | 46 | 42 |

# ATTACHMENT 59

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF ROAD TRAFFIC NOISE AND VIBRATION EFFECTS PART 2 OF 3

# 3 Appendix 3: Noise Contour Maps




Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area

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Not to be used for construction.

Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R1 - Existing Road Traffic Noise

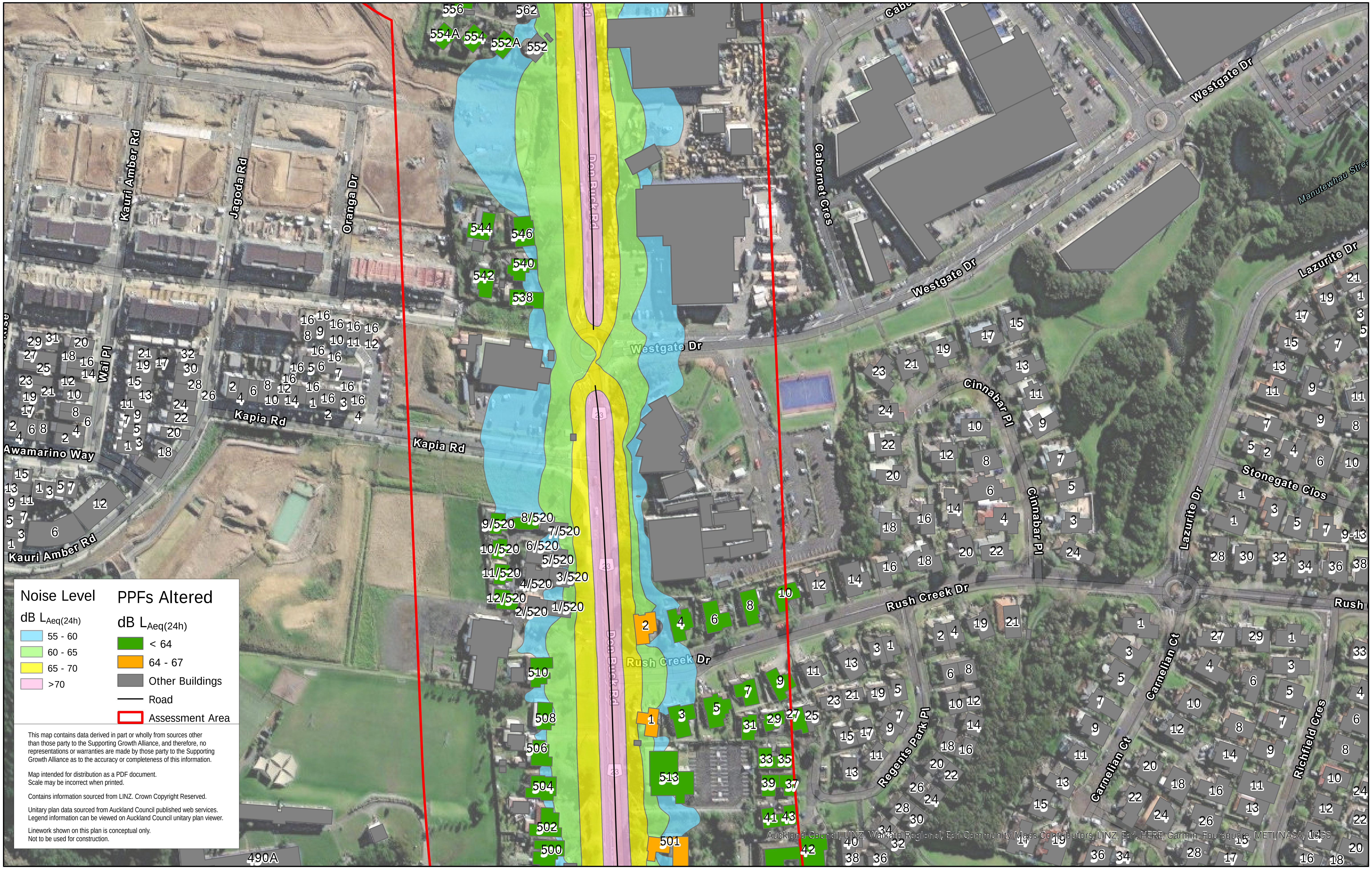
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

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| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R1 - Existing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


**Noise Level**

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

**PPFs Altered**

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area

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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R1 - Existing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area

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0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R1 - Existing Road Traffic Noise



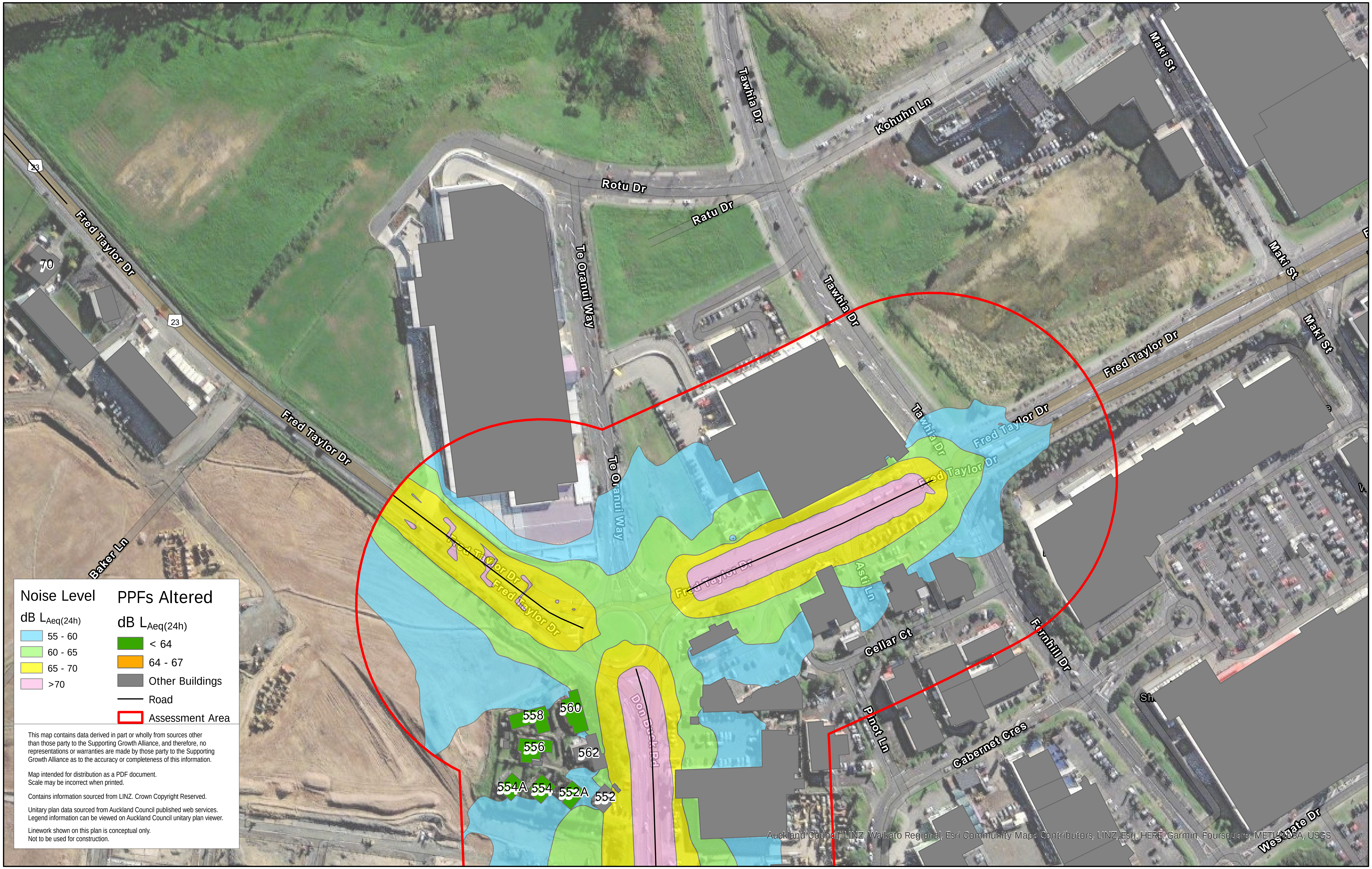
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:




Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R1 - Do Nothing Road Traffic Noise

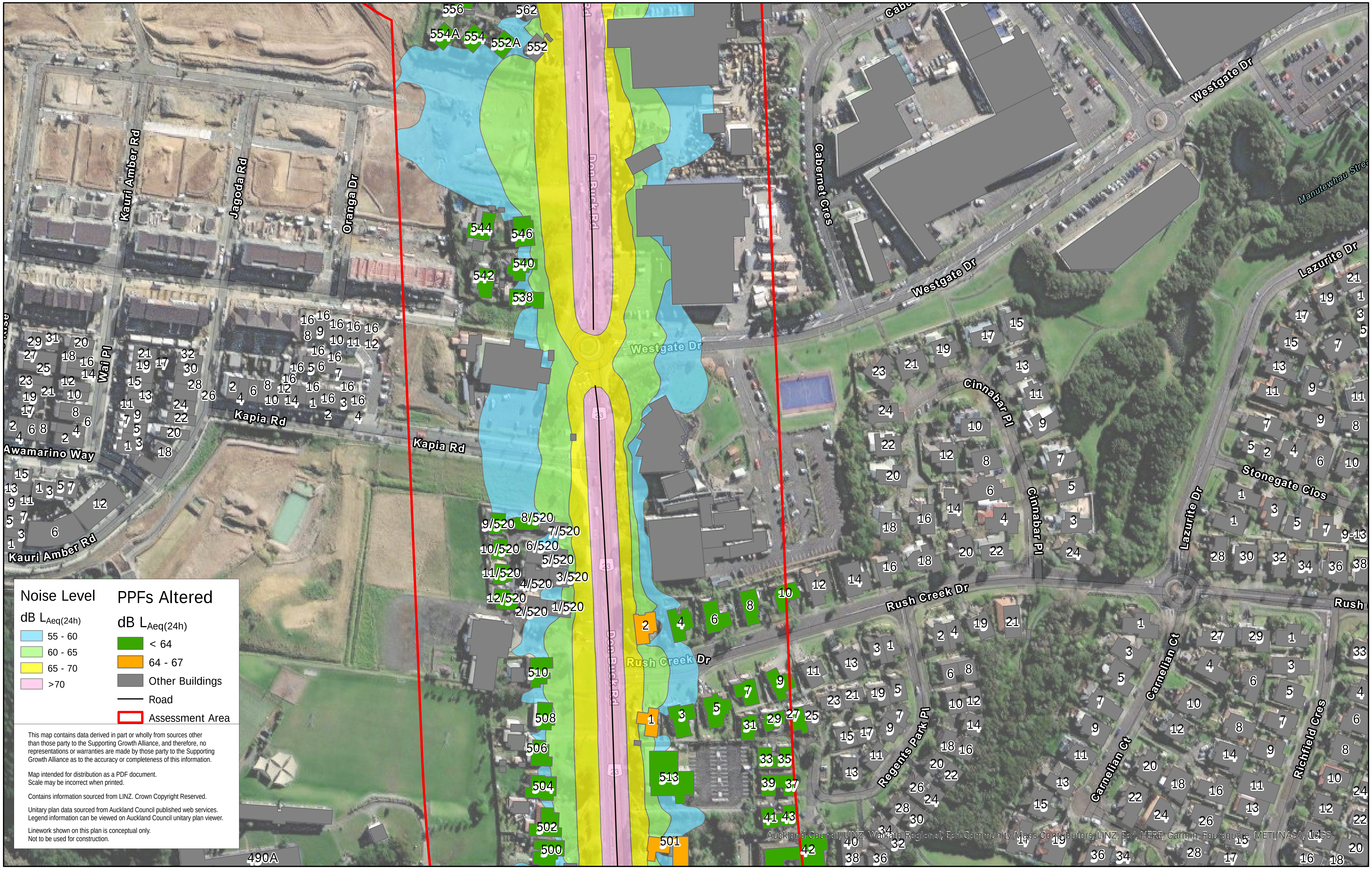
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R1 - Do Nothing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area

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0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R1 - Do Nothing Road Traffic Noise

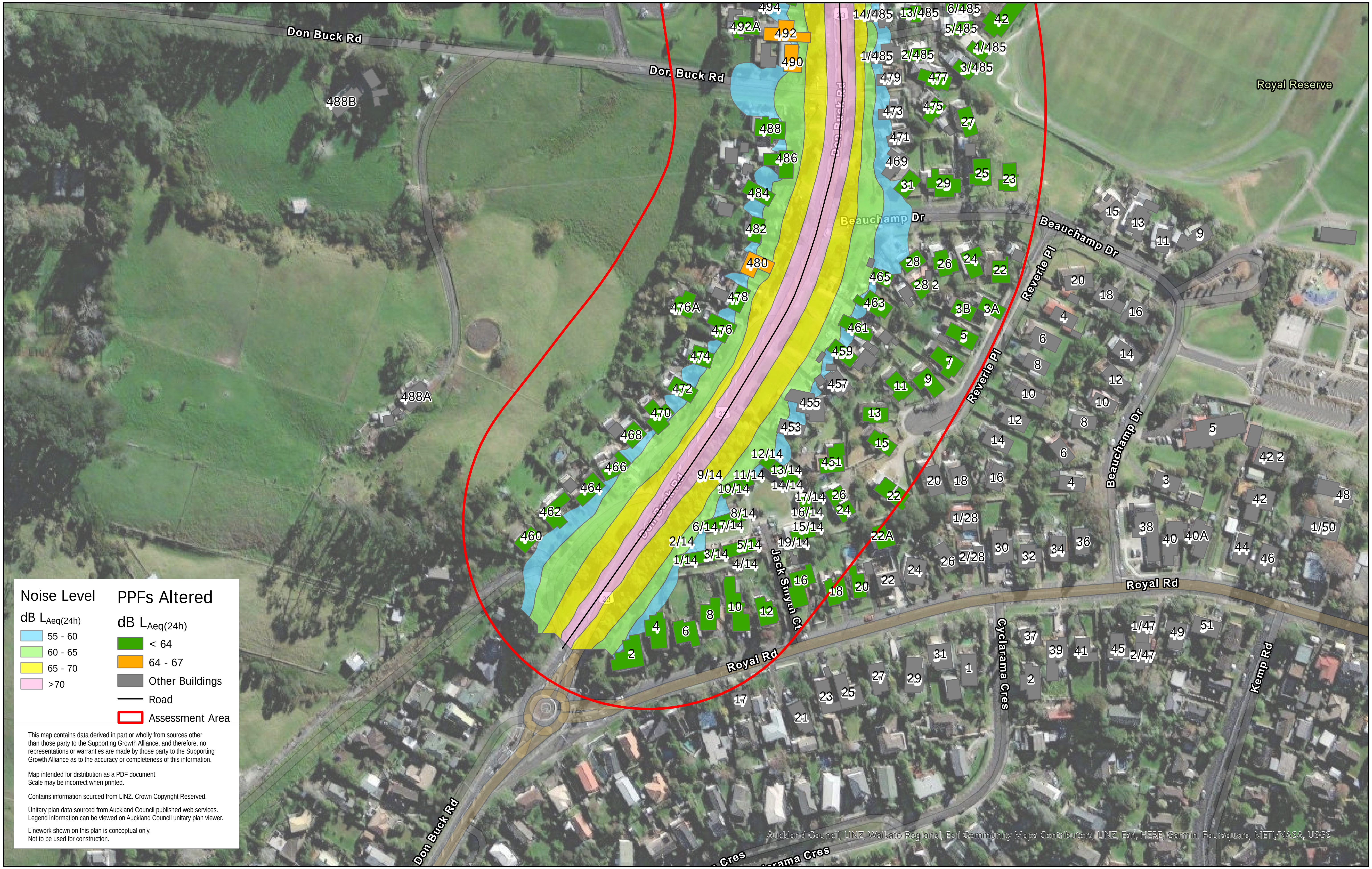
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:




Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area

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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R1 - Do Nothing Road Traffic Noise



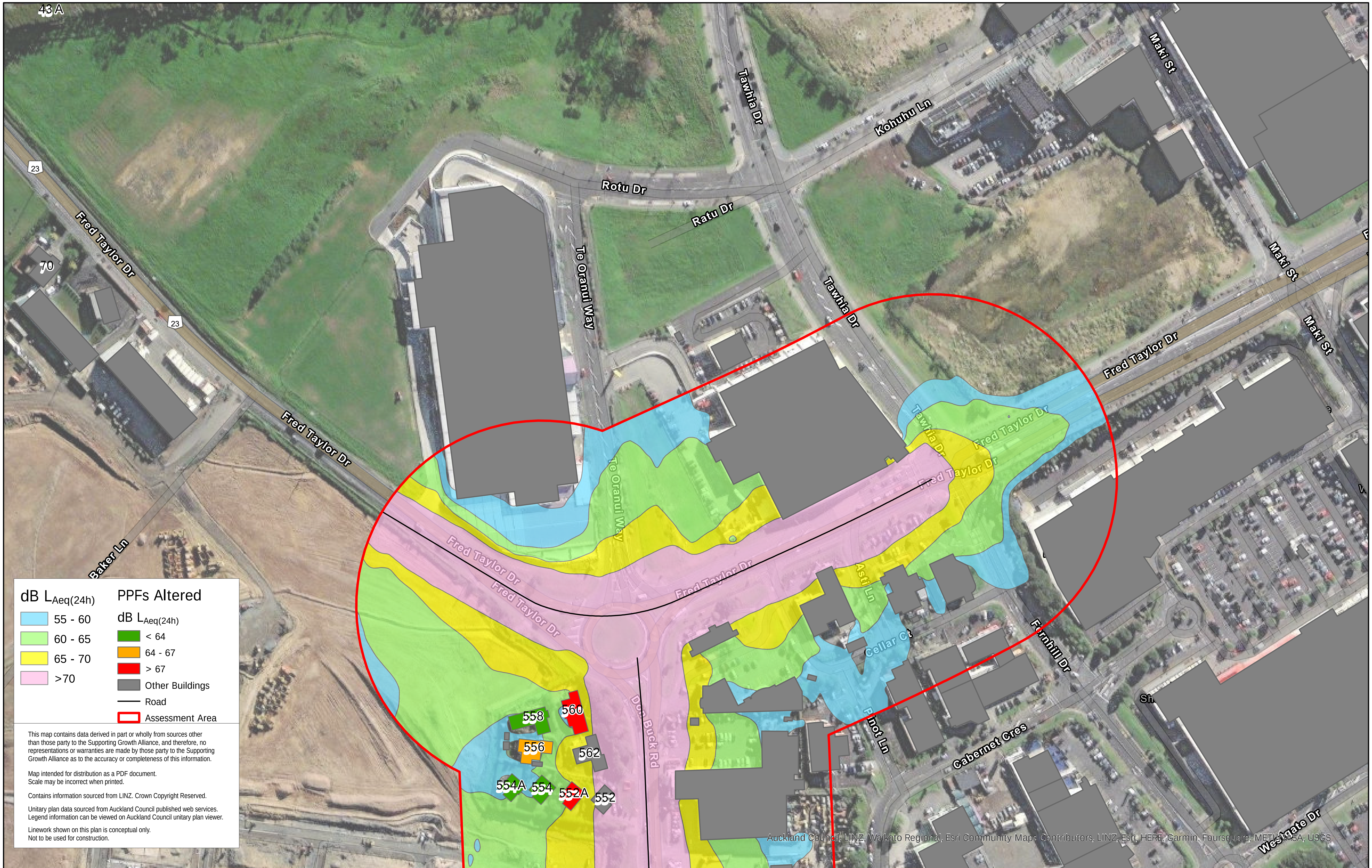
Client: Supporting Growth

Project: North West Package

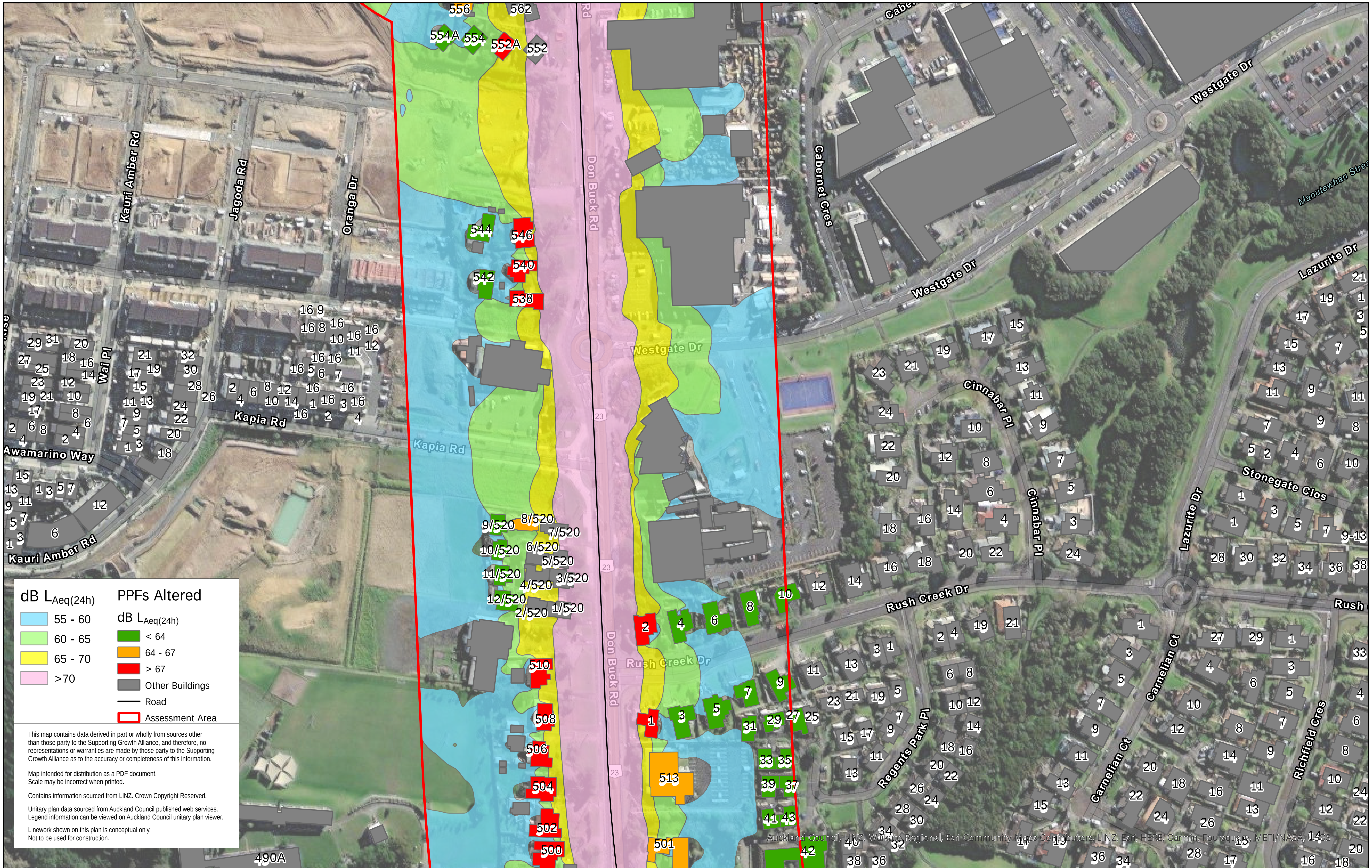
TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




| Map Scale @ A3: 0 50 100 Meters | Revision | Author | Verified | Approved | Date | Title: Supporting Growth NoR R1 - Do Minimum Road Traffic Noise | Client: Supporting Growth | TE TUPU NGĀTAHI Supporting Growth | Discipline: GIS |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | DA | SJ | CD | 22/11/22 | | Project: North West Package | | Drawing No: |

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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R1 - Do Minimum Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:


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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

# Supporting Growth

## NoR R1 - Do Minimum Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R1 - Do Minimum Road Traffic Noise

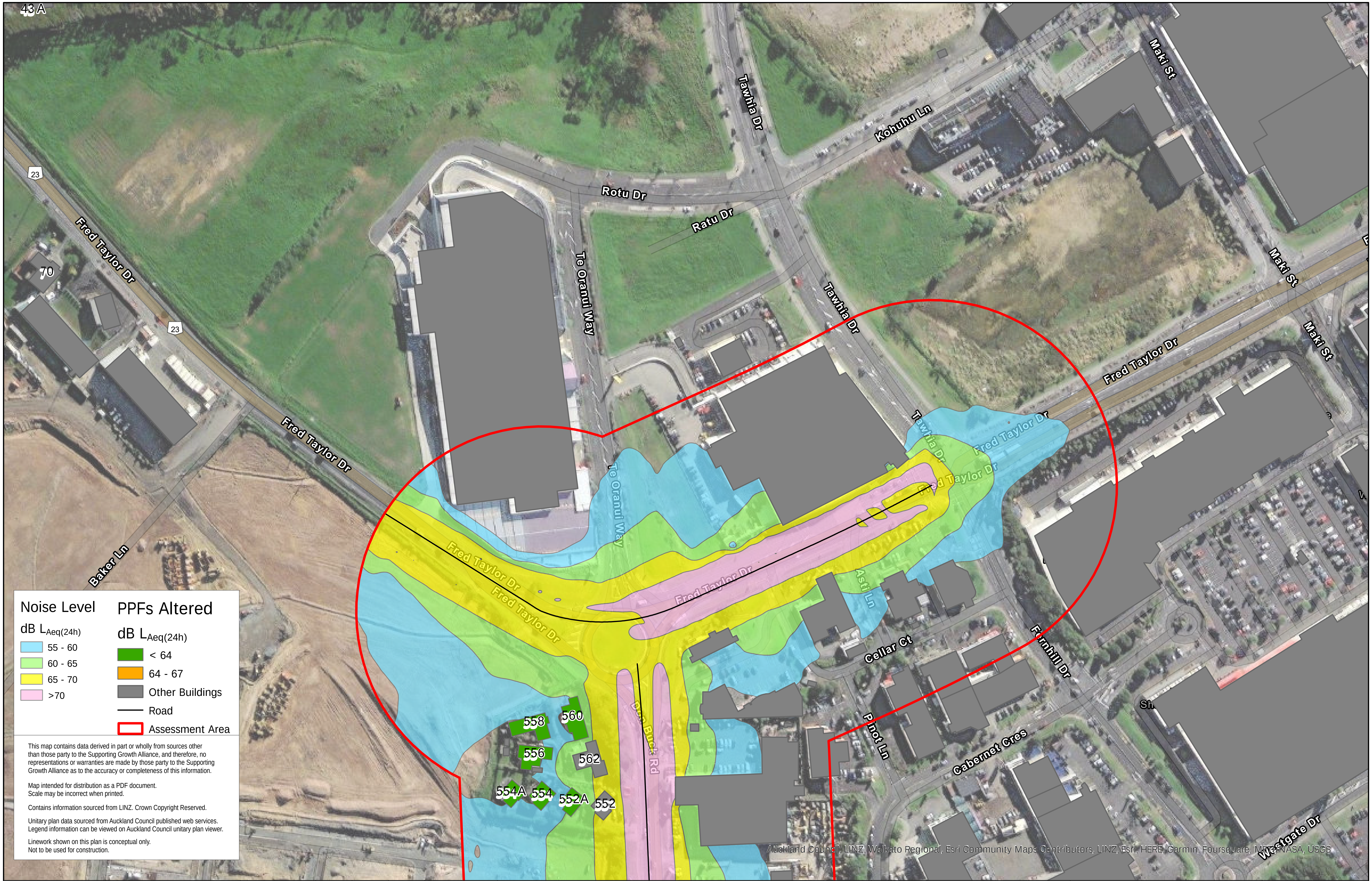
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:




Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R1 - Mitigation Option 1 Road Traffic Noise

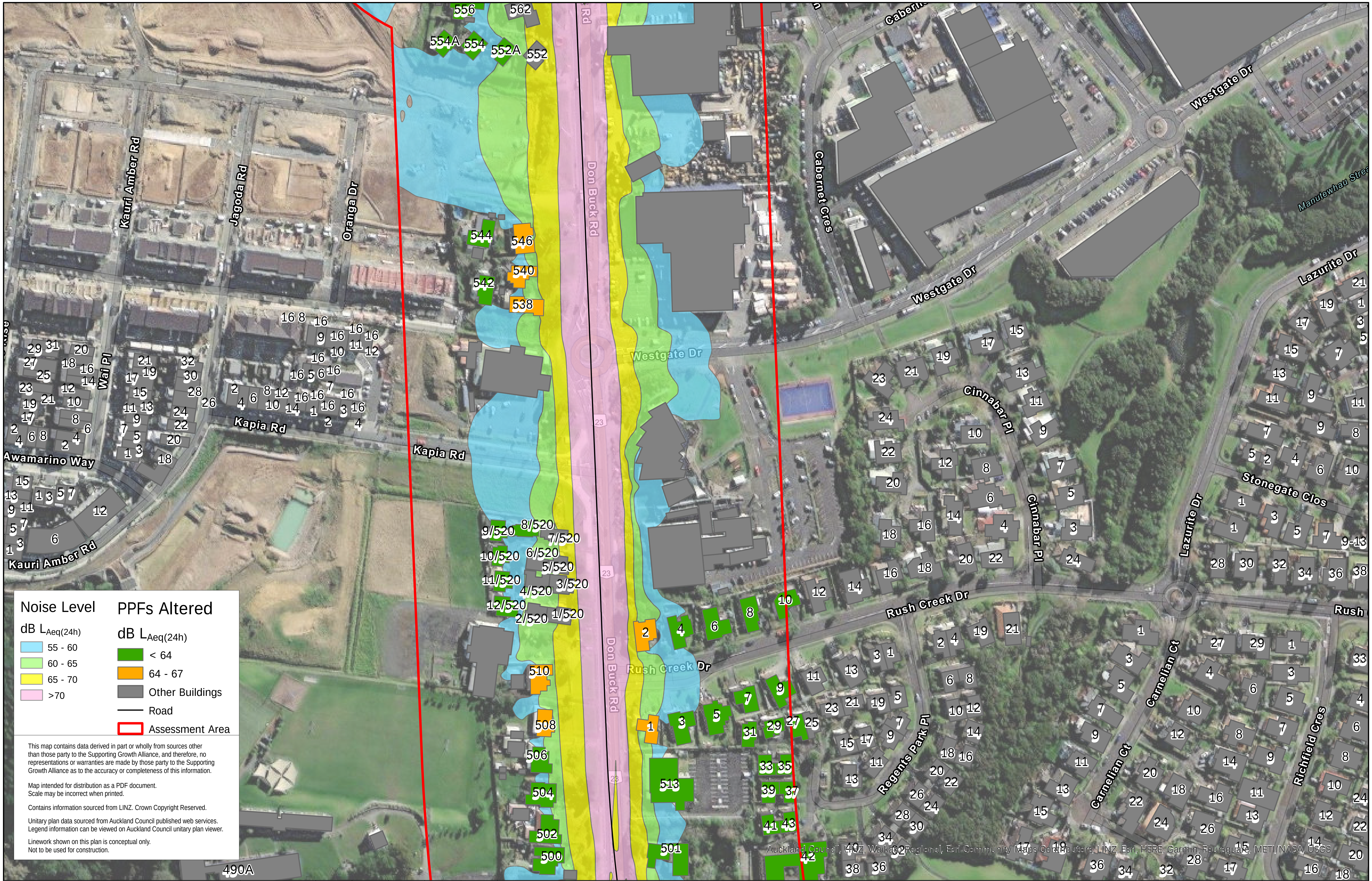
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R1 - Mitigation Option 1 Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R1 - Mitigation Option 1 Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


**Noise Level**

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

**PPFs Altered**

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area

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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R1 - Mitigation Option 1 Road Traffic Noise

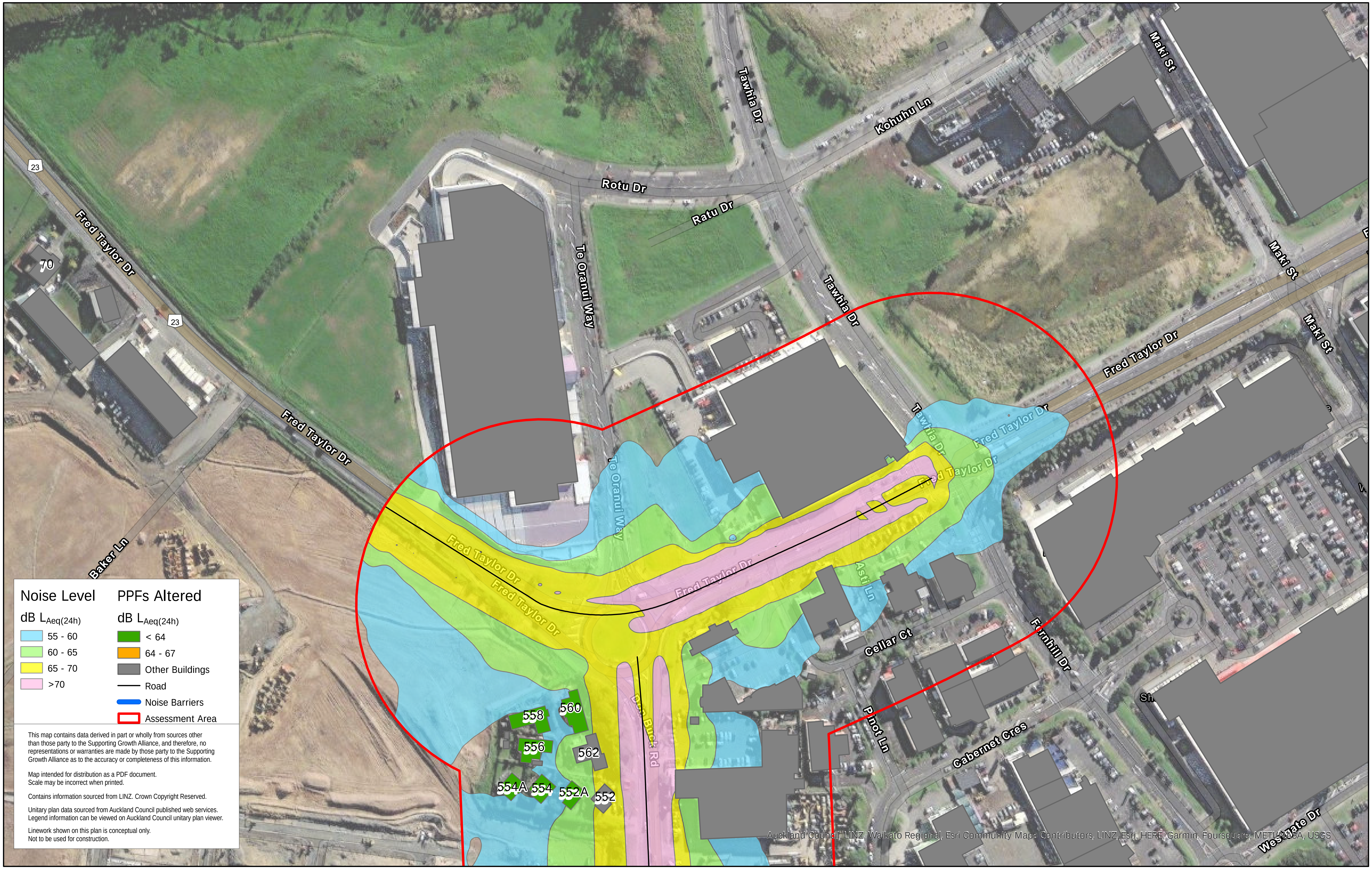
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
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| | | | | |
| | | | | |
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R1 - Mitigation Option 2 Road Traffic Noise

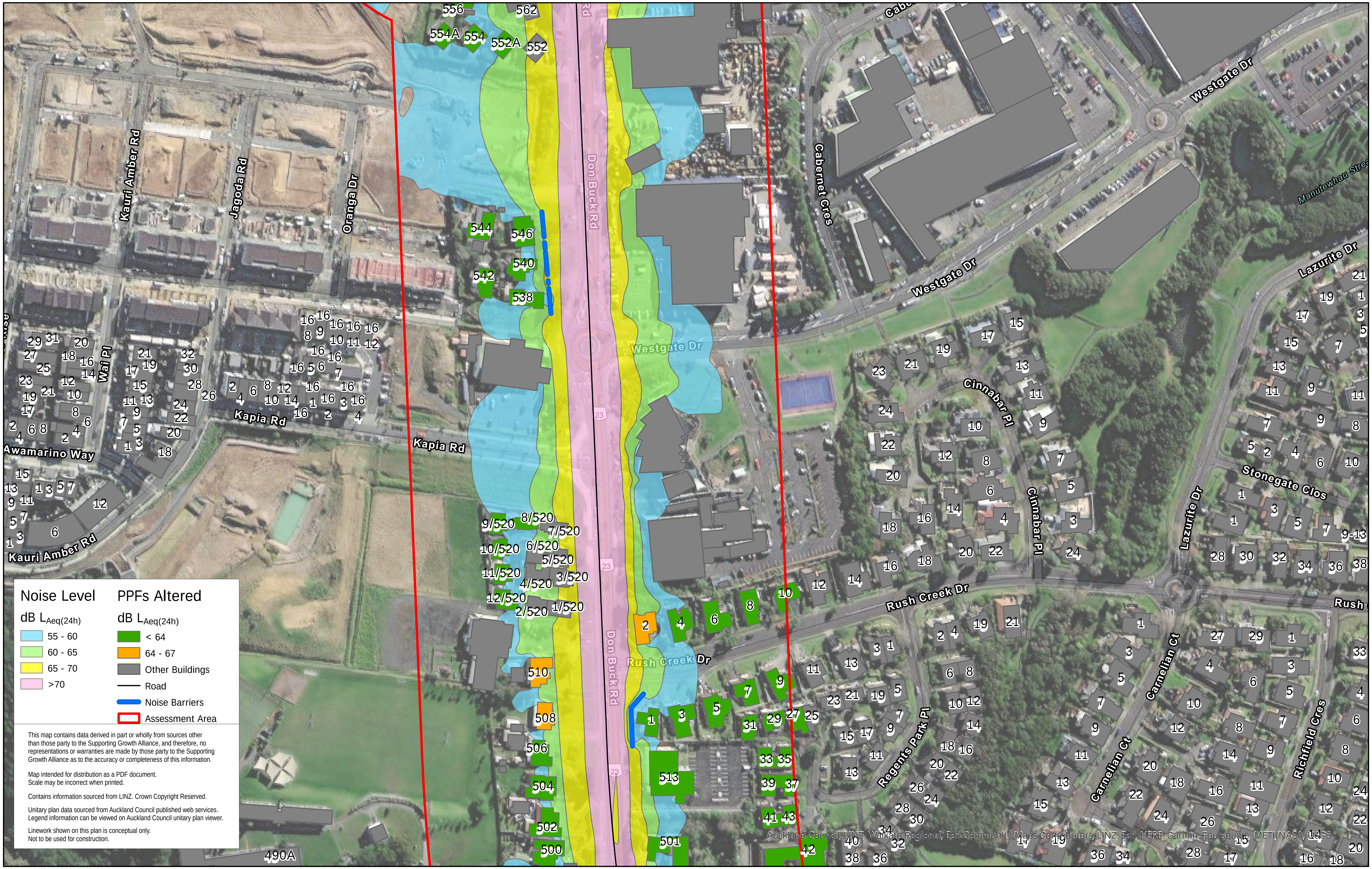
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R1 - Mitigation Option 2 Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


| Noise Level | | PPFs Altered | |
|---|---|---|---|
| dB $L_{Aeq(24h)}$ | | dB $L_{Aeq(24h)}$ | |
| | 55 - 60 | | < 64 |
| | 60 - 65 | | 64 - 67 |
| | 65 - 70 | | Other Buildings |
| | >70 | | Road |
| | | | Noise Barriers |
| | | | Assessment Area |

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Map Scale @ A3:

0 50 100
Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
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| | | | | |
| | | | | |
| 1 | DA | SJ | CD | 22/11/22 |

Title:

# Supporting Growth
## NoR R1 - Mitigation Option 2 Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

# Supporting Growth
## NoR R1 - Mitigation Option 2 Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


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| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R2 - Existing Road Traffic Noise

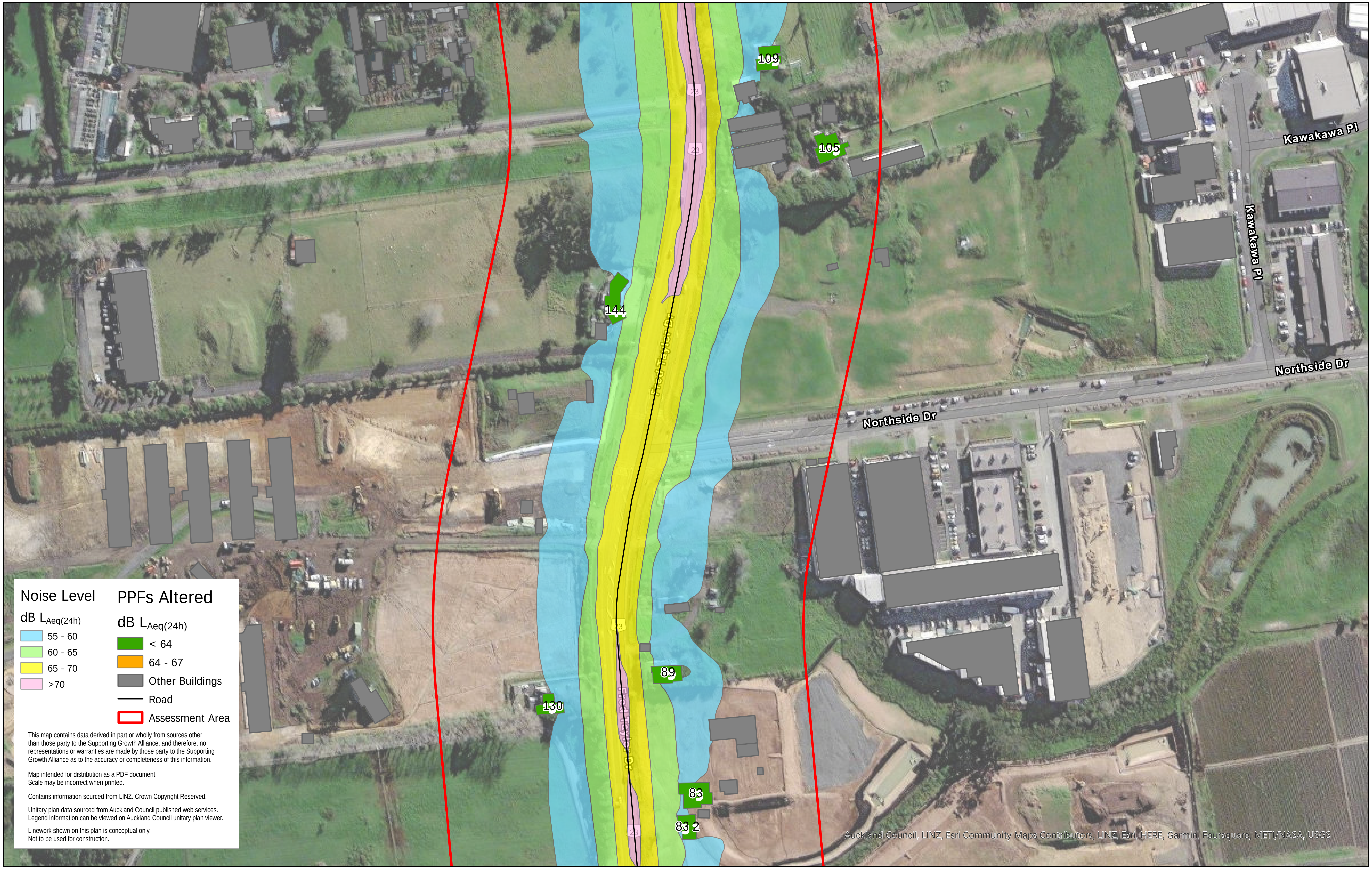
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:




Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area



Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R2 - Existing Road Traffic Noise



Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R2 - Existing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area

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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R2 - Existing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R2 - Do Nothing Road Traffic Noise

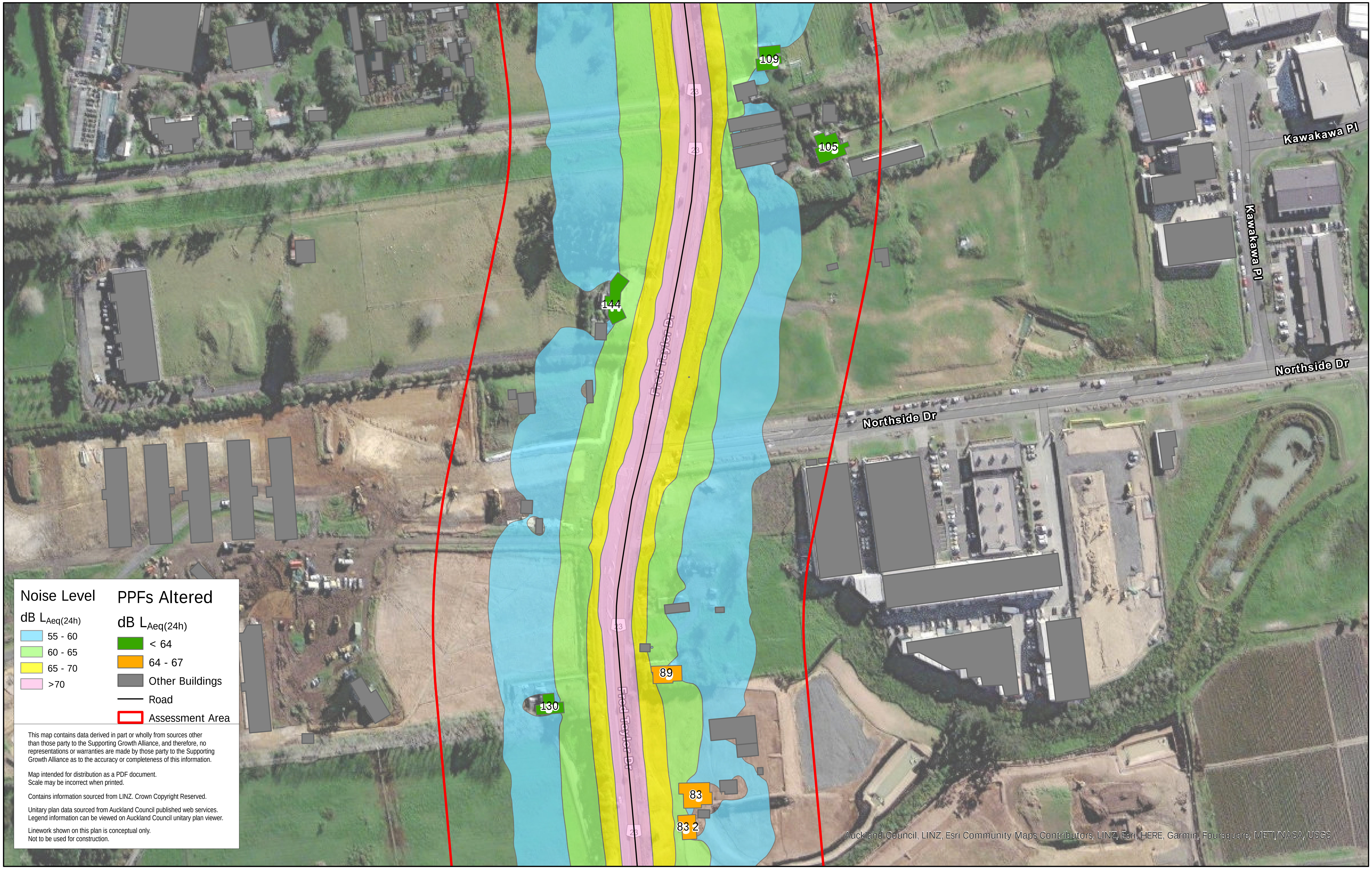
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

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Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
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| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth
NoR R2 - Do Nothing Road Traffic Noise

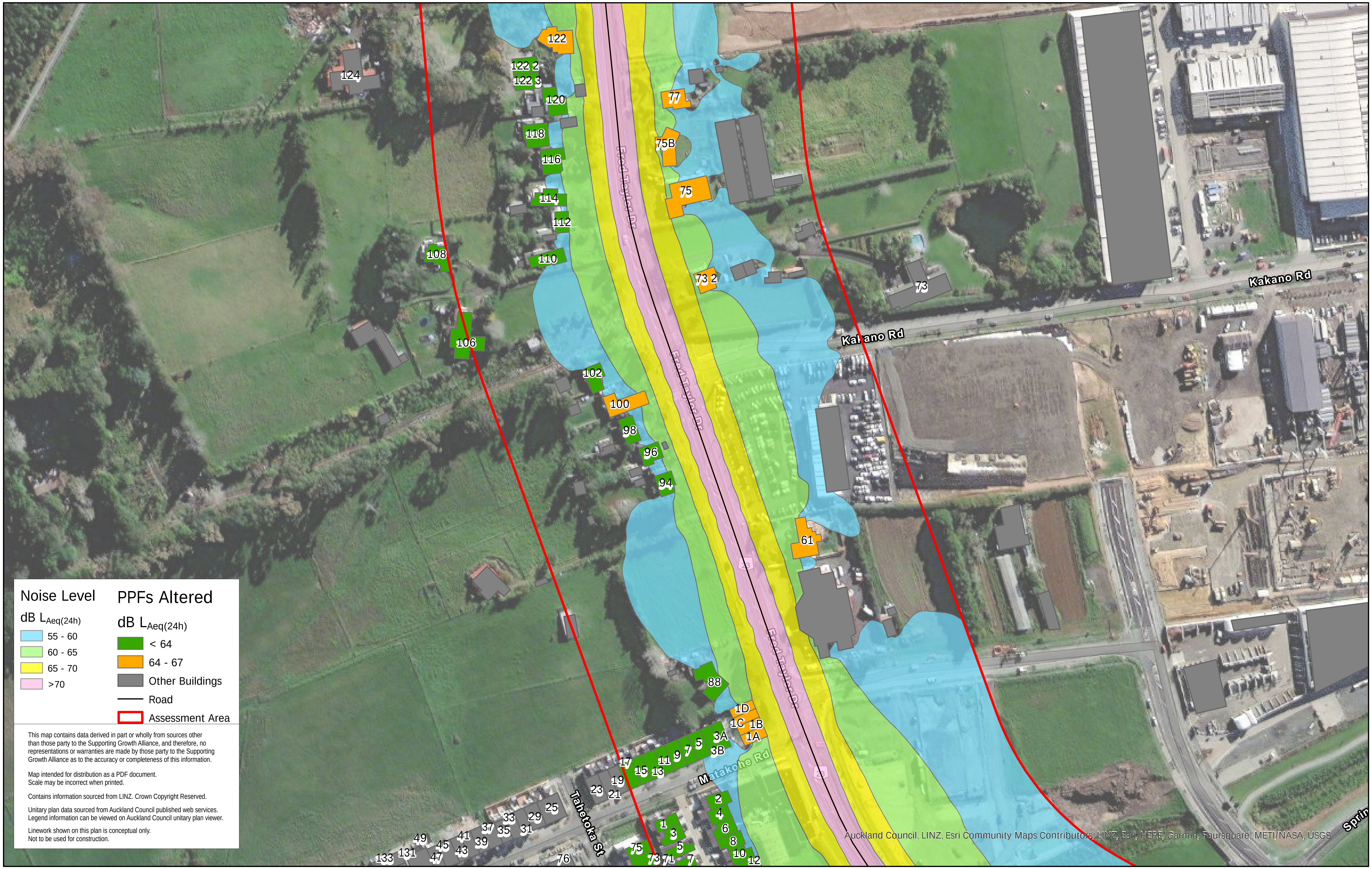
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

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Title: Supporting Growth
NoR R2 - Do Nothing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:


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Title: Supporting Growth
NoR R2 - Do Nothing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

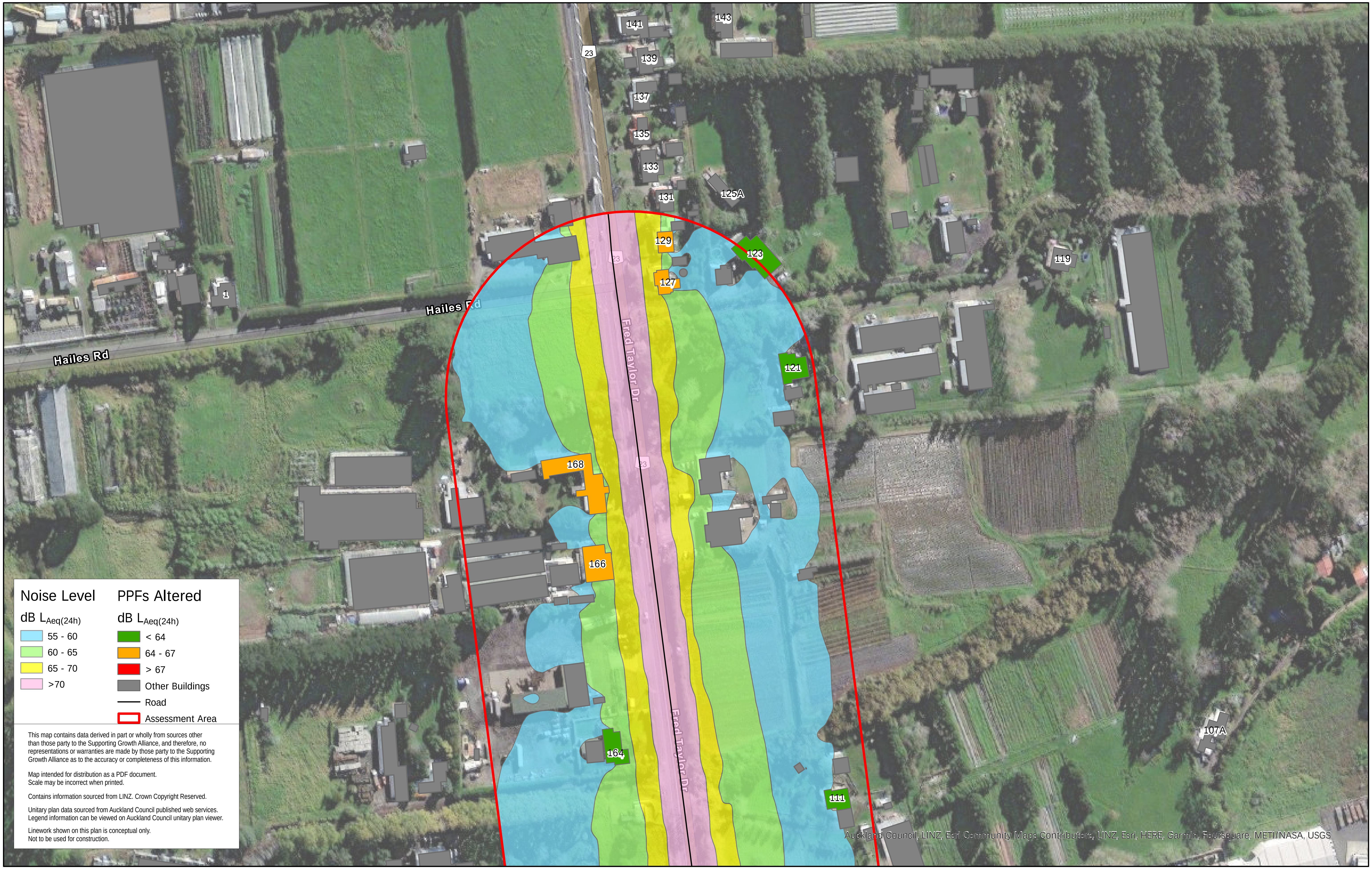
TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

# ATTACHMENT 60

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF ROAD TRAFFIC NOISE AND VIBRATION EFFECTS PART 3 OF 3




Map Scale @ A3:

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| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R2 - Do Minimum Road Traffic Noise

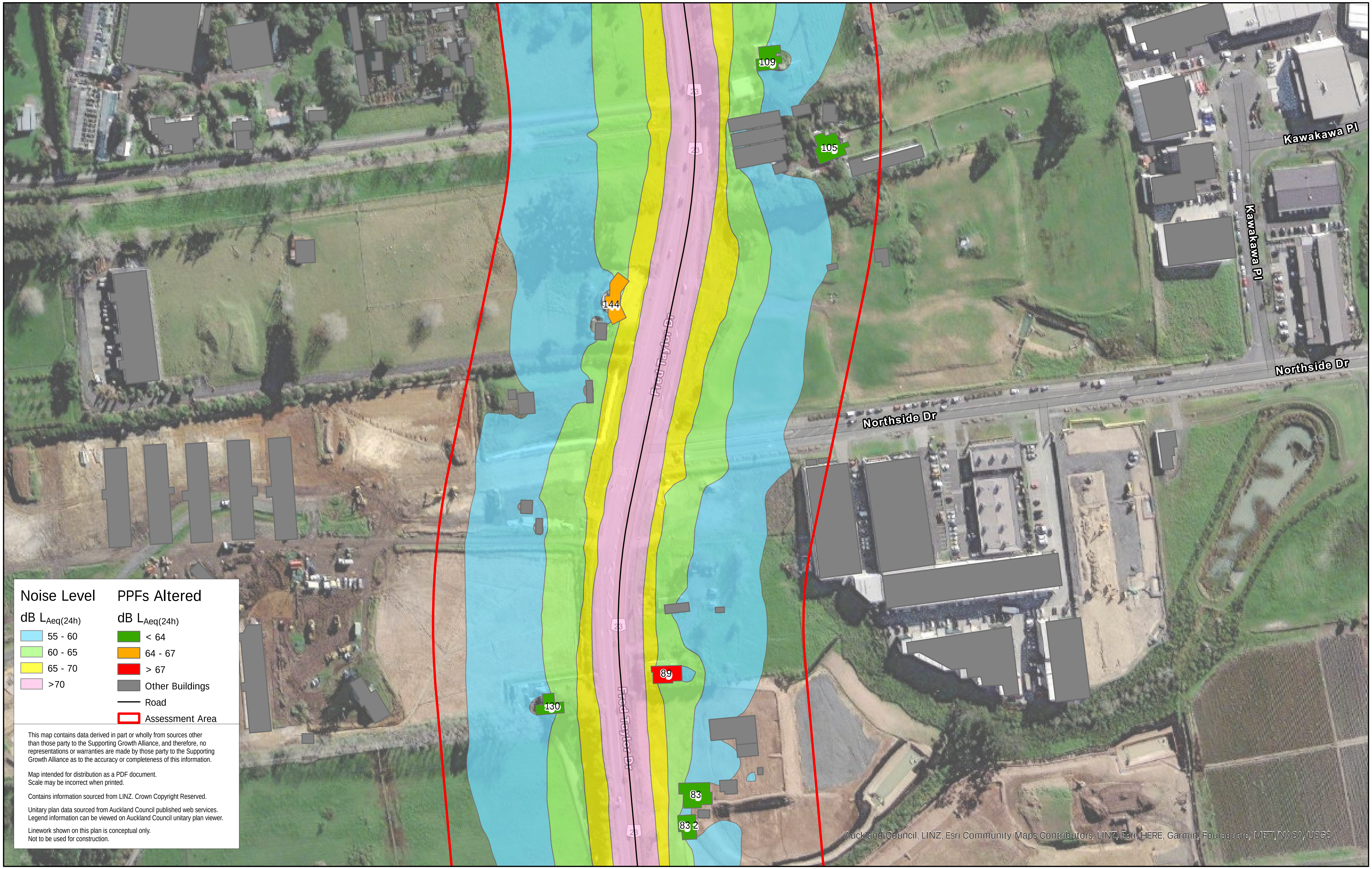
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- > 67
- Other Buildings
- Road
- Assessment Area

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| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R2 - Do Minimum Road Traffic Noise

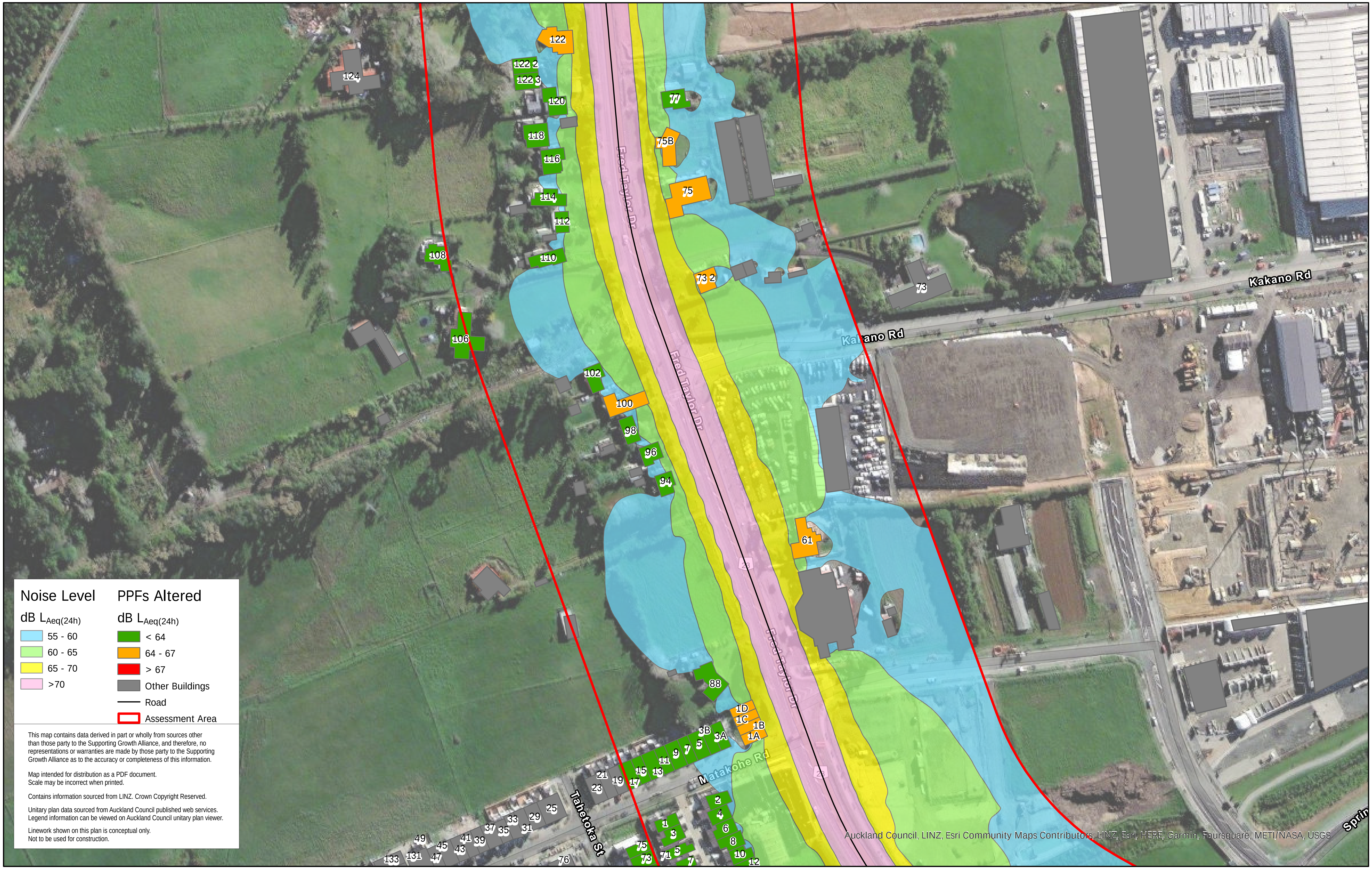
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




| Noise Level | PPFs Altered |
|---|---|
| dB $L_{Aeq(24h)}$ | dB $L_{Aeq(24h)}$ |
| 55 - 60 | < 64 |
| 60 - 65 | 64 - 67 |
| 65 - 70 | > 67 |
| >70 | Other Buildings |
| | Road |
| | Assessment Area |

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| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R2 - Do Minimum Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R2 - Do Minimum Road Traffic Noise

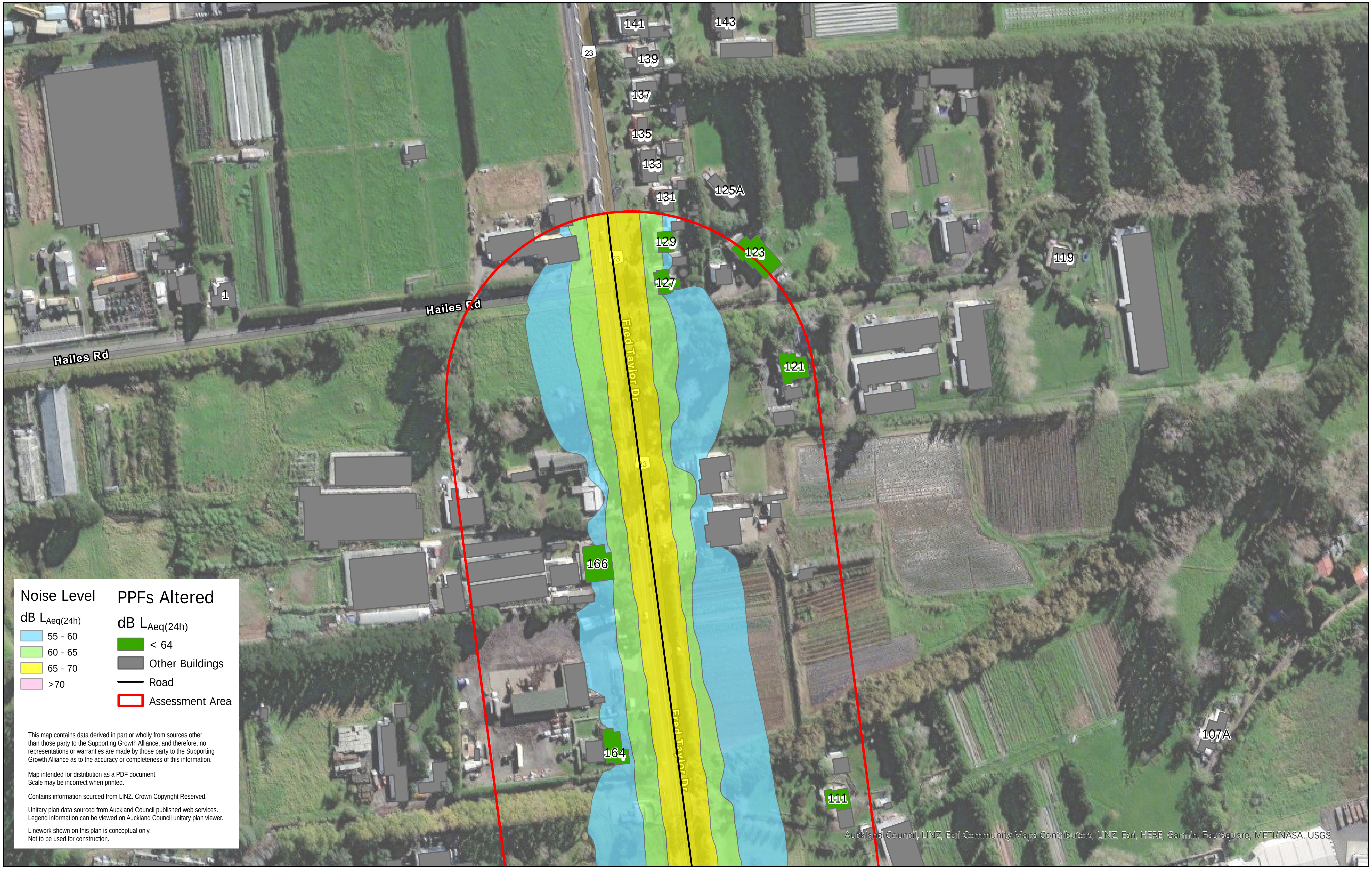
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:




Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- Other Buildings
- Road
- Assessment Area

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| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R2 - Mitigated Road Traffic Noise

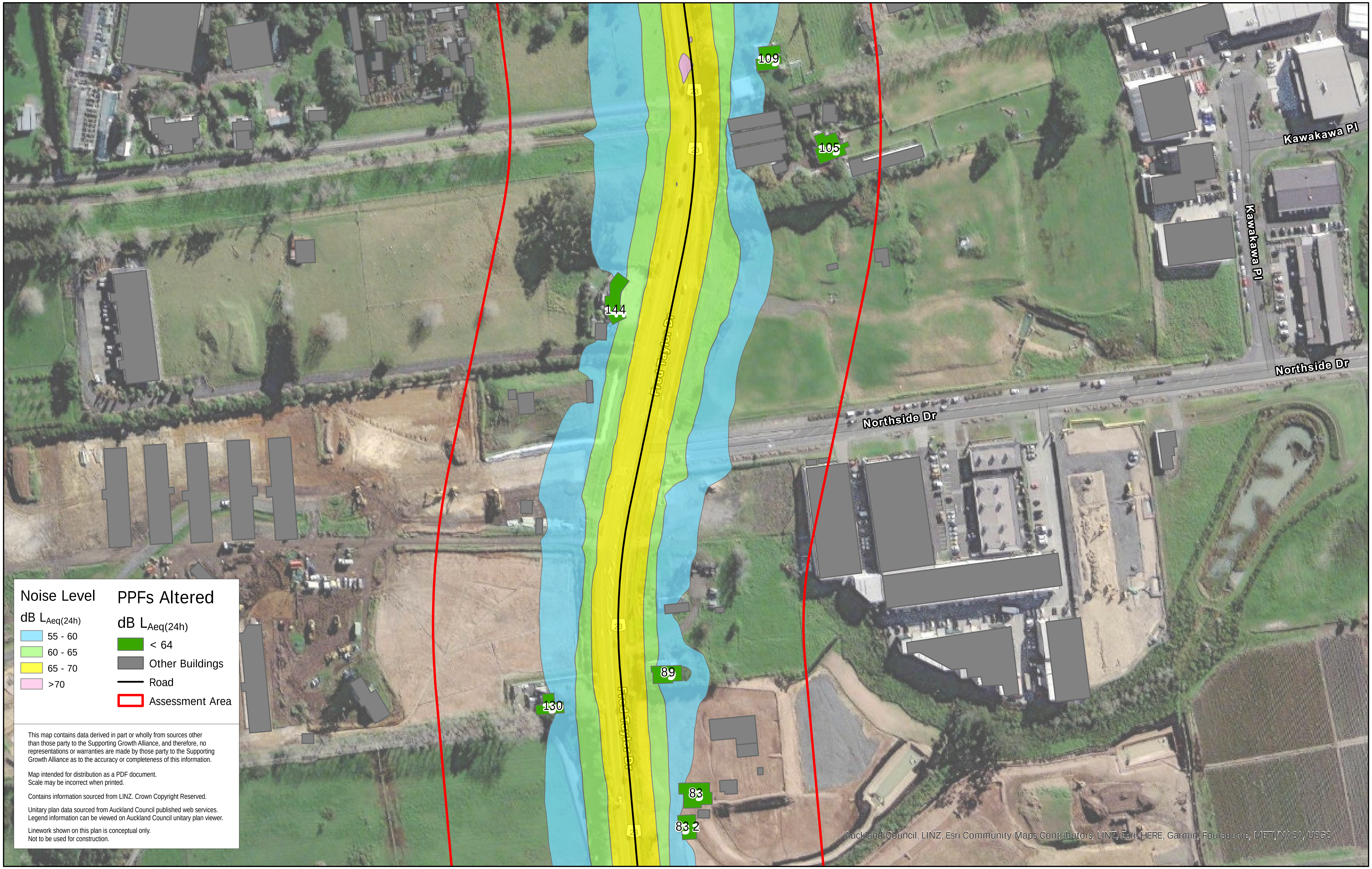
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

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| Revision | Author | Verified | Approved | Date |
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| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R2 - Mitigated Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


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| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R2 - Mitigated Road Traffic Noise

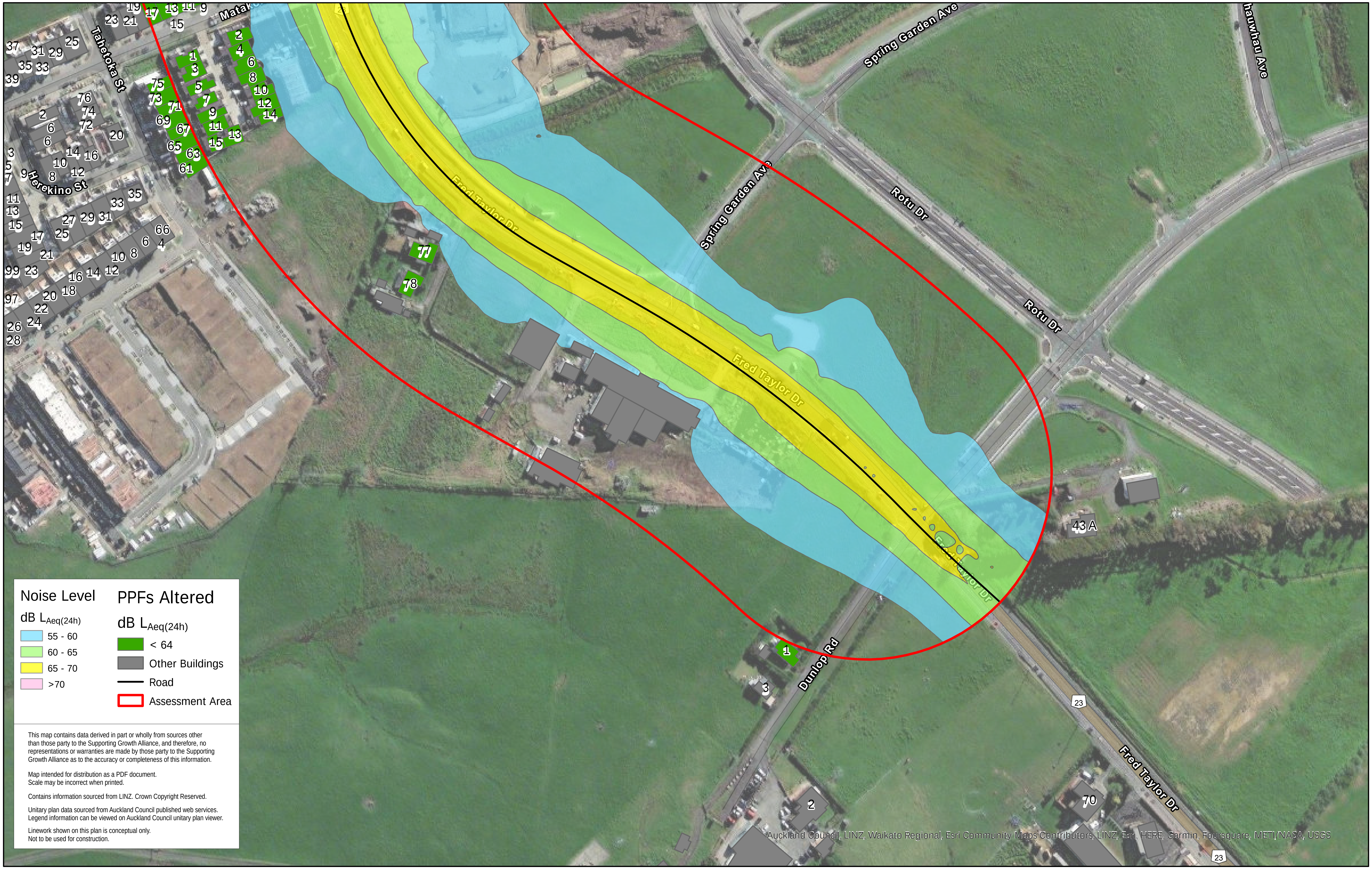
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

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Title:
Supporting Growth
NoR R2 - Mitigated Road Traffic Noise

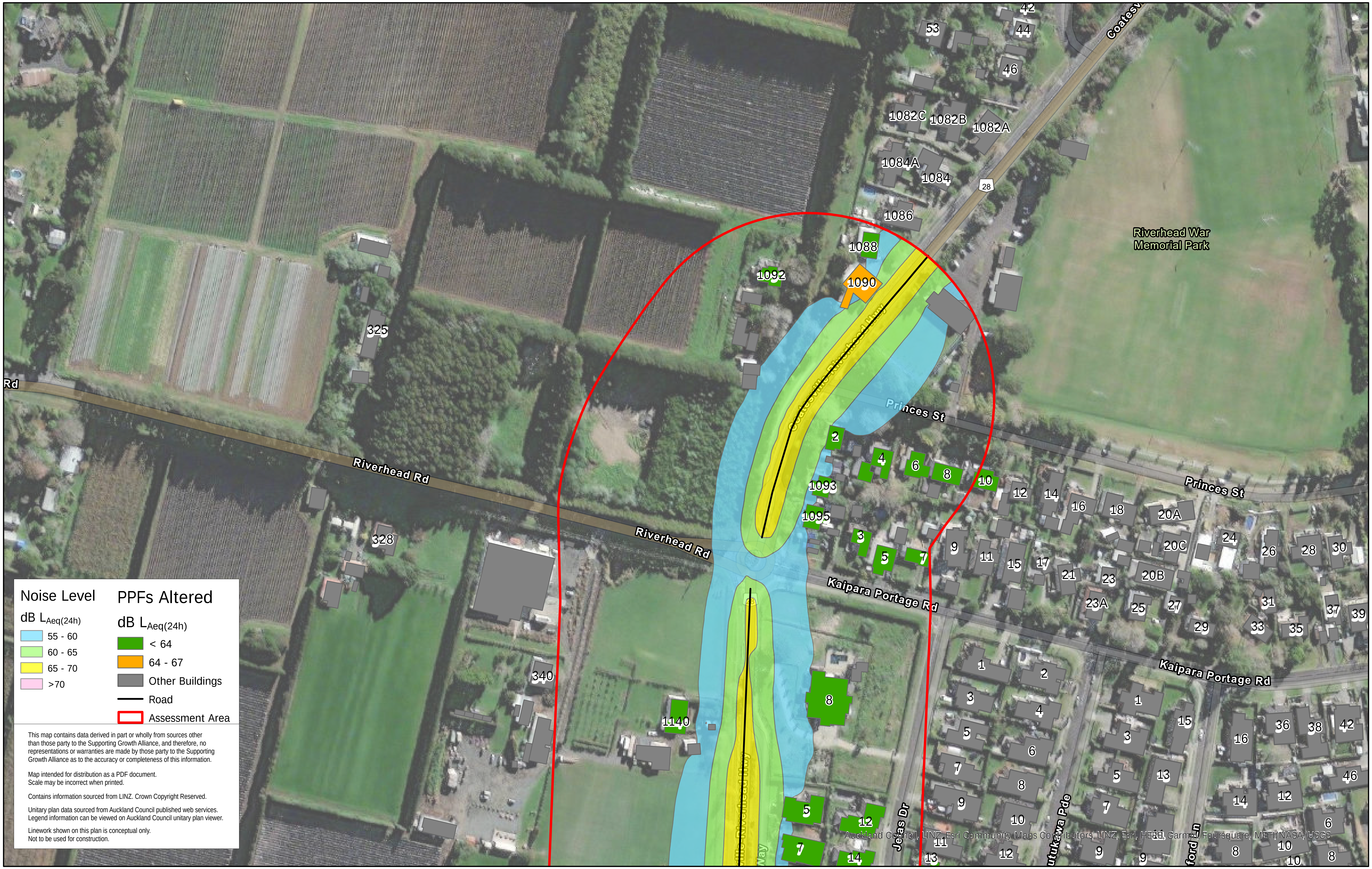
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

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| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth
NoR R3 - Existing Road Traffic Noise

229

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:


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Map Scale @ A3:

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| Revision | Author | Verified | Approved | Date |
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| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R3 - Existing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
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| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R3 - Existing Road Traffic Noise

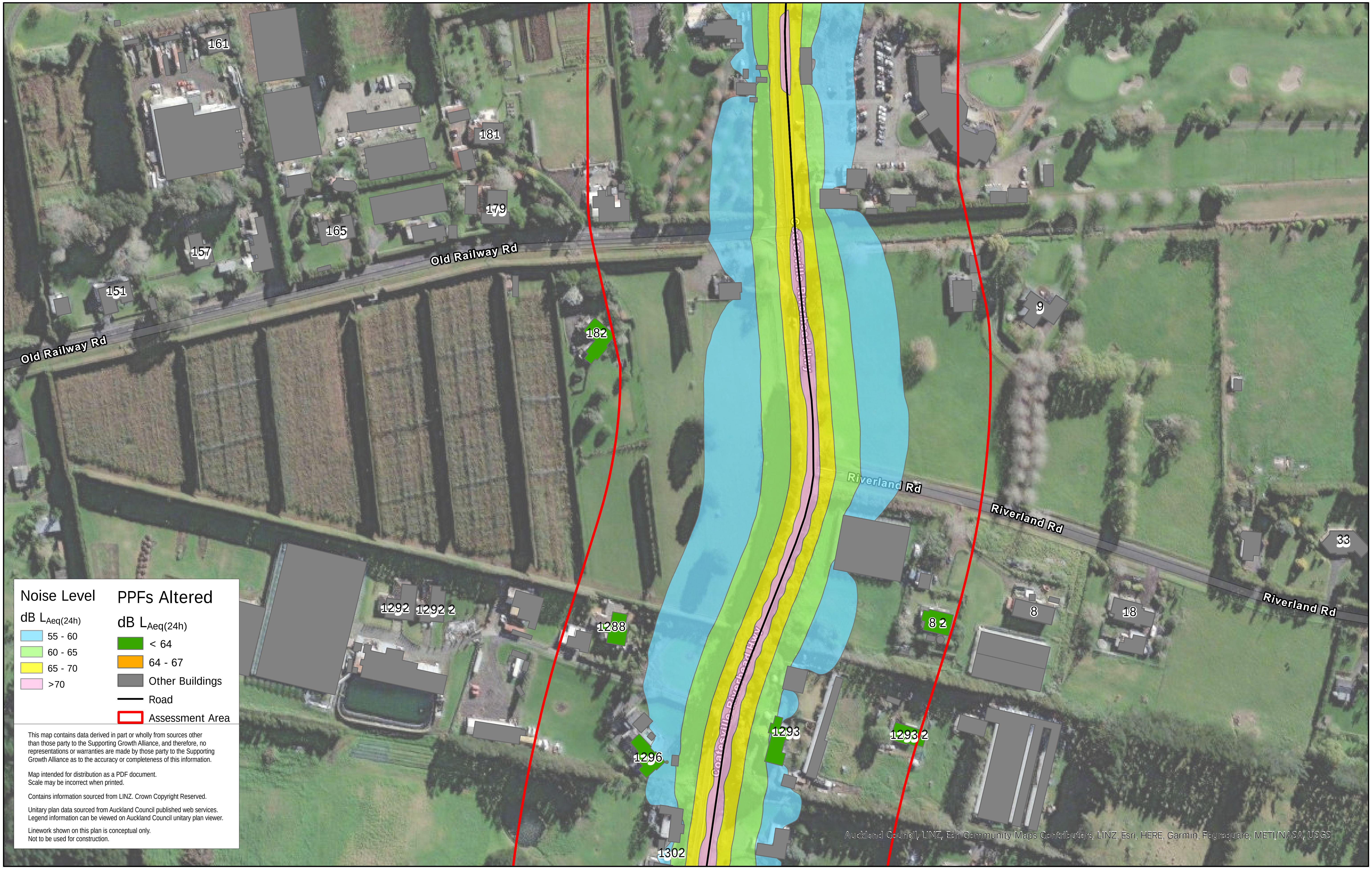
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

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| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R3 - Existing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
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| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R3 - Existing Road Traffic Noise



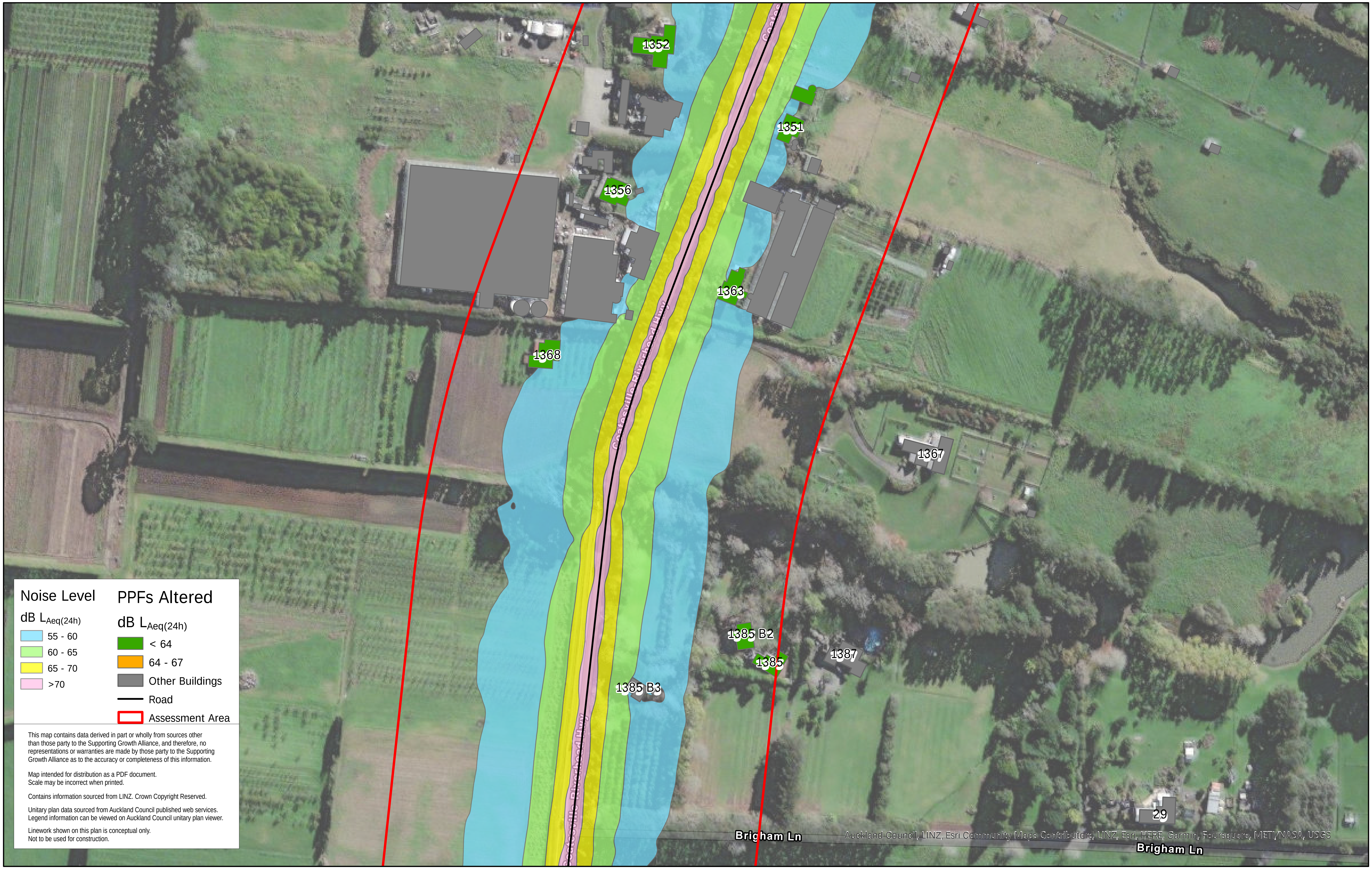
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:




Noise Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- >70

PPFs Altered

dB $L_{Aeq(24h)}$

- < 64
- 64 - 67
- Other Buildings
- Road
- Assessment Area



Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R3 - Existing Road Traffic Noise

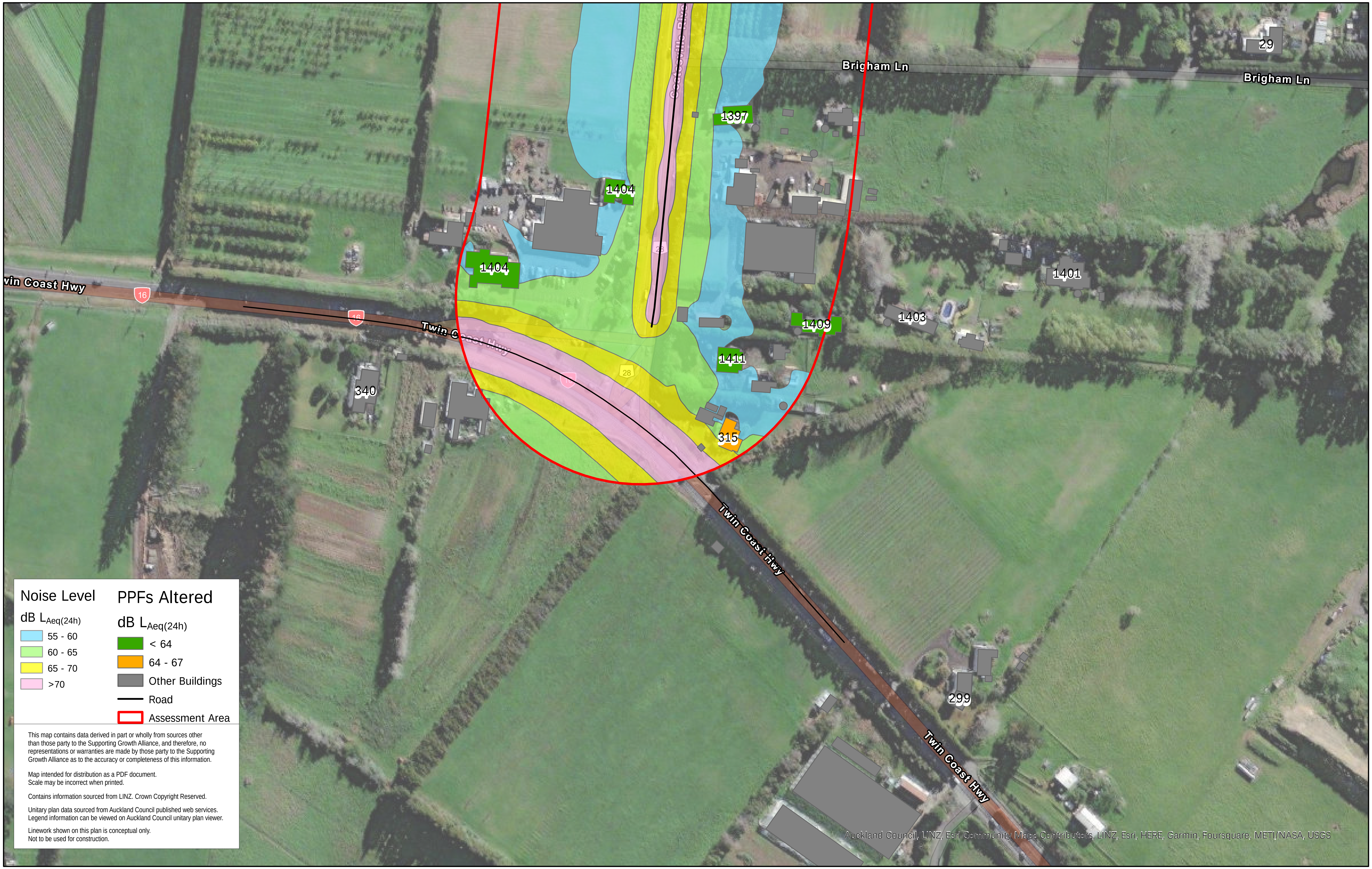
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

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| Revision | Author | Verified | Approved | Date |
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Title:
Supporting Growth
NoR R3 - Existing Road Traffic Noise

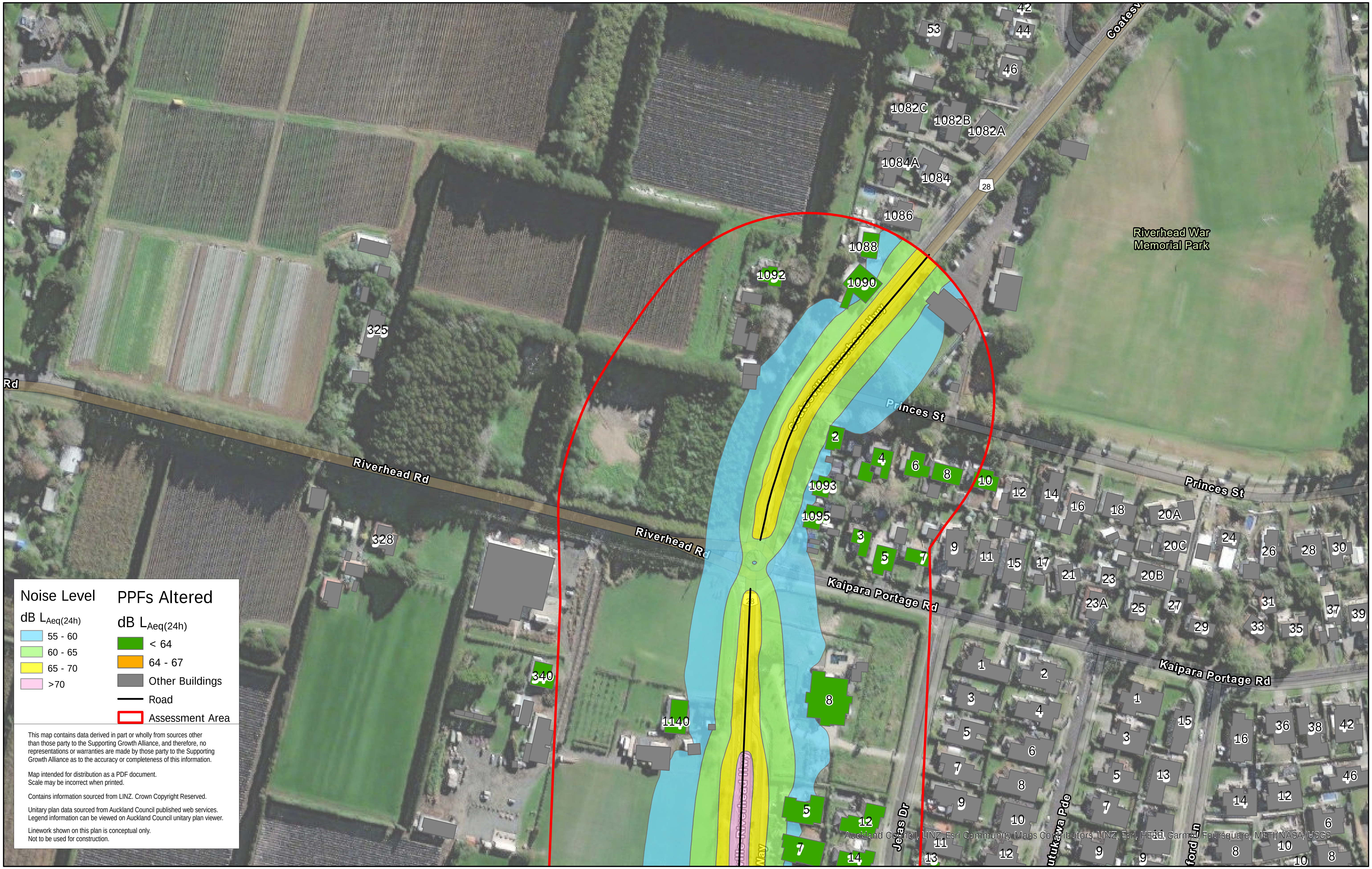
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

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| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R3 - Do Nothing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
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| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R3 - Do Nothing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


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| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R3 - Do Nothing Road Traffic Noise



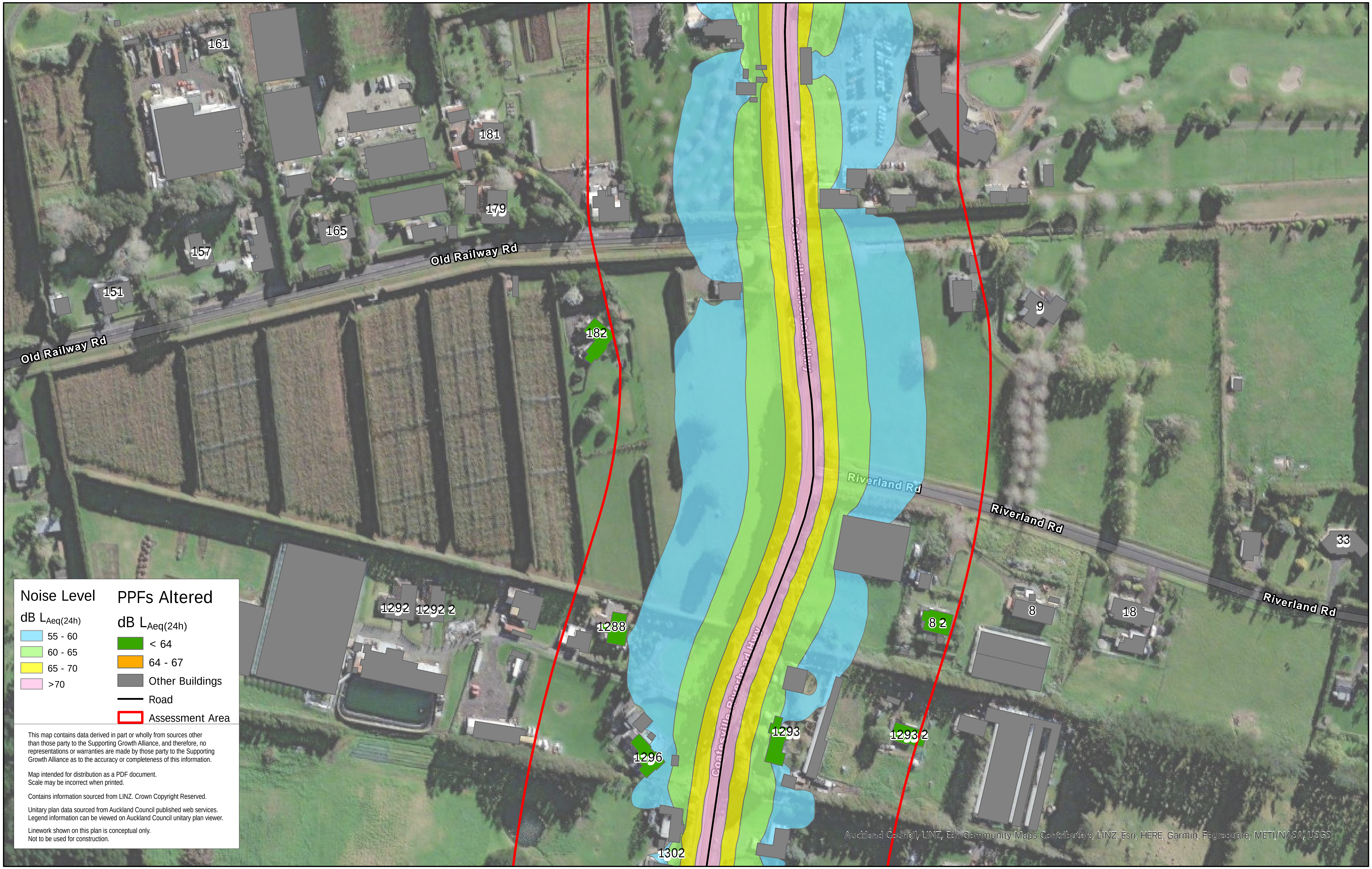
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:




Map Scale @ A3:

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| Revision | Author | Verified | Approved | Date |
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| 1 | DA | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R3 - Do Nothing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

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| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth

NoR R3 - Do Nothing Road Traffic Noise

240

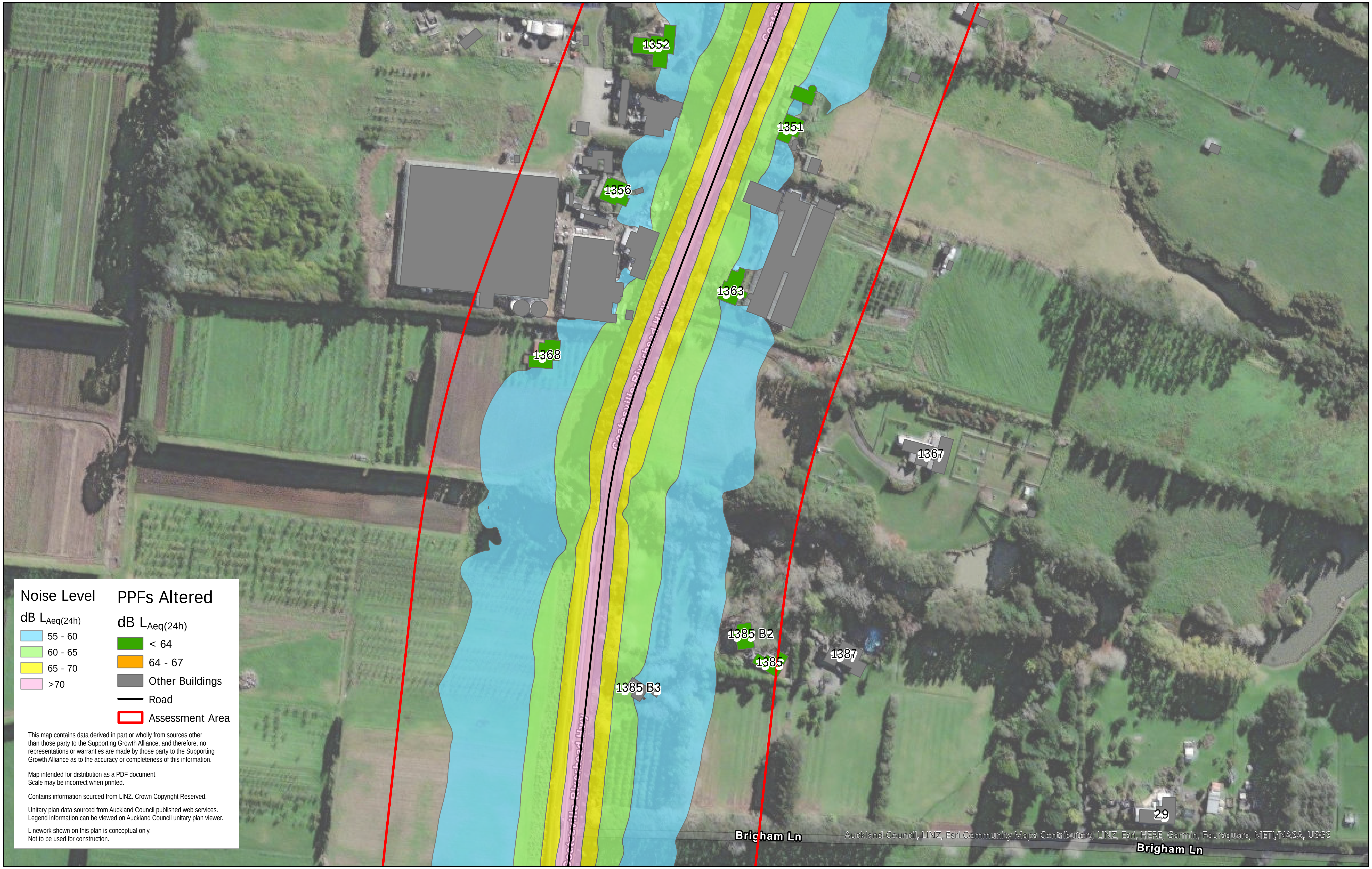
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

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Title: Supporting Growth
NoR R3 - Do Nothing Road Traffic Noise

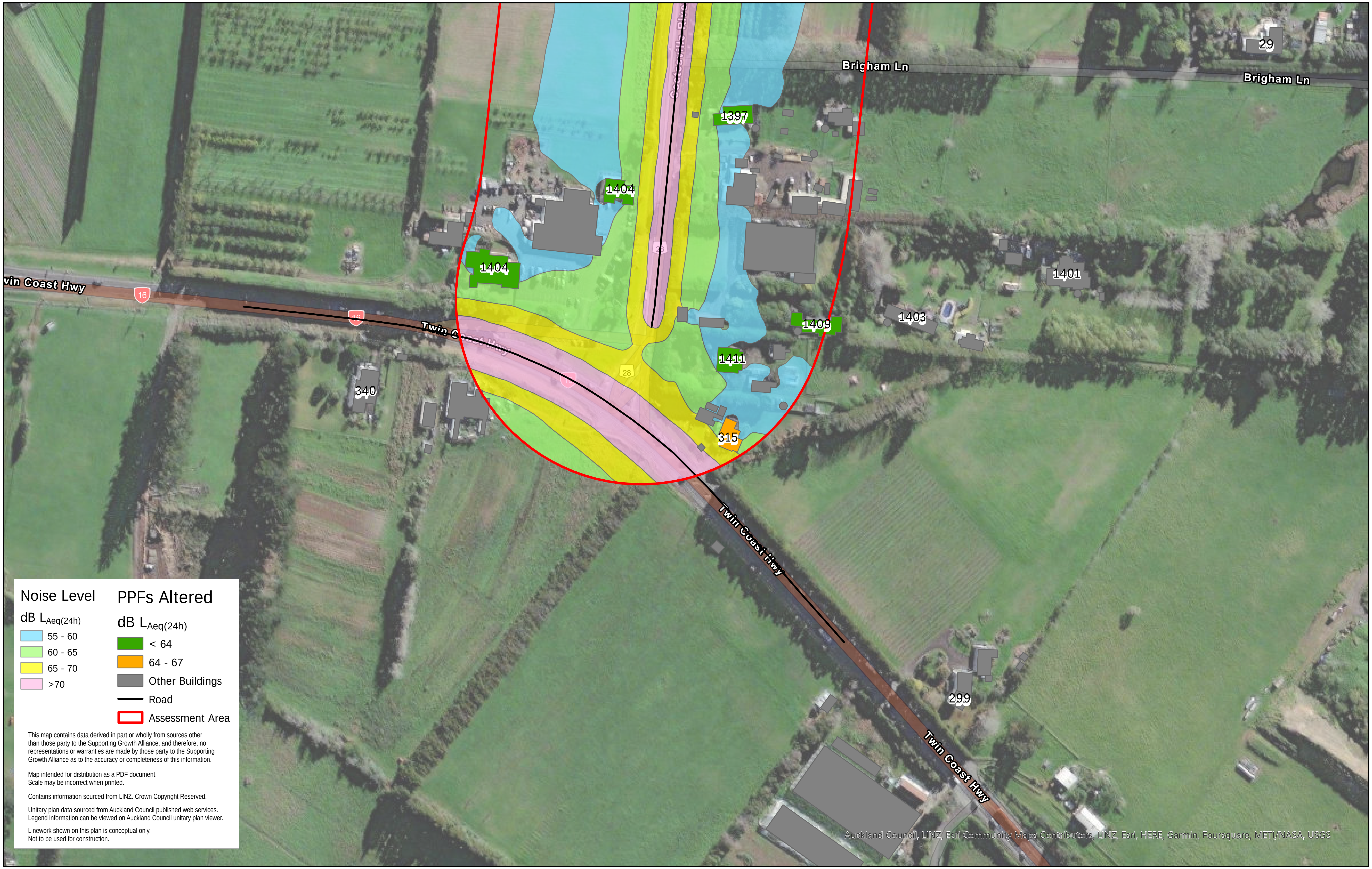
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

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| 1 | DA | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R3 - Do Nothing Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DK | SJ | CD | 22/11/22 |

Title:

Supporting Growth

NoR R3 - Do Minimum Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


**Noise Level**
dB $L_{Aeq(24h)}$
- 55 - 60
- 60 - 65
- 65 - 70
- >70

**PPFs Altered**
dB $L_{Aeq(24h)}$
- < 64
- 64 - 67
- > 67
- Other Buildings
- Road
- Assessment Area

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| 1 | DK | SJ | CD | 22/11/22 |

Title: Supporting Growth
NoR R3 - Do Minimum Road Traffic Noise

Client: Supporting Growth
Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS
Drawing No:


Map Scale @ A3:

0 50 100 Meters

| Revision | Author | Verified | Approved | Date |
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Title: Supporting Growth

NoR R3 - Do Minimum Road Traffic Noise

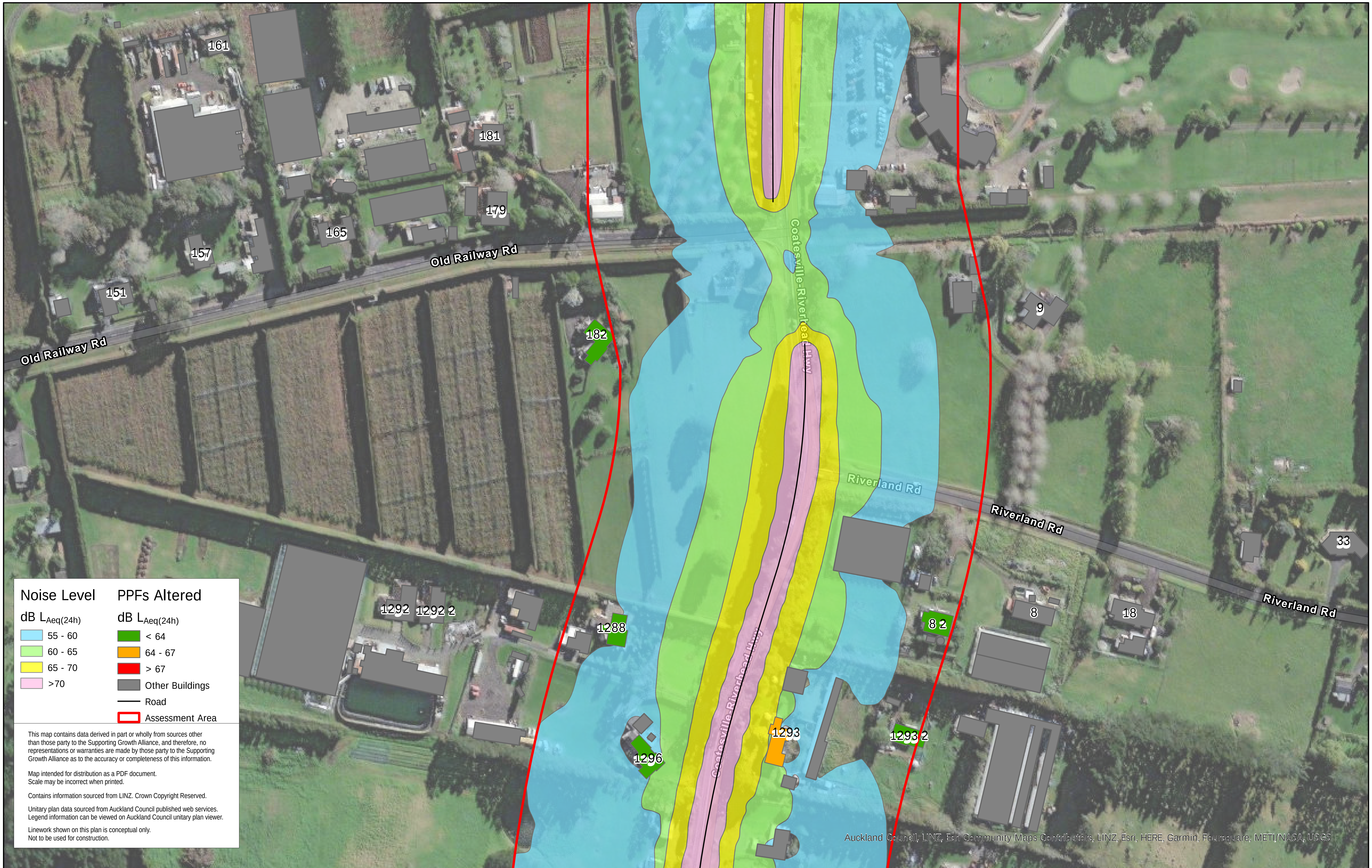
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:

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Title: Supporting Growth

NoR R3 - Do Minimum Road Traffic Noise

Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI Supporting Growth

Discipline: GIS

Drawing No:


| Noise Level dB $L_{Aeq(24h)}$ | PPFs Altered dB $L_{Aeq(24h)}$ |
|---|---|
| 55 - 60 | < 64 |
| 60 - 65 | 64 - 67 |
| 65 - 70 | > 67 |
| >70 | Other Buildings |
| | Road |
| | Assessment Area |

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Map Scale @ A3:

0 50 100
Meters

| Revision | Author | Verified | Approved | Date |
|---|---|---|---|---|
| 1 | DK | SJ | CD | 22/11/22 |

Title:
Supporting Growth
NoR R3 - Do Minimum Road Traffic Noise

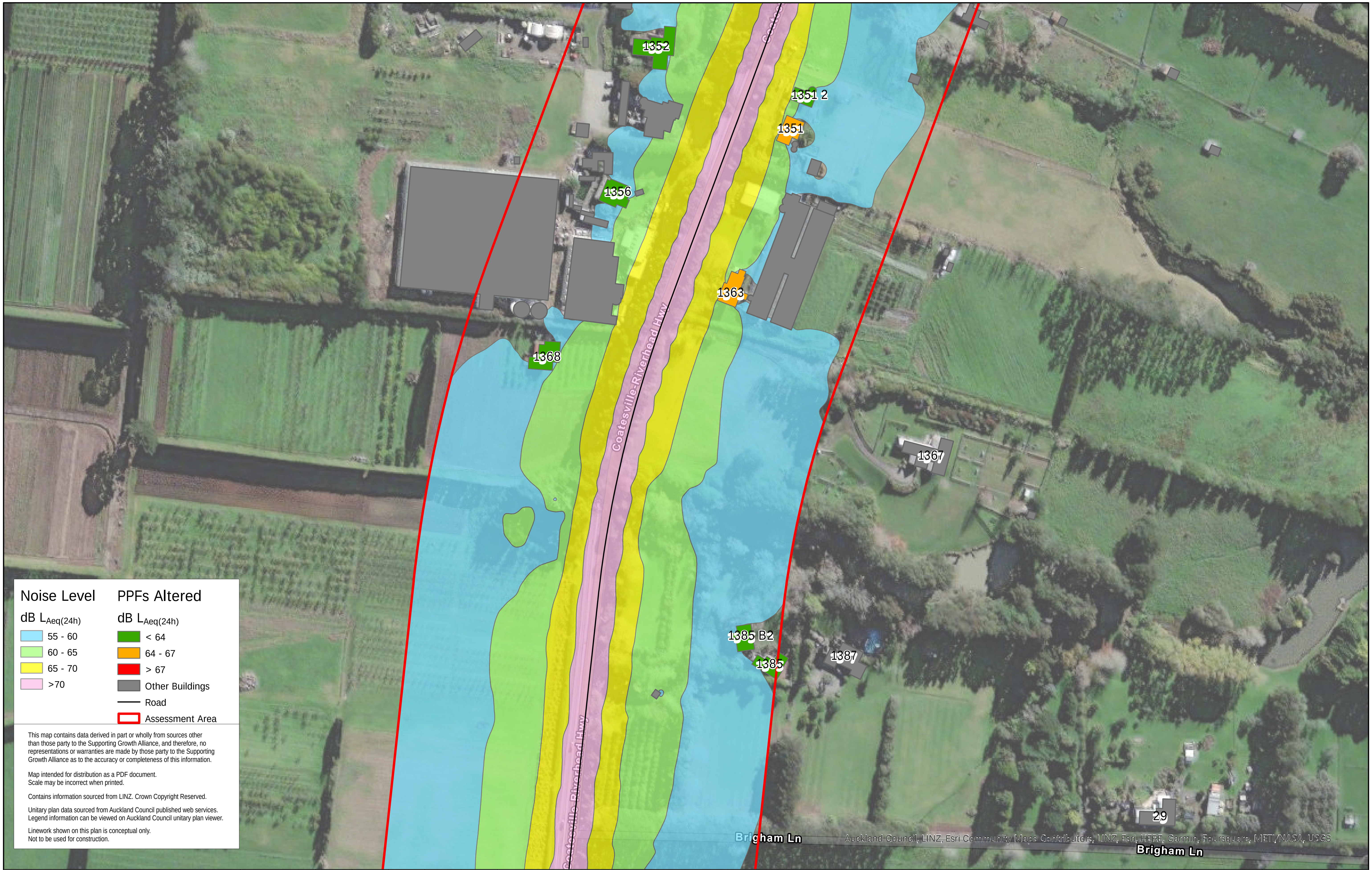
Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

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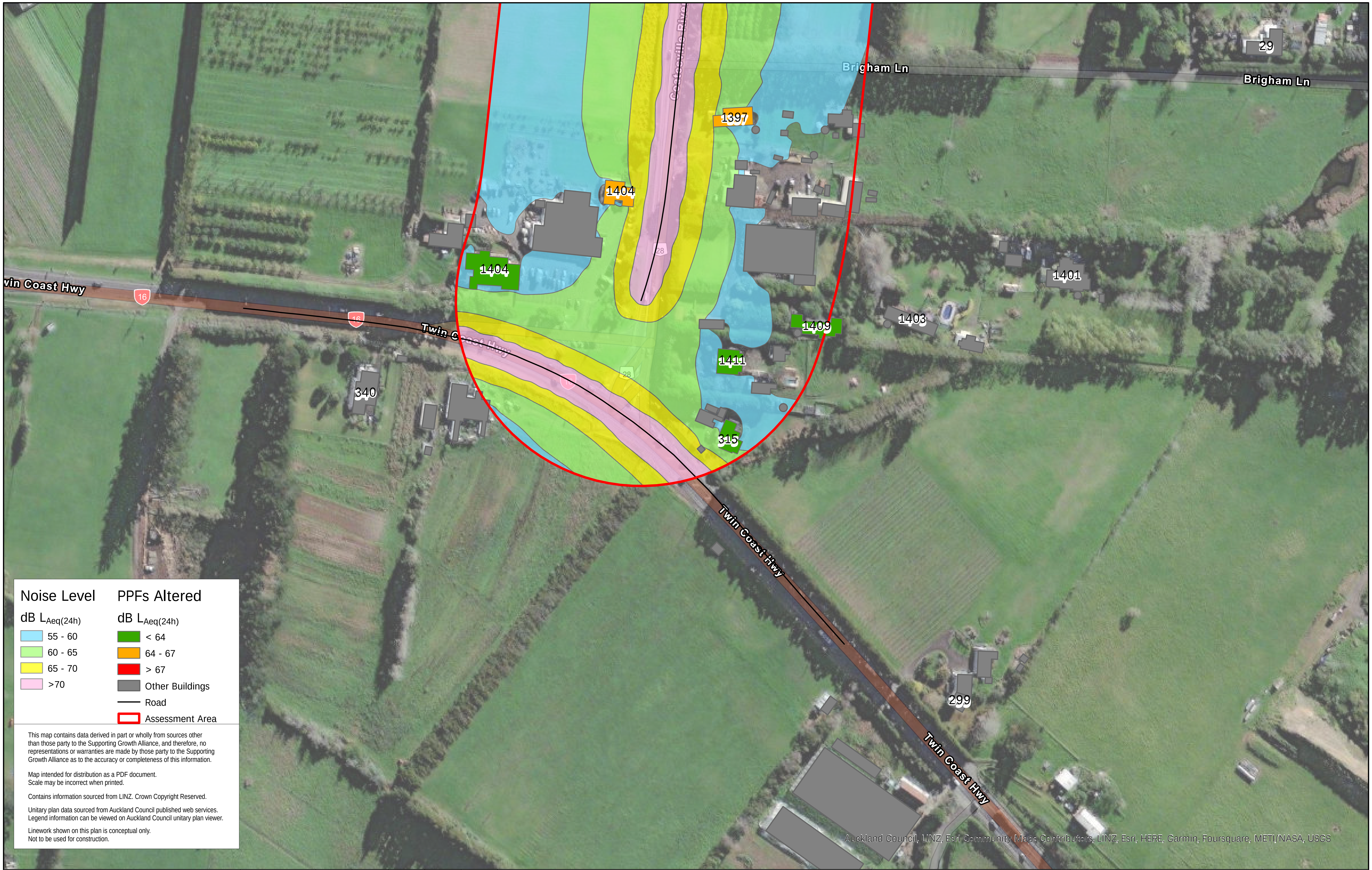


| Noise Level dB $L_{Aeq(24h)}$ | PPFs Altered dB $L_{Aeq(24h)}$ |
|---|---|
| 55 - 60 | < 64 |
| 60 - 65 | 64 - 67 |
| 65 - 70 | > 67 |
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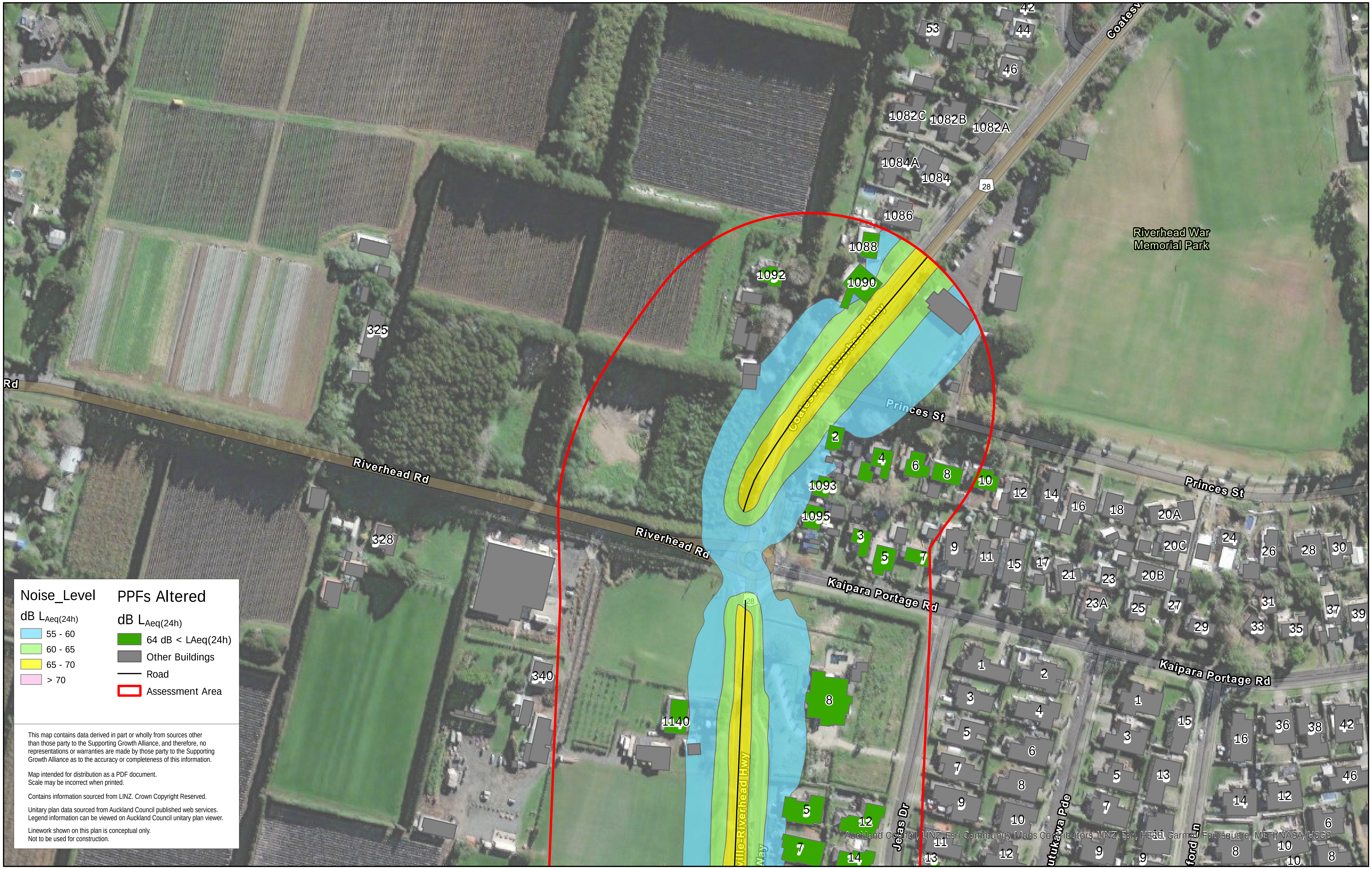


Noise_Level

dB $L_{Aeq(24h)}$

- 55 - 60
- 60 - 65
- 65 - 70
- > 70

PPFs Altered

dB $L_{Aeq(24h)}$

- 64 dB < LAeq(24h)
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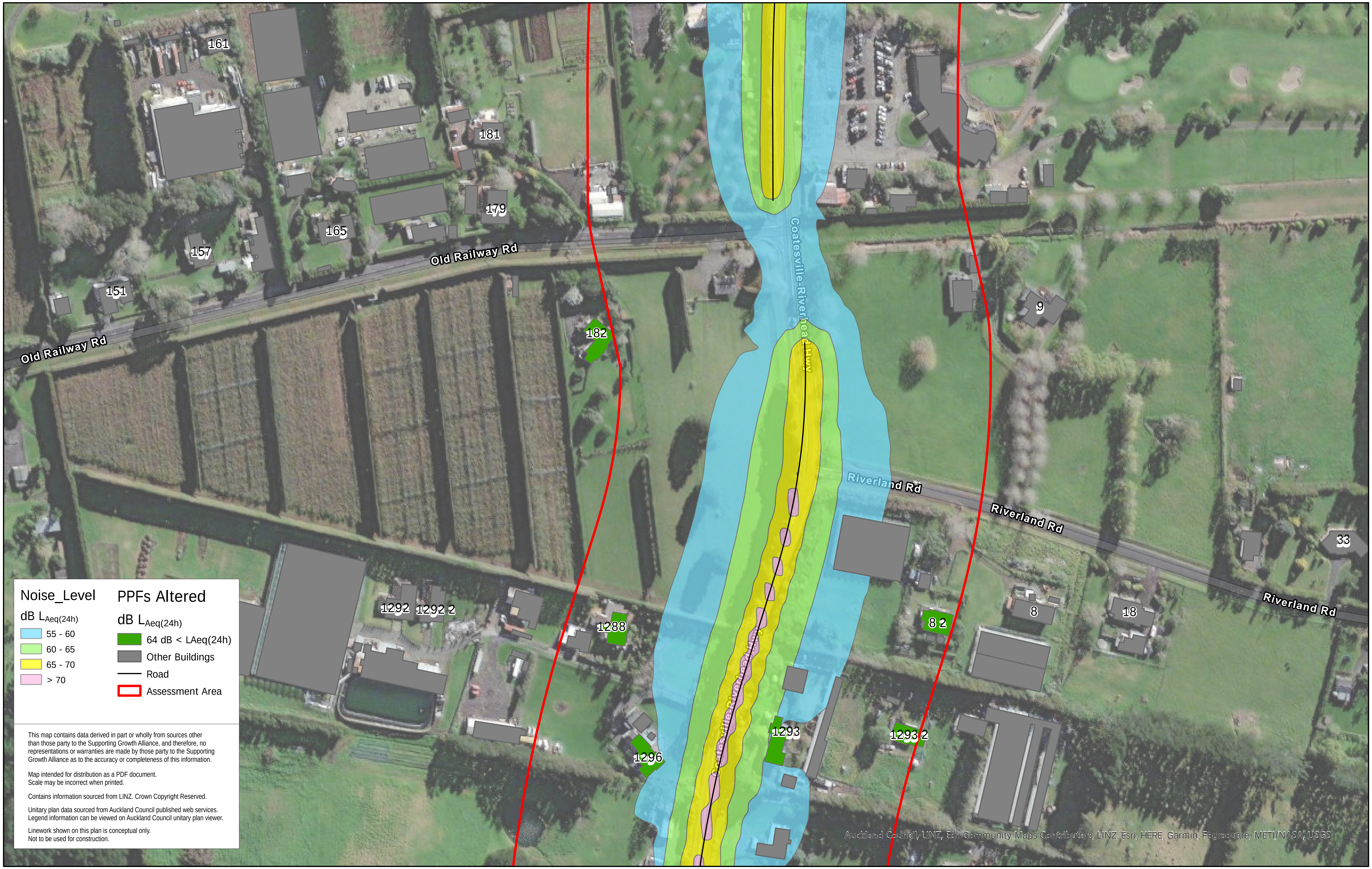


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64 dB < LAeq(24h)

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Road

Assessment Area

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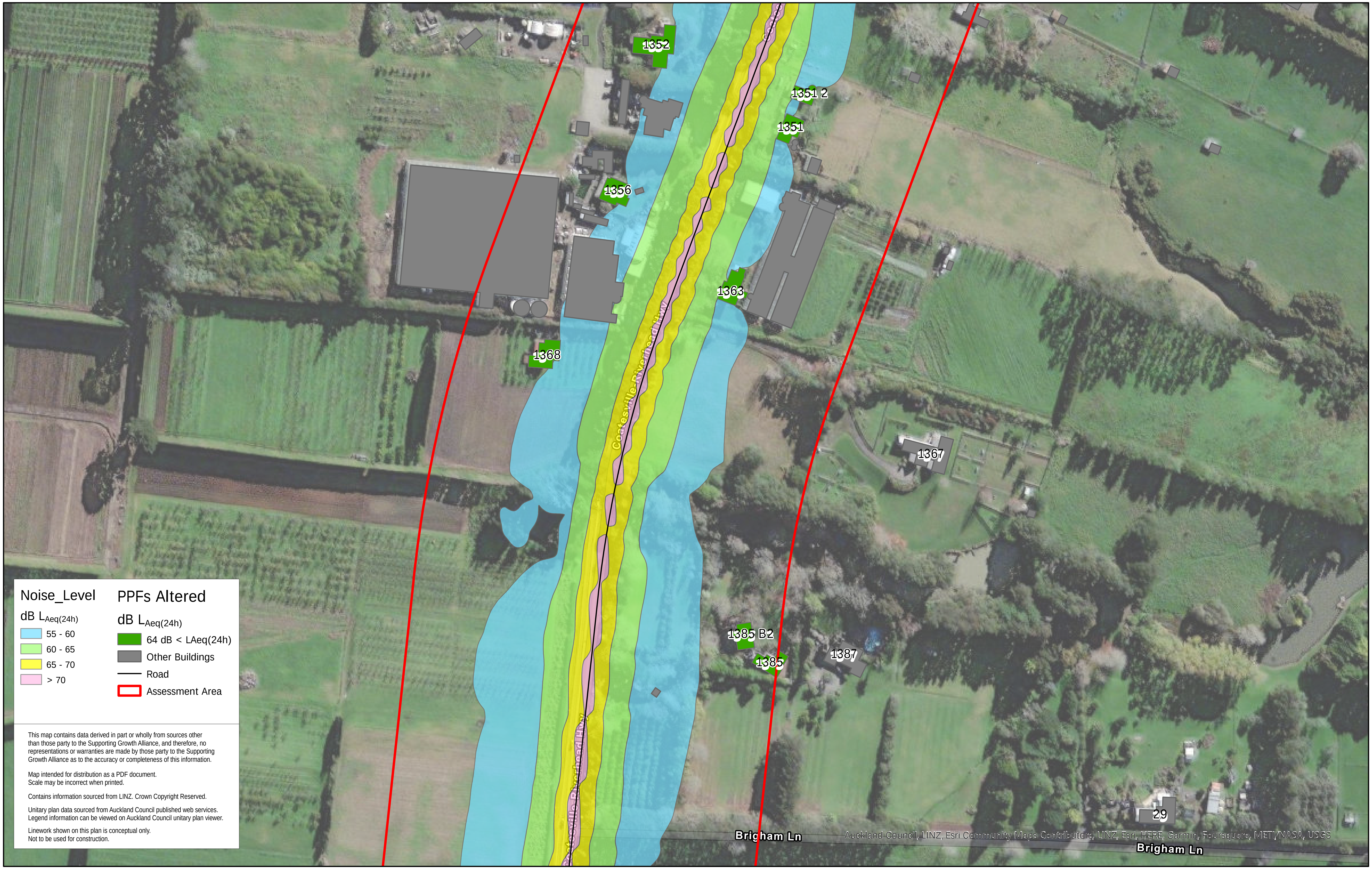


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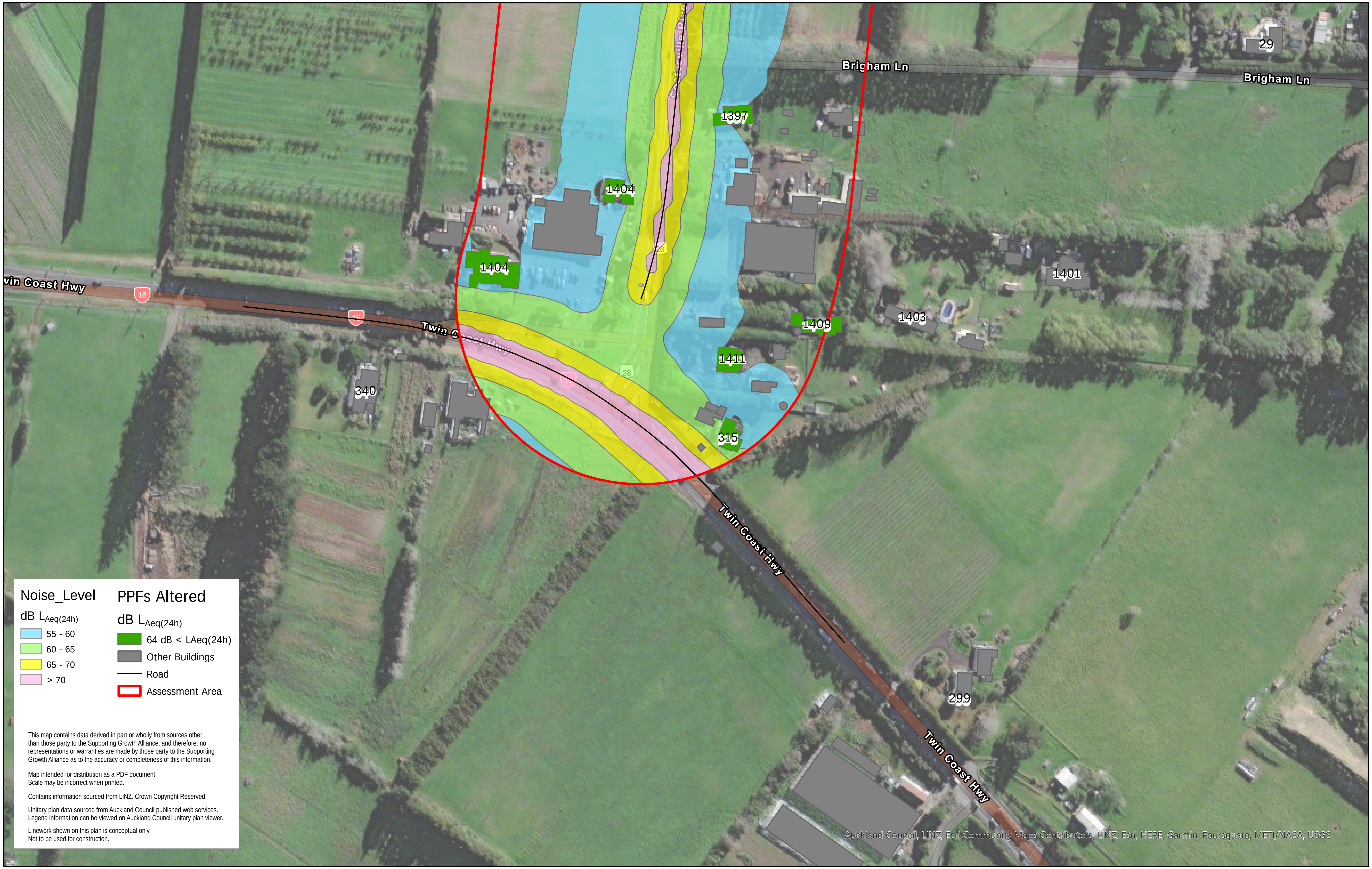


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Title: Supporting Growth
NoR R3 - Mitigated Road Traffic Noise



Client: Supporting Growth

Project: North West Package

TE TUPU NGĀTAHI
Supporting Growth

Discipline: GIS

Drawing No:

# ATTACHMENT 61

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF FLOODING EFFECTS

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Redhills Riverhead
# Assessment of Flooding Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY



New Zealand Government

## Document Status

| Responsibility | Name |
|---|---|
| Author | Loudene Marais and Katelyn Symington |
| Reviewer | Mike Summerhays |
| Approver | John Daly |

## Revision Status

| Version | Date | Reason for Issue |
|---|---|---|
| 0.1 | 16/12/2022 | Notice of Requirement Lodgement |

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# Appendices



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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AC** | Auckland Council |
| **AEE** | Assessment of Effects on the Environment |
| **ARI** | Average Recurrence Interval |
| **ASH** | Alternative State Highway |
| **AT** | Auckland Transport |
| **AUP:OP** | Auckland Unitary Plan Operative in Part |
| **BCI** | Brigham Creek Interchange |
| **CC** | Climate change |
| **CEMP** | Construction Environmental Management Plan |
| **FTN** | Frequent Transit Network |
| **FULSS** | Future Urban Land Supply Strategy |
| **FUZ** | Future Urban Zone |
| **MfE** | Ministry for the Environment |
| **MPD** | Maximum Probable Development |
| **NAL** | North Auckland Line |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **PWV** | Precipitable water vapour |
| **RCP** | Representative Concentration Pathways |
| **RL** | Reduced level |
| **RMA** | Resource Management Act 1991 |
| **RTC** | Rapid Transit Corridor |
| **RAMC** | Regional Active Mode Corridor |
| **RUB** | Rural Urban Boundary |
| **SG** | Te Tupu Ngātahi Supporting Growth |
| **SH16** | State Highway 16 |
| **Te Tupu Ngātahi** | Te Tupu Ngātahi Supporting Growth |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |

# Glossary of Acronyms / Terms

| Acronym/Term | Description |
|---|---|
| **AT** | Auckland Transport an Auckland Council controlled organisation. |
| **Auckland Council** | Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010. |
| **Dry Pond** | A permanent pond that is normally dry but during rainfall events temporarily stores stormwater runoff to control discharges. Dry ponds provide limited water quality treatment. |
| **Flood difference map** | The difference between the pre-development and post-development flood levels as shown on the map |
| **Freeboard** | An allowance above the modelled flood level, be it road level or other features (e.g. existing floor level). For buildings freeboard shall be measured from the top water level to the finished floor level. The relevant design manual shall be referred to for the appropriate freeboard and method of calculation. |
| **Lay down areas** | An area that has been cleared for the temporary storage of materials and equipment and may include site compounds, stockpiles, sediment retention ponds. |
| **MPD** | Maximum Probable Development according to the AUP:OP zonings |
| **Pre-development** | Prior to construction of the Project |
| **Post-development** | After construction of the Project |
| **Redhills Riverhead Assessment Package** | Two Notices of Requirement (for Don Buck Road and Coatesville-Riverhead Road) and one alteration to an existing designation (Fred Taylor Drive) for the Redhills Riverhead Package of Projects for Auckland Transport. |
| **Stormwater Wetland** | Constructed wetlands that temporarily store runoff and support conditions suitable for the growth of wetland plants. Stormwater wetlands provide enhanced water quality treatment of stormwater runoff through vegetation uptake, retention and settling. |
| **Terrain** | An elevation model which includes the ground levels based on 2016 LiDAR and the concept design ground levels. |
| **Wet Pond** | A permanent pond that has a standing pool of water and provides water quality treatment, and storage of stormwater runoff to reduce the peak water volume from a rainfall event and provide downstream erosion protection. |

# 1 Executive Summary

This report provides an assessment of flood risks associated with the construction, operation and maintenance of the Projects that comprise the Redhills Riverhead Assessment Package.

Flooding is a natural hazard and has therefore been considered as part of the Redhills Riverhead Assessment Package Notices of Requirement. The works required for the Redhills Riverhead Assessment Package have the potential to lead to flooding effects and an assessment of predicted flood effects is provided to demonstrate that these effects can be appropriately mitigated in the future. It is also acknowledged that there will be a subsequent process for seeking regional resource consents which will address a wider range of potential stormwater quantity and quality effects.

In the context of this assessment, flood hazard risk may include changes to:

- the flood freeboard to existing habitable buildings, overland flow paths;
- the ability to access property by residents and emergency vehicles;
- the level of flooding to roads and flooding arising from the blockage of stormwater drainage;
- effects to existing habitable buildings / infrastructure and potential future effects on upstream and downstream properties.

**Methodology**

The assessment of flooding effects for the Redhills Riverhead Assessment Package has involved the following steps:

- Desktop assessment to identify potential flooding locations from Auckland Council Geomaps.
- Modelling of the pre-development and post-development terrain with Maximum Probable Development (MPD) and 100 year Average Recurrence Interval (ARI) plus climate change rainfall.
- Two climate scenarios were modelled, one allowing for 2.1°C of temperature increase and one for 3.8°C of temperature increase. The higher climate change scenario has been used to undertake a sensitivity analysis to understand the increased risk of greater climate change impacts.
- Producing flood level maps for pre-development and post-development scenarios and flood difference maps to show the change in flood levels and extents (greater than 50 mm) as a result of the Project.
- Inspection and review of flood difference maps at key locations such as bridges and where there are noticeable changes in flood extents or flood levels.

While stormwater effects apart from flooding are not assessed, provision is made for the future mitigation of potential stormwater effects (stormwater quantity, stormwater quality and instream structures) by identifying the space required for stormwater management devices (for example drainage channels and ponds) and incorporating land for that purpose into the proposed designation boundaries. These devices have been designed to attenuate the 100year ARI event using 10% of the total roading impervious catchment area (proposed and existing) in accordance with Auckland Council and Waka Kotahi guidance[1,2]. Note for existing roads being widened this allows for greater impervious area than the road widening alone.

[1] Auckland Council's Stormwater Management Devices in the Auckland Region, Guideline Document 2017/001 (December 2017)
[2] Waka Kotahi NZTA's Stormwater Design Philosophy Statement (May 2010)

The assessment considers that flooding effects will be subject to further assessment at a detailed design stage. It is expected that coordination and integration of the corridor design with future urban zone (FUZ) development will be undertaken to confirm and mitigate potential future adverse effects.

**Positive Effects**

There is the potential for a number of positive effects associated with the projects. These include where the existing road levels will be raised, reducing the potential for flood levels to overtop the road and reducing flood hazard. Additional positive effects can be realised through upgrades to existing culverts or new culvert crossings to improve overland and stream flow under the proposed project corridor. The scale of these effects will be determined at detailed design stage. Water quality treatment allowances will result in reduced environmental impacts as the total road area, and not just the added road area, for existing roads have been included for treatment.

**Construction phase effects**

The potential construction flooding effects can be appropriately managed with the measures set out in Section 7.1 . It is expected that construction works can be carried out in a way that will appropriately manage the risk. Flood risk mitigation measures will be captured in the Construction Environmental Management Plan (CEMP) and it is recommended this be included as a condition of the proposed designation.

**Operational phase effects**

**NoR RE1: Don Buck Road FTN Upgrade**

There is no additional risk of flooding expected as the corridor is located on a ridgeline and in an area that has already been developed i.e. does not have FUZ. The project design includes adequate stormwater attenuation and treatment for the additional impervious area from the widened road which will also minimise any additional risk of flooding and improve water quality.

**NoR RE2: Fred Taylor Drive FTN Upgrade (alteration to existing designation 1433)**

There is a minor risk of flooding at points FT1 and FT2 outside of the Project area. This risk is due to an existing flood issue however the widening of the road corridor may increase flood levels on the western side of the corridor. In order to minimise flood effects, it is recommended that the overland flow path is realigned and upgrades to existing culverts are investigated at the detailed design stage with the aim of achieving flood neutrality.

There is a minor risk at point FT3 where the proposed corridor upgrade intercepts this flood plain. It is recommended that realignment of the overland flow path is reviewed at the detailed design stage to minimise or mitigate the potential effect.

Potential flooding effects will be appropriately managed and will be negligible up to minor subject to the recommended design outcomes and conditions outlined in this Report.

**NoR R1: Coatesville-Riverhead Highway Upgrade**

The raising of the Coatesville-Riverhead Highway will increase freeboard at a number of points along the road. This will result in positive effects by reducing the risk of the road flooding (specifically at Chainage 320, Chainage 700, Chainage 1040 Chainage 1940). Detailed design should confirm if any additional cross drainage is required to achieve flood neutrality.

The road currently overtops during the 100 year flood event and there is a minor risk of flooding at points CR1, CR2 and CR3. Mitigation measures include providing a new channel with an inlet structure west of the corridor and to upgrade the existing pipe network to allow more flow through to minimise or mitigate the potential flood effect. At point CR4 there is a positive effect from the redirection of stormwater through the new inlet/pipe, however there is a moderate increase at Point CR5 as a result of this change. The moderate effect can be mitigated by providing new diversion drains alongside road to discharge into the new inlet and pipe that flows into the open channel to the east.

Potential flooding effects will be appropriately managed and will be negligible up to minor subject to the recommended design outcomes and conditions outlined in this Report.

**Sensitivity Analysis**

The sensitivity analysis for the potential increased rainfall due to climate change found there was a slight change to the identified flood effects at key locations under a more severe climate change scenario (3.8 degree temperature change). However, no additional mitigation is required as it is anticipated these effects can be mitigated as set out above.

**Conclusion**

There may be some temporary construction phase flooding risk associated with temporary works required for the construction of culverts and stormwater management infrastructure. However, the details of the construction approach will be confirmed at detailed design.

It is expected that construction works can be carried out in a way that will appropriately manage the risk, and this can be defined through flood risk mitigation measures captured in the CEMP. Flood hazard has been identified as a matter to be addressed in the CEMP and included as a condition of the proposed designation.

The operational flood risks are classified as minor to moderate. Operational impacts will aim to be resolved during detailed design by optimising the design of culverts to minimise flood effects upstream and downstream of culvert crossings. Potential flooding effects will be appropriately managed and will be negligible up to minor subject to the recommended design outcomes and conditions outlined in this Report.

# 2 Introduction

This flooding assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "**Redhills Riverhead Assessment Package**"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

This report assesses the flooding effects of the North West Redhills Riverhead Assessment Package identified in Figure 4-1 and Table 2-1 below.

Refer to the Assessment of Effects on the Environment (AEE) for a more detailed project description.

**Table 2-1: North West Redhills Riverhead Assessment Package – Notices of Requirement and Projects**

| Notice | Project |
|---|---|
| **NoR RE1** | Don Buck Road FTN Upgrade |
| **NoR RE2** | Fred Taylor Drive FTN Upgrade (alteration to existing designation 1433) |
| **NoR R1** | Coatesville-Riverhead Highway Upgrade |

## 2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Redhills Riverhead Assessment Package. Its purpose is to inform the AEE that accompanies the Redhills Riverhead Assessment Package sought by Waka Kotahi and AT.

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Redhills Riverhead Assessment Package on the existing and likely future environment as it relates to flooding effects and recommends measures that may be implemented to minimise, remedy and / or mitigate these effects.

The key matters addressed in this report are as follows:

a) Identify and describe the stormwater context of the Redhills Riverhead Assessment Package area;
b) Identify and describe the actual and potential flooding effects of each Project corridor within the Redhills Riverhead Assessment Package;
c) Recommend measures as appropriate to minimise, remedy or mitigate actual and potential flooding effects (including any conditions/management plan required) for each Project corridor within the Redhills Riverhead Assessment Package; and
d) Present an overall conclusion of the level of actual and potential flooding effects for each Project corridor within the Redhills Riverhead Assessment Package after recommended measures are implemented.

This report draws a distinction between stormwater effects and flood hazard effects, which are a subset of potential stormwater effects.

Stormwater effects are broadly divided into:

- Quantity effects (such as flooding, erosion and changes to hydrology - which may cause effects on stream habitat, baseflow and sediment movement in streams),
- Quality (including the discharge of contaminants – which may cause effects on aquatic fauna, public health and amenity values) and the effects on streams due to the presence of in-stream structures.

These effects are considered through RMA section 13, 14 and 15 consents and are administered by regional councils (or, in the case of Auckland, as regional consents by the Auckland Council as a Unitary Authority).

Provision is made for the future management of the stormwater effects (stormwater quantity, stormwater quality and instream structures) by identifying the space required for stormwater management devices (for example drainage channels and wetlands) and incorporating land for that purpose into the NoRs. In identifying the land required for these devices, preliminary sizing and siting has been undertaken and offset allowances made for construction phase works.

The designation is a land use or district planning mechanism. Hence, the assessment of effects has been limited to flood hazard matters as they are the only matters that would trigger a District Plan consent requirement under the AUP:OP. In presenting information on flood hazard effects, it is therefore acknowledged that there will be a subsequent process for seeking regional council consents.

Flood hazard effects include changes to; the flood freeboard to buildings, the depth of flooding on property, the creation of new overland flow paths, the ability to access property by residents and emergency vehicles and potential flood prone areas caused by blockage of culverts.

## 2.2 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each Project corridor and project features within the Redhills Riverhead Assessment Package as it relates to stormwater,
c) Identification and description of the existing and likely future flooding environment;
d) Description of the actual and potential positive effects of the Project;
e) Description of the actual and potential adverse flooding effects of construction of the Project;
f) Description of the actual and potential adverse flooding effects of operation of the Project;
g) Recommended measures to minimise, remedy or mitigate potential adverse flooding effects; and
h) Overall conclusion of the level of potential adverse flooding effects of the Project after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised for the Project, 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 flooding. 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.

## 2.3 Preparation for this Report

In preparation of this report several resources were used to support the assessment. These included technical specialist inputs, previous reports, catchment flood models and team workshops.

The AUP:OP was used to identify the existing and likely future environment. Information from the Project Team and SGA Redhills and Riverhead models were used to assess the flood water levels and extents of the existing (pre-development) terrain.

It should be noted the existing terrain (based on AC 2016 LiDAR) has been used for flood modelling of the pre-development and post-development scenarios as there is no information about what future landforms will take.

# 3 Assessment Methodology

## 3.1 Chapter Summary

The assessment of flooding effects has involved the following steps using the AC and SG GIS to identify where:

- Desktop assessment to identify potential flooding locations, namely:

  – Existing buildings appear to be near/within the existing flood plains.
  – Where the Projects involve work near stream crossings and major overland flow paths.

- Flood modelling of the pre-development (without SGA) and post-development (with SGA) terrain, including:

  – Flood modelling of the proposed future land use using Maximum Probable Development (MPD) development with the 100 year ARI plus climate change rainfall
  – Model results were used to identify changes in the flood water levels to create flood difference maps.

- Inspection of the flood difference maps to identify flooding effects, including:

  – At key cross drainage locations such as culverts and where there are noticeable deep flood levels, consideration was given to flood hazard issues.
  – Properties and buildings with habitable floors showing potential to flooding hazard through flood extent within the existing building footprints.

- A sensitivity analysis to assess the potential risk of extreme climate change (3.8°) compared to the existing projected climate change temperature increase (2.1°).

## 3.2 Outcomes based approach

The stormwater and flooding considerations are based on an indicative design and proposed designation boundary which incorporate flexibility for design changes to respond to the future environment. The effects assessment is based on the Project being able to meet the requirements of the proposed designation condition and provide any required mitigation within the designation boundary.

The proposed condition requires the Project be designed to achieve the following outcomes:

- No increase in flood levels for existing authorised habitable floors that are already subject to flooding (that is, no increase in flood level where the flood level using the pre-project model scenario is above the habitable floor level)
- No more than a 10% reduction in freeboard for existing authorised habitable floors (that is, if existing freeboard was 500mm, an acceptable change would be to reduce freeboard to 450mm)
- No increase of more than 50mm in flood level on land zoned for urban or future urban development where there is no existing habitable dwelling
- No new flood prone areas (with a flood prone area defined as a potential ponding area that relies on a single culvert for drainage and does not have an overland flow path)

- No more than a 10% average increase of flood hazard (defined as flow depth times velocity) for main access to authorised habitable dwellings.

Compliance with the recommended flooding outcomes, secured by the proposed condition, will ensure that potential flooding effects will be negligible up to minor and appropriately managed.

Where the above outcomes can be achieved through alternative measures outside of the designation such as flood stop banks, flood walls and overland flow paths, this may be agreed with the affected property owner and Auckland Council.

This assessment identifies where flood effects require consideration and the types of mitigation measures that could be implemented to address the effect. The designation boundary has been confirmed to provide sufficient land to accommodate those potential mitigation measures identified.

Compliance with these flooding outcomes would be demonstrated through a detailed stormwater design and further flood modelling of the pre-development and post-development 100 year ARI flood levels (with allowances for full development according to the AUP:OP zonings with associated imperviousness and climate change) at the resource consent stage.

## 3.3 Desktop Assessment

To identify locations considered to be at risk of flooding effects a desktop study was carried out to identify areas where:

- Existing buildings are near / within the existing flood plains
- The project involves carrying out significant work near the stream crossings / major overland flow paths
- The project may alter the existing flood plains, ponding volumes, and natural drainage paths.

The following reference materials were used to perform the desktop study:

- Auckland Unitary Plan Operative in Part
- Auckland Council GIS resources (Auckland GeoMaps)
- Design Drawings
- Flood maps created by the SG modelling team
- Indicative Construction Methodologies
- NZTA Stormwater Specification P46
- New Zealand Bridge Manual (SP/M/022) for freeboard allowance

A full list of references is provided in Section 13.

## 3.4 Flood Modelling

### 3.4.1 Stormwater Catchment Overview

The projects are situated within the Whenuapai, Redhills, Riverhead and Massey stormwater catchments as shown in Figure 3-1.

The Whenuapai catchment is approximately 1,931 ha and drains by numerous creeks and streams, including Brigham Creek, Totara Creek and Waiarohia Stream. The Redhills catchment is approximately 1,366 ha and drains by the Waiteputa and Ngongetepara Streams. The Massey catchment is approximately 914 ha and drained by Momutu Stream, Manutewhau and Rarawaru Streams. The Riverhead catchment is approximately 1,299 ha and drains mainly by Rangitopuni Stream and smaller unnamed streams. The receiving environment for the Whenuapai, Redhills, Massey and Riverhead catchments is the upper reaches of the Waitemata Harbour.

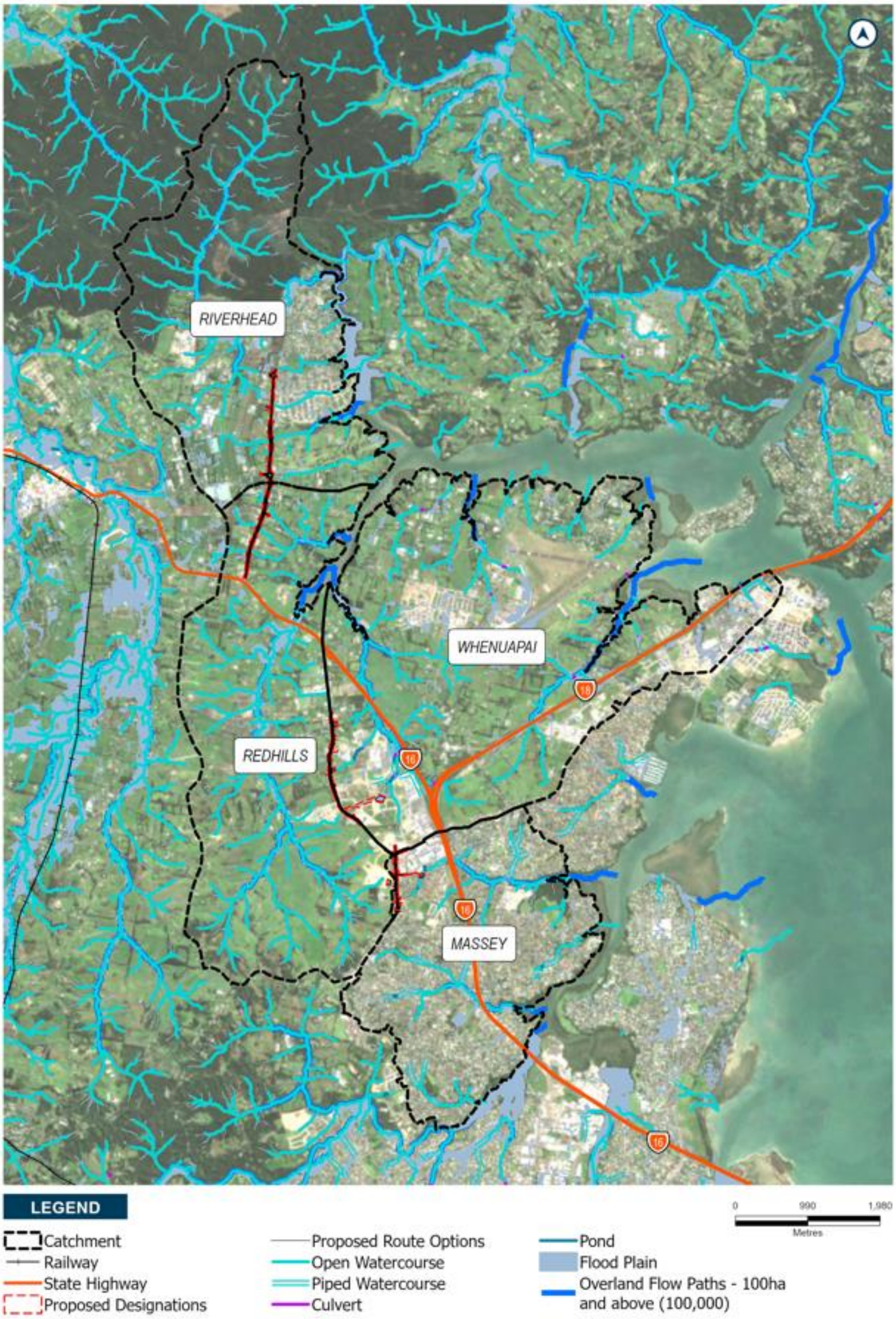


**Figure 3-1: Existing 100 year ARI flood pain for Whenuapai, Massey, Riverhead and Redhills catchments (Auckland Council GIS)**

### 3.4.2 Modelling Parameters

Auckland Council have produced Whenuapai, Redhills and Riverhead Rapid Flood Hazard Assessment catchment models which were adapted for this assessment (the models).

The Massey catchment flood model, which covers NoR RE1 (Don Buck Road FTN Upgrade), has not been used for this assessment as the NoR RE1 corridor is located on a ridge, in an area that is already developed, and no increased flooding risk is anticipated from either change in terrain or impacts on crossings.

To assess the flooding effects of the Project on the Whenuapai, Redhills and Riverhead catchments two scenarios were considered for NoR RE2 Fred Taylor Drive FTN Upgrade (alteration to existing designation 1433) and NoR R1 Coatesville-Riverhead Highway Upgrade.

The two scenarios modelled for the assessment of effects are:

Scenario 1: pre-development

- Future 100 year ARI rainfall event with 2.1°C of warming and future land-use without the project in place

Scenario 2: post-development

- Future 100 year ARI rainfall event with 2.1°C of warming and future land-use with the project in place

For the sensitivity analysis a further two scenarios were modelled:

Scenario 3: pre-development increased climate change

- Future 100 year ARI rainfall event with 3.8°C of warming and future land-use without the project in place

Scenario 4: post-development increased climate change

- Future 100 year ARI rainfall event with 3.8°C of warming and future land-use with the project in place

The modelling used an indicative design for the road which is not the final design. The type and size of cross drainage structures are not fixed and will be assessed further for subsequent regional consenting and design phases. Changes to these structures will alter the model outputs and upsizing the crossings may be required to reduce upstream and downstream flood risk.

The models include the existing roads and existing culverts where the culverts are 600mm or greater and details could be located. In the models existing culverts < 600 mm diameter are considered to be fully blocked although larger culverts are considered to be fully working.  This approach is a refinement of the AC rapid flood hazard modelling approach where pipes smaller than 1,200mm are excluded from the model. The reason for selecting 600mm is that the risk of blockage is much greater.

New culverts have been added to convey flows at existing overland flow paths that are crossed by new road alignments and some existing culverts have been extended to allow for the proposed road widening. To extend the culverts the existing grade has been extrapolated and the inlet and outlet invert levels have been established.

New bridges are incorporated into the model by leaving a gap in the terrain to replicate the bridge opening. Piers are not modelled specifically.

### 3.4.3 Climate Change

Climate change is accounted for in the model runs as per the revised Auckland Council (AC) Code of Practise (CoP) version 3 dated January 2022, which allows for 2.1°C of warming and a 16.8% increase on rainfall. A sensitivity analysis to understand the risk of climate change by comparing the results of 2.1°C of warming to 3.8°C of warming see Section 12.

### 3.4.4 Modelling Outputs

The modelling outputs were used to identify changes in predicted flood water levels and flooding extents. Increased flood hazard is associated with higher risk effects, for example a change in flood water level on land can result in the loss of use of the land or a reduction in the performance of drainage systems. The assessment criteria for the flooding assessment are shown in Table 3-1. For those areas identified as having potential flood effects mitigation measures have been proposed which can be addressed at detailed design stage.

**Table 3-1: Flooding effects assessment criteria**

| **Effect** | **More vulnerable uses e.g. residential dwellings** | **Less vulnerable uses e.g. open space, road corridors, commercial and industrial buildings** |
|---|---|---|
| Positive | A reduction in flood level | A reduction in flood level |
| Negligible | Less than 0.05 m | Less than 0.05 m |
| Minor | 0.05 m to 0.5 m | 0.05 m to 0.15 m |
| Moderate | Greater than 0.5 m | Greater than 0.15 m |

For more vulnerable land uses, including dwellings, if less than 0.5 m freeboard is available there is a greater risk of damage to property. The effects of properties identified as potentially at risk of flooding considers the flood water level only. Surveyed floor levels of the existing habitable buildings are not available and should be done during the detailed design stage.

The required freeboard for bridges and culverts used to assess the suitability of the indicative design is set out in Table 3-2.

**Table 3-2 Freeboard allowance for the level of serviceability to traffic (NZ Bridge Manual)**

| **Waterway Structure** | **Situation** | **Freeboard** | |
|---|---|---|---|
| | | **Measurement Points** | **Level (m)** |
| Bridge | Normal circumstances | From the predicted peak flood water level to the underside of the superstructure | 0.6 |
| | Where the possibility that large trees may be carried down the waterway exists | | 1.2 |

| Waterway Structure | Situation | Freeboard | |
|---|---|---|---|
| | | Measurement Points | Level (m) |
| Culvert | All situations | From the predicted flood water level to the road surface | 0.5 |

### 3.4.5 Future Urban Zone

Development within the FUZ areas will change catchment hydrology, the terrain, building and property types that are potentially exposed to flooding. The assessment has therefore considered specific effects on existing properties and more generally considered effects on potential future development. It is anticipated that future developments will take account of flood risk and manage that risk within their development.

The models do not include the additional runoff generated by the increased impervious area from the new road as stormwater devices have been designed to adequately capture this additional runoff (see Section 3.4.6). However, the models do account for the increased impervious area as a result of development within the FUZ area.

Hence, the models' output incorporates a high degree of conservatism around future flood effects as it is anticipated that future developments outside the designation will need to design, construct and operate their own stormwater devices to ensure they can mitigate the stormwater generated by additional impervious areas to the pre-development scenario.

It is anticipated that coordination and integration of the corridor design with FUZ development will be required to confirm and address potential future effects. Mitigation measures in the future detailed design will reflect the actual development in the FUZ areas. See Section 3.4.6 for more detail of the limitations of this assessment.

### 3.4.6 Model Limitations

NoR RE2 Fred Taylor Drive FTN Upgrade (alteration to existing designation 1433) and NoR R1 Coatesville-Riverhead Highway Upgrade have upstream and / or downstream catchments which contain FUZ. The modelled scenarios use imperviousness assumptions associated with the future land use(s) shown in the Auckland Plan. However, it is possible that significant change in the catchments may take place before or shortly after the corridor is constructed. Therefore, it is anticipated that further modelling will be required during the corridor detailed design phase to take account of catchment characteristics at that time.

Rapid Flood Hazard Assessment models have a relatively coarse terrain grid and do not include stormwater drainage pipes smaller than 600mm diameter. Culverts have been added at selected crossings of the project corridors. However, the results from the models are considered appropriate to assess the relative or overall flooding effects due to the project corridors for the current stage of design.

Generally NoRs for the Redhills and Riverhead Assessment Packages are located on elevated terrain (ridgelines) and it is unlikely that upgrades to existing culverts will be required. However, any new or upgraded culverts will be confirmed at the detailed design stage and will take into account matters such as consent requirements, asset owner requirements, level of service, stream simulation design, fish passage and possible blockage.

The Massey catchment flood model, which covers NoR RE1 was not built. The pre-development model was not considered necessary as the corridor is located on a ridgeline and does not include flood plain or flood prone areas. A post-development flood model was not considered necessary to assess the effects as the area has already been developed i.e. does not have FUZ, therefore no significant changes in topography which would result in increased flooding risk are anticipated. The preliminary design has considered stormwater attenuation for the additional impervious area of the widened road (see Section 3.5).

### 3.4.7 Sensitivity Analysis

Sensitivity is the degree to which a system is affected, adversely or beneficially, by a given exposure[3]. In this instance the sensitivity of the designation to increased rainfall as a result of climate change has been considered.

As set out in Section 12 the flood model has allowed for 2.1°C of warming and a 16.8% increase on rainfall based on the AC CoP. However, given the uncertainty of climate change effects in the future the assessment has also considered a more severe climate change scenario based on 3.8°C of warming and a 32.7% increase on rainfall.

The results for 3.8°C of warming have been compared to those reported in the flood assessment for 2.1°C of warming and areas where higher rainfall may increase flooding risk have been identified. Further mitigation at these locations has been included where necessary to encourage flood resilience.

In the future it is possible there may be different requirements for climate change, however, at this time a pragmatic approach has been taken and the sensitivity analysis has been prepared to better understand the risk of climate change and enable decision makers to respond to this.

[3] Intergovernmental Panel on Climate Change. (2007). Climate Change 2007: Contribution of Working Group II to the Fourth Assessment Report. Cambridge, UK: Cambridge University Press.

## 3.5 Stormwater devices

While stormwater effects apart from flooding are not assessed, provision is made for the future management of potential stormwater effects (stormwater quantity and stormwater quality) by identifying the space required for stormwater management devices (SWMDs, i.e. treatment swale and wetlands) and incorporating land for that purpose into the NORs. In identifying the land required for these devices, preliminary sizing and siting has been undertaken and extra space allowed for constructing the works.

Some key assumptions that were used to identify the amount of land sought for stormwater management works within the designation include the following:

- Wetlands are sized to attenuate 100 year peak flows from the corridor (as of the required stormwater wetland sizing criteria this gives the largest footprint). Quality and retention/detention requirements are able to fit within the footprint
- Allowance is made for wetland attenuation storage and hydraulic gradients from corridor inlet to discharge point (typically a minimum of 2.0 to 2.5m vertically)
- Wetland geometry and footprints were modelled to determine the required cut and fill and a 15m buffer added for construction purposes and maintenance access
- A minimum 6m buffer is provided around the corridor earthworks extents to provide space for construction purposes and allow for works such as drainage channels and culvert inlets/outlets and flexibility in the vertical alignment
- Diversion channels are identified where they are needed to prevent upstream flooding.

These allowances are considered appropriate for sizing the devices at this early stage of the design process and also provide some flexibility for future refinement. The design of devices is not discussed further in this report as this is considered a matter that will be developed further for the future regional consents and implementation processes.

In general, the approach has been to avoid SWMDs in floodplains where possible. If this is not possible, the design has sought to employ offline systems located in low velocity flood zones where has minimal risk of scour for resilient and maintainable systems.

The flood model does not account for the flood water storage capacity provided by the proposed SWMDs (wetlands or swales) even though they are designed with attenuation capacity for the additional runoff generated by the increased impervious area from the new road infrastructure.

While the project is not intended to remediate existing flood hazards, it is anticipated the proposed SWMDs will provide improvements in water quality and attenuation where practicable.

# 4 Redhills Riverhead Assessment Package Overview

An overview of the Redhills Riverhead Assessment Package is provided in Figure 4-1 below.


Figure 4-1: Redhills and Riverhead Assessment upgrades

A summary of the Redhills Riverhead Assessment Package projects is provided in Table 4-1 below.

Table 4-1: Redhills Riverhead Assessment Package Project Summary

| Corridor | NOR | Description | Requiring Authority |
|---|---|---|---|
| **Don Buck Road FTN Upgrade** | RE1 | Upgrade of Don Buck Road corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Fred Taylor Drive FTN Upgrade** | RE2 | Upgrade of Fred Taylor Drive corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Coatesville-Riverhead Highway Upgrade** | R1 | Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial cross-section with active mode facilities on the western side; and<br><br>Upgrading the northern section of the corridor to a 24m two-lane urban arterial cross-section with active mode facilities on both sides of the corridor. | Auckland Transport |

Please refer to the AEE for further information on these projects, including a project description, key project features and the planning context.

# 5 Summary of Modelling Results

A summary of the operational effects for each of the corridors is set out in . The outcomes generally reflect a negligible up to minor flood effect i.e. <0.05m increase in flood depth.

The outcomes set out in Section 3.2 will form part of the designation conditions and compliance with those conditions will ensure the residual flood effects for all NoRs will be negligible up to minor.

Table 5-1 below and discussed in more detail in Section 8. There will be a minor effect for NoR RE2 and a minor up to moderate effect for NoR R1.

Indicative mitigation measures have been provided in in Section 8 which will minimise flooding effects and help enable the outcomes set out in Section 3.2 to be met. The outcomes generally reflect a negligible up to minor flood effect i.e. <0.05m increase in flood depth.

The outcomes set out in Section 3.2 will form part of the designation conditions and compliance with those conditions will ensure the residual flood effects for all NoRs will be negligible up to minor.

**Table 5-1: Summary of flood modelling results**

| Corridor name | Location | Potential effect without mitigation | Potential effect with implementation of the recommended flooding outcomes |
|---|---|---|---|
| NoR RE1 | n/a | n/a | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| NoR RE2 | FT1 (Figure 10-1)<br>Building/ house/ driveway, FUZ | +0.13 m increase in flood level,<br>Minor effect | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | FT2 (Figure 10-1)<br>Open area, FUZ | +0.24 m increase in flood level,<br>Minor effect | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | FT3 (Figure 10-1)<br>Building/ house/ driveway, FUZ | +0.12 m increase in flood level,<br>Minor effect | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| NoR R1 | Coatesville Riverhead Highway south of Moontide Road (Chainage 700, points 15 and 16 Figure 11-1)<br>Road corridor | -0.06 m upstream, +0.07 m downstream,<br>Positive effect upstream, minor effect downstream<br>Design road level is outside of flood plain | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | Coatesville Riverhead Highway north of Brigham Lane (Chainage 320, points 17 and 18 in Figure 11-1)<br>Road corridor | -1.65 m upstream, -0.10 m downstream,<br>Positive effect<br>Design road level is outside of flood plain | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | Point CR1 (Figure 11-2)<br>Building/ house/ driveway, FUZ | +0.20 m increase in flood level,<br>Minor effect | No more than 0.05 m increase in flood level, Negligible up to minor effect |

| Corridor name | Location | Potential effect without mitigation | Potential effect with implementation of the recommended flooding outcomes |
|---|---|---|---|
| | Point CR2 (Figure 11-2)<br>Open area, FUZ | +0.19  m increase in flood level,<br>Minor effect | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | Point CR3 (Figure 11-2)<br>Road corridor | +0.20  m increase in flood level,<br>Minor effect | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | Point CR4 (Figure 11-3)<br>Road corridor | +1.16  m increase in flood level,<br>Negligible effect as new road level predicted to have +0.01m flood depth | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | Point CR5 (Figure 11-3)<br>Road corridor | +1.05  m increase in flood level,<br>Moderate effect | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | Coatesville Riverhead Highway south of Short Road (Chainage 1940, points 11 and 12 Figure 11-4)<br>Road corridor | -1.09 m upstream, +0.20 m downstream<br>Positive effect upstream and minor effect downstream<br>Design road level is outside of flood plain | No more than 0.05 m increase in flood level, Negligible up to minor effect |
| | Coatesville Riverhead Highway north of Moontide Road (Chainage 1040, points 13 and 14 Figure 11-5)<br>Road corridor | 0.39 m upstream, -0.12 m downstream<br>Moderate effect<br>Design road level is outside of flood plain | No more than 0.05 m increase in flood level, Negligible up to minor effect |

# 6 Positive Effects

The positive effects for projects are those where the predicted 100year ARI flood level difference map shows a decrease in water levels and an increase in freeboard for bridges, culverts and habitable buildings using the criteria set out in Table 3-1 and Table 3-2. There are positive flooding effects for NoR R1. NoR RE2 does not have any identified positive flooding effects.

Positive flooding effects for the projects include raising the existing road levels which will have a positive effect for road users by preventing flood flows across the road and reducing flood hazard. The elevated alignment will increased freeboard along Coatesville Riverhead Highway at north of Brigham Lane (Chainage 320), south of Moontide Road (Chainage 700), north of Moontide Road (Chainage 1040and south of Short Road (Chainage 1940).

The projects create the opportunity to improve existing culvert capacities and/or provide new culvert crossings to improve ponding and stream flow in the area. The final design will be subject to further flood modelling during the detailed design stage aimed at achieving flood neutrality.

# 7 Construction Effects

Construction effects apply to the entire project, however are more likely at locations within or adjacent to overland flows or flood prone areas. The proposed construction works which could result in flooding effects include:

- Construction of new culvert crossings or upgrading of existing culvert crossings;
- Installation of diversion drains / realignment of existing overland flow paths;
- Construction of new attenuation ponds or upgrading of existing attenuation ponds, and;
- Temporary use of lay down areas.

The potential effects of these are:

- Bulk earthworks to complete the contouring for new landscape features e.g. attenuation ponds and new or upgraded culverts require a dry works area and can alter overland flow paths or generate erosion and sediment effects;
- The siting of attenuation ponds within an existing overland flow path can obstruct runoff and result in flows being diverted towards existing properties due to the need for embankments.

Section 7.1 below describes methods for minimising/mitigating these potential effects.

## 7.1 Recommended Measures to Minimise, Remedy or Mitigate Construction Effects

The management and mitigation measures for construction effects are outlined below:

<u>General</u>

- Carrying out earthworks during the summer / dry months to reduce the risk of flooding;
- Locating lay down areas outside of predicted overland flow paths and flood plains;
- Managing the overland flow paths to make sure flows are not diverted toward existing buildings or properties;
- Construction Environmental Management Plans (CEMP) be developed prior to construction by an experienced Stormwater Engineer and shall mitigate the effects of temporary works, earthworks, storage of materials, temporary diversion and drainage on flow paths, flow levels and velocities. Including (but not limited to):
  - Siting construction yards and stockpiles outside the predicted flood plains;
  - Diverting overland flow paths away from area of work;
  - Minimizing the physical obstruction to flood flows at the road sag points;
  - Staging and programming to provide new drainage prior to raising road design levels and carry out work when there is less risk of extreme flood events;
  - Actions to take in response to heavy rain warnings which may include reducing the conveyance of materials and plant that are considered necessary to be stored or sited within the predicted flood plain or significant overland flow path.

<u>Construction of new and existing culvert crossings and </u>stormwater wetlands and ponds:

- Existing culvert extensions should be done prior to commencement of bulk earthworks to allow for the passage of clean water across the site;

- Installing temporary diversions to allow flows to be maintained while new culverts and ponds are constructed;
- For larger embankments requiring a longer duration of works or for overland flow paths with more regular and higher flow rates diversions should be installed prior to works commencing;
- Where no diversion is required a 6m working clearance between any earthworks and designation boundary should be adopted to accommodate access and materials;
- For larger diameter pipes (> 600mm in size) a working clearance of ±20m from the upstream extent and ±15m from the downstream extents should be provided.

# 8 Operational Effects

There are a range of operational effects particularly from proposed crossings. The model is based on an indicative design which will respond to the future environment and it may be that some of these structures are modified in the future. Future detailed design will be subject to a separate flooding assessment at the resource consent stage. For the project the assessment of operational flooding effects considered:

- New culvert crossings (≥ 600 mm diameter);
- Areas where the new road embankment encroaches onto predicted flood plain and flood prone land;
- The potential of flooding on existing properties due to the new project corridor.

The effects of these are:

- Increasing impervious areas resulting in increased runoff and potentially increased flood levels;
- Altering existing overland flow paths resulting in flows being redirected on a different alignment;
- Obstructing an existing overland flow path resulting in ponding at existing low points or newly created depressions along the corridor;
- Improving flows under the road reducing upstream flood levels and increasing flood levels at properties further downstream.

The mitigation measures set out in Section 8.1 have been designed to assist in minimising flood effects. There are a range of potential mitigation measures that can be applied and additional modelling during detailed design will consider which measures are most appropriate to ensure adverse flood effects are minimised, remedied or mitigated. The detailed design would then need to demonstrate compliance with outcomes set out in Section 3.2 as required by an appropriate designation condition.

## 8.1 Recommended Measures to Minimise, Remedy or Mitigate Operational Effects

It is recommended that during detailed design additional flood modelling is carried out and mitigation measures implemented as required to achieve the outcomes set out in Section 3.2. Compliance with these outcomes will be required as a designation condition. Based on the interim design potential mitigation measures have been identified in order to show that the feasibility to meet these outcomes has been considered.

Mitigation measures which may be implemented include:

- Creating new overland flow path diversions to discharge to nearby overland flow paths or streams to mitigate ponding and decrease flood levels at affected properties. This is where existing predicted overland flow paths run parallel to the proposed roads and do not cross under the road;
- Increasing culvert sizes so that the upstream and downstream water level differences do not increase by more than 0.5m on land zoned for urban and future urban development or 0.05m for existing floors at risk of flooding;
- Upgrading culverts by adding smaller culverts to create a balance between the flood level differences upstream and downstream;
- Installing drains at the toe of embankment sloping towards the culverts can also allow for additional storage to decrease the velocity and peak flow through the culvert crossings;

- Integrating development design requirements for FUZ upstream and downstream of the proposed corridor.

# 9 NoR RE1: Don Buck Road FTN Upgrade

## 9.1 Project Corridor Features

### 9.1.1 Catchment Characteristics

The corridor is located on a ridgeline and as such there are no visible stream crossings or major flood plains along the corridor. No flood prone areas are evident on Auckland Council GIS resources.

## 9.2 Existing and Likely Future Environment

### 9.2.1 Planning Context

The land adjacent to Don Buck Road is comprised of various business, residential and open space zoning. The following outlines the key elements of the planning context for the Don Buck Road FTN Upgrade:

- The eastern side of Don Buck Road above Westgate Drive is zoned under the AUP:OP as Business – Light Industry. To the south of Westgate Drive, the eastern side of Don Buck Road contains an Open Space – Community Zone (occupied by Massey Leisure Centre), with the remaining land zoned as Residential – Mixed Housing Zone.
- The western side of Don Buck Road is within the I610 Redhills Precinct and is predominantly zoned Residential – Mixed Housing Urban, with a portion of land in the northern section of the corridor zoned Residential – Terraced Housing and Apartment Buildings Zone (**THAB**). Land further to the west of Don Buck Road forms part of the Redhills Precinct.

Table 9-1 below provides a summary of the existing and likely future environment as it relates to the Don Buck Road FTN Upgrade.

**Table 9-1: Don Buck Road FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[4] | Likely Future Environment[5] |
|---|---|---|---|
| Business | Business (Industrial) | Low | Business |
| Residential | Residential – Mixed Housing Urban Zone<br>Residential – Terraced Housing and Apartment Zone | Low | Residential |
| Open Space | Open Space – Community Zone | Low | Open Space |

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

[4] Based on AUP:OP zoning/policy direction

[5] Based on AUP:OP zoning/policy direction

## 9.3 Proposed works

One stormwater catchment is created along the transport corridor and runoff from the catchment flows into two proposed stormwater wetlands, as shown in the Indicative Design Drawings for treatment and attenuation.

## 9.4 Assessment of Flooding Effects and Measures to Minimise, Remedy or Mitigate Actual or Potential Adverse Effects

### 9.4.1 Positive Effects

The corridor lies on a ridgeline and away from any existing flood prone areas and no increased flooding risks are anticipated. The proposed road is mostly above its existing alignment, therefore improving freeboard and reducing any potential flood risk.

### 9.4.2 Assessment of Construction Effects

Potential construction effects have been described in Section 7 above.

However it is noted the proposed upgraded Stormwater Wetland 2 is located within flood plain and overland flow path.

### 9.4.3 Recommended Measures to Minimise, Remedy or Mitigate Construction Effects

Resource consents for diversion and discharge of stormwater and stream works will be sought as part of future resource consent processes.

The potential flooding effects during construction will be considered by, and managed through, flood risk mitigation measures to be set out in the Construction Environmental Management Plan (CEMP).

All other mitigation measures as set out in in Section 7.1 apply.

### 9.4.4 Assessment of Operational Effects

No modelling results are provided, as described in section 3.4.6. The corridor is located on a ridgeline and crosses no major overland flow paths or streams and is outside any floodplain or flood prone areas therefore no operational effects are anticipated.


Figure 9-1: 100 year ARI flood difference map for Don Buck Road

### 9.4.5 Recommended Measures to Minimise, Remedy or Mitigate Operational Effects

No specific measures have been identified as there is a minimal risk of flooding. The detailed design will still need to demonstrate compliance with the outcomes set out in Section 3.2 as required by the designation conditions.

## 9.5 Conclusions

The corridor is located on a ridgeline and is not subject to risk of flooding. No potential flooding risks during operations are anticipated.

# 10 NoR RE2: Fred Taylor Drive FTN Upgrade

## 10.1 Project Corridor Features

### 10.1.1 Catchment Characteristics

The project corridor runs predominantly on a ridgeline with several overland flow paths and streams draining west of the corridor towards Ngongetepara Stream and east of the corridor towards Totara Creek. An existing minor culvert crossing drains the low-lying area alongside the road at Chainage 1040.

Existing flood prone areas have been identified from Auckland Council GIS at Chainages 1500 and 2520. A flood prone area and an existing 375 mm diameter pipe crossing are at Chainage 1040. The existing overland flow path in this location is shown to flow alongside the road towards Hailes Road.

Flood plains are evident on both sides of the corridor with additional flood prone areas (depression areas with a single outlet) further downstream of the catchment on the eastern side.

## 10.2 Existing and Likely Future Environment

### 10.2.1 Planning Context

The existing Fred Taylor Drive corridor runs through a mix of residential and industrial land uses.

The northern section of Fred Taylor Drive is within the Redhills North FUZ, with an area of land zoned under the AUP:OP as Open Space – Sport and Active Recreation Zone (Fred Taylor Park) adjacent the road corridor. The southern section of Fred Taylor Drive is zoned under the AUP:OP as THAB zone on the western side, and forms part of the I610 Redhills Precinct. The eastern side is zoned Business – Light Industry Zone and Business – Mixed Use Zone and forms part of the I615 Westgate Precinct.

Table 10-1 below provides a summary of the existing and likely future environment as it relates to the Fred Taylor Drive FTN Upgrade.

**Table 10-1: Fred Taylor Drive FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[6] | Likely Future Environment[7] |
|---|---|---|---|
| Business | Business (Light Industrial) | Low | Business |
| | Business (Mixed Use) | Low | |
| Residential | Residential – Terraced Housing and Apartment Zone | Low | Residential |
| Open Space | Open Space – Sport and Active Recreation | Low | Open Space |

[6] Based on AUP:OP zoning/policy direction
[7] Based on AUP:OP zoning/policy direction

| Environment today | Zoning | Likelihood of Change for the environment[6] | Likely Future Environment[7] |
|---|---|---|---|
| Undeveloped greenfield areas | Future Urban | High | Urban |

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

## 10.3 Proposed works

Along NoR RE2 it is proposed to widen Fred Taylor Drive to accommodate a 30m wide four-lane FTN arterial with separated walking and cycling facilities[8].

Other proposed works in NoR RE2 which are relevant for the flooding assessment include:

- Construction of diversion drains / realignment of existing overland flow path running parallel with the existing and proposed road alignment;
- Construction of three Stormwater Ponds, one of which is the upgrade of an existing pond;
- Upgrade of an existing channel towards Stormwater Pond 1.

Additional flood storage using attenuation ponds is required for NoR RE2 to attenuate and discharge the 100 year ARI pre-development peak flow. Stormwater catchments and features are shown in the Indicative Design Drawings.

## 10.4 Assessment of Flooding Effects and Measures to Minimise, Remedy or Mitigate Actual or Potential Adverse Effects

### 10.4.1 Assessment of Construction Effects

Potential construction effects have been described in Section 7 above.

It is noted the proposed upgraded Stormwater Wetland 1 is located within flood plain and overland flow path.

### 10.4.2 Recommended Measures to Minimise, Remedy or Mitigate Construction Effects

Resource consents for diversion and discharge of stormwater and stream works will be sought as part of future resource consent processes. Various culverts need to be installed or upgraded. There could be increased flood levels or new flow paths created during construction if adequate flow diversions are not provided.

The potential flooding effects during construction will be considered by, and managed through, flood risk mitigation measures to be set out in the Construction Environmental Management Plan (CEMP).

[8] The Fred Taylor Drive FTN Upgrade has an interdependency with the North West Strategic Transport Network, therefore the portion of Fred Taylor Drive north of Hailes Road forms part of the upgrade to Brigham Creek Interchange.

Lay down areas will be confirmed during the construction phase and therefore siting them with respect to flooding constraints should be considered further through the CEMP. All other mitigation measures as set out in Section 7.1 apply.

### 10.4.3 Assessment of Operational Effects

#### 10.4.3.1 160 – 168 Fred Taylor Drive

An existing 375 mm diameter culvert crossing is located on Fred Taylor Drive at Chainage 1040 between Northside Drive and Hailes Road which is undersized and an existing overland flow path will be compromised by the corridor upgrade (Figure 10-1). Further assessment of the crossing suggests the wider corridor may increase flood levels on the western side of the corridor due to the predicted flood plain being within the road formation footprint.

This has identified impacts on existing buildings outside of the proposed designation:

- Point FT1 is predicted to be affected by an increased flood level of +0.13 m under a post-development scenario and this effects is considered minor.
- Point FT2 is predicted to be affected by an increased flood level of +0.24 m under a post-development scenario and this effects is considered minor.

The flood effects could be mitigated by upgrading the existing culvert at Chainage 1040 and creating a new overland flow path alongside the corridor. The designation boundary at Chainage 1040 includes sufficient area to enable mitigation to be undertaken and a final solution can be addressed at a future stage of design.

While this area is currently undeveloped it is zoned as FUZ and the model (and the assessment) allowed for this area to be developed for residential use according to the AUP:OP. New housing and would be required to include a minimum freeboard which would also ensure flood effects to future properties would be minimised.

#### 10.4.3.2112 Fred Taylor Drive

Point FT3 (Figure 10-1) at 112 Fred Taylor Drive (Chainage 1800) is anticipated to have an increased flood depth of +0.12, this effect is considered minor. Flooding is the result of the terrain with a local setpoint which does not drain away.

Mitigation could include providing drainage at this location e.g. at the toe of the batter for the proposed new road alignment at detailed design or by regrading this location so the water can escape. This is possible within the current designation boundary and a final solution can be addressed at a future stage of design.

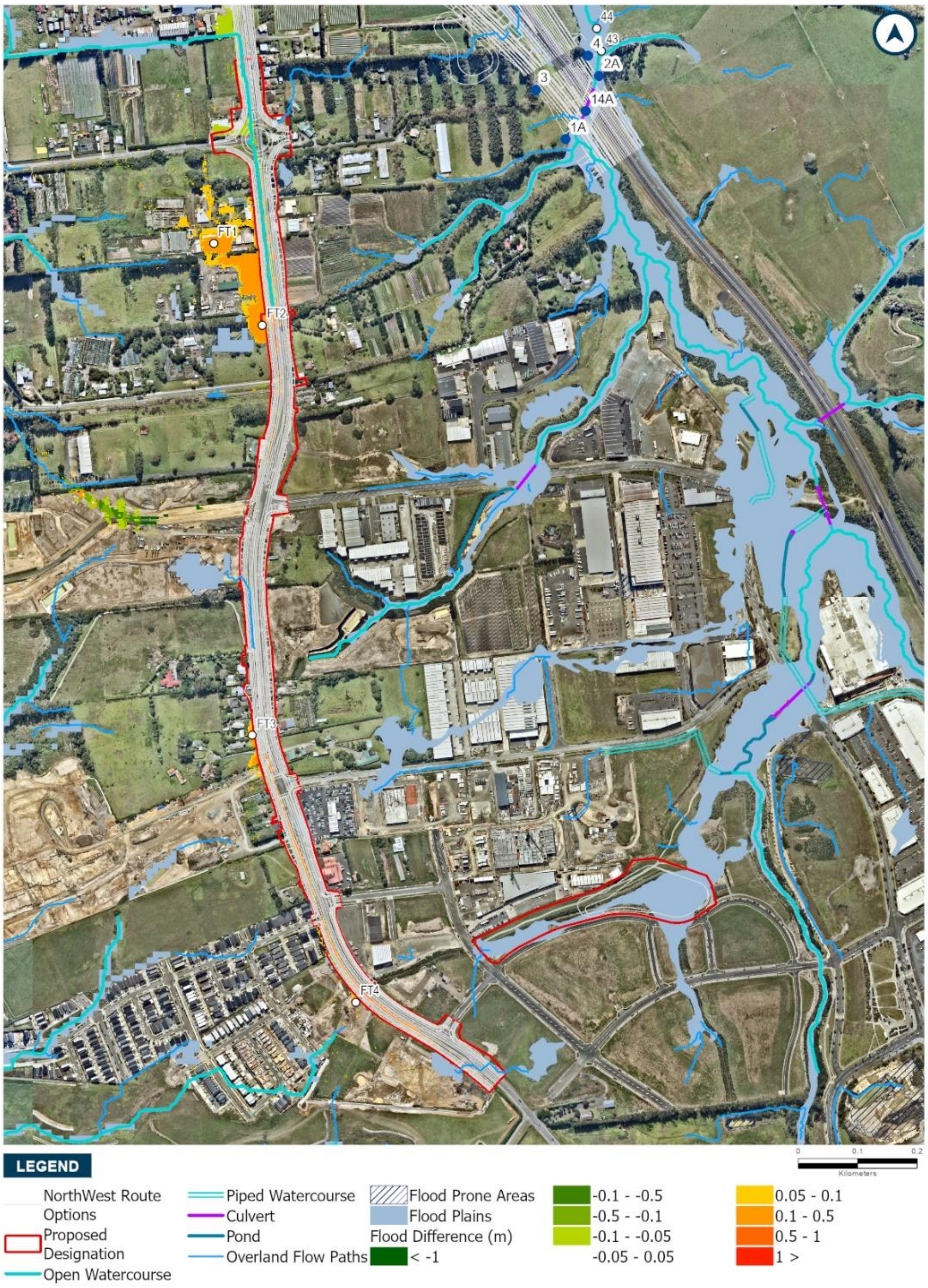


**Figure 10-1: 100 year ARI flood difference map for Fred Taylor Drive**

### 10.4.4 Recommended Measures to Minimise, Remedy or Mitigate Operational Effects

The potential mitigation measures  could be adopted as set out in Section 8.1. Specifically the following has been considered:

- Increase existing culvert size at Chainage 1040 and include the realignment of an overland flow path running alongside the corridor

- At Chainage 1800 provide a way for water to escape from the local setpoint through additional drainage infrastructure or regrading at this location.

While the potential operational effects were assessed as moderate these are likely to be significantly reduced with the mitigation measures above. Further assessment at the detailed design stage can be used to confirm the potential effects following mitigation.

Compliance with the recommended flooding outcomes set out in Section 3.2, to be included in the designation conditions, will ensure that potential flooding effects will be negligible up to minor and appropriately managed.

## 10.5 Conclusions

No increased risk from flooding was identified during the assessment of construction effects and flood effects will be managed as set out in Section 7.1.

The assessment of operational effects found a minor to moderate flood risk to properties in the NoR RE2 Fred Taylor Drive FTN Upgrade FTN Upgrade. There is space within the designation to mitigate this risk by diverting flows or realigning overland flow paths and / or upgrading the existing culverts which can be addressed at the detailed design stage.

Potential flooding effects can be appropriately managed and will be negligible up to minor subject to the recommended design outcomes and conditions outlined in set out in Section 3.2 of this report being met.

# 11 NoR R1: Coatesville-Riverhead Highway Upgrade

## 11.1 Project Corridor Features

### 11.1.1 Catchment Characteristics

The corridor crosses five unnamed streams that drain east towards the estuaries. Existing predicted flood plain and flood prone areas from Auckland GIS are evident where overland flow paths and streams traverse the road. Existing flood plain and flood prone areas are evident upstream of the unnamed stream crossings.

There is no information available regarding culverts at Coatesville Riverhead Highway north of Moontide Road (Chainage 1040), south of Moontide Road (Chainage 700) and north of Brigham Lane (Chainage 320). There is a 1200 mm culvert at Coatesville Riverhead Highway south of Short Road (Chainage 1940). The unknown culverts are not included in the model which will affect the results.

## 11.2 Existing and Likely Future Environment

### 11.2.1 Planning Context

The southern section of Coatesville-Riverhead Highway from SH16 to Short Road runs through rural land uses predominantly zoned under the AUP:OP as Rural – Mixed Rural Zone on both sides of the existing corridor. The northern section (close to and within the Riverhead township) runs through land zoned as Residential – Single House Zone and to the east and future urban zoned land on the west.

Table 11-1 below provides a summary of the North West existing and likely future environment as it relates to the Coatesville-Riverhead Highway Upgrade.

**Table 11-1: Coatesville-Riverhead Highway Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[9] | Likely Future Environment[10] |
|---|---|---|---|
| Rural | Rural | Low | Rural |
| Residential | Residential | Low | Residential |
| Future Urban Zone / Undeveloped greenfield areas | Future Urban | High | Urban |

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

## 11.3 Proposed works

The Coatesville-Riverhead Highway Upgrade Project involves:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side; and

[9] Based on AUP:OP zoning/policy direction
[10] Based on AUP:OP zoning/policy direction

- Upgrading the northern section of the corridor to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor.

The project includes upgrades to the intersections with Old Railway Road and Riverhead Road and is expected to tie in with a future roundabout at SH16 as part of the Waka Kotahi SH16 Safety Improvements Project.

Other proposed works in NoR R1 which are relevant for the flooding assessment include:

- Construction of a new stormwater wetland
- Construction of a new culvert crossings at Chainages 320, 700, 1040 and 1940

Additional flood storage using attenuation ponds is required for NoR RE2 to attenuate and discharge the 100 year ARI pre-development peak flow. Stormwater catchments and features are shown in the Indicative Design Drawings.

## 11.4 Assessment of Flooding Effects and Measures to Minimise, Remedy or Mitigate Actual or Potential Adverse Effects

### 11.4.1 Positive Effects

There are a number of positive effects due to the raising of the vertical alignment which provides additional freeboard and reduces the flood hazard risk for users of the road. These locations include:

- Coatesville Riverhead Highway south of Short Road (Chainage 1940, Points 11 and 12 in Figure 11-1) the road currently overtops during the 100 year ARI flood event. For the proposed road the centreline level is lifted to RL 21.49 m and the flood level is reduced to RL 19.33 m which increases the freeboard to +2.16 m.
- Coatesville Riverhead Highway north of Moontide Road (Chainage 1040, Points 13 and 14 in Figure 11-1) the road currently overtops during the 100 year ARI flood event. For the proposed road the centreline level is lifted to RL 33.1 m and the flood elevation is 31.22 m which increases the freeboard to +1.88 m. This is a positive effect.
- Coatesville Riverhead Highway south of Moontide Road (Chainage 700, Points 15 and 16 in Figure 11-1) the road currently overtops during the 100 year ARI flood event. For the proposed road the centreline level is lifted to RL 32.1 m and the post-development flood level is RL 30.52 which increases the freeboard to +1.58 m.
- Coatesville Riverhead Highway north of Brigham Lane (Chainage 320, Points 17 and 18 in Figure 11-1) the road currently overtops during the 100 year ARI flood event. For the proposed road the centreline level is lifted to RL 31.5 m and modelling of the design case found the flood level would be RL 29.25 which increases the freeboard to +2.25 m.

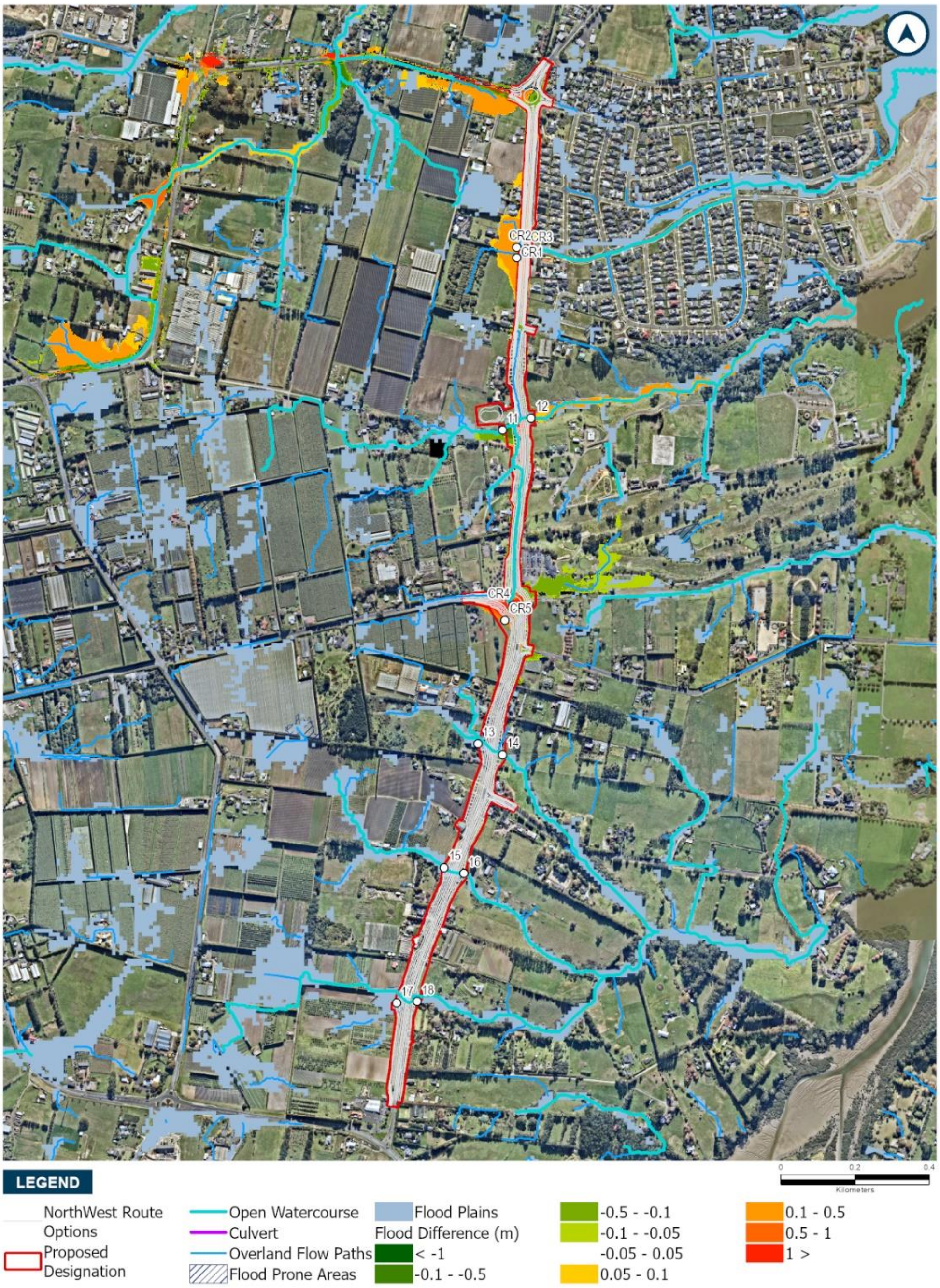


**Figure 11-1: 100 year ARI flood difference map for Coatesville Riverhead Highway**

### 11.4.2 Assessment of Construction Effects

Potential construction effects have been described in Section 7 above.

### 11.4.3 Recommended Measures to Minimise, Remedy or Mitigate Construction Effects

Resource consents for diversion and discharge of stormwater and stream works will be sought as part of future resource consent processes. Various culverts need to be installed or upgraded. There could be increased flood levels or new flow paths created during construction if adequate flow diversions are not provided.

The potential flooding effects during construction will be considered by, and managed through, flood risk mitigation measures to be set out in the Construction Environmental Management Plan (CEMP).

Lay down areas will be confirmed during the construction phase and therefore siting them with respect to flooding constraints should be considered further through the CEMP. All mitigation measures as set out in Section 7.1 apply.

### 11.4.4 Assessment of Operational Effects

#### 11.4.4.1 Coatesville Riverhead Highway at Riverhead Point Drive

The assessment found flood plain and flood prone areas are evident next to the road and the flood plain overtops the existing road. The existing drainage consist of earth channels on the western side of the road that drains into a pipe network and discharges to an open channel further east of the corridor. Water ponding on the western side may be due to the pipes being undersized.

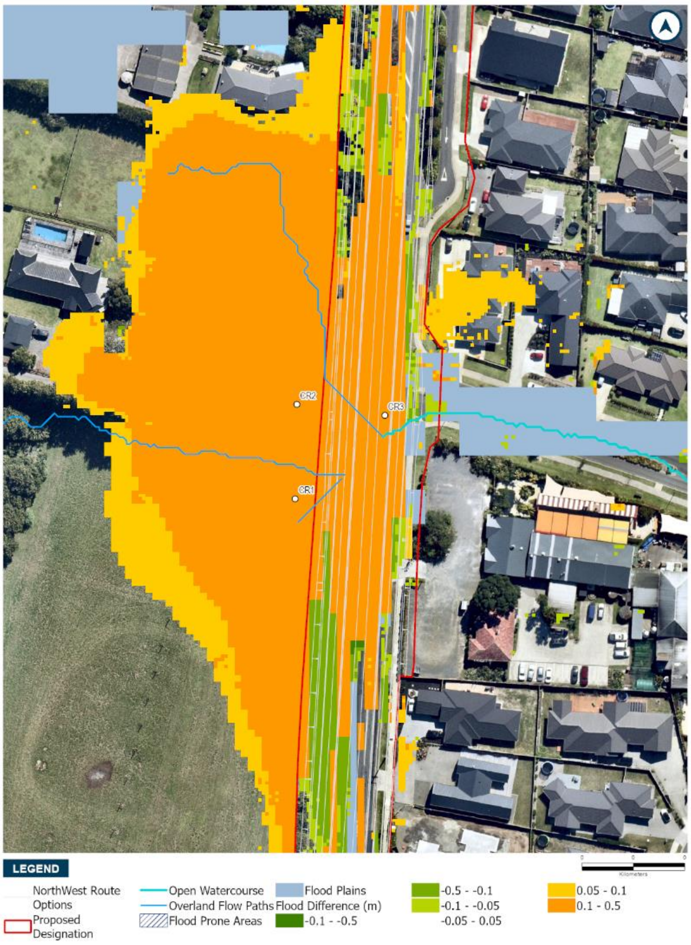


**Figure 11-2: 100 year ARI flood difference map for Coatesville Riverhead Highway at Riverhead Point Drive**

The 100 year pre-development flood level at point CR3, as shown in Figure 11-2, is RL 31.87 m under the post-development scenario the flood level is 32.06 with a flood level difference of 0.20 m. The existing road centreline level is RL 31.78 m and currently overtops during a 100 year ARI flood event. Under the current design the centreline of the proposed road is lifted to RL 31.88 m, however the road will still overtop.

Properties at 1170 and 1186 Coatesville-Riverhead Highway (points CR1 and CR2 in Figure 11-2) are within the FUZ and also within existing flood plain and flood prone areas. The existing flood prone area on these properties will be filled by the proposed road which will potentially increase flood levels west of the road or create new flood prone areas nearby unless added capacity is provided to reduce this impact. Mitigation is required and could include a new channel with inlet structure west of corridor and upgrade to the pipe network. This is possible within the current designation boundary and a final solution can be addressed at a future stage of design.

#### 11.4.4.2 Coatesville Riverhead Highway at Old Railway Drive

There is a positive effect at point CR4 (Figure 11-3) as the vertical alignment of the road has increased to RL 33.25 m. However, the road may still overtop during the 100 year ARI event with flooding approximately 0.01m. This flood effect would have a negligible flood depth. Mitigation for this effect could be to raise the alignment to increase freeboard. This is possible within the current designation boundary and a final solution can be addressed at a future stage of design.

The increased vertical alignment has also created an area of ponding at point CR5. In addition to the area of increased flood difference the road overtops at this location. Flood effects could be alleviated by providing drainage infrastructure such as a channel alongside the proposed road with a culvert underneath the road corridor to convey water to the east to discharge. This is possible within the current designation boundary and a final solution can be addressed at a future stage of design.

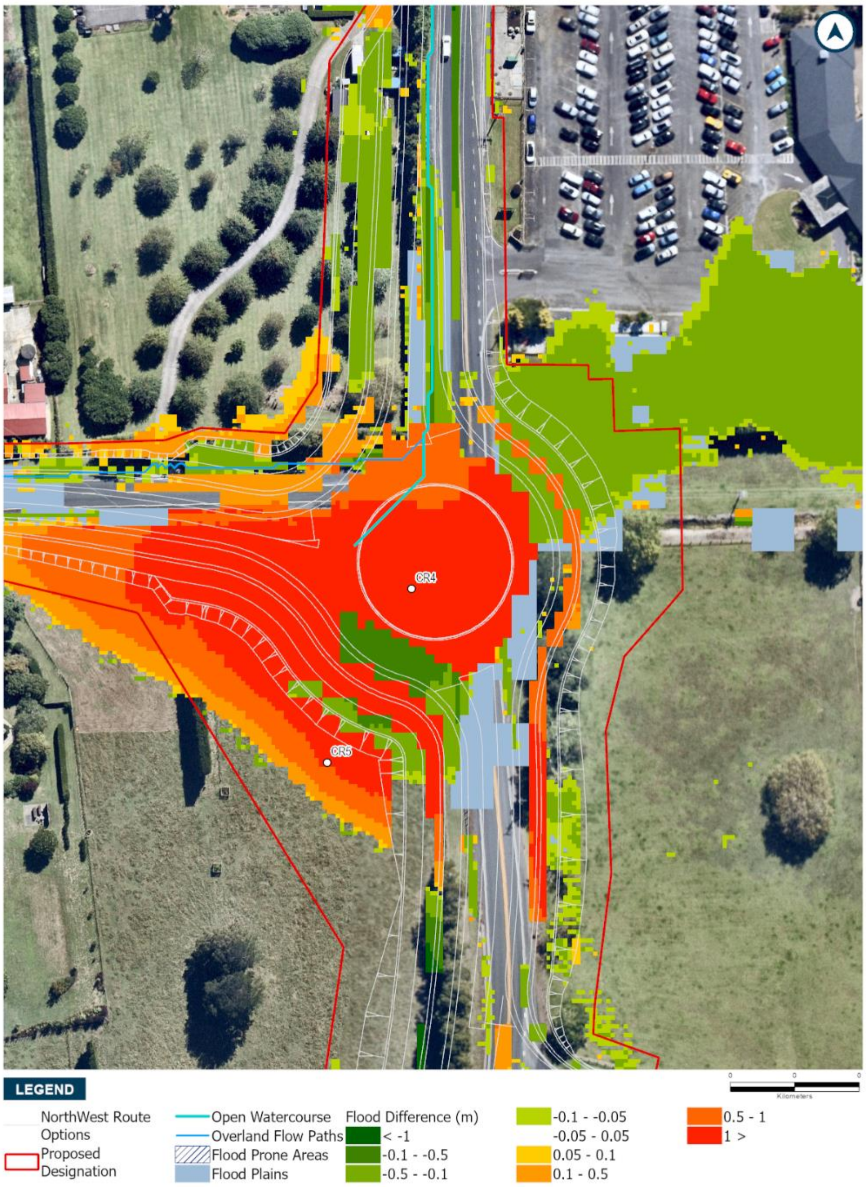


**Figure 11-3: 100 year ARI flood difference map for Coatesville Riverhead Highway at Old Railway Drive**

#### 11.4.4.3 Coatesville Riverhead Highway south of Short Road (Chainage 1940)

While positive effects at Coatesville Riverhead Highway south of Short Road (Chainage 1940) are reported due to increased freeboard there is a minor effect downstream as a result of the culvert modelled being too large (points 11 and 12 Figure 11-4). The culvert size could be refined during detailed design to achieve flood neutrality. This mitigation can be achieved within the current designation boundary and a final solution can be addressed at a future stage of design.

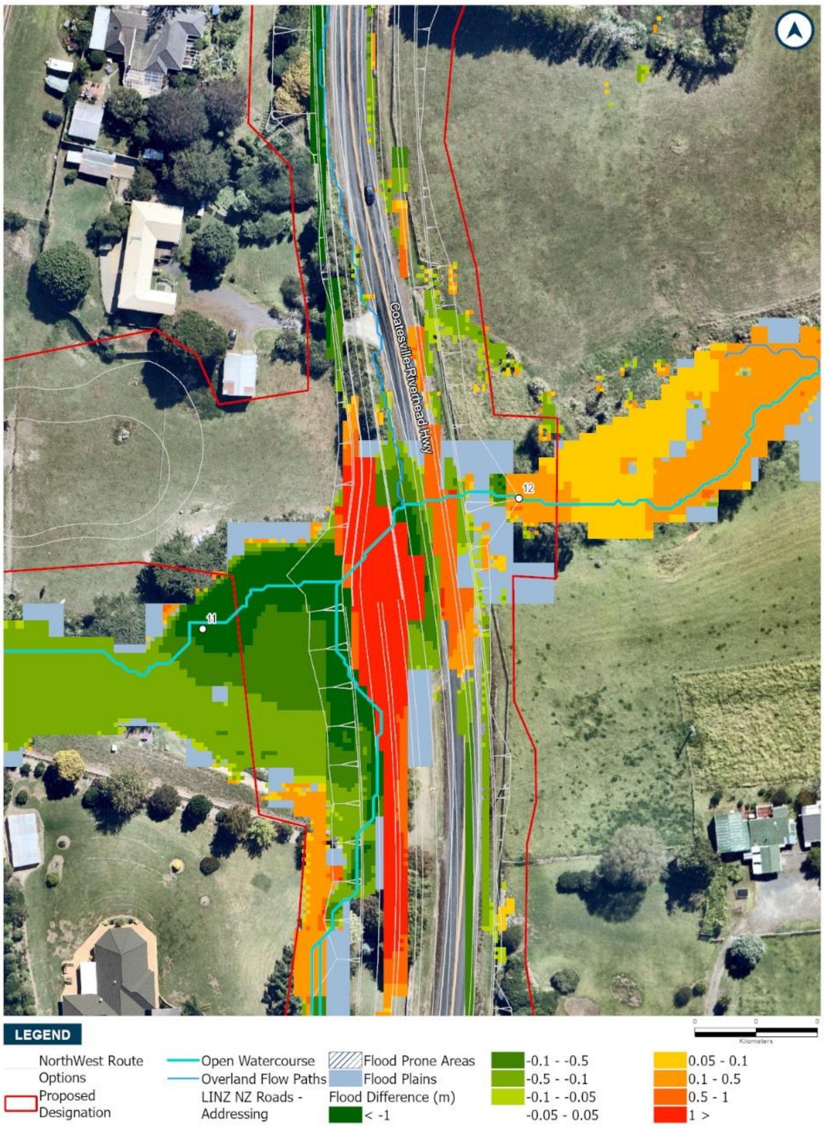


**Figure 11-4: 100 year ARI flood difference map for Coatesville Riverhead Highway south of Short Road**

#### 11.4.4.4 Coatesville Riverhead Highway north of Moontide Road (Chainage 1040)

Coatesville Riverhead Highway north of Moontide Road (Chainage 1040) has a positive effect reported due to increased freeboard. At this location an undersized culvert is creating ponding upstream (points 13 and 14 Figure 11-5). Resizing of the culvert during detailed design should seek to achieve flood neutrality. This mitigation can be achieved within the current designation boundary.

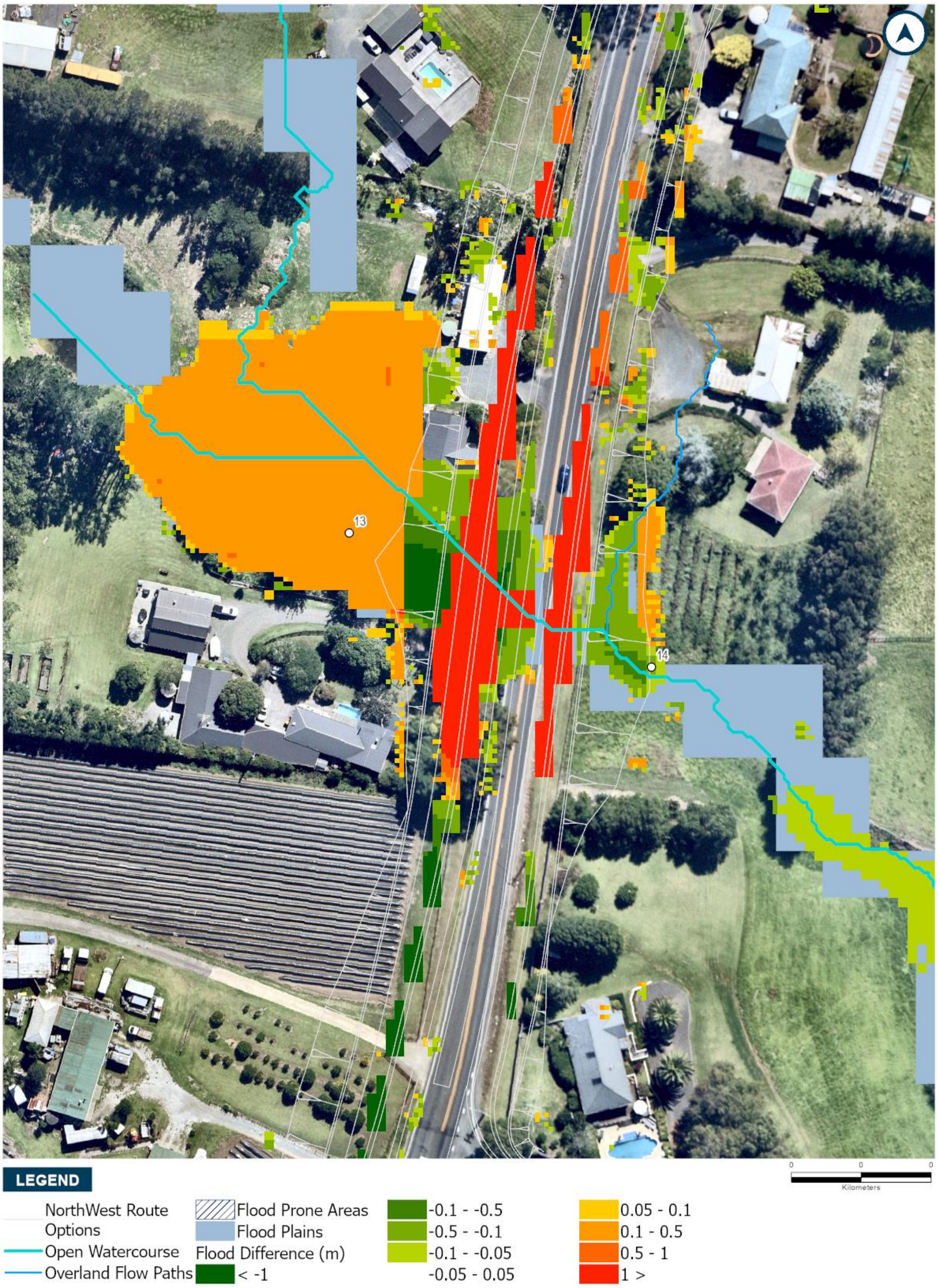


**Figure 11-5: 100 year ARI flood difference map for Coatesville Riverhead Highway north of Moontide Road**

### 11.4.5 Recommended Measures to Minimise, Remedy or Mitigate Operational Effects

The potential mitigation measures  could be adopted as set out in Section 8.1. Specifically the following has been considered:

- Increasing culvert size south of Short Road (Chainage 1940) so that the upstream and downstream flood levels do not increase by more than 0.05 m
- Decreasing culvert size north of Moontide Road (Chainage 1040) so that the upstream and downstream flood levels do not increase by more than 0.05 m
- Include a new 5 m wide channel/drain west of the corridor between Chainage 2260-2460 with an inlet structure to connect to an upgraded underground pipe network to allow more flow through to discharge to the open channel east near the intersection of Riverhead Point Drive
- Raise the road alignment and provide additional drainage capacity at Coatesville-Riverhead Highway near Old Railway Drive to reduce ponding

While some of the potential operational effects were assessed as moderate these are likely to be significantly reduced with the mitigation measures above. Further assessment at the detailed design stage can be used to confirm the potential effects following mitigation.

Compliance with the recommended flooding outcomes set out in Section 3.2, to be included in the designation conditions, will ensure that potential flooding effects will be negligible up to minor and appropriately managed.

## 11.5 Conclusions

No increased risk from flooding was identified during the assessment of construction effects and flood effects will be managed as set out in Section 7.1.

The corridor is currently under the 100 year ARI flood plain hence the proposed road with a lifted vertical alignment will increase freeboard and a reduce the potential flood risk resulting in a number of positive effects. The assessment of operational effects found minor to moderate flood effects.

Effects could be mitigated by providing new channels or drains next to corridor to increase attenuation and lower the peak flow and diverting flows to discharge to new inlet/pipe. Mitigation will be confirmed at detailed design stage.

Potential flooding effects can be appropriately managed and will be negligible up to minor effect subject to the recommended design outcomes and conditions outlined in set out in Section 3.2 of this report being met.

# 12 Sensitivity Analysis

The sensitivity analysis at the locations where a flood risk has been identified are shown in Table 12-1 and Table 12-2. For this Project the road corridors are generally at a higher elevation and follow existing roads. The sensitivity analysis found that there was no change to the identified flood risk at these locations under a more severe climate change scenario (3.8 degree temperature change).

### 12.1.1 NoR RE1: Don Buck Road FTN Upgrade

This corridor is located on a ridgeline and crosses no major overland flow paths or streams and is outside any floodplain or flood prone areas therefore no operational effects are anticipated.

### 12.1.2 NoR RE2: Fred Taylor Drive FTN Upgrade

There was a flood level change of up to +0.04 m at Fred Taylor Drive (point FT1) however there was no change to the potential flood effect (Table 12-1). There was an increased flood effect at point FT3 of +0.02m this resulted in an increase in flood effect from minor to moderate (Table 12-1). No further mitigation is proposed beyond that already recommended. It is expected that revised modelling at the detail design stage will consider any additional climate change requirements.

**Table 12-1: Consideration of flooding at key locations identified NoR RE2: Fred Taylor Drive**

| Point on flood difference map | 2.1 degree temperature change | | 3.8 degree temperature change | | Flood depth change (m) |
|---|---|---|---|---|---|
| | Water Level (m) | Potential Effect | Water Level (m) | Potential Effect | |
| FT1 | 42.46 m | Minor | 42.49 m | Moderate | +0.02 m |
| FT2 | 43.21 m | Moderate | 43.25 m | Moderate | +0.04 m |
| FT3 | 52.78 m | Minor | 52.81 m | Moderate | +0.02 m |

### 12.1.3 NoR R1: Coatesville-Riverhead Highway Upgrade

There was a flood level change of +0.14 m upstream and +0.16 m downstream of Coatesville Riverhead Highway south of Short Road (Chainage 1940) for the upgrade of Coatesville-Riverhead Highway (NoR R1) which resulted in a potential increase in flooding at this location. For other locations along Coatesville-Riverhead Highway, even with increased flood levels due to climate change there was no change to the effect.

For properties assessed at most locations there was no change to flood levels or flood risk. No further mitigation is proposed beyond that already recommended. It is expected that revised modelling at the detail design stage will consider the appropriate RCP, or any additional climate change requirements.

**Table 12-2: Flood levels at key crossings NoR R1: Coatesville-Riverhead Highway**

| Chainage | Proposed cross drainage | 2.1 degree temperature change | 3.8 degree temperature change | Flood level change | Change in potential effect without mitigation |
|---|---|---|---|---|---|
| | | 100 Year flood level (RL) pre-development | 100 Year flood level (RL) pre-development | | |
| Coatesville Riverhead Highway south of Short Road (Chainage 1940) | (x2) 3000 mm x 1000 mm box culverts<br>Design road CL level RL 31.5 m | 29.25 m upstream 28.40 m downstream | 29.34 m upstream 28.45 m downstream | +0.09 m upstream +0.04 m downstream | Upstream no change – positive effect<br>Downstream no change – positive effect |
| Coatesville Riverhead Highway north of Moontide Road (Chainage 1040) | (x2) 2500 mm x 1000 mm box culverts<br>Design road CL level RL 32.1 m | 30.52 m upstream 28.20 m downstream | 30.70 m upstream 28.23 m downstream | +0.18 m upstream +0.03 m downstream | Upstream reduction in freeboard – negligible effect<br>Downstream no change – positive effect |
| Coatesville Riverhead Highway south of Moontide Road (Chainage 700) | (x2) 2000 mm x 1000 mm box culverts<br>Design road CL level RL 33.1 m | 31.22 m upstream 28.33 m downstream | 31.30 m upstream 28.37 m downstream | +0.07 m upstream +0.04 m downstream | Upstream no change – positive effect<br>Downstream no change – positive effect |
| Coatesville Riverhead Highway north of Brigham Lane (Chainage 320) | (x2) 3000 mm x 1000 mm box culverts<br>Design road CL level RL 21.49 m | 19.33 m upstream 18.07 m downstream | 19.47 m upstream 18.23 m downstream | +0.14 m upstream +0.16 m downstream | Upstream no change – positive effect<br>Downstream increased flood level – Minor |

**Table 12-3: Consideration of flooding at key locations identified NoR R1: Coatesville-Riverhead Highway**

| Point on flood difference map | 2.1 degree temperature change | | 3.8 degree temperature change | | Flood depth change (m) |
|---|---|---|---|---|---|
| | Water Level (m) | Potential Effect | Water Level (m) | Potential Effect | |
| 1170 Coatesville-Riverhead Highway (Point CR1) | 32.06 m | Minor | 32.08 m | Minor | +0.02 m |
| 1186 Coatesville-Riverhead Highway (Point CR2) | 32.06 m | Minor | 32.08 m | Minor | +0.02 m |
| Coatesville-Riverhead Highway at Riverhead Point Drive (Point CR3) | 32.04 m | Minor | 32.05 m | Minor | +0.02 m |
| Coatesville-Riverhead Highway at Old Railway Drive (Point CR4) | 33.26 m | Positive | 33.26 m | Positive | No change |
| Coatesville-Riverhead Highway at Old Railway Drive (Point CR5) | 33.31 m | Moderate | 33.32 m | Moderate | +0.02 m |

# 13 Conclusion

The assessment reviewed the flood risk for:

- NoR RE1 Don Buck Road FTN Upgrade
- NoR RE2 Fred Taylor Drive (alteration to existing designation 1433)
- NoR R1 Coatesville-Riverhead Highway Upgrade

NoR RE1 (Don Buck Road FTN Upgrade) was note modelled as this corridor is on a ridgeline and the area has already been developed. There is no change expected as a result of the Project.

NoR RE2 (Fred Taylor Drive) and NoR R1 (Coatesville-Riverhead Highway Upgrade) were assessed using the predicted flood depth based on the results of modelling of the existing terrain assuming 100 year with climate change rainfall and future fully developed catchments. Locations where flooding is predicted were identified and the flood effects ascertained.

The assessment found that there was unlikely to be an increased risk from flood effects during construction and flood effects will be managed as set out in Section 7.1.

The assessment identified during operations likely positive effects based on the vertical elevation of the reference design which would increase freeboard at several locations including along the Coatesville-Riverhead Highway.

The assessment found that during operation there were areas of minor and moderate flood effects from flooding in both NoR RE2 (Fred Taylor Drive) and NoR R1 (Coatesville-Riverhead Highway Upgrade). The assessment has recommended mitigation measures which could be implemented to address any flood effects, however, final measures will be identified at detailed design stage. There is sufficient area for mitigation measures to be implemented within the proposed designation boundary.

Potential flooding effects can be appropriately managed and will be negligible up to minor subject to the recommended design outcomes and conditions outlined in set out in Section 3.2 of this report being met. Additional modelling of the final design at a detailed design stage will be used to confirm that flood effects are minimised, remedied or mitigated as appropriate.

The sensitivity analysis for the potential increased rainfall due to climate change found there was no change to the identified flood risk at key locations under a more severe climate change scenario (3.8 degree temperature change).

# 14 References


Auckland Council (Nov 2011) Auckland Council Stormwater Modelling Specification

Auckland Council GeoMaps (accessed 2021)

Te Tupu Ngātahi flood models, as follows:

| Available Models | North West Redhills Riverhead Package projects within the catchment models |
|---|---|
| Whenuapai Rapid Flood Hazard Assessment | Fred Taylor Drive FTN Upgrade (NoR RE2) |
| Redhills Rapid Flood Hazard Assessment | Fred Taylor Drive FTN Upgrade (NoR RE2) |
| Riverhead Rapid Flood Hazard Assessment | Coatesville-Riverhead Highway (NoR R1) |

New Zealand Transport Agency (April 2016) NZTA P46 Stormwater Specification

New Zealand Transport Agency (2013) Bridge Manual SP/M/022 third edition

# 1 Appendix 1 – Flood model results

## 1.1 NoR RE2: Fred Taylor Drive FTN Upgrade

**Table 14-1: Properties potentially at risk of flooding along Fred Taylor Drive FTN Upgrade**

| Point on difference map | Existing Cross Drainage / Property address | Modelled Cross Drainage / Affected area | 100 Year flood depth and flood level (RL) pre-development | 100 Year flood depth and flood level (RL) post-development | Level difference for 100 year flood | Potential effect without mitigation |
|---|---|---|---|---|---|---|
| FT1 (Figure 10-1) | 166 Fred Taylor Drive, Whenuapai | Building/ house/ driveway, FUZ, ground level RL 42.28 m | 42.33 m | 42.46 m | +0.13 m | Minor effect |
| FT2 (Figure 10-1) | 160 Fred Taylor Drive, Whenuapai | Open area, FUZ, ground level RL 42.52 m | 42.97 m | 43.21 m | +0.24 m | Minor effect |
| FT3 (Figure 10-1) | 112 Fred Taylor Drive, Whenuapai | Building/ house/ driveway, FUZ, ground level RL 52.62 m | 52.66 m | 52.78 m | +0.12 m | Minor effect |

## 1.2 NoR R1: Coatesville-Riverhead Highway Upgrade

**Table 14-2: Coatesville-Riverhead Highway Upgrade existing flood levels at key crossings**

| Point on difference map | Existing Cross Drainage / Property address | Modelled Cross Drainage / Affected area | 100 Year flood depth and flood level (RL) pre-development | 100 Year flood depth and flood level (RL) post-development | Level difference for 100 year flood | Potential effect without mitigation |
|---|---|---|---|---|---|---|
| Coatesville Riverhead Highway south of Moontide Road (Chainage 700, points 15 and 16 Figure 11-1) | Unknown<br>Existing road CL level RL 30.27 m | (x2) 2500 mm x 1000 mm box culverts<br>Design road CL level RL 32.1 m | 30.58 m upstream,<br>28.13 m downstream | 30.52 m upstream,<br>28.20 m downstream | -0.06 m upstream, +0.07 m downstream | Positive effect upstream, minor effect downstream |
| Coatesville Riverhead Highway north of Brigham Lane (Chainage 320, points 17 and 18 in Figure 11-1) | Unknown<br>Existing road CL level RL 30.6 m | (x2) 3000 mm x 1000 mm box culverts<br>Design road CL level RL 31.5 m | 30.90 m upstream,<br>28.51 m downstream | 29.25 m upstream,<br>28.40 m downstream | -1.65 m upstream, -0.11 m downstream | Positive effect |
| Point CR1 (Figure 11-2) | 1186 Coatesville-Riverhead Highway, Riverhead | Open area, FUZ, ground level RL 31.71 m | 31.86 m | 32.06 m | +0.20 m | Minor effect |
| Point CR2 (Figure 11-2) | 1170 Coatesville-Riverhead Highway, Riverhead | Open area, FUZ, ground level RL 31.69 m | 31.87 m | 32.06 m | +0.19 m | Minor effect |
| Point CR3 (Figure 11-2) | Coatesville-Riverhead Highway, near Riverhead Point Drive<br>Road corridor, top of road RL 31.77 m | Road corridor, top of road RL 31.77 m | 31.84 m | 32.04 m | +0.20 m | Minor effect |

| Point on difference map | Existing Cross Drainage / Property address | Modelled Cross Drainage / Affected area | 100 Year flood depth and flood level (RL) pre-development | 100 Year flood depth and flood level (RL) post-development | Level difference for 100 year flood | Potential effect without mitigation |
|---|---|---|---|---|---|---|
| Point CR4 (Figure 11-3) | Coatesville-Riverhead Highway, near Old Railway Road<br>Road corridor, ground level RL 32.27 m | Road corridor, top of road RL 33.25 m | 32.10 m | 33.26 m | +1.16 m | Negligible effect as new road level predicted to have +0.01m flood depth |
| Point CR5 (Figure 11-3) | Coatesville-Riverhead Highway, near Old Railway Road<br>Road corridor, ground level RL 31.27 m | Road corridor, top of road RL 32.27 m | 32.19 m | 33.31 m | +1.05 m | Moderate Effect |
| Coatesville Riverhead Highway south of Short Road (Chainage 1940, points 11 and 12 Figure 11-4) | 1200 mm diameter pipe<br>Design road CL level RL 20.24 m | (x2) 3000 mm x 1000 mm box culverts<br>Design road CL level RL 21.49 m | 20.42 m upstream, 17.87 m downstream | 19.33 m upstream, 18.07 m downstream | -1.09 m upstream, +0.20 m downstream | Positive effect upstream and minor effect downstream |
| Coatesville Riverhead Highway north of Moontide Road (Chainage 1040, points 13 and 14 Figure 11-5) | Unknown<br>Design road CL level RL 30.6 m | (x2) 2000 mm x 1000 mm box culverts<br>Design road CL level RL 33.1 m | 30.89 m upstream, 28.45 m downstream | 31.21 m upstream, 28.33 m downstream | 0.32 m upstream, -0.12 m downstream | Minor effect upstream and positive effect downstream |

# ATTACHMENT 62

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF ECOLOGICAL EFFECTS

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Redhills Riverhead

# Assessment of Ecological Effects

December 2022

Version 1

## Document Status

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| --- | --- |
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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AEE** | Assessment of Effects on the Environment |
| **ASH** | Alternative State Highway |
| **AT** | Auckland Transport |
| **AUP:OP** | Auckland Unitary Plan Operative in Part |
| **BCI** | Brigham Creek Interchange |
| **CC2W** | City Centre to Westgate |
| **FTN** | Frequent Transit Network |
| **FULSS** | Future Urban Land Supply Strategy |
| **FUZ** | Future Urban Zone |
| **NAL** | North Auckland Line |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **RMA** | Resource Management Act 1991 |
| **RTC** | Rapid Transit Corridor |
| **RAMC** | Regional Active Mode Corridor |
| **RUB** | Rural Urban Boundary |
| **SG** | Te Tupu Ngātahi Supporting Growth |
| **SH16** | State Highway 16 |
| **The Council** | Auckland Council |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |

# Glossary of Acronyms / Terms

| Acronym/Term | Description |
|---|---|
| **Auckland Council** | Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010. |
| **Primary Study Area** | Comprises the area and features within the proposed designation boundary. |
| **Redhills Riverhead Assessment Package** | Two Notices of Requirement (for Don Buck Road and Coatesville-Riverhead Road) and one alteration to an existing designation (Fred Taylor Drive) for the Redhills Riverhead Package of Projects for Auckland Transport. |
| **Secondary Study Area** | Comprises the area and features within a 100 m radius boundary of the designation. |
| **Study Areas** | Primary Study Area and Secondary Study Area. |

# 1 Executive Summary

This Ecological assessment has been prepared for the North West Local Arterial Network Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "Riverhead Redhills Assessment Package"). This report assesses the ecological effects of the NoRs in the North West Riverhead and Redhills Assessment Packages including: Don Buck Road, Fred Taylor Drive and Coatesville-Riverhead Highway.

As the Redhills-Riverhead package relates to proposed designations, this EcIA assesses District plan matters only. Regional matters (along with Wildlife Act (1953) compliance) will be subject to a future consenting phase along with a supporting EcIA. As such regional matters have not been formally assessed in this report, however the relevant matters have been screened to inform the designation boundary and future regional resource consents.

In order to inform the ecological baseline, ecological features within each Notice of Requirement (NoR) boundary were identified, mapped and their value assessed in terms of representativeness, rarity/distinctiveness, diversity/pattern and ecological context. A summary of the ecological values are provided in: for terrestrial vegetation (Table 1-1), District plan trees[1] (Table 1-2), terrestrial fauna (Table 1-3), streams (Table 1-4) and wetlands (Table 1-5).

**Table 1-1 Ecological values of terrestrial vegetation types for each NoR**

| Vegetation Type | Abbrev. | Don Buck Road | Fred Taylor Drive | Coatesville-Riverhead Hwy |
|---|---|---|---|---|
| Brown Field | BF | - | - | - |
| Exotic Grassland | EG | Negligible | Negligible | Low |
| Exotic Scrub | ES | - | Low | Low |
| Planted Vegetation – Native (recent) | PL.1 | Moderate | - | - |
| Planted Vegetation – Native (mature) | PL.2 | - | Moderate | - |
| Planted Vegetation – Exotic (amenity) | PL.3 | Low | Low | Moderate |
| Treeland – Mixed Native/Exotic | TL.2 | - | Moderate | - |
| Treeland – Exotic-Dominated | TL.3 | Low | Moderate | Moderate |

[1] Only district plan vegetation (trees >4m in high and or in open space) were included as it is NoR application.

### Table 1-2 Ecological values of District Plan trees for each NoR

| Vegetation Type | Don Buck Road | Fred Taylor Drive | Coatesville-Riverhead Hwy |
|---|---|---|---|
| District Plan trees[2] | Moderate | Low | Moderate |

### Table 1-3 Ecological values of terrestrial fauna for each NoR

| Fauna Type | Don Buck Road | Fred Taylor Drive | Coatesville-Riverhead Hwy |
|---|---|---|---|
| Bats | - | - | Very High |
| Birds (Non-TAR*) | Low | Low | Low |
| Birds (TAR) | Very High | - | High (At Risk – Declining)<br>Very High (Threatened – Nationally Increasing) |
| Lizards | High | High | High |

Notes: * TAR = Threatened and At Risk.

### Table 1-4 Ecological values of streams for each NoR

| Stream | Site | Don Buck Road | Fred Taylor Drive | Coatesville-Riverhead Hwy |
|---|---|---|---|---|
| Rush Creek | R1-S1 | Moderate | - | - |
| Tributary-Rush Creek | R1-S2 | Moderate | - | - |
| Tributary- Brigham Creek | R3-S1 | - | - | Moderate |
| Tributary- Brigham Creek | R3-S2 | - | - | Moderate |
| Tributary- Brigham Creek | R3-S3 | - | - | Low |
| Tributary Rangitopuni Creek | R3-S4 | - | - | Moderate |
| Tributary | R3-S5 | - | - | High |

[2] Terrestrial vegetation units most likely to be relevant to the provisions of the AUP:OP relate to the treeland unit as defined by Singers et al. (2017). Units conforming to this classification (within the existing road corridor) was subject to a value and effects assessment. In addition, any notable trees were identified and included in the assessment.

**Table 1-5 Ecological values of wetlands for each NoR**

| Wetland | NPS-FM | Don Buck Road | Fred Taylor Drive | Coatesville-Riverhead Hwy |
|---|---|---|---|---|
| R1-W1 | Artificial | Moderate | - | - |
| R3-W1 | Natural | - | - | High |

## Construction Effects

Table 1-6 to Table 1-12 provides a summary of district matter ecological effects during construction prior to any mitigation. The summary represents the level of effect for the baseline and likely future ecological environment as one, as they were found to be the same in all instances[3]. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed. Construction effects mitigation measures will include:

- A Bat Management Plan (BMP) for Coatesville-Riverhead. Details of the BMP will depend on bat habitat within the future environment and is likely to include bat habitat surveys prior to construction, siting of compounds and laydown areas to avoid bat habitat, lighting design to reduce light levels and spill from construction areas and restriction of nightworks around treeland bat habitat.
- Bird management will be required for Don Buck (stormwater upgrade in Rush Creek Reserve) and Coatesville-Riverhead (in areas where construction is adjacent to open water and wetland). Considerations for bird management will include a bird survey prior to construction to confirm Threatened or At Risk (TAR) species are not present and to provide guidance if TAR species are present, including the avoidance of the bird breeding season (September to February) during construction.

**Table 1-6 Summary of ecological effects during construction prior to mitigation for district plan trees**

| Construction - Terrestrial vegetation (district plan vegetation only) | |
|---|---|
| NoR | Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan vegetation only) |
| Don Buck (R1) | Low |
| Fred Taylor (R2) | Very Low |
| Coatesville-Riverhead (R3) | Low |

**Table 1-7 Summary of ecological effects during construction prior to mitigation for bats**

| Construction - Bats | | | |
|---|---|---|---|
| NoR | Disturbance and displacement to roosts and individuals (existing) due to | Loss of foraging habitat due to removal of district plan vegetation | Mortality or injury to bats due to removal of district plan vegetation |

[3] The effects assessment considered the baseline and the likely future environment as the construction of the road will only occur more than 20 years in the future.

| Construction - Bats | | | |
|---|---|---|---|
| | construction activities (noise, light, dust etc.) | | |
| Coatesville-Riverhead (R3) | **Moderate** | Low | **Moderate** |

Table 1-8 Summary of ecological effects during construction prior to mitigation for birds

| Construction - Birds | | | | | |
|---|---|---|---|---|---|
| NoR | Disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust etc.) - non-TAR birds | Disturbance and displacement to nests and individuals (existing) due to construction activities (noise, light, dust etc.) – TAR birds | Loss of foraging habitat due to removal of district plan vegetation | Nest loss due to removal of district plan vegetation | Mortality or injury to birds due to removal of district plan vegetation |
| Don Buck (R1) | Very Low | **Moderate** | Low | Low | Low |
| Fred Taylor (R2) | Very Low | - | Very Low | Very Low | Very Low |
| Coatesville-Riverhead (R3) | Low | **Moderate** (Threatened), **High** (At Risk) | Low | Low | Low |

Table 1-9 Summary of ecological effects during construction prior to mitigation for lizards

| Construction – Lizards | |
|---|---|
| NoR | Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.) |
| Don Buck (R1) | Very Low |
| Fred Taylor (R2) | Very Low |
| Coatesville-Riverhead (R3) | Very Low |

The residual (post-mitigation) level of effect for all construction effects are considered **Negligible** or **Low.**

## Operational Effects

Table 1-10 to Table 1-12 provides a summary of district matter operational effects due to the presence of road resulting in disturbance or loss in connectivity to bats, birds and lizards. The summary represents the level of effect for the baseline and likely future ecological environment as one, as they were found to be the same in all instances. Mitigation has been developed where the level of effect was assessed to be **Moderate** or higher.

Operational effects mitigation measures will include a BMP. The BMP will include buffer planting along road corridors associated with stream crossings[4], lighting design along strategic location of the road (stream crossings) and retention of large, mature trees (specifically TL.3 stands) where practicable.

**Table 1-10 Summary of ecological effects during operation prior to mitigation for bats**

| Operation - Bats | | |
|---|---|---|
| **NoR** | **Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration** | **Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape** |
| Coatesville-Riverhead (R3) | Low | **Moderate** |

**Table 1-11 Summary of ecological effects during operation prior to mitigation for birds**

| Operation - Birds | | |
|---|---|---|
| **NoR** | **Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.)** | **Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure** |
| Don Buck (R1) | Very Low (Non-TAR species)[5] | Very Low (Non-TAR species)[6] |
| Fred Taylor (R2) | Very Low | Very Low |
| Coatesville-Riverhead (R3) | Very Low (Non-TAR species), Low (TAR species) | Very Low (Non-TAR species), Low (TAR species) |

**Table 1-12 Summary of ecological effects during operation prior to mitigation for lizards**

| Operation - Lizards | | |
|---|---|---|
| **NoR** | **Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road** | **Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland** |

[4] The extent of buffer planting is not specifically defined in this report as the requirements may change in the future. For example, stream corridors may have no or immature buffer planting under present conditions that may change in the future. The requirement to provide buffer planting and/or retain trees (that already meet the function of buffer planting) is likely to include the area between the road embankment and the designation boundary to a minimum distance of 10 m on either side of stream crossings (noting that buffer planting can occur on the road embankments).

[5] Effects on TAR species are considered less than negligible and therefore excluded from the effect's assessment.

[6] Effects on TAR species are considered less than negligible and therefore excluded from the effect's assessment.

| Operation - Lizards | | |
|---|---|---|
| | | and riparian habitat due to the presence of the infrastructure |
| Don Buck (R1) | Very Low | Very Low |
| Fred Taylor (R2) | Very Low | Very Low |
| Coatesville-Riverhead (R3) | Very Low | Very Low |

The residual (post-mitigation) level of effect for operational effects are considered **Low** or **Very Low**.

# 2 Introduction

This Ecological assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (NoRs) for Auckland Transport (AT) (the "Redhills Riverhead Assessment Package"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (Te Tupu Ngātahi) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

This report assesses the Ecological effects of the North West Redhills Riverhead Assessment Package identified in **Error! Reference source not found.** and Table 2-1.

Refer to the main Assessment of Effects on the Environment (AEE) for a more detailed project description.

Table 2-1 North West Redhills Riverhead Assessment Package – Notices of Requirement and Projects

| Notice | Project |
|---|---|
| **NoR RE1** | Don Buck Road FTN Upgrade |
| **NoR RE2** | Fred Taylor Drive FTN Upgrade (alteration to existing designation 1433) |
| **NoR R1** | Coatesville-Riverhead Highway Upgrade |

## 2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Redhills Riverhead Assessment Package. Its purpose is to inform the AEE that accompanies the Redhills Riverhead Assessment Package sought by Waka Kotahi and AT.

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Redhills Riverhead Assessment Package on the existing and likely future environment as it relates to Ecological 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:

a) Identify and describe the Ecological context/baseline of the Redhills Riverhead Assessment Package area;
b) Identify and describe the actual and potential ecological effects of each Project corridor, resulting from activities which relate to district matters in the AUP:OP, within the Redhills Riverhead Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential ecological effects (including any conditions/management plan required) for each Project corridor within the Redhills Riverhead Assessment Package; and
d) Set out ecological considerations that will need to be considered and assessed as part of a future regional resource consent;

e) Present an overall conclusion of the level of actual and potential Ecological effects for each Project corridor within the Redhills Riverhead Assessment Package after recommended measures are implemented.

## 2.2 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each Project corridor and project features within the Redhills Riverhead Assessment Package as it relates to ecology;
c) A discussion on area wide positive effects;
d) An area wide desktop assessment;
e) Identification and description of the existing and likely future ecological environment for each NoR;
f) Description of the actual and potential adverse ecological effects of construction and operation of each NoR as they relate to district plan matters, including recommended measures to avoid, remedy or mitigate potential adverse ecological effects; and
g) Description of potential adverse ecological effects for consideration during resource consenting;
h) Overall conclusion of the level of potential adverse ecological effects for each NoR after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised for the Project, 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 Ecological 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.

# 3 Assessment Methodology

## 3.1 EcIA Assessment

The approach followed in this study is consistent with the approach outlined in the Ecological Impact Assessment (EcIA) Guidelines (EIANZ, 2018). The overarching goal of the ecological assessment is to determine the ecological effects of specific Project features or activities. The requirements for such an assessment are outlined within the EIANZ Guidelines (EIANZ, 2018) and forms the basis of this report. This process is summarised in Figure 3-1 below. Note that for the impact management (Stage 3) additional consideration was also given to the likely future ecological environment (refer Section 3.2).

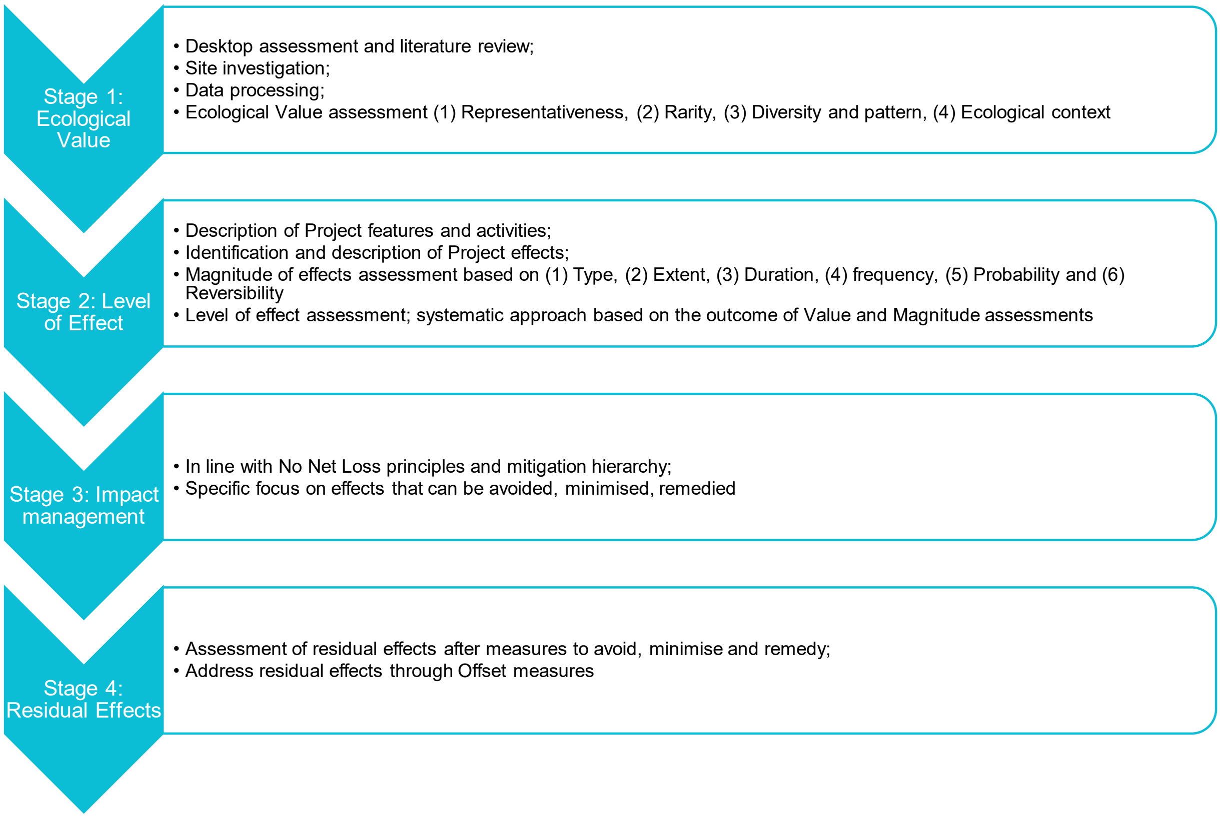


**Figure 3-1: Approach process followed for this assessment**

## 3.2 EcIA and the Likely Future Ecological Environment

The EIANZ Guidelines provide guidance to assist with the assessment of the likely future ecological environment in this report. The assessment states:

*"The ecologist needs to consider the permitted baseline in order to describe the potential "future ecological environment and to assess effects at that time, and should discuss this with the project planner or legal advisor if in any doubt".*

The NW Planning Team has advised of the following to inform the assessment of the likely future environment:

- The purpose of the NoRs within the Riverhead Redhills Assessment Package is to protect the transport corridors that will support the future urbanisation of Riverhead and Redhills. Construction and operation of the new and upgraded corridors will not occur until urbanization has at least been confirmed by way of a plan change or is under development. Guidance on the future urbanization can be taken form the Spatial Land Use Strategy – North West (2021);
- In addition, the AUP:OP permits activities for infrastructure, which will also change the likely future environment. These activities include vegetation clearance and the removal of trees, excluding notable trees and street trees, in Urban Zones and the Future Urban Zone (FUZ). The relevant permitted activities for ecology provisions are set out in Appendix 2;
- Given the planned urbanization of areas within Riverhead and Redhills, assessing the effects on the environment solely as it exists today (i.e. at the time of ecological site investigation / the preparation of this ecology assessment) will not provide an accurate reflection of the environment in which ecological effects, resulting from the construction and operation of each of the NoRs, will be experienced;
- The assessment of ecological effects should therefore take account of the likely future environment, which takes account of permitted activities for infrastructure and planned urbanisation within the FUZ.

A summary of the likely future environment is provided in the assessment section of each NoR (8.2, 9.2, and 10.2).

## 3.3 Assessment of District Plan Matters and Approach to Regional Matters

Designations are a form of 'spot zoning' over a route in a district plan. The designation authorises AT, as requiring authority, to undertake work and activity without the need for land use consent. The designated area is still subject to restrictions on land use under regional matters in the AUP:OP.

As the Redhills Riverhead Assessment Package relates to a proposed designation the ecological effects assessment assesses district plan matters only. Regional matters will be subject to a future consenting phase along with a supporting ecological impact assessment (EcIA). As such regional matters have not been formally assessed in this report, however the relevant matters have been screened to inform the designation boundary and future regional resource consents and are presented in Sections 8.3.4, 9.3.4, and 10.3.4.

Appendix 3 sets out the split between District and Regional matters in the AUP:OP.

## 3.4 Wildlife Act Matters

The Wildlife Act (1953) includes specific provisions for activities that may disturb, injure or kill native animals. Construction and operational activities that may require consideration under the Wildlife Act are outlined in Appendix 3. The scope of this report pertains to District matters and although not required for District consents, further consideration has been given to ecological effects under the Wildlife Act in Sections 8.3.4, 9.3.4, and 10.3.4. Construction and operational activities that may require consideration under the Wildlife Act are outlined in Appendix 3.

# 4 Assessment Methodology

Desktop and site investigations were undertaken for ecological features within all three NoRs. Ecological features within the proposed designation boundary and a distance of approximately 100 m[7] radius of the designation have been mapped and included onto this assessment. Vegetation, stream and wetland features were investigated and mapped to provide context for potential adjustments to the proposed designation boundary. In addition to the study area, potential habitat for native fauna was considered within the Zone of Influence (ZOI) (see Section 4.1).

## 4.1 Zone of Influence

The ZOI of the Project relates to an area occupied by habitats and species that are adjacent to and may go beyond the boundary of the Project Area. It is defined in the EIANZ Guidelines as "the areas/resources that may be affected by the biophysical changes caused by the proposed Project and associated activities." The distance of the ZOI and type of effect from the Project can be different for different species and habitat types. ZOI is used throughout this report to describe the impacts of the Project (construction and operation) on adjacent or connected terrestrial, freshwater and wetland habitats and associated native species. For example, all Significant Ecological Area's (SEA's) within 2 km of each Project Area has been included in the desktop review, along with their connectivity to each Project Area. This is to ensure that important habitat within the wider landscape has been taken into consideration and can be used to inform the potential for flora and fauna to be present within each of the Project Areas and also whether the Project ZOI extends out to these SEA's.

The ZOI of the Project on different species differs depending on how they use their environment e.g. mobile species such as long-tailed bats have a larger home range and more diverse habitat requirements compared to lizards and threatened plant species which may be restricted to a small area or specific habitat type. This affects how a species could be impacted by the Projects and this was taken into consideration during the desktop review and site investigations. To reflect the likelihood of a species occurring or dispersal ability within each of the Project Areas, varying search distances were used depending on the species context.

## 4.2 Desktop Review

A desktop review of existing ecological records was undertaken to gain an understanding of the species and habitats that could be present within the ZOI of each of the three NoRs.

The sources of information that were reviewed to determine the likelihood of a species or habitat occurring within or adjacent to each of the NoRs include:

- Auckland Council Geomaps[8];
- Department of Conservation (DOC) Bioweb records[9];
- Department of Conservation Threat Classification Series[10];
- Ecological Regions and Districts of New Zealand (McEwen, 1987);

[7] The designation boundary has undergone several rounds of refinement. The ecological mapping was undertaken on the initial designation boundary and is considered sufficiently wide to provide a contingency for relatively small adjustment during refinement. The 100 m area mapping was included to provide additional context regarding the nature and extent of ecological features (including wetlands).

[8] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

[9] https://www.doc.govt.nz/our-work/monitoring-reporting/request-monitoring-data/

[10] All Department of Conservation Threat Classification Documents are listed in the below webpage. When individual reports are referenced hereafter, they are referenced in-text and in Section 12. https://www.doc.govt.nz/about-us/science-publications/conservation-publications/nz-threat-classification-system/

- iNaturalist records[11] (research grade observations), records within approximately 5 km radius of the overall ZOI (including all NoRs);
- Indigenous terrestrial and wetland ecosystems of Auckland (Singers et al., 2017);
- National Institute of Water and Atmospheric Research (NIWA) freshwater fish database[12];
- National Institute of Water and Atmospheric Research NZ River Maps[13]
- New Zealand Bird Atlas eBird database[14]; recorded within 10km$^2$ grid squares. Results from grid square AA66, positioned over the Redhills Riverhead area; and
- NZ River Name Lines (LINZ Data Service[15])

## 4.3 Site Investigations

Site investigations were undertaken in order to:

- Prepare an ecological baseline of terrestrial, freshwater and wetland ecology;
- Inform the assessment of each of the NoRs against the relevant district matters (terrestrial ecology);
- Set out freshwater and wetland matters which may be considered as part of a future regional resource consent, or under relevant wildlife legislation;
- Inform the designation footprint.

### 4.3.1 Terrestrial Habitat

Site walkovers were undertaken between January 2022 and March 2022 to map and describe the habitats[16] present within and adjacent to each of the three NoRs. Habitats were classified into ecosystem type based on those described in Singers et al. (2017). The habitats were also assessed as to their potential to support indigenous fauna, including birds, bats, and lizards.

The habitat assessment focused on areas of potentially significant value, such as habitat that was identified as a SEA, classified as forest habitat on Auckland Council's Geomaps – Ecosystems Current Extent (Singers et al., 2017) or appears to be wetland or forest habitat based on aerial photos and during site investigation. Species records from relevant literature and biodiversity databases were utilised to focus search efforts on certain areas within the NoRs.

Broad indigenous vegetation communities were mapped on recent aerial photography and incorporated into the Project's GIS database. The vegetation assessment included recording the dominant or characteristic species present and the general quality described, including structure, maturity, presence of weeds and evidence of grazing and foliar dieback. Vegetation surveys also included searches for any rare or threatened plant species previously recorded within the NoR boundaries.

Common plant names are predominantly used within this report. Maps showing the vegetation cover along the NoRs are provided in Appendix 5. Terrestrial ecological value assessment methodology is discussed in Section 4.4.

11 https://www.inaturalist.org/
12 https://nzffdms.niwa.co.nz/search
13 https://shiny.niwa.co.nz/nzrivermaps/
14 https://ebird.org/atlasnz/home
15 https://data.linz.govt.nz/layer/103632-nz-river-name-lines-pilot/
16 Ecosystem codes from Singers et al. (2017) were used.

### 4.3.2 Bat Surveys

A bat survey was undertaken for a wider study area (Appendix 11). Two bat monitors were located within 2 km of the Don Buck Road study area, three monitors were located within 2 km of the Fred Taylor Drive study area, and five bat monitors were located within 2 km of the Coatesville-Riverhead Highway study area. The bat monitors were deployed between November 2021 and January 2022. Monitoring data for 14 suitable days (weather conditions not constraining bat activity) were analysed and used for the report.

### 4.3.3 Freshwater Habitat

Where possible to access, streams within the three NoRs that had been identified on Auckland Council Geomaps ('Named Streams') were ground truthed and classified as permanent, intermittent or ephemeral, according to the stream definitions described by Storey and Wadhwa (2009). Any additional streams observed during site walkovers were also classified. Streams are mapped in Appendix 5.

Freshwater assessments were undertaken by ecologists on all streams identified on site. In addition to stream classifications the Rapid Habitat Assessment (RHA) protocol was implemented. The RHA provides a standardised protocol for making a quick, qualitative, site-based assessment of physical stream habitat conditions (Clapcott, 2015). Stream Ecological Valuation (SEV) assessments were not undertaken but are expected to be completed during the Resource consent phase. Macroinvertebrate and fish surveys were not undertaken as part of this assessment. However, NIWA fish records (Franklin et al., 2018) were used to inform potential ecological value of streams. Access was restricted at several locations and as such stream assessments were based solely on desktop information. Freshwater ecological value assessment methodology is discussed in Section 4.4.

### 4.3.4 Wetland Habitat

Potential wetland habitat areas were identified by experienced ecologists based on Auckland Council Geomaps contours and the presence of wetland vegetation on aerial maps (including a review of historical images). These areas were then ground truthed during the site investigation either through the application of the RHA where vegetation indicators were apparent or sample plots where vegetation was ambiguous. The wetland delineation followed the method outlined within the wetland delineation guidelines (Clarkson, 2018), noting limitations in terms of access and scope discussed in more detail below. Areas conforming with the delineation guidelines were mapped and described in terms of vegetation cover, soil and hydrology. Instances where wetland delineation relied on desktop assessment, due to access constraints, were noted and a more conservative delineation was adopted. Ambiguous areas were assumed to be wetlands, where these areas were not accessible. It is important to note that the scope of the specialist study, for route protection, did not provide for a detailed wetland delineation (i.e. mapping accuracy of <1:10 000). The key focus was to confirm wetland presence and approximate extent. This approach is considered practical for the purposes of route protection, while it is expected that a more detailed wetland assessment will be undertaken during the resource consenting phase.

Wetlands were assessed based on the RMA definition of a wetland[17] and classified into ecosystem type based on those described in Singers et al. (2017). If the habitat present met this definition, it was then further evaluated against the provisions of the NPS-FM for natural wetlands (assessed for

[17] "wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions"

potential exclusion on the basis of being artificial or pasture dominated and temporary rain derived ponding). Details regarding the wetland value assessment is outlined in Section 4.4.

## 4.4 Ecological Value Assessment

The ecological value of ecological features were assessed by assigning a score of 0 (None), 1 (Low), 2 (Moderate), 3 (High) or 4 (Very High) based on professional judgement (with justification) to aspects associated with each of the four ecological matters: 1) Representativeness, 2) Rarity/distinctiveness, 3) Diversity and pattern, 4) Ecological context. Considerations in relation to the four matters and corresponding aspects for terrestrial, freshwater and wetland features are detailed below:

**Terrestrial Ecology**

1) **Representativeness**: Typical structure, species composition and indigenous representation
2) **Rarity/distinctiveness**: Species of conservation significance, distinctive ecological values
3) **Diversity and pattern**: Habitat diversity, species diversity and patterns in habitat use
4) **Ecological context**: Size, shape and buffering function, sensitivity to change, ecological networks (linkages, pathways, migration)

**Freshwater Ecology**

1) **Representativeness**: RHA score for accessible sites and riparian habitat modification based on desktop stream and catchment assessments
2) **Rarity/distinctiveness**: Species of conservation significance informed by the potential occurrence of Threatened and At-Risk (TAR) fish species
3) **Diversity and pattern**: Level of natural diversity informed by the habitat diversity subsection of the RHA. Stream order, slope and hydroperiod were applied as desktop proxies to judge the likely habitat diversity for streams where access was constraint
4) **Ecological context**: Stream order and hydroperiod

**Wetland Ecology**

1) **Representativeness**: Hydrological modification based on observations of drains, ponds and catchment land use. Native vegetation informed by site visit and review of landcover information;
2) **Rarity/distinctiveness**: Wetland type (rare or distinctive); distinctive ecological values (ecosystem services) in a larger catchment context;
3) **Diversity and pattern**: Representation of different hydroperiods (permanent, seasonal or temporary) and the structural complexity of vegetation cover
4) **Ecological context**: flood attenuation, streamflow regulation, sediment trapping, water purification, connectivity and migration

The score for each matter was constrained to the highest score for each aspect (for example a High score allocated to a wetland for flood attenuation will result in a High score for the Ecological context matter). The combined ecological value score (ranging from **Very High** to **Negligible**), for the four matters, was determined in accordance with the EcIA guidelines (EIANZ, 2018) and was recorded within a matrix spreadsheet for use within the ecological impact assessment (refer Appendix 9).

# 5 Redhills Riverhead Assessment Package Overview

A brief summary of the Redhills Riverhead Assessment Package projects is provided in

Table 5-1.

Readers should refer to the AEE for further information on these projects, including a project description, key project features and the planning context.

**Table 5-1 Redhills Riverhead Assessment Package Project Summary**

| Corridor | NoR | Description | Requiring Authority |
|---|---|---|---|
| **Don Buck Road FTN Upgrade** | RE1 | Upgrade of Don Buck Road corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Fred Taylor Drive FTN Upgrade** | RE2 | Upgrade of Fred Taylor Drive corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Coatesville-Riverhead Highway Upgrade** | R1 | Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial cross-section with active mode facilities on the western side; and<br>Upgrading the northern section of the corridor to a 24m two-lane urban arterial cross-section with active mode facilities on both sides of the corridor. | Auckland Transport |

Please refer to the AEE for further information on these projects, including a project description, key project features and the planning context.

# 6 Area Wide Ecological Desktop Review

This section presents the findings of an area wide desktop study. The study identifies all the habitats and species ('ecological features') present within the ZOI of each of the NoRs.

NoR specific ecological baselines have also been set out in Sections 8.2.2, 9.2.2, and 10.2.2.

## 6.1 Historical Ecological Context

The designations lie within the Tamaki Ecological District, which has a warm humid climate and is characterised by volcanic cones, isthmus, harbours and volcanic terrain (McEwen, 1987). Originally forested, the landscape would have been dominated by northern North Island lowland broadleaved forest with abundant taraire (*Beilschmiedia tarairi*) and puriri (*Vitex lucens*) (Singers, 2017). Now, only 7% of the native land cover; and 1% of freshwater wetlands and wetland forests remain in the Tamaki Ecological District (Auckland Regional Council, 2013). For context, a reduction to around 20% of former extent is usually considered to be significant. Reduction to below 5% is considered to be severe (Walker et al., 2008). The reductions in the Tamaki Ecological District are well below these levels.

## 6.2 Terrestrial Habitat and Fauna

### 6.2.1 Terrestrial vegetation

Where natural habitat remains, the AUP:OP has mapped and classified habitats as terrestrial or marine SEAs. SEAs which occur within 2 km of the Project Area, are presented and described in Table 6-1. A distance of 2 km was selected as potential ZOI for adverse effects of the Project given the potential receiving environment and the habitats and species present with a SEA.

**Table 6-1 Significant Ecological Areas present within 2 km of the Project Area**

| SEA | Relevant NoR | Distance from Relevant NoR (km) | SEA Type Terrestrial/ Marine | SEA Description |
|---|---|---|---|---|
| SEA_T_2041 | NoR RE1 | 0.7 km | Terrestrial | Terrestrial riparian habitat, with presence of threatened species Galaxias maculatus (īnanga). |
| SEA_T_2040 | NoR RE1 | 0.8 km | Terrestrial | Terrestrial riparian habitat supporting a migration pathway |
| SEA_T_4866 | NoR RE1 | 0.9 km | Terrestrial | Terrestrial riparian habitat supporting a migration pathway |
| SEA_T_2042 | NoR RE1 | 1.0 km | Terrestrial | Terrestrial riparian habitat, with presence of threatened species Galaxias maculatus (īnanga). |
| SEA_T_2031 | NoR RE1 | 1.1 km | Terrestrial | Terrestrial area of mānuka, kānuka scrub |
| SEA_T_2043 | NoR RE1 | 1.1 km | Terrestrial | Terrestrial riparian habitat, with presence of threatened species Galaxias maculatus (īnanga) and threatened Marattia salicina (King fern). |

| SEA | Relevant NoR | Distance from Relevant NoR (km) | SEA Type Terrestrial/ Marine | SEA Description |
|---|---|---|---|---|
| SEA_T_4661 | NoR RE1 | 1.5 km | Terrestrial | Anguilla dieffenbachii, gobiomorphus huttoni, naultinus elegans. Buffers an SEA |
| SEA_T_2034 | NoR RE2 | 0.6 km | Terrestrial | Terrestrial riparian habitat supporting a migration pathway for threatened species Galaxias maculatus (īnanga). |
| SEA_M2_57B | NoR RE2,<br>NoR R1 | 1.1 km,<br>0.7km | Marine | This area covers the inner Waitematā Harbour, and it contains various mudflats and mangrove-lined inlets and creeks, with a natural succession between terrestrial, freshwater and marine habitats. These habitats are an important migration corridor for indigenous freshwater fish and for coastal fringe bird species. |
| SEA_T_6359 | NoR R1 | 0.3 km | Terrestrial | Area of diverse habitat, including broadleaved species scrub forest and mangrove forest and scrub. |
| SEA_T_6540 | NoR R1 | 1.4 km | Terrestrial | Terrestrial habitat bordering a river, which is used as a migration pathway for species. Rare species *Loxsoma cunninghamii* (endemic terrestrial fern) present within the SEA. |

### 6.2.2 Bats

The Department of Conservation (DOC) and SGA desktop records confirm the presence of long-tailed bats (*Chalinolobus tuberculatus*) within a 10 km radius of the three NoRs. The conservation status of this species is 'Nationally Critical' (O'Donnell et al., 2017). There are DOC records of bats within 5 km to the southwest of the Project Area, near Redhills; and approximately 2 km to the north of the Project Area in the Riverhead Forest (Figure 6-1). Previous SGA bat studies have recorded bats within 2 km to the west of Don Buck Road and southwest of Fred Taylor Drive.

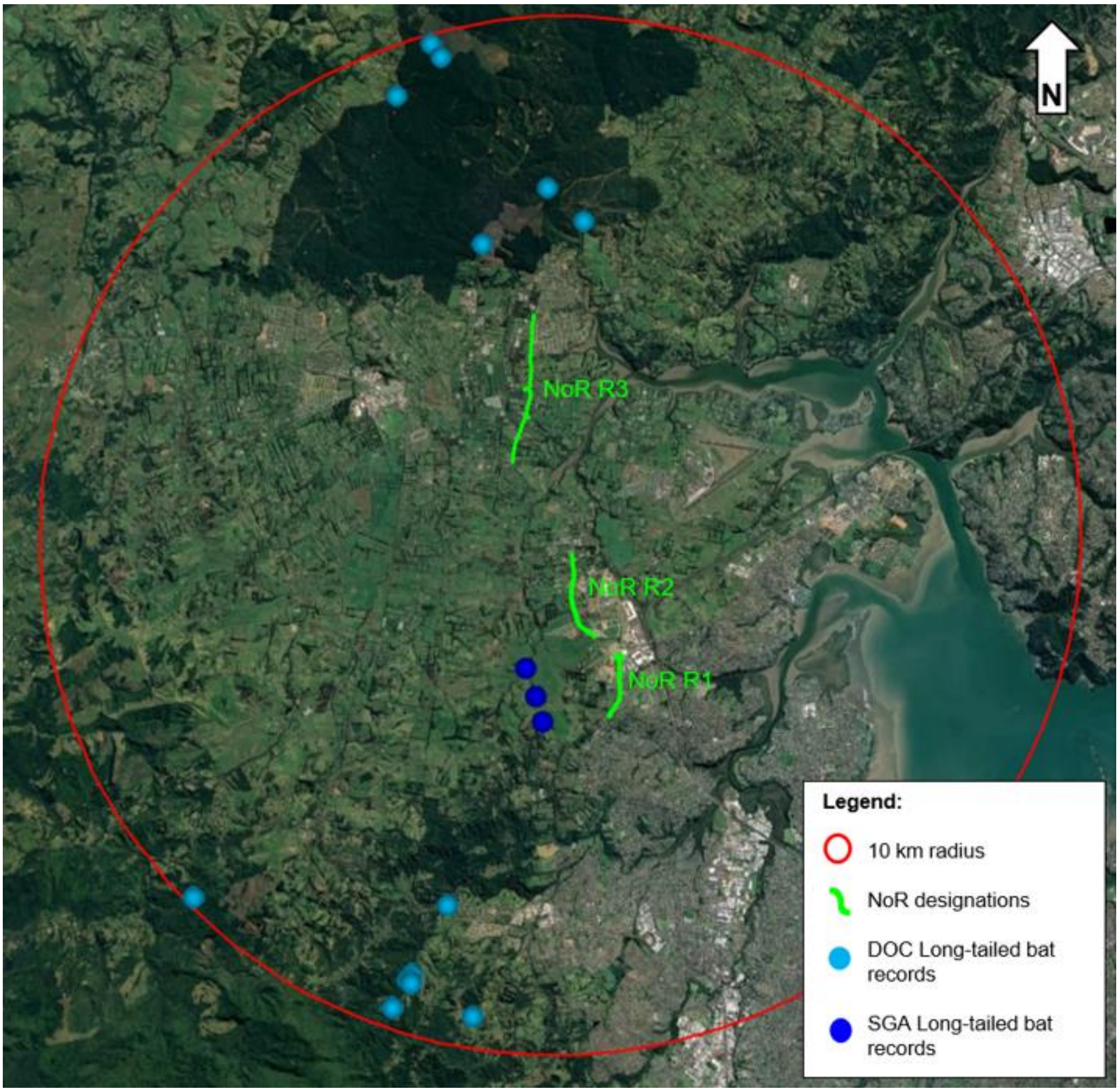


Figure 6-1 DOC and SGA historical long-tailed bat records within 10 km radius of NoR RE1, R2 and R3

### 6.2.3 Birds

The area wide desktop review identified 53 forest, freshwater, and coastal bird species (44 of which are indigenous) within a 5 km radius of the three NoRs. The full species list can be found in Appendix 2. This included 14 indigenous bird species which are listed as 'At Risk' or 'Threatened' (Robertson et al., 2021) (Table 6-2). The majority of these indigenous bird species are associated with coastal and marine habitats which are located < 2 km from the NoRs, while spotless crake (At Risk – Declining) and dabchick (Threatened – Nationally Vulnerable) may utilise wetland and stormwater ponds at locations within the three NoRs.

Table 6-2 Desktop study At-Risk and Threatened bird species records and their conservation status

| Common Name | Māori Name | Scientific Name | Conservation Status (Robertson et al., 2021) |
|---|---|---|---|
| Black shag | Kawau | *Phalacrocorax carbo novaehollandiae* | At Risk - Naturally Uncommon |

| Common Name | Māori Name | Scientific Name | Conservation Status (Robertson et al., 2021) |
|---|---|---|---|
| Black-billed gull | Tarāpuka | *Larus bulleri* | Threatened - Nationally Critical |
| Caspian tern | Taranui | *Hydroprogne caspia* | Threatened - Nationally Vulnerable |
| Cook's petrel | Tītī | *Pterodroma cookii* | At Risk - Relict |
| Dabchick | Waiwea | *Poliocephalus rufopectus* | Threatened – Nationally Vulnerable |
| Grey duck | Pārera | *Anas superciliosa* | Threatened - Nationally Critical |
| Little black shag | Kawau tūī | *Phalacrocorax sulcirostris* | At Risk - Naturally Uncommon |
| Northern New Zealand Dotterel | Tūturiwhatu | *Charadrius obscurus aquilonius* | At Risk - Recovering |
| Pied shag | Kāruhiruhi | *Phalacrocorax varius varius* | At Risk - Recovering |
| Red-billed gull | Tarāpunga | *Larus novaehollandiae scopulinus* | At Risk - Declining |
| Royal Spoonbill | Kōtuku ngutupapa | *Platalea regia* | At Risk - Naturally Uncommon |
| South Island pied oystercatcher | Tōrea | *Haematopus finschi* | At Risk - Declining |
| Variable oystercatcher | Tōrea pango | *Haematopus unicolor* | At Risk - Recovering |
| White-fronted tern | Tara | *Sterna striata striata* | At Risk - Declining |
| Wrybill | Ngutuparore | *Anarhynchus frontalis* | Threatened - Nationally Vulnerable |

### 6.2.4 Herpetofauna

A review of the DOC Bioweb database found six indigenous lizard records within a 10 km radius of the Project Area (Table 6-3). No records were found within the Project Area; however, this is likely to indicate that lizard surveys have not been completed in the local area, rather than lizards are not present. Five of the six indigenous lizard species identified in the DOC Bioweb search have a threat status of 'At Risk' (Hitchmough et al., 2021).

The At-Risk Declining copper skink is however widespread and frequently recorded within highly modified habitats such as exotic scrub and rank grassland. The closest record is less than 2 km from the Project Area (NoR R1). It is therefore highly likely to occur within and adjacent to the Project Area.

**Table 6-3 Indigenous lizard species records within 10 km of the Project Area**

| Common Name | Scientific Name | Conservation Status (Hitchmough et al., 2021) |
|---|---|---|
| Auckland green gecko | *Naultinus elegans* | At Risk - Declining |

| Common Name | Scientific Name | Conservation Status (Hitchmough et al., 2021) |
|---|---|---|
| Forest gecko | *Mokopirirakau granulatus* | At Risk - Declining |
| Pacific gecko | *Dactylocnemis pacificus* | Not Threatened - Taxonomically indeterminate |
| Copper skink | *Oligosoma aeneum* | At Risk - Declining |
| Moko skink | *Oligosoma moco* | At Risk - Relict |
| Ornate skink | *Oligosoma ornatum* | At Risk - Declining |

## 6.3 Freshwater Habitat and Fauna

A desktop review of existing ecological records was undertaken to gain an understanding of the freshwater habitat and fauna that could be present within the ZOI of each of the Projects.

### 6.3.1 Streams

The NIWA NZ River Maps site was used to identify any streams or rivers that may be crossed by any of the NoRs. The Don Buck NoR includes a stormwater pond on Rusk Creek. The Fred Taylor NoR will not cross, or directly impact any streams, while the Coatesville-Riverhead NoR will cross five unnamed tributary streams, which flow southeast into Brigham Creek inlet and Rangitopuni inlet (Table 6-4).

**Table 6-4 Desktop assessment of streams that will be crossed Project wide (LINZ Database)**

| Relevant NoR | Stream Name |
|---|---|
| Don Buck | Rush Creek |
| Coatesville-Riverhead | Brigham creek inlet tributaries |
| | Rangitopuni inlet tributary |

### 6.3.2 Fish

The NIWA freshwater fish database was reviewed for fish records within stream catchments affected by the Projects. Of the fish recorded, two species are īnanga (*Galaxias maculatus*) and longfin eel (*Anguilla australis*) are classed as 'At Risk – Declining' (Dunn et al., 2017). The desktop review results are presented in Table 6-5.

**Table 6-5 Freshwater fish species recorded within the catchments affected by the Project**

| Common Name | Scientific Name | Conservation Status (Dunn et al., 2017) | Relevant NoR | | |
|---|---|---|---|---|---|
| | | | RE1 | RE2 | R1 |
| Banded kokopu | *Galaxias fasciatus* | Not Threatened | X | X | |

| Common Name | Scientific Name | Conservation Status (Dunn et al., 2017) | Relevant NoR | | |
|---|---|---|---|---|---|
| | | | RE1 | RE2 | R1 |
| Common bully | *Gobiomorphus cotidianus* | Not Threatened | X | | |
| Crans bully | *Gobiomorphus basalis* | Not Threatened | X | | |
| Grass carp | *Ctenopharyngodon idella* | Introduced and Naturalised | | | X |
| Īnanga | *Galaxias maculatus* | At Risk - Declining | X | | |
| Koura | *Paranephrops* | NA | X | | |
| Longfin eel | *Anguilla dieffenbachii* | At Risk - Declining | X | X | |
| Rudd | *Scardinius erythropthalmus* | Introduced and Naturalised | X | | |
| Shortfin eel | *Anguilla australis* | Not Threatened | X | X | |
| Unidentified eel | *Anguilla* | NA | X | X | X |

# 7 Riverhead Redhills Positive Effects

The following section outlined the positive effects of the proposed alignment for each NoR in relation to specific ecological features. The statement regarding positive effects assumes that native planting will occur on the roadsides as part of the landscape management.

There is the potential for positive effects which apply to each of the NoRs. These are:

- The ability for future landscape planting within each NoR to tie into stream and riparian corridors. Most notably for the Coatesville-Riverhead NoR and its associated streams.
- All existing culverts in the Coatesville-Riverhead Highway NoR will be upgraded as part of the implementation of the Project, this upgrade will give consideration to the provisions of the NES-FM. The existing culverts are located at streams R3-S2 (located between 1352 and 1335 Coatesville-Riverhead Highway), R3-S3 (located between 1302 and 1295 Coatesville-Riverhead Highway), and R3-S5 (located between 1210 and 1229 Coatesville-Riverhead Highway).
- Net increase in green infrastructure and associated habitats within each of the NoRs. The net increases are associated with street trees, berm and stormwater plantings and planted stormwater wetlands.

# 8 NoR RE1: Don Buck Road FTN Upgrade

## 8.1 Project Corridor Features

The Don Buck Road corridor features a north-south alignment, running on a watershed between the Totara Creek catchment (to the east) and Ngongetepara Creek catchment (to the west). This corridor does not cross any watercourses or transect any area of native vegetation, with the exception of native plantings associated with Rush Creek and an existing stormwater pond on the same stream.

## 8.2 Existing and Likely Future Environment

### 8.2.1 Planning Context

The land adjacent to Don Buck Road is comprised of various business, residential and open space zoning. The following outlines the key elements of the planning context for the Don Buck Road FTN Upgrade:

- The eastern side of Don Buck Road above Westgate Drive is zoned under the AUP:OP as Business – Light Industry. To the south of Westgate Drive, the eastern side of Don Buck Road contains an Open Space – Community Zone (occupied by Massey Leisure Centre), with the remaining land zoned as Residential – Mixed Housing Urban Zone;
- The western side of Don Buck Road is within the I610 Redhills Precinct and is predominantly zoned Residential – Mixed Housing Urban, with a portion of land in the northern section of the corridor zoned Residential – Terraced Housing and Apartment Buildings Zone (**THAB**). Land further to the west of Don Buck Road forms part of the Redhills Precinct;

Table 8-1 below provides a summary of the existing and likely future environment as it relates to the Don Buck Road FTN Upgrade.

**Table 8-1 Don Buck Road FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[18] | Likely Future Environment[19] | Implications of Future Environment on Ecological Features |
|---|---|---|---|---|
| **Business** | Business (Industrial) | Low | Business | N/A |
| **Residential** | Residential – Mixed Housing Urban Zone<br>Residential – Terraced Housing and Apartment Zone | Low | Residential | N/A |

[18] Based on AUP:OP zoning/policy direction
[19] Based on AUP:OP zoning/policy direction

| Environment today | Zoning | Likelihood of Change for the environment[18] | Likely Future Environment[19] | Implications of Future Environment on Ecological Features |
|---|---|---|---|---|
| **Open Space** | Open Space – Community Zone and Informal Recreation Zone | Low | Open Space | N/A |

### 8.2.2 Ecological Baseline

This section presents the findings of the site and desktop investigations in relation to the terrestrial, freshwater, and wetland habitats and associated fauna species (‘ecological features’) currently present within the proposed Don Buck NoR.

All features within both study areas were investigated and mapped to provide context for the effects assessment and inform potential adjustments to the proposed designation boundary (Appendix 5). Based on this information, and desktop assessments, an ecological value has been calculated for each ecological feature within this NoR.

#### 8.2.2.1 Terrestrial Habitat

Table 8-2 summarises the vegetation types and their classification (Singers et al., 2017) associated with the Don Buck NoR. Maps are presented in Appendix 5. The study area for the Don Buck NoR is dominated by brown field and exotic grasses.

**Table 8-2 Vegetation types present within NoR RE1, categorised according to Singers et al. (2017)**

| Vegetation Type | Abbreviation | Habitat Description |
|---|---|---|
| Brown Field (includes cropland) | BF | This definition includes industrial hard standing concrete and unmanaged bare ground. For the purposes of mapping this has been extended to include bare ground associated with cropland, market gardens and construction sites. Consists of small areas patches of rural homesteads. |
| Exotic Grassland | EG | Grassland dominated by exotic species. This includes pasture and gardens. |
| Planted Vegetation – Native (recent) | PL.1 | Native restoration plantings with <50% exotic biomass. Recently planted native scrub and forest <20 years old. PL.1 is associated with stream bank planting of Rush Creek. |
| Planted Vegetation – Exotic (amenity) | PL.3 | Exotic amenity plantings. This includes parks and gardens and roadside vegetation dominated by exotic species. |
| Treeland – Exotic-Dominated | TL.3 | Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas. |

#### 8.2.2.2 Terrestrial Fauna

**Bats**

Area wide bat surveys have been undertaken and include the Don Buck NoR. The results of the bat survey are detailed Appendix 11. Long-tailed bats (pekapeka) were detected within 2 km southwest and 1.5 km northwest of the NoR. However, the terrestrial habitat associated with the Don Buck NoR is considered to be of negligible value to bats and the project is occurring with an existing fragmented landscape. As such bats are not further considered for this NoR.

**Birds**

No dedicated bird surveys were undertaken for the Project. Incidental observations of bird species were noted, and the following birds were seen or heard throughout the NoR (Table 8-3). No TAR species were observed during site investigations, however dabchick may use the open water habitat present in the NoR. The most commonly noted birds were introduced species including blackbirds, mynas, and sparrows. Based on habitat, the stormwater pond associated with Rush Creek may provide potential habitat for dabchick (Threatened – Nationally Recovering).

Table 8-3 Incidental bird observations at the Don Buck NoR and conservation status

| Common Name | Māori Name | Scientific Name | Conservation Status (Robertson et al., 2021) |
|---|---|---|---|
| Blackbird | Manu pango | *Turdus merula* | Introduced and Naturalised |
| House sparrow | Tiu | *Fringilla coelebs* | Introduced and Naturalised |
| Mallard | - | *Anas platyrhynchos* | Introduced and Naturalised |
| Myna | - | *Acridotheres tristis* | Introduced and Naturalised |

**Lizards**

Indigenous lizards were not identified during opportunistic searches completed during the site walkover. Copper skink have been recorded within 3 km of the NoR. Copper skink is likely to be associated with all of the vegetation units presented in Table 8-2, where there is appropriate understorey.

#### 8.2.2.3 Terrestrial Ecological Value

Appendix 6.1 presents the terrestrial vegetation observed within the NoR and their ecological value in accordance with the EcIA Guidelines (EIANZ, 2018). Information obtained for the ecological baseline (Sections 8.2.2.1 and 8.2.2.2), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of habitats ranged from **Negligible** (e.g., EG) to **Moderate** (e.g., TL.3 (District Plan))[20].

[20] The ecological value of brown fields was considered less than negligible and therefore was not assessed.

Notwithstanding the combined ecological value associated with vegetation/habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EcIA Guidelines):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project footprint.

For the reasons outlined above, the ecological value assessments for individual species are considered to range from **High** to **Very High** (Table 8-4).

**Table 8-4 Ecological value for terrestrial fauna (TAR species only)**

| Fauna type | Species within habitat | Habitat description | Conservation Status | Ecological Value |
|---|---|---|---|---|
| TAR Birds | Dabchick | OW | Threatened – Nationally Increasing | **Very High** |
| Herpetofauna – lizards | Copper skink | EG, PL.1, PL.3 and TL.3 | At Risk - Declining | **High** |

#### 8.2.2.4 Freshwater Habitat

All potential streams within NoR RE1 were mapped (Appendix 5) and classified as either permanent or intermittent. Permanent or intermittent streams that were within the designation boundary were numbered and assessed.

Two stream branches were identified during the area wide desktop assessment (Section 6) and site investigations, R1-S1 and R1-S2. R1-S1 was classified as permanent as there was evidence of continuous flow, and R1-S2 was classified as intermittent as three of more of the intermittent stream criteria were met (Storey & Wadwha, 2009).

#### 8.2.2.5 Freshwater Fauna

Fish surveys were not carried out during site investigations, however ‘At Risk – Declining’ species īnanga and longfin eel have been recorded within 2 km of the designation as part of the desktop review (Table 6-5).

#### 8.2.2.6 Freshwater Ecological Value

Appendix 7 presents the ecological value for the freshwater habitats identified within the Don Buck NoR. Information obtained for the ecological baseline (Section 8.2.2.4 and 8.2.2.5) as well as the desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological values of freshwater habitats are:

- R1-S1: Moderate

- R1-S2: Moderate

#### 8.2.2.7 Wetland Habitat

The Don Buck NoR does not cross, or directly impact, any natural wetland habitat. However, an artificial wetland (existing stormwater pond on Rush Creek) is present off Westgate Drive (R1-W1).

#### 8.2.2.8 Wetland Ecological Value

Appendix 7.2 presents the ecological value for the artificial wetland identified within the Don Buck NoR. The ecological value associated with the stormwater pond (artificial wetland), (R1-W1) is assessed as **Moderate**. The relatively high value associated with the feature relate to potential habitat for TAR species (dabchick) and important functional values such as flood attenuation, sediment trapping and water purification.

## 8.3 Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Section 8.3 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP. Refer to Section 3.3 for a discussion regarding the assumptions made for the effects assessment as it relates to permitted activities and likely future environment.

### 8.3.1 Construction Effects – Terrestrial Ecology

The potential construction effects (direct and indirect) to the terrestrial habitat and species within and adjacent to the Don Buck NoR (as they relate to district matters) have been identified:

- Vegetation removal subject to district controls (Appendix 5).
- Disturbance and displacement to roosts/nests and individual (existing) birds and lizards due to construction activities (noise, light, dust etc.). It is assumed that this effect will occur after vegetation clearance (subject to regional consent controls) has been implemented and is therefore likely to happen in habitats adjacent to the project footprint/designation or underneath structures such as bridges.

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

#### 8.3.1.1 Terrestrial Vegetation

Terrestrial vegetation to be removed that is subject to district controls is detailed in the table below. It includes native planted vegetation (PL.1) in open space (informal recreational zone) associated with Rush Creek south of Westgate Drive. The effects of district plan vegetation removal on birds (as it relates to loss in foraging habitat, and mortality and injury) is assessed in Section 8.3.1.2.

**Table 8-5 Don Buck NoR: Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction**

| Effect Description | Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only) | |
|---|---|---|
| | Baseline | Likely Future Ecological Environment |
| **Level of effect prior to impact management** | **PL.1 (Open Space) (total area of 4,000 $m^2$)**<br>The magnitude of effect is assessed as **Low** due to the relatively low likelihood that edge effect and additional fragmentation will occur.<br>The ecological value of PL.1 is assessed to be **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. | Same as the Baseline. |
| **Impact management and residual level of effect** | N/A | N/A |
| **Management of residual effect** | N/A | N/A |

#### 8.3.1.2 Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat adjacent to the Don Buck NoR. Additionally, birds may be impacted by removal of district plan vegetation through the following effects:

- Loss of foraging habitat
- Nest loss
- Mortality or injury to birds

Table 8-6 outlines the effect assessment for birds due to construction activities related to noise and light, and removal of district plan vegetation.

**Table 8-6 Assessment of ecological effects for birds and impact management during construction for the Don Buck NoR**

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Nest loss<br>- Mortality or injury to birds | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** local extent and the short duration of the effect.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.<br>**TAR birds (dabchick)**<br>The magnitude of effect is assessed as **Low** due to the local extent and the short duration of the effect (assuming presence).<br>The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. | Same as Baseline. | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** for all three effects associated with district plan tree removal.<br>The ecological value of birds is assessed as **Low**, and the overall level of effect due district plan vegetation removal is assessed as **Low** prior to mitigation.<br>**TAR bird (dabchick)**<br>Will not be affected by district plan vegetation removal. | Same as Baseline. |

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Nest loss<br>- Mortality or injury to birds | |
|---|---|---|---|---|
| | Baseline | Likely Future Ecological Environment | Baseline | Likely Future Ecological Environment |
| **Impact management and residual level of effect** | Impact management is required for dabchick.<br>The Bird Management Plan should consider the following:<br>• Preconstruction surveys to confirm presence and guide further management<br>• Where practical, construction works near wetland habitat (the stormwater pond) should commence prior to the bird breeding season (September to February) on order to discourage bird nesting.<br>• Bird management should be consistent with any regional consent conditions that may be required for regional compliance.<br>The residual impact is assessed as **Low** post mitigation. | Same as Baseline. | Impact management will be required under the Wildlife Act to prevent killing or injuring of birds. As part of this management, timing of vegetation removal should be constraint, or pre-clearance inspections should be undertaken prior to vegetation removal. | Same as Baseline. |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

#### 8.3.1.3 Lizards

Construction effects on lizards associated with noise, light and vibration are presented in Table 8-7. Construction activity relates to the upgrade of an existing road and as such lizards are likely to be habituated to noise and vibration from the existing road. It is expected that the effects on lizards due vegetation removal will be assessed under Regional matters and is further discussed in Section 8.3.4.3.

**Table 8-7 Assessment of ecological effects for lizards and impact management during construction for the Don Buck NoR**

| Effect Description | Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.) | |
|---|---|---|
| | Baseline | Likely Future Ecological Environment |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Negligible** due to the infrequent but likely probability of lizard disturbance.<br>The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A |
| **Management of residual effect** | N/A | N/A |

### 8.3.2 Operational Effects – Terrestrial Ecology

The Project involves upgrading an existing road, therefore it is unlikely that operational effects such as fragmentation and noise and lighting will increase from the current baseline. In general, potential operational effects from the Project that relate to district plan matters are summarised below.

- Loss in connectivity to indigenous fauna (e.g. birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g., bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

#### 8.3.2.1 Birds

Noise, vibration and lighting disturbance caused by the presence of the road could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to the Don Buck NoR, while noise, light and vibration may also affect connectivity in the broader landscape. The stormwater pond (R1-W1) will be upgraded and reinstated after construction and therefore no operational effects are expected for TAR birds that may use the stormwater pond. Table 8-8 outlines the operational effect assessment and impact management for birds.

Table 8-8 Assessment of ecological effects for birds and impact management during operation for the Don Buck NoR

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.) | | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** as the Don Buck NoR is along an existing road and birds are likely to be habituated to noise, light and vibration from the road.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to operational disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.<br>**TAR birds (dabchick)**<br>No effect during operation. | Same as Baseline. | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** as the Don Buck NoR is along an existing road.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required.<br>**TAR birds (dabchick)**<br>No effect during operation. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A | N/A | N/A |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

#### 8.3.2.2 Lizards

Suitable habitat (EG, PL.1, PL.3 and TL.3) was identified within the NoR boundary which could potentially support native lizards. Native lizards require vegetated corridors to facilitate natural dispersal, although they are considered to be relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

The Don Buck NoR includes upgrading the existing roads, therefore it is not expected to result in the additional fragmentation of lizard habitat. Similarly, resident (existing and future) lizards are likely to be habituated to disturbance such as noise, vibration and lighting and no additional effect on lizards is expected, provided that the post-upgraded road will not result in higher levels of noise and vibration. Table 8-9 outlines the operational effect assessment and impact management for lizards.

**Table 8-9 Assessment of ecological effects for lizards and impact management during operation for Don Buck NoR**

| Effect Description | Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road | | Further decrease in dispersal ability for existing and future lizard populations due to permanent habitat loss associated with the presence of the road | |
|---|---|---|---|---|
| | Baseline | Likely Future Ecological Environment | Baseline | Likely Future Ecological Environment |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Negligible** as the Project is not expected to further exacerbate existing disturbance adjacent to the NoR.<br>The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. | The magnitude of effect is assessed as **Negligible** as the Project is not expected to further exacerbate existing and future restrictions on lizard dispersal adjacent to the NoR.<br>The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A | N/A | N/A |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

### 8.3.3 Conclusions

The ecological level of effects assessed as **Moderate**, **High** or **Very High** for the Don Buck NoR include:

- **Moderate** level of effect for disturbance and displacement to Dabchick (TAR species) nests and individual birds (existing) within the stormwater pond adjacent to construction activities (noise, light, dust etc) for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible** for this effect.

### 8.3.4 Design and Future Regional Resource Consent Considerations

Ecological effects associated with activities that require regional consents and Wildlife Act Authority permits are briefly discussed in the section below. This section has informed the proposed designation boundary of the Don Buck Road NoR.

#### 8.3.4.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the NoRs, including suitable habitat that is potentially being used by native fauna (birds and lizards). Loss of vegetation that is subject to district plan controls is discussed in Section 8.3.1. The amounts and types of all[21] terrestrial habitat and vegetation (including habitat used by native fauna) that could be lost as a result of the Project is presented in Table 8-10.

The terrestrial vegetation to be lost (temporary and permanent) is comprised of both native and exotic vegetation which ranges from **Negligible** to **Moderate** ecological value (Section 8.2.2.3). Some of these areas are likely to provide habitat to native fauna, as discussed in sections 8.3.4.2 and 8.3.4.3 below.

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EIANZ Guidelines) which will be used to support future regional resource consent and wildlife permit applications (if required).

**Table 8-10 Potential area of permanent terrestrial vegetation loss within the road footprint for the Don Buck NoR**

| Feature | Classification* | Footprint (m²) |
|---|---|---|
| Brown Field (includes cropland) | BF | 39,766 |
| Exotic Grassland | EG | 3,826 |
| Planted Vegetation - Native | PL.1 | Adjacent to road footprint. |
| Planted Vegetation - Exotic | PL.3 | 4,667 |
| Exotic-Dominated Treeland | TL.3 | Adjacent to road footprint. |

Notes: * = Classification from Singers et al. (2017)

[21] Includes vegetation that is subject to district and regional plan controls as well as vegetation that can be removed as a permitted activity.

#### 8.3.4.2 Birds

Native birds are likely to be present within the NoR and utilise all identified terrestrial habitats (excluding brown fields). Vegetation clearance required for construction could result in the loss of these habitats of local value to native birds. The value of these habitats ranges from **Low** to **Moderate** value and any vegetation clearance within the bird nesting season (September – February) will need to be managed in accordance with the Wildlife Act 1953. The loss of some of this habitat is already assessed because they are district plan trees.

#### 8.3.4.3 Lizards

Native lizards are likely to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native lizard species and result in the removal of their habitat. Any vegetation clearance where lizards are likely to occur will also need to be managed in accordance with the Wildlife Act 1953.

#### 8.3.4.4 Freshwater Ecology

The upgrade of the Rush Creek stormwater pond associated with the Don Buck NoR will impact two existing streams, with **Moderate** ecological value. Approximately 50 m of stream loss will be required to accommodate the Project works. The predicted permanent and intermittent stream loss for the Project is presented in Table 8-11. These calculations will require re-evaluation as part of the future regional consent process. Both streams are affected by the existing stormwater pond but reflect good native riparian planting. It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

**Table 8-11 Potential stream loss (permanent and intermittent) within the Don Buck NoR**

| Stream ID | Hydroperiod | Ecological Value | Active channel width (m)* | Length to be lost (m)* | Loss ($m^2$)* |
|---|---|---|---|---|---|
| R1-S1 | Permanent | Moderate | 2 | 25 | 50 |
| R1-S2 | Intermittent | Moderate | 1.5 | 25 | 38 |

Notes: * = Some assessments were carried out at a desktop level, making it difficult to accurately delineate stream width and length. Therefore, widths, lengths and areas are indicative.

Under a future regional consent for instream works, earthworks and vegetation removal, impact management would also be required for fish salvage and relocation, sediment control and management of the riparian condition.

#### 8.3.4.5 Wetland Ecology

The construction of the Don Buck NoR will not directly impact any natural wetlands. During construction management will be required for earthworks and potential flow modification for downstream wetland (R1-W1).

# 9 NoR RE2: Fred Taylor Drive FTN Upgrade

## 9.1 Project Corridor Features

The Fred Taylor Driver corridor features a north-south alignment, running on a watershed between the Totara Creek catchment (to the east) and Ngongetepara Creek catchment (to the west). This corridor does not cross any watercourses or transect any area of native vegetation. The majority of the area associated with this NoR is brown fields (BF) and exotic grass (EG).

## 9.2 Existing and Likely Future Environment

### 9.2.1 Planning Context

The existing Fred Taylor Drive corridor runs through a mix of residential and industrial land uses. The northern section of Fred Taylor Drive is within the Redhills North FUZ, with an area of land zoned under the AUP:OP as Open Space – Sport and Active Recreation Zone (Fred Taylor Park) adjacent the road corridor. The southern section of Fred Taylor Drive is zoned under the AUP:OP as THAB zone on the western side, and forms part of the I610 Redhills Precinct. The eastern side is zoned Business – Light Industry Zone and Business – Mixed Use Zone and forms part of the I615 Westgate Precinct. Table 9-1 below provides a summary of the existing and likely future environment as it relates to the Fred Taylor Drive FTN Upgrade.

**Table 9-1 Fred Taylor Drive FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[22] | Likely Future Environment[23] | Implications of Future Environment on Ecological Features |
|---|---|---|---|---|
| **Business** | Business (Light Industrial) | Low | Business | N/A |
| | Business (Mixed Use) | Low | | N/A |
| **Residential** | Residential – Terraced Housing and Apartment Zone | Low | Residential | N/A |
| **Open Space** | Open Space – Sport and Active Recreation | Low | Open Space | N/A |
| **Undeveloped greenfield areas** | Future Urban | **High** | Urban | Dominated by exotic grassland and exotic planting likely to be |

[22] Based on AUP:OP zoning/policy direction
[23] Based on AUP:OP zoning/policy direction

| Environment today | Zoning | Likelihood of Change for the environment[22] | Likely Future Environment[23] | Implications of Future Environment on Ecological Features |
|---|---|---|---|---|
| | | | | removed during future development. |

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

### 9.2.2 Ecological Baseline

This section presents the findings of the site and desktop investigations in relation to the terrestrial, freshwater, and wetland habitats and associated fauna species ('ecological features') currently present within the proposed Fred Taylor NoR.

All features within the study areas were investigated and mapped to provide context for the effects assessment and inform potential adjustments to the proposed designation boundary (Appendix 5). Based on this information, and desktop assessments, an ecological value has been calculated for each ecological feature within this NoR.

#### 9.2.2.1 Terrestrial Habitat

Table 9-2 summarises the vegetation types and their classification (Singers et al., 2017) associated with the Fred Taylor NoR. Maps are presented in Appendix 5. The study area for the Fred Taylor NoR is dominated by exotic grasses, amenity plantings and exotic treeland.

**Table 9-2 Vegetation types present within the Fred Taylor NoR, categorised according to Singers et al. (2017)**

| Vegetation Type | Abbreviation | Habitat Description |
|---|---|---|
| Brown Field (includes cropland) | BF | This definition includes industrial hard standing concrete and unmanaged bare ground. For the purposes of mapping this has been extended to include bare ground associated with cropland, market gardens and construction sites. Consists of small areas patches of rural homesteads. |
| Exotic Grassland | EG | Grassland dominated by exotic species. This includes pasture and gardens. |
| Exotic Scrub | ES | Exotic secondary scrub or shrubland with >50% cover/biomass of exotic species. Generally growing along historical farm drains. Dominant species include gorse, woolly nightshade and privet species. |
| Planted Vegetation – Native (mature) | PL.2 | Native restoration plantings with <50% exotic biomass. Planted native scrub and forest >20 years old or wetland >10 years old. |
| Planted Vegetation – Exotic (amenity) | PL.3 | Exotic amenity plantings. This includes parks and gardens and roadside vegetation dominated by exotic species. |

| Vegetation Type | Abbreviation | Habitat Description |
|---|---|---|
| Treeland – Mixed Native/Exotic | TL.2 | Tree canopy cover 20-80%. Mixed native/exotic: with 25-75% native tree cover. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas. |
| Treeland – Exotic-Dominated | TL.3 | Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas. |

### 9.2.2.2 Terrestrial Fauna

#### Bats

Area wide bat surveys have been undertaken and include the Don Buck NoR. The results of the bat survey are detailed in Appendix 11. Long-tailed bats (pekapeka) were detected within 2 km southwest and 1.5 km northwest of the NoR. However, the terrestrial habitat associated with the Don Buck NoR is considered to be of negligible value to bats and the project is occurring with an existing fragmented landscape. As such bats are not further considered for this NoR.

#### Birds

No dedicated bird surveys were undertaken for the Project. Incidental observations of bird species were noted, and the following birds were seen or heard throughout the NoR (Table 9-3). No TAR species were observed during site investigations. The most commonly noted birds were introduced species, including mynas and sparrows.

**Table 9-3 Incidental bird observations at NoR RE2 and conservations status (Robertson et al., 2021)**

| Common Name | Māori Name | Scientific Name | Conservation Status |
|---|---|---|---|
| House sparrow | Tiu | *Fringilla coelebs* | Introduced and Naturalised |
| Myna | - | *Acridotheres tristis* | Introduced and Naturalised |

#### Lizards

Indigenous lizards were not identified during opportunistic searches completed during the site walkover. However, the introduced plague skink was identified within the Fred Taylor NoR. Copper skink have been recorded within 4 km of the NoR. Copper skink is likely to be associated with all of the vegetation units presented in Table 9-2, where there is appropriate understorey.

### 9.2.2.3 Terrestrial Ecological Value

Appendix 6.2 presents the terrestrial vegetation observed within the Fred Taylor Drive NoR and their ecological value in accordance with the EcIA Guidelines (EIANZ, 2018). Information obtained for the ecological baseline (Sections 9.2.2.1 and 9.2.2.2), as well as the area wide desktop assessment

(Section 6), was used to score the matters that inform the ecological value. The ecological value of habitats ranged from **Negligible** (e.g., EG) to **Moderate** (e.g., TL.3)[24].

Notwithstanding the ecological value associated with vegetation/habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EcIA Guidelines):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project footprint.

For the reasons outlined above, the ecological value assessments for individual TAR species are considered to be **High** (Table 9-4).

**Table 9-4 Ecological value for terrestrial fauna (TAR species only)**

| Fauna Type | Species within habitat | Habitat Description | Conservation Status | Ecological Value |
|---|---|---|---|---|
| Herpetofauna – lizards | Copper skink | EG, ES, PL.2, PL.3, TL.2, TL.3 | At Risk - Declining | **High** |

#### 9.2.2.4 Freshwater Habitat

The Fred Taylor NoR does not cross, or directly impact, any freshwater habitat. For this reason, no freshwater surveys took place.

#### 9.2.2.5 Freshwater Fauna

Fish surveys were not carried out during site investigations, and no species of threat classification were identified in the desktop review.

#### 9.2.2.6 Freshwater Ecological Value

The Fred Taylor NoR does not cross, or directly impact, any freshwater streams, therefore no freshwater ecological value has been assessed for this NoR.

#### 9.2.2.7 Wetland Habitat

The Fred Taylor NoR does not cross, or directly impact, any wetland habitat. For this reason, no wetland habitat surveys took place.

#### 9.2.2.8 Wetland Ecological Value

The NoR does not cross, or directly impact, any wetland habitat, therefore no wetland ecological value has been assessed for this NoR.

[24] The ecological value of brown fields was considered less than negligible and therefore was not assessed.

## 9.3 Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Section 9.3 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

### 9.3.1 Construction Effects – Terrestrial Ecology

The potential construction effects (direct and indirect) to the terrestrial habitat and species within and adjacent to the Fred Taylor NoR (as they relate to district matters) were the same as for Don Buck NoR (Section 8.3.1).

#### 9.3.1.1 Terrestrial Vegetation

Vegetation to be removed that is subject to district controls is presented in Appendix 5 and also detailed in the table below. The effects of district plan vegetation removal on fauna i.e., birds (as it related to loss in foraging habitat, and mortality and injury) is assessed in Section 9.3.1.2.

**Table 9-5 Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction for NoR RE2**

| Effect Description | Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only) | |
|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | <u>**TL.2 (total area of 12.06 m$^2$) & TL.3 (total area of 21.89 m$^2$)**</u><br>The magnitude of effect is assessed as **Negligible** due to the low likelihood that the loss of these trees will result in this effect.<br>The ecological value of both vegetation types was is assessed to be **Moderate**, and the overall level of effect is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A |
| **Management of residual effect** | N/A | N/A |

#### 9.3.1.2 Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat adjacent to the Fred Taylor NoR. Additionally, birds may be impacted by removal of district plan vegetation through the following effects:

- Loss of foraging habitat

- Nest loss
- Mortality or injury to birds

Table 9-6 outlines the effect assessment for birds due to construction activities related to noise and light, and removal of district plan vegetation.

Table 9-6 Assessment of ecological effects for birds and impact management during construction for the Fred Taylor NoR

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Nest loss<br>- Mortality or injury to birds | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** due to definite presence of native birds associated with several habitat features of the NoR, and the short-term duration of the effect.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. | **Non-TAR birds**<br>The magnitude for all three effects is assessed as **Negligible** due small extent of district plan trees that will be removed resulting in an unlikely probability<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A | Impact management will be required under the Wildlife Act to prevent killing or injuring of birds. As part of this management, timing of vegetation removal should be constraint, or pre-clearance inspections should be undertaken prior to vegetation removal. | Same as Baseline |

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Nest loss<br>- Mortality or injury to birds | |
|---|---|---|---|---|
| | Baseline | Likely Future Ecological Environment | Baseline | Likely Future Ecological Environment |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

#### 9.3.1.3 Lizards

Construction effects on lizards associated with noise, light and vibration are presented in Table 9-7. Construction activity relates to the upgrade of an existing road and as such lizards are likely to be habituated to noise and vibration from the existing road. It is expected that the effects on lizards due vegetation removal will be assessed under Regional matters and is further discussed in Section 9.3.4.3.

**Table 9-7 Assessment of ecological effects for lizards and impact management during construction for the Fred Taylor NoR**

| Effect Description | Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.) | |
|---|---|---|
| | Baseline | Likely Future Ecological Environment |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Negligible** due to the infrequent but likely probability of lizard disturbance.<br>The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A |
| **Management of residual effect** | N/A | N/A |

### 9.3.2 Operational Effects – Terrestrial Ecology

The potential operational effects (direct and indirect) to the terrestrial habitat and species within the Fred Taylor NoR (as they relate to district matters) were the same as for the Don Buck NoR (Section 8.3.2).

#### 9.3.2.1 Birds

Noise, vibration and lighting disturbance caused by the presence of the road could potentially displace native birds from suitable nesting and foraging habitat within and adjacent to the Fred Taylor NoR, while noise, light and vibration may also affect connectivity in the broader landscape. Table 9-8 outlines the operational effect assessment and impact management for birds.

**Table 9-8 Assessment of ecological effects for birds and impact management during operation for the Fred Taylor NoR (R2)**

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.) | | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** as NoR RE2 is along an existing road and birds are likely to be habituated to noise, light and vibration from the road.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to operational disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** for both effects, as NoR RE2 is along an existing road.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to operational disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A | N/A | N/A |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

#### 9.3.2.2 Lizards

Suitable habitat (EG, ES, PL.3, PL.3, TL.2, and TL.3) was identified within the NoR boundary which could potentially support native lizards. Native lizards require vegetated corridors to facilitate natural dispersal, although they are considered to be relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

The Fred Taylor NoR includes upgrading the existing roads, therefore it is not expected to result in the additional fragmentation of lizard habitat. Similarly, resident (existing and future) lizards are likely to be habituated to disturbance such as noise, vibration and lighting and no additional effect on lizards is expected, provided that the post-upgraded road will not result in higher levels of noise and vibration. Table 9-9 outlines the operational effect assessment and impact management for lizards.

**Table 9-9 Assessment of ecological effects for lizards and impact management during operation for the Fred Taylor NoR**

| Effect Description | Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road | | Further decrease in dispersal ability for existing and future lizard populations due to permanent habitat loss associated with the presence of the road | |
|---|---|---|---|---|
| | Baseline | Likely Future Ecological Environment | Baseline | Likely Future Ecological Environment |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Negligible** as the Project is not expected to further exacerbate existing disturbance adjacent to the NoR.<br>The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. | The magnitude of effect is assessed as **Negligible** as the Project is not expected to further exacerbate existing and future restrictions on lizard dispersal adjacent to the NoR.<br>The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A | N/A | N/A |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

### 9.3.3 Conclusions

The Fred Taylor NoR does not present any ecological effects that are more than **Low** prior to mitigation.

### 9.3.4 Design and Future Regional Resource Consent Considerations

Ecological effects associated with activities that require regional consents and Wildlife Act Authority permits are briefly discussed in the section below. This section has informed the proposed designation boundary of the Fred Taylor Drive NoR.

#### 9.3.4.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the NoRs, including suitable habitat that is potentially being used by native fauna (bats, birds and lizards). Loss of vegetation that is subject to district plan controls is discussed in Section 9.3.1. The amounts and types of all[25] terrestrial habitat and vegetation (including habitat used by native fauna) that could be lost as a result of the Project is presented in Table 9-10 under the Footprint column.

The terrestrial vegetation to be lost (temporary and permanent) is comprised of both native and exotic vegetation which ranges from **Negligible** to **Moderate** ecological value (Section 9.2.2.3). Some of these areas are likely to provide habitat to native fauna, as discussed in sections 9.3.4.2 and 9.3.4.3 below.

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EcIA Guidelines) which will be used to support future regional resource consent and wildlife permit applications (if required).

**Table 9-10 Potential area of permanent terrestrial vegetation loss within the road footprint for the Fred Taylor NoR**

| Feature | Classification* | Footprint (m²) |
|---|---|---|
| Brown Field (includes cropland) | BF | 11,066 |
| Exotic Grassland | EG | 5,698 |
| Exotic Scrub | ES | 44 |
| Planted Vegetation - Native (mature) | PL.2 | Adjacent to road footprint. |
| Planted Vegetation – Exotic (amenity) | PL.3 | 7,013 |
| Treeland – Mixed Native/Exotic | TL.2 | 16 |
| Treeland – Exotic-Dominated | TL.3 | 26 |

Notes: * = Classification from Singers et al. (2017)

25 Includes vegetation that is subject to district and regional plan controls as well as vegetation that can be removed as a permitted activity.

### 9.3.4.2 Birds

Native birds are likely to be present within the NoR and utilise all identified terrestrial habitats (excluding brown fields). Vegetation clearance required for construction could result in the loss of these habitats of local value to native birds. The value of these habitats ranges from **Low** to **Moderate** value and any vegetation clearance within the bird nesting season (September – February) will need to be managed in accordance with the Wildlife Act 1953. The loss of some of this habitat is already assessed because they are district plan trees.

### 9.3.4.3 Lizards

Native lizards are likely to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native lizard species and result in the removal of their habitat. Any vegetation clearance where lizards are likely to occur will also need to be managed in accordance with the Wildlife Act 1953.

# 10 NoR R1: Coatesville-Riverhead Highway Upgrade

## 10.1 Project Corridor Features

Coatesville-Riverhead NoR (R3) features a north-south alignment, extending over four streams each of which flows into SEA (M2-57b) associated with Brigham Creek and Rangitopuni Stream inlets. The rural landscape provides mature exotic treeland (TL.3) which along with the five stream corridors provide potential ecological connectivity between Riverhead Forest and the SEA (M2-57b). The most notable of the stream corridors is on 1229 Coatesville-Riverhead Highway.

## 10.2 Existing and Likely Future Environment

### 10.2.1 Planning Context

The southern section of Coatesville-Riverhead Highway from SH16 to Short Road runs through rural land uses predominantly zoned under the AUP:OP as Rural – Mixed Rural Zone on both sides of the existing corridor. The northern section (close to and within the Riverhead township) runs through land zoned as Residential – Single House Zone and to the east and future urban zoned land on the west.

Table 10-1 below provides a summary of the North West existing and likely future environment as it relates to the Coatesville-Riverhead Highway Upgrade.

**Table 10-1 Coatesville-Riverhead Highway Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[26] | Likely Future Environment[27] | Implications of Future Environment on Ecological Features |
|---|---|---|---|---|
| **Rural** | Rural | Low | Rural | N/A |
| **Residential** | Residential | Low | Residential | N/A |
| **Future Urban Zone/Undeveloped greenfield areas** | Future Urban | **High** | Urban | Area to be developed include the upper portion of Coatesville-Riverhead Highway (1140-1200). Existing ecological features mainly include exotic grass, exotic treeland, exotic planting. No wetland or streams. |

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

[26] Based on AUP:OP zoning/policy direction
[27] Based on AUP:OP zoning/policy direction

### 10.2.2 Ecological Baseline

This section presents the findings of the site and desktop investigations in relation to the terrestrial, freshwater, and wetland habitats and associated fauna species ('ecological features') currently present within the proposed the Coatesville-Riverhead NoR.

All features within both study areas were investigated and mapped to provide context for the effects assessment and inform potential adjustments to the proposed designation boundary (Appendix 5). Based on this information, and desktop assessments, an ecological value has been calculated for each ecological feature within this NoR.

#### 10.2.2.1 Terrestrial Habitat

Table 10-2 summarises the vegetation types and their classification (Singers et al., 2017) associated with the Coatesville-Riverhead NoR. Maps are presented in Appendix 5. The study area for the Coatesville-Riverhead NoR is dominated by exotic grassland with woody vegetation mostly in the form of shelterbelt and roadside planting.

**Table 10-2 Vegetation types present within the Coatesville-Riverhead NoR, categorised according to Singers et al. (2017)**

| Vegetation Type | Abbreviation | Habitat Description |
|---|---|---|
| Brown Field (includes cropland) | BF | This definition includes industrial hard standing concrete and unmanaged bare ground. For the purposes of mapping this has been extended to include bare ground associated with cropland, market gardens and construction sites. Consists of small areas patches of rural homesteads |
| Exotic Grassland | EG | Grassland dominated by exotic species. This includes pasture, gardens for most of the NoR RE2 |
| Exotic Scrub | ES | Exotic secondary scrub or shrubland with >50% cover/biomass of exotic species. Generally growing along historical farm drains. Dominant species include gorse, woolly nightshade and privet species. |
| Planted Vegetation – Exotic (amenity) | PL.3 | Exotic amenity plantings. This includes parks and gardens and roadside vegetation dominated by exotic species. |
| Treeland – Exotic-Dominated | TL.3 | Tree canopy cover 20-80%: <25% native with exotic tree cover dominant. For the purposes of mapping this includes planted and wilding exotic vegetation and mature shelterbelts. This includes mature riparian vegetation and scattered or discontinuous canopy of mature trees within gardens, farms and amenity areas. |

#### 10.2.2.2 Terrestrial Fauna

**Bats**

Area wide bat surveys have been undertaken for the three NoRs (including the Coatesville-Riverhead NoR). The results of the bat survey are detailed in Appendix 11. The results of these surveys relevant to the Coatesville-Riverhead NoR is the presence of long-tailed bats (pekapeka) which were detected 2 km southwest of the NoR. Mature shelterbelt vegetation (mostly represented by TL.3) may provide bat habitat, roost potential and enable bat movement in the wider landscape.

### Birds

No dedicated bird surveys were undertaken for the Project. Incidental observations of bird species were noted, and the following birds were seen or heard throughout the Coatesville-Riverhead NoR (Table 10-3). No TAR species were observed during site investigations, but spotless crake and dabchick may use wetland and open water habitat associated with the NoR. The most commonly noted birds were introduced species: including blackbirds, sparrows, and pūkeko. The structure of habitat associated with exotic shrub vegetation (ES), more mature exotic treelands (TL.3) and native plantings (PL.1) present with the NoR may provide localised value for birds.

**Table 10-3 Incidental bird observations at the Coatesville-Riverhead NoR and conservations status (Robertson et al., 2021)**

| Common Name | Māori Name | Scientific Name | Conservation Status |
|---|---|---|---|
| Blackbird | Manu pango | *Turdus merula* | Introduced and Naturalised |
| Fantail | Pīwakawaka | *Rhipidura fuliginosa placabilis* | Not Threatened |
| House sparrow | Tiu | *Fringilla coelebs* | Introduced and Naturalised |
| Magpie | Makipae | *Gymnorhina tibicen* | Introduced and Naturalised |
| Myna | - | *Acridotheres tristis* | Introduced and Naturalised |
| Pūkeko | Pūkeko | *Porphyrio melanotus melanotus* | Not Threatened |
| Spur winged plover | - | *Vanellus miles novaehollandiae* | Not Threatened |
| Swamp Harrier | Kāhu | *Circus approximans* | Not Threatened |
| Welcome swallow | Warou | *Hirundo neoxena neoxena* | Not Threatened |

### Lizards

Indigenous lizards were not identified during opportunistic searches completed during the site walkover. However, the introduced plague skink was identified within the Coatesville-Riverhead NoR. Copper skink have been recorded within 2 km of the Coatesville-Riverhead NoR. Copper skink is likely to be associated with all of the vegetation units presented in Table 10-2, where there is appropriate understorey.

## 10.2.2.3 Terrestrial Ecological Value

Appendix 6.3 describes the terrestrial vegetation observed within the Coatesville-Riverhead NoR and their ecological value in accordance with the EcIA Guidelines (EIANZ, 2018). Information obtained for the ecological baseline (Sections 10.2.2.1 and 10.2.2.2), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of habitats ranged from **Low** (e.g., EG) to **Moderate** (e.g., TL.3)[28].

Notwithstanding the ecological value associated with vegetation/habitat units, specific consideration still needs to be given to individual species and their conservation significance for the following reasons (in accordance with EIANZ Guidelines):

- The habitat value may dilute the conservation value associated with specific species. For example, the combined value for exotic grassland is **Low**, while the value for copper skink (At Risk - Declining) is **High**. The combined value of **Low** therefore understates the conservation value of the species;
- Species may not be restricted to a single vegetation unit;
- Potential effects on species are unrelated to habitat units. For example, impact on highly mobile species (such as bats) by noise and light may be independent of the habitat loss associated with the Project footprint.

For the reasons outlined above, the ecological value assessments for individual species are considered to range from **High** to **Very High** (Table 10-4).

**Table 10-4 Ecological value for terrestrial fauna (TAR species only)**

| Fauna Type | Species within habitat | Habitat Description | Conservation Status | Ecological Value |
|---|---|---|---|---|
| Bats | Long-tailed bat | TL.3 | Threatened - Nationally Critical | **Very High** |
| TAR Birds | Spotless crake | OW and EW | At Risk - Declining | **High** |
| | Dabchick | OW | Threatened - Nationally Increasing | **Very High** |
| Herpetofauna – lizards | Copper skink | EG, ES, PL.3, and TL.3 | At Risk - Declining | **High** |

#### 10.2.2.4 Freshwater Habitat

All potential streams within the Coatesville-Riverhead NoR were mapped (Appendix 5) and classified as either permanent or intermittent. Permanent or intermittent streams that were within the designation boundary were numbered and assessed.

**Stream classification, description and RHA assessment**

Nine streams were identified during the desktop and site investigations within the Coatesville-Riverhead NoR. These streams are detailed in Table 10-5. Streams were assessed against the stream classification criteria developed by Storey and Wadhwa, 2009. Barriers to fish migration was assessed, to describe any fragmentation or loss of connectivity.

A total of five streams were not accessible. The ecological value for these streams were assessed at desktop level (Section 10.2.2.6).

[28] The ecological value of brown fields was considered less than negligible and therefore was not assessed.

All other streams were accessed during site investigations and surveyed using the RHA. The streams measured overall habitat quality scores that ranged from ‘Poor’ to ‘Moderate’ (Table 10-5). Detailed RHA results are presented in Appendix 6.

**Table 10-5 Summary of streams identified in the Coatesville-Riverhead NoR**

| Stream Number | Classification | Barrier type | RHA Category |
|---|---|---|---|
| R3-S1 | Intermittent | Partial | Poor |
| R3-S2* | Intermittent | Total | N/A |
| R3-S3* | Intermittent | Total | N/A |
| R3-S4 | Permanent | Partial | Moderate |
| R3-S5 | Permanent | Partial | Moderate |
| R3-S6* | Permanent | Partial | N/A |
| R3-S7 | Permanent | Partial | Poor |
| R3-S8* | Permanent | Partial | N/A |
| R3-S9* | Intermittent | Total | N/A |

Notes: * = Stream assessed at a desktop level

#### 10.2.2.5 Freshwater Fauna

Fish surveys were not carried out during site investigations, however incidental sightings of eels (species unidentifiable) were made at R3-S4, R3-S5 and R3-S7. No TAR species were identified within 2 km of the designation during the desktop review (Table 6-5).

#### 10.2.2.6 Freshwater Ecological Value

Appendix 7.2 presents the ecological value for the freshwater habitats identified within the Coatesville-Riverhead NoR. Information obtained for the ecological baseline (Section 10.2.2.4 and 10.2.2.5), as well as the area wide desktop assessment (Section 6), was used to score the matters that inform the ecological value. Of the nine streams, five of them will impacted and the ecological values of these freshwater habitats are presented in Table 10-6.

**Table 10-6 Summary of freshwater ecological value identified in the Coatesville-Riverhead NoR.**

| Stream ID | Ecological Value |
|---|---|
| R3-S1 | Moderate |
| R3-S2 | Moderate |
| R3-S3 | Low |
| R3-S4 | Moderate |
| R3-S5 | High |

#### 10.2.2.7 Wetland Habitat

One wetland within the Coatesville-Riverhead NoR was identified and assessed via desktop (R3-W1). This was conservatively classified as an NPS-FM ‘natural wetland’ with Exotic Wetland (EW) vegetation type.

#### 10.2.2.8 Wetland Ecological Value

Appendix 8.1 presents the ecological value for the wetland habitat (R3-W1) identified within the Coatesville-Riverhead NoR. Information obtained for the ecological baseline (Section 10.2.2.7), as well as the desktop assessment (Section 6), was used to score the matters that inform the ecological value. The ecological value of R3-W1 was **High**.

## 10.3 Assessment of Ecological Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

Section 10.3 assesses the ecological effects of activities which relate to district plan matters under the AUP:OP.

### 10.3.1 Construction Effects – Terrestrial Ecology

The potential construction effects (direct and indirect) to the terrestrial habitat and species within and adjacent to Coatesville-Riverhead NoR (as they relate to district matters) have been identified:

- Vegetation removal subject to district controls (Appendix 5).
- Disturbance and displacement to roosts/nests and individual (existing) bats, birds and lizards due to construction activities (noise, light, dust etc.). It is assumed that this effect will occur after vegetation clearance (subject to regional consent controls) has been implemented and is therefore likely to happen in habitats adjacent to the project footprint/designation or underneath structures such as bridges.

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

#### 10.3.1.1 Terrestrial Vegetation

Vegetation to be removed that is subject to district controls is presented in Appendix 5 and also detailed in the table below. The effects of district plan vegetation removal on fauna i.e., bats and birds (as it relates to loss in foraging habitat, and mortality and injury) are discussed in assessed in sections 10.3.1.2 and 10.3.1.3.

**Table 10-7 Assessment of ecological effects for terrestrial vegetation (district plan trees only) and impact management during construction for the Coatesville-Riverhead NoR**

| Effect Description | Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only) | |
|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | **TL.3 (total area of 4,820.2 m²)**<br>The magnitude of effect is assessed as **Low** due to the extent and subsequent likelihood that this effect may occur.<br>The ecological value of TL.3 is assessed to be **Moderate**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A |
| **Management of residual effect** | N/A | N/A |

### 10.3.1.2 Bats

Bats may utilise the TL.3 habitat associated with the Coatesville-Riverhead NoR for roosting or foraging. During construction of the Project, night works may be required, and site compounds are likely to be lit overnight. Lighting at night has the potential to modify the behaviour of bats if foraging within this area or roosting in nearby isolated stands of mature trees.

Noise and vibration during construction can be an issue if bats are roosting in the immediate vicinity of the construction works. Although bat foraging has been confirmed, ABM survey at the Project scale cannot confirm roost occupation within or adjacent to the designation boundary. However, it can be assumed that bats will utilise roost sites within the Project Area based on the following assumptions:

- Confirmed habitat suitability (numerous trees with moderate to high bat roost potential, connected to linear stream corridors and wetlands);
- Confirmed foraging presence; and
- Frequent utilisation of numerous roosting sites throughout their home range (Davies et al*.*, 2017).

Additionally, bats may be impacted by removal of district plan vegetation through the following effects[29]:

- Loss of foraging habitat
- Mortality or injury to bats

Table 10-8 outlines the effect assessment for bats due to construction activities related to noise and light, and removal of district plan vegetation.

[29] Roost lost has been considered but discounted as an effect as the **consequence** of roost loss (if it does occur at all) is considered less than **Negligible** in the context of this NoR.

**Table 10-8 Assessment of ecological effects for bats and impact management during construction for the Coatesville-Riverhead NoR**

| Effect Description | Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Mortality or injury to bats | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Low** due to likely probability of bats being disturbed.<br>The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. | Same as Baseline. | **Loss of foraging habitat**<br>The magnitude of effect is assessed as **Negligible** due to the relatively small contribution of district plan trees to the available foraging habitat.<br>The ecological value of bats is assessed as **Very High** and the overall level of effect is assessed as **Low** prior to mitigation.<br>**Mortality or injury to bats**<br>The magnitude of effects is assessed as **Low** due to a higher likelihood associated with the roost potential of the district plan trees and the overall level of effect is assessed as **Moderate** prior to mitigation. | Same as Baseline. |
| **Impact management and residual level of effect** | A Bat Management Plan (BMP) should be developed to include consideration for:<br>• Surveys prior to construction confirm activity to confirm | Same as Baseline. | **Loss of foraging habitat**<br>N/A<br>**Mortality or injury to bats**<br>The BMP should also include: | Same as Baseline. |

| Effect Description | Disturbance and displacement to roosts and individual bats (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Mortality or injury to bats | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| | presence/likely absence. Surveys to confirm bat roost locations if activity is confirmed.<br>• Siting of compounds and laydown areas to avoid TL.3 habitat.<br>• Lighting design to reduce light levels and spill from construction areas.<br>• Restriction of nightworks around TL.3 habitat.<br>• Bat management should consider any regional consent conditions (i.e., Bat Management Plans) that may be required for bats.<br>The post mitigation level of effect can be reduced to **Negligible.** | | • Consideration to the provisions of the Wildlife Act.<br>• Design and implementation of a vegetation removal protocol.<br>• The protocol should provide for roost potential and ABM surveys prior to vegetation removal; and<br>• timing of vegetation removal should be constrained to avoid the maternity period (vegetation removal should occur during October or between March and April).<br>The post mitigation level of effect related to mortality or injury to bats due to district plan vegetation removal can be reduced to **Negligible.** | |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

### 10.3.1.3 Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace native birds from suitable nesting and foraging habitat adjacent to the Coatesville-Riverhead NoR. Additionally, birds may be impacted by removal of district plan vegetation through the following effects:

- Loss of foraging habitat
- Nest loss
- Mortality or injury to birds

Table 10-9 outlines the effect assessment for birds due to construction activities related to noise and light, and removal of district plan vegetation.

**Table 10-9 Assessment of ecological effects for birds and impact management during construction for the Coatesville-Riverhead NoR**

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Nest loss<br>- Mortality or injury to birds | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | **<u>Non-TAR birds</u>**<br>The magnitude of effect is assessed as **Moderate** due to definite presence of native birds associated with several habitat features of the NoR.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required.<br>**<u>TAR birds (spotless crake)</u>**<br>The magnitude of effect is assessed as **Moderate** due to a very high probability of disturbance.<br>The ecological value of these species is **High**, and the overall level of effect is assessed as **High** prior to mitigation. As such impact management is required. | Same as Baseline. | **<u>Non-TAR birds</u>**<br>The magnitude of all three effect is assessed as **Moderate** due to high likelihood of these effects occurring.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to construction disturbance is assessed as **Low** prior to mitigation. As such no impact management is required.<br>**<u>TAR birds</u>**<br>Unlikely to be affected by district plan vegetation removal. | Same as Baseline. |

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Nest loss<br>- Mortality or injury to birds | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| | **TAR birds (dabchick)**<br>The magnitude of effect is assessed as **Moderate** due to a very high probability of disturbance.<br>The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Moderate** prior to mitigation. As such impact management is required. | | | |
| **Impact management and residual level of effect** | Impact management is required for spotless crake and dabchick.<br>The Bird Management Plan should consider the following:<br>• Pre-construction survey to confirm presence and further management controls.<br>• Where practical, construction works near wetland habitat should commence prior to the bird breeding season (September to February) in order to discourage bird nesting. | Same as Baseline. | Impact management will be required under the Wildlife Act to prevent killing or injuring of birds. As part of this management, timing of vegetation removal should be constraint, or pre-clearance inspections should be undertaken prior to vegetation removal. | N/A |

| Effect Description | Disturbance and displacement to roosts and individual birds (existing) adjacent to construction activities (noise, light, dust etc.) | | Effects due to removal of district plan vegetation:<br>- Loss of foraging habitat<br>- Nest loss<br>- Mortality or injury to birds | |
|---|---|---|---|---|
| | Baseline | Likely Future Ecological Environment | Baseline | Likely Future Ecological Environment |
| | • Bird management should be consistent with any regional consent conditions that may be required for regional compliance.<br>The residual impact is assessed as **Negligible** to **Low** post mitigation. | | | |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

#### 10.3.1.4 Lizards

Construction effects on lizards associated with noise, light and vibration are presented in Table 10-10. Construction activity relates to the upgrade of an existing road and as such lizards are likely to be habituated to noise and vibration from the existing road. For future rural sections of the Coatesville-Riverhead Highway areas within and adjacent to riparian strips it is expected that the effects on lizards due to vegetation removal will be assessed under Regional matters and is further discussed in Section 10.3.4.4.

**Table 10-10 Assessment of ecological effects for lizards and impact management during construction for the Coatesville-Riverhead NoR**

| Effect Description | Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.) | |
|---|---|---|
| | Baseline | Likely Future Ecological Environment |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Negligible** due to the infrequent but likely probability of lizard disturbance.<br>The ecological value of copper skink and ornate skink is assessed as **High**, and the overall level of effect due to construction disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A |
| **Management of residual effect** | N/A | N/A |

### 10.3.2 Operational Effects – Terrestrial Ecology

The potential construction effects (direct and indirect) to the terrestrial habitat and species within and adjacent to Coatesville-Riverhead NoR (as they relate to district matters) have been identified:

- Vegetation removal subject to district controls (Appendix 5).
- Disturbance and displacement to roosts/nests and individual (existing) bats, birds and lizards due to construction activities (noise, light, dust etc.). It is assumed that this effect will occur after vegetation clearance (subject to regional consent controls) has been implemented and is therefore likely to happen in habitats adjacent to the project footprint/designation or underneath structures such as bridges.

The following sections detail the magnitude of effect and subsequent level of effect on ecological features (further detail regarding how these were determined are provided in Appendix 1). Impact management and residual effects are also presented where the level of effect is assessed to be **Moderate** or higher.

#### 10.3.2.1 Bats

The loss of connectivity through permanent habitat loss and disturbance such as operational noise/vibration and light can lead to an overall reduction in size and quality of bat foraging habitat and can impact on bat movement in the broader landscape. Lighting spillage from street lighting could also disturb commuting and foraging bats at night and adversely affect insect prey populations. The level of effect on bats due to operational impacts associated with loss in connectivity should be assessed in the context of confirmed bat activity in the broader landscape, the existing degree of fragmentation and that of the future urban environment. Table 10-11 outlines the effects assessment for:

- Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to additional fragmentation of terrestrial habitat due to the presence of the infrastructure.
- Disturbance and displacement of bats due to light, noise and vibration from the road.

Table 10-11 Assessment of ecological effects for bats and impact management during operation for the Coatesville-Riverhead NoR

| Effect Description | Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration | | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Negligible** due to unlikely probability low frequency and local extent of disturbance.<br>The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Low** for disturbance. | Same as Baseline. | The magnitude of effect is assessed as **Low** despite unlikely probability and localised consequences of fragmentation.<br>The ecological value of bats is assessed to be **Very High**, and the overall level of effect is assessed as **Moderate** for additional loss in connectivity. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A | A Bat Management Plan should be developed to include consideration for:<br>• Lighting design to minimise light levels and light spill along the road corridor.<br>• Retention of large, mature trees where practicable, to act as hop overs.<br>The implementation of the proposed impact management measures will reduce the level of effect to **Low.** | Same as Baseline. |

| Effect Description | Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration | | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape | |
|---|---|---|---|---|
| | Baseline | Likely Future Ecological Environment | Baseline | Likely Future Ecological Environment |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

#### 10.3.2.2 Birds

Additional noise, vibration and lighting disturbance caused by the use of the upgraded road could potentially contribute to the displacement of native birds from suitable nesting and foraging habitat within and adjacent to the Coatesville-Riverhead NoR, while noise, light and vibration may also affect connectivity in the broader landscape. Table 10-12 outlines the operational effect assessment and impact management for birds.

**Table 10-12 Assessment of ecological effects for birds and impact management during operation for the Coatesville-Riverhead NoR**

| Effect Description | Further disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.) | | Further loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| **Level of effect prior to impact management** | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** for as the Coatesville-Riverhead NoR is along an existing road and birds are likely to be habituated to noise, light and vibration from the road.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to operational disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.<br>**TAR birds (spotless crake)**<br>The magnitude of effect is assessed as **Low** due to a lower probability of disturbance.<br>The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. | Same as Baseline. | **Non-TAR birds**<br>The magnitude of effect is assessed as **Low** as the Coatesville-Riverhead NoR is along an existing road.<br>The ecological value of birds in the context of habitat features are assessed to be **Low**, and the overall level of effect due to operational disturbance is assessed as **Very Low** prior to mitigation. As such no impact management is required.<br>**TAR birds (spotless crake)**<br>The magnitude of effect is assessed as **Low** due to a lower probability of connectivity loss for this species.<br>The ecological value of these species is **High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required.<br>**TAR birds (dabchick)**<br>The magnitude of effect is assessed as **Negligible** due to a lower | Same as Baseline. |

| Effect Description | Further disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.) | | Further loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | |
|---|---|---|---|---|
| | **Baseline** | **Likely Future Ecological Environment** | **Baseline** | **Likely Future Ecological Environment** |
| | **TAR birds (dabchick)**<br>The magnitude of effect is assessed as **Negligible** due to a lower probability of disturbance.<br>The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. | | probability of connectivity loss for this species.<br>The ecological value of these species is **Very High**, and the overall level of effect is assessed as **Low** prior to mitigation. As such no impact management is required. | |
| **Impact management and residual level of effect** | N/A | N/A | N/A | N/A |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

#### 10.3.2.3 Lizards

Suitable habitat (EG, ES, PL.3 and TL.3) was identified within the NoR boundary which could potentially support native lizards. Native lizards require vegetated corridors to facilitate natural dispersal, although they are considered to be relatively resident species and do not require migration or large-scale movement to support reproduction, refuge and feeding.

The Coatesville-Riverhead NoR includes upgrading the existing roads, therefore it is not expected to result in the additional fragmentation of lizard habitat. Similarly, resident (existing and future) lizards are likely to be habituated to disturbance such as noise, vibration and lighting and no additional effect on lizards is expected, provided that the post-upgraded road will not result in higher levels of noise and vibration. Table 10-13 outlines the operational effect assessment and impact management for lizards.

**Table 10-13 Assessment of ecological effects for lizards and impact management during operation for the Coatesville-Riverhead NoR**

| Effect Description | Disturbance and displacement of existing and future lizards due to light, noise and vibration effects from the presence of the road | | Further decrease in dispersal ability for existing and future lizard populations due to permanent habitat loss associated with the presence of the road | |
|---|---|---|---|---|
| | Baseline | Likely Future Ecological Environment | Baseline | Likely Future Ecological Environment |
| **Level of effect prior to impact management** | The magnitude of effect is assessed as **Negligible** as the Project is not expected to further exacerbate existing disturbance adjacent to the NoR.<br>The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. | The magnitude of effect is assessed as **Negligible** as the Project is not expected to further exacerbate existing and future restrictions on lizard dispersal adjacent to the NoR.<br>The ecological value of copper skinks and ornate skinks is assessed to be **High**, and the overall level of effect due to the presence of the road is assessed as **Very Low** prior to mitigation. As such no impact management is required. | Same as Baseline. |
| **Impact management and residual level of effect** | N/A | N/A | N/A | N/A |
| **Management of residual effect** | N/A | N/A | N/A | N/A |

### 10.3.3 Conclusions

The ecological level of effects assessed as **Moderate**, **High** or **Very High** for the Coatesville-Riverhead NoR are described in Sections 10.3.3.1 and 10.3.3.2.

#### 10.3.3.1 Long-tailed bats

- **Moderate** level of effect for noise and light disturbance of individual bats or roosts during construction for the Baseline and Future Environment.
- **Moderate** level of effect for mortality or injury to bats during construction due to removal of district plan vegetation for the Baseline and Future Environment.
- **Moderate** level of effect for the loss in connectivity to bats due to operational effects from the presence of the road for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible** for mortality or injury effects during construction, **Negligible** for construction and operational related disturbance effects and **Low** for connectivity effects.

#### 10.3.3.2 TAR birds (spotless crake, dabchick)

- **Moderate** (for Threatened - Nationally Increasing species) and **High** (for At Risk - Declining species) level of effect for noise and light disturbance of individual birds or roosts during construction for the Baseline and Future Environment.

The post mitigation level of effect is considered to be **Negligible** and **Low** for construction related connectivity effects.

### 10.3.4 Design and Future Regional Resource Consent Considerations

Ecological effects associated with activities that require regional consents and Wildlife Act Authority permits are briefly discussed in the section below. This section has informed the proposed designation boundary of the Coatesville-Riverhead Highway NoR.

#### 10.3.4.1 Terrestrial Ecology

Construction of the Project will result in temporary and permanent loss of vegetation within the NoRs, including suitable habitat that is potentially being used by native fauna (bats, birds and lizards). Loss of vegetation that is subject to district plan controls is discussed in Section 10.3.1. The amounts and types of all[30] terrestrial habitat and vegetation (including habitat used by native fauna) that could be lost as a result of the Project is presented in Table 10-14 under the Footprint column. For context, the extent of similar habitat features is provided for the road footprint and the designation boundary.

The terrestrial vegetation to be lost (temporary and permanent) is comprised of both native and exotic vegetation which ranges from **Negligible** to **Moderate** ecological value (Section 10.2.2.3). Some of these areas are likely to provide habitat to native fauna, as discussed in Sections 10.3.4.2 to 10.3.4.4 below.

As the design develops and resource consent applications are prepared, more detailed habitat and fauna surveys may be required to inform an EcIA (in line with the EcIA Guidelines) which will be used to support future regional resource consent and wildlife permit applications (if required).

[30] Includes vegetation that is subject to district and regional plan controls as well as vegetation that can be removed as a permitted activity.

**Table 10-14 Potential area of permanent terrestrial vegetation loss within the road footprint for the Coatesville-Riverhead NoR**

| Feature | Classification* | Footprint (m²) |
|---|---|---|
| Brown Field (includes cropland) | BF | 8,710 |
| Exotic Grassland | EG | 24,062 |
| Exotic Scrub | ES | Adjacent to road footprint. |
| Planted Vegetation – Exotic (amenity) | PL.3 | 24,475 |
| Treeland – Exotic-Dominated | TL.3 | 15,163 |

Notes: * = Classification from Singers et al. (2017)

#### 10.3.4.2 Bats

Mature trees in suitable habitat areas (TL.3) may provide potential habitat for bat roosts and facilitate bat movement in the broader landscape. The presence of bats should be re-assessed prior to obtaining any regional resource consents for vegetation removal within 20 m of riparian strips and to support an application for a wildlife permit. The loss of some of this habitat is already assessed because they are district plan trees.

#### 10.3.4.3 Birds

Native birds are likely to be present within the NoR and utilise all identified terrestrial habitats (excluding brown fields). Vegetation clearance required for construction could result in the loss of these habitats of local value to native birds. The value of these habitats ranges from **Low** to **Moderate** value and any vegetation clearance within the bird nesting season (September – February) will need to be managed in accordance with the Wildlife Act 1953. The loss of some of this habitat is already assessed because they are district plan trees.

#### 10.3.4.4 Lizards

Native lizards are likely to be present within vegetation impacted by the Project. Therefore, there is potential that site clearance required for construction could kill or injure native lizard species and result in the removal of their habitat. Any vegetation clearance where lizards are likely to occur will also need to be managed in accordance with the Wildlife Act 1953.

#### 10.3.4.5 Freshwater Ecology

The construction of the Coatesville-Riverhead NoR will impact five existing streams, with **Moderate** ecological value. Stream reclamation is estimated at approximately 370 m. The predicted permanent and intermittent stream loss for the Project along is presented in Table 8-11. These calculations will require re-evaluation as part of the future regional consent process. It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

During the detailed design phase, stream crossing plans (i.e., bridge or culvert) will be confirmed. Under a future regional consent for earthworks, impact management would also be required to ensure sediment discharge to streams is controlled appropriately.

**Table 10-15 Potential stream loss (permanent and intermittent) within the Coatesville-Riverhead NoR**

| Stream ID | Hydroperiod | Ecological Value | Active channel width (m)* | Length to be lost (m)* | Loss ($m^2$)* |
|---|---|---|---|---|---|
| R3-S1 | Intermittent | Moderate | 1 | 65 | 65 |
| R3-S2 | Intermittent | Moderate | 1 | 60 | 60 |
| R3-S3 | Intermittent | Low | 1 | 65 | 65 |
| R3-S4 | Permanent | Moderate | 2 | 113 | 126 |
| R3-S5 | Permanent | High | 2 | 70 | 140 |

### 10.3.4.6 Wetland Ecology

The construction of the Coatesville-Riverhead NoR will impact one **High** value natural wetland (R3-W1). Approximately 200 $m^2$ of wetland loss is unavoidable. It is expected that details regarding the offset/compensation requirements will be addressed during the future regional resource consent application.

# 11 Conclusion

## Construction Effects

Table 11-1 to Table 11-4 provides a summary of district matter ecological effects during construction prior to any mitigation. The summary represents the level of effect for the baseline and likely future ecological environment activities as one where they are the same. Construction effect mitigation measures will include:

- A Bat Management Plan (BMP) for Coatesville-Riverhead. Details of the BMP will depend on bat habitat within the future environment and is likely to include bat habitat surveys prior to construction, siting of compounds and laydown areas to avoid bat habitat, lighting design to reduce light levels and spill from construction areas and restriction of nightworks around treeland bat habitat.
- Bird management will be required for Don Buck Road (stormwater upgrade in Rush Creek Reserve – potential presence of dabchick) and Coatesville-Riverhead (in areas where construction is adjacent to open water and wetland – potential presence of dabchick/spotless crake). Considerations for bird management will include avoiding the bird breeding season (September to February) during construction (as it relates to the existing stormwater pond), or bird survey prior to construction to confirm TAR species are not present and to provide guidance if TAR species are present.

**Table 11-1 Summary of ecological effects during construction prior to mitigation for district plan vegetation removal**

| Construction - Terrestrial vegetation (district plan vegetation only) | |
|---|---|
| **NoR** | **Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan vegetation only)** |
| Don Buck (R1) | Low |
| Fred Taylor (R2) | Very Low |
| Coatesville-Riverhead (R3) | Low |

**Table 11-2 Summary of ecological effects during construction prior to mitigation for bats (NoR-R3 only)**

| Construction - Bats | | | |
|---|---|---|---|
| **NoR** | **Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)** | **Loss of foraging habitat due to removal of district plan vegetation** | **Mortality or injury to bats due to removal of district plan vegetation** |
| Coatesville-Riverhead (R3) | **Moderate** | Low | **Moderate** |

**Table 11-3 Summary of ecological effects during construction prior to mitigation for birds**

| Construction - Birds | | | | | |
|---|---|---|---|---|---|
| **NoR** | **Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) - non-TAR birds** | **Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) – TAR birds** | **Loss of foraging habitat due to removal of district plan vegetation** | **Nest loss due to removal of district plan vegetation** | **Mortality or injury to birds due to removal of district plan vegetation** |
| Don Buck (R1) | Very Low | **Moderate** | Low | Low | Low |
| Fred Taylor (R2) | Very Low | - | Very Low | Very Low | Very Low |
| Coatesville-Riverhead (R3) | Low | **Moderate** (Threatened), **High** (At Risk) | Low | Low | Low |

**Table 11-4 Summary of ecological effects during construction prior to mitigation for lizards**

| Construction – Lizards | |
|---|---|
| **NoR** | **Disturbance and displacement of individuals (existing) adjacent to construction activities (noise, dust etc.)** |
| Don Buck (R1) | Very Low |
| Fred Taylor (R2) | Very Low |
| Coatesville-Riverhead (R3) | Very Low |

The residual (post-mitigation) level of effect for all construction effects are considered **Negligible** or **Low.**

## Operational Effects

Table 11-5 to Table 11-7 provides summary of district matter operational effects due to the presence of road resulting in disturbance or loss in connectivity to bats, birds and lizards.

Operational effects mitigation measures will include a BMP. The BMP will include buffer planting along road corridors associated with stream crossings, lighting design along strategic location of the road (stream crossings) and retention of large, mature trees (specifically TL.3 stands) where practicable.

Table 11-5 Summary of ecological effects during operation prior to mitigation for bats (Coatesville-Riverhead NoR only)

| Operation - Bats | | |
|---|---|---|
| NoR | Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration | Loss in connectivity due to permanent habitat loss, light, and noise effects from the road, leading to fragmentation of terrestrial habitat and influencing bat movement in the broader landscape |
| Coatesville-Riverhead (R3) | Low | **Moderate** |

Table 11-6 Summary of ecological effects during operation prior to mitigation for birds

| Operation - Birds | | |
|---|---|---|
| NoR | Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure |
| Don Buck (R1) | Very Low (Non-TAR species), Low (TAR Species) | Very Low (Non-TAR species), Low (TAR Species) |
| Fred Taylor (R2) | Very Low | Very Low |
| Coatesville-Riverhead (R3) | Very Low | Very Low |

Table 11-7 Summary of ecological effects during operation prior to mitigation for lizards

| Operation - Lizards | | |
|---|---|---|
| NoR | Disturbance and displacement to roosts and individual birds (existing) due to the presence of the road (noise, light, dust etc.) | Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure |
| Don Buck (R1) | Very Low | Very Low |
| Fred Taylor (R2) | Very Low | Very Low |
| Coatesville-Riverhead (R3) | Very Low | Very Low |

The residual (post-mitigation) level of effect for operational effects are considered **Low** or **Very Low**.

# 12 References

Auckland Council. (2012). Environmental strategy and policy: Auckland Council's indigenous biodiversity strategy, July 2012. Auckland: Auckland Council.

Clapcott, J. E. (2015). National Rapid Habitat Assessment Protocol Development for Streams and Rivers. Prepared for Northland Regional Council. Report Number 2649. Cawthron Institute: Nelson, New Zealand.

Clarkson, B. R. (2013). A vegetation tool for wetland delineation in New Zealand. Landcare Research. DOI: 10.7931/J2TD9V77

de Lange, P. J., Rolfe, J. R., Barkla, J. W., Courtney, S. P., Champion, P. D., Perrie, L. R., Beadel, S. M., Ford, K. A., Breitwieser, I., Schönberger, I., Hindmarsh-Walls, R., Heenan, P. B. & Ladley, K. (2017). Threat Classification of New Zealand Vascular Plants. New Zealand Threat Classification Series 22. Department of Conservation: Wellington, New Zealand.

Department of Conservation. (2010). The New Zealand Coastal Policy Statement 2010. Issued by notice in the New Zealand Gazette on 4 November 2010 and takes effect on 3 December 2010. Wellington: Department of Conservation.

Department of Conservation. (2014). Conservation Management Strategy: Auckland 2014-2024. Volume I - operative 17 November 2014. Wellington: Department of Conservation.

Department of Conservation, Ministry for the Environment. (2000). The New Zealand biodiversity strategy 2000-2020. Wellington: Department of Conservation and Ministry for the Environment.

Department of Conservation, Ministry for the Environment. (2007). Protecting our Places - Information about the national priorities for protecting rare and threatened native biodiversity on private land. Wellington, Ministry for the Environment.

Dunn, N. R., Allibone, R. M., Closs, G. P., Crow, S. K., David, B. O., Goodman, J. M., Griffiths, M., Jack, D. C., Ling, N., Waters, J. M. & Rolfe, J. R. (2018). Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p.

Franklin, P., Gee, E., Baker, C. & Bowie, S. (2018). New Zealand Fish Passage Guidelines. National Institute of Water & Atmospheric Research (NIWA): Hamilton, New Zealand.

Hitchmough, R., Barr, B., Knox, C., Lettink, M., Monks, J.M., Patterson, G.B., Reardon, J.T., van Winkel, D., Rolfe, J. & Michel, P. (2021). Conservation status of New Zealand reptiles. New Zealand Threat Classification Series 35. Department of Conservation.

McEwen, W. M. (1987). Ecological regions and districts of New Zealand. New Zealand Biological Resources Centre Publication, 5, Part 1: Wellington, Department of Conservation.

Ministry for the Environment. (2011). Proposed National Policy Statement for Biodiversity. Wellington: Ministry for the Environment.

Ministry for the Environment. (2017). National Policy Statement for Freshwater Management 2014. Updated August 2017 to incorporate amendments from the National Policy Statement for Freshwater Amendment Order 2017. Wellington: Ministry for the Environment.

NZ Transport Agency. (2013). Fish passage guidance for state highways. Wellington: Waka Kotahi NZ Transport Agency.

O'Donnell, C. F. J., Borkin, K. M., Christie, J. E., Lloyd, B., Parsons, S. & Hitchmough, R. A. (2018). Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Department of Conservation, Wellington. 4 p.

Robertson, H. A., Baird, K. A., Elliott, G. P., Hitchmough, R. A., McArthur, N. J., Makan, T. D., Miskelly, C. M., O'Donnell, C. F. J., Sagar, P. M., Scofield, R. P., Taylor, G. A. & Michel, P. (2021). Conservation status of birds in Aotearoa New Zealand, 2021. New Zealand Threat Classification Series 36. Department of Conservation, Wellington.

Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D. & Ussher, G. T. (2018). Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition. Melbourne: Environment Institute of Australia and New Zealand.

Singers, N., Osborne, B., Lovegrove, T., Jamieson, A., Boow, J., Sawyer, J., Hill, K., Andrews, J., Hill, S. & Webb, C. (2017). Indigenous terrestrial and wetland ecosystems of Auckland. Auckland Council: Auckland, New Zealand.

Storey, R., Wadhwa, S. (2009). An assessment of the lengths of permanent, intermittent and ephemeral streams in Auckland region. Auckland Council Technical Report 2009/028.

Storey, R. G., Neale, M. W., Rowe, D. K., Collier, K. J., Hatton, C., Joy, M. K., Maxted, J. R., Moore, S., Parkyn, S. M., Phillips, N. & Quinn, J.M. (2011). Stream Ecological Valuation (SEV): a method for assessing the ecological function of Auckland streams. Auckland Council Technical Report 2011/009. Auckland: Auckland Council.

van Winkel, D., Baling, M. & Hitchmough, R. (2018). Reptiles and Amphibians of New Zealand. Auckland University Press: Auckland, New Zealand.

Walker, S., Price, R. & Rutledge, D. (2008). New Zealand's remaining indigenous cover: recent changes and biodiversity protection needs. Science for Conservation 284. Department of Conservation, Wellington. 82p.

# 1 Appendix 1 - Ecological Impact Assessment Methodology

The standard by which this EcIA was undertaken follows the guidelines published by the Environment Institute of Australia and New Zealand (EIANZ Guidelines) (EIANZ, 2018).

## 1.1 Assessment of Ecological Value

The first step in the EcIA approach is to assess the value of ecological features in terms of Representativeness, Rarity, Diversity and Pattern, and Ecological context. Details on each matter and its associated considerations are provided in Table 12-1 for terrestrial ecological value and Table 12-2 freshwater ecological value

**Table 12-1 Matters and considerations for the assessment of terrestrial ecological value**

| Representativeness |
|---|
| Typical structure and composition |
| Indigenous representation |
| **Rarity/distinctiveness** |
| Species of conservation significance |
| Range restricted or endemic species |
| Distinctive ecological values |
| **Diversity and pattern** |
| Habitat diversity |
| Species diversity |
| Patterns in habitat use |
| **Ecological context** |
| Size, shape and buffering |
| Sensitivity to change |
| Ecological networks (linkages, pathways, migration) |

**Table 12-2 Matters and considerations for the assessment of freshwater ecological value**

| Representativeness (including SEV, RHA and ecological integrity) |
|---|
| Extent to which site/catchment is typical of characteristic |
| Instream habitat modification |
| Riparian habitat modification |

| Representativeness (including SEV, RHA and ecological integrity) |
| --- |
| Hydrological modification |
| Catchment conditions |
| Geomorphological modification |
| Water quality modification |
| Presence of alien and invasive species |
| Invertebrate assemblage representation |
| Fish assemblage representation |
| **Rarity/descriptiveness** |
| Pool characterisation |
| Species of conservation significance |
| Range restricted or endemic species |
| Stream type (rare or distinctive) |
| **Diversity and pattern** |
| Distinctive ecological values |
| Level of natural diversity |
| Diversity metrics |
| Complexity of community |
| **Ecological context (Ecosystem services, importance sensitivity)** |
| Stream order |
| Catchment size |
| Hydroperiod |
| Sensitivity to flow modification |
| Sensitivity water quality modification |
| Sensitivity to sedimentation/erosion |
| Connectivity and migration |

## 1.2 Assessment of Ecological Effects

The ecological effects assessment includes several steps that collectively assess the way the Project will interact with elements of the physical and biological, environment to produce effects to habitat and receptors. The method for determining the level of effect is outlined in the following sections.

Basic impact characteristic terminology and respective descriptors are incline with the EIANZ Guidelines and are provided in Table 12-3.

**Table 12-3 Magnitude of effect assessment terminology**

| Characteristic | Definition | Designations |
|---|---|---|
| Type | A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect) | Direct |
| | | Indirect |
| Extent | The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.) | Local |
| | | Regional |
| | | National |
| Duration | The time period over which a resource/receptor is affected | Temporary (days or months) |
| | | Short-term (<5 years) |
| | | Long-term (15-25 years) |
| | | Permanent (>25 years) |
| Frequency | A measure of the constancy or periodicity the receptor will be affected | Infrequently |
| | | Periodically |
| | | Frequently |
| | | Continuously |
| Likelihood | The probability of an effect occurring if it is unplanned | Highly Unlikely |
| | | Unlikely |
| | | Likely |
| | | Highly Likely |
| | | Definite |
| Reversibility | The degree to which the ecological effect can be reversed in a reasonable time scale through natural processes or mitigation | Totally |
| | | Partially |
| | | Irreversible |
| | | Not applicable |

Based on the above-mentioned descriptors, the characteristics of each effect are used to assign a magnitude to the specific effect. Magnitude designations are provided in Table 12-4.

**Table 12-4: Magnitude of effect designations**

| Magnitude | Description |
|---|---|
| Very High | Total loss of, or very major alteration to, key elements/features of the existing baseline conditions, such that the post-development character, composition and or attributes will be fundamentally changes and may be lost from the site altogether; and/or loss of very high proportion of the known population or range of the elements/features |
| High | Major loss or major alteration to key elements/features of the existing baseline such that the post-development character, composition and/or attributes will be fundamentally changed; and/or loss of a high proportion of the known population or range of the element/feature |
| Moderate | Loss or alteration to one or more key elements/features of the existing baseline such that the post-development character, composition and/or attributes will be partially changed; and/or loss of a moderate proportion of the known population or range of the element/feature |
| Low | Minor shift away from the existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline conditions will be similar or pre-development circumstances or patterns; and or having a minor effect on the known population or range of the element/feature |
| Negligible | Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; and/or having negligible effect on the known population or range of the element/feature |

The magnitude of an effect is considered in relation to the ecological value of the habitat or receptor to be impacted on (Section). The ecological value of habitat or receptors are the primary focus of the ecological assessment. The ecological value of habitat or receptors are typically expressed on a local, district, regional or national scale. The ecological value designations are provided in Table 12-5.

**Table 12-5: Ecological value designations**

| Value | Description |
|---|---|
| Very high | Area rates High for three or all the four assessment matters. Likely to be of National importance and recognised as such |
| High | Area rates High for two of the assessment matters, Moderate and Low for the remainder or Area rates High for 1 so the assessment matters, moderate for the remainder. Likely to be regionally important and recognised as such |
| Moderate | Area rates High for one matter, Moderate and Low Dortha remainder, or Area rates Moderate for 2 or more assessment matters Low or Very low for the remainder. Likely to be important at the level of the Ecological District |
| Low | Area rates Low or Very low for most assessment matters and Moderate for one. Limited ecological value other as local habitat for tolerant species |
| Negligible | Area rates Very low for three matters and Moderate, Low or Very low for the remainder |

Once magnitude of effect and the ecological value of the habitat or receptor have been determined, the level of effect can be assigned for each effect using the matrix shown in Table 12-6.

**Table 12-6 Ecological effect matrix**

| | | Ecological Values | | | | |
|---|---|---|---|---|---|---|
| | | Very High | High | Moderate | Low | Negligible |
| **Magnitude** | Very High | Very High | Very High | High | Moderate | Low |
| | High | Very High | Very High | Moderate | Low | Very Low |
| | Moderate | High | High | Moderate | Low | Very Low |
| | Low | Moderate | Low | Low | Very Low | Very Low |
| | Negligible | Low | Very Low | Very Low | Very Low | Very Low |
| | Positive | Negligible | Negligible | Negligible | Negligible | Negligible |

From Table 12-6, the level of effect designations are defined below:

- **Negligible**: An effect of negligible consequence is one where habitat or receptors will not be affected in any meaningful way by a Project activity or the predicted effect is indistinguishable from natural background variations;
- **Low**: An effect of minor consequence is one where habitat or receptors will experience a noticeable effect, but the effect magnitude is sufficiently small (with or without mitigation) and/or the resource/receptor is of low ecological value. In either case, the magnitude should be well within applicable standards;
- **Moderate**: An effect of moderate consequence has an effect magnitude that is within applicable standards but higher than that of a minor effect. The emphasis for moderate effects is to show that the effect has been reduced or minimised in line with the mitigation hierarchy;
- **High**: A high level of effect of is one where an accepted limit or standard may be exceeded, or moderate magnitude of effect will occur to moderate or high value habitat or receptors;
- **Very High**: A very high level of effect will occur when the magnitude and value of effects are assessed as high or very high. Typically, very high level of effects notably exceeds standard limits.

## 1.3 Impact Management

Informed by the level of effects suitable impact management measures are provided consistent with the mitigation hierarchy. The priority in mitigation is to first apply mitigation measures to the source of the impact (avoid) and then to address the resultant effects (reduce or minimise) of the impact.

## 1.4 Residual Impacts

Once mitigation measures are declared, the next step in the effect assessment process was to assign residual impact significance. This is a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional recommended mitigation measures.

## 1.5 Managing Uncertainty

Biophysical impacts are difficult to predict with certainty, but uncertainty stemming from on-going development of the Project design and implementation is inevitable, and the environment is variable over time. If uncertainties are relevant to the effect assessment, they were stated and approached conservatively, to identify a range of likely residual effects and relevant mitigation measures.

## 1.6 Cumulative Effects

Cumulative impacts and effects are those that arise because of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect. These are termed cumulative impacts and effects. No structured methods were employed to assess cumulative impacts, but where relevant descriptions of potential cumulative effects have been provided.

# 2 Appendix 2 – Auckland Unitary Plan Activities

The following tables specify the activity status of land use and activities relevant to the Riverhead Redhills Assessment Package as set out in the AUP:OP and any permitted standards or matters of control/discretion.

The following abbreviations are used to identify the class of activity:

| Activity Class Abbreviation | Meaning |
|---|---|
| P | Permitted Activity |
| C | Controlled Activity |
| RD | Restricted Discretionary Activity |
| D | Discretionary Activity |
| NC | Non-complying Activity |
| Pr | Prohibited Activity |

### Auckland Unitary Plan – E26 Infrastructure

Table E26.4.3.1 below is relevant for considering effects and recommending mitigation in relation to tree removal. Note that, except for Trees in Roads, in Open Space Zones and Notable Trees, trees are not protected under the AUP.

**Table E26.4.3.1 Activity table - Network utilities and electricity generation – Trees in roads and open space zones and the Notable Trees Overlay**

| Activity | Activity Status | | | Permitted Standards or Matters of Discretion / Control |
|---|---|---|---|---|
| | Trees in roads [dp] | Open space zones [dp] | Notable trees [dp] | |
| (A89) Tree removal of Notable Trees | N/A | N/A | D | N/A |
| (A90) Tree trimming, alteration or removal on roads adjoining rural zones and on roads adjoining the Future Urban Zone | P | N/A | N/A | N/A |
| (A91) Tree alteration or removal of any tree less than 4m in height and/or less than 400mm in girth | P | P | RD | N/A |
| (A92) Tree alteration or removal of any tree greater than 4m in height and/or greater than 400mm in girth | RD | RD | N/A | N/A |
| (A93) Tree trimming, alteration and removal not otherwise provided for | D | D | D | N/A |

### Auckland Unitary Plan – E26 Infrastructure

The table below is relevant for considering effects and recommending mitigation in relation to vegetation clearance. Also refer to Table E15.4.1.

**Table E26.3.3.1 Activity table – Network utilities and electricity generation and vegetation management**

| Activity | Activity Status | | | | | | Permitted Standards |
|---|---|---|---|---|---|---|---|
| | Rural zones, coastal areas and riparian areas [rp] | SEA [rp] | ONF [dp] | HNC [dp] | ONL [dp] | ONC [dp] | |
| (A76) Vegetation alteration or removal | P | P | P | P | P | P | Refer to E26.3.5.4. Vegetation alteration or removal for Permitted Activity Standards |
| (A77) Vegetation alteration or removal that does not comply with Standards E26.3.5.1 to E26.3.5.4 | RD | RD | RD | RD | RD | RD | |
| (A78) Vegetation alteration or removal not otherwise provided for | D | D | D | D | D | D | |

Note: Greyed-out boxes relate to Regional Activities which are not considered as part of the NoR and will be relevant for future Regional Resource Consents.

### Auckland Unitary Plan – E15 Vegetation management and biodiversity

Table E15.4.1 below is relevant for considering effects of activities over and above those that are permitted and recommending mitigation in relation to vegetation clearance in urban and FUZ zones, and adjacent to riparian areas.

**Table E15.4.1 Activity table - Auckland-wide vegetation and biodiversity management rules**

| Activity | Activity Status | Permitted Standards |
|---|---|---|
| Riparian areas (as described below) | | |
| (A16) Vegetation alteration or removal within 20m of rural streams, other than those in Rural – Rural Production Zone and Rural – Mixed Rural Zone | RD | N/A |

| Activity | Activity Status | Permitted Standards |
|---|---|---|
| (A17) Vegetation alteration or removal within 10m of rural streams in the Rural – Rural Production Zone and Rural – Mixed Rural Zone | RD | N/A |
| (A18) Vegetation alteration or removal within 20m of a natural wetland, in the bed of a river or stream (permanent or intermittent), or lake | RD | N/A |
| (A19) Vegetation alteration or removal within 10m of urban streams | RD | N/A |
| All other zones and areas not covered above (i.e. Urban Zones and FUZ) | | |
| (A22A) Vegetation alteration or removal | P | Refer to E15.6. Vegetation alteration or removal for Permitted Activity Standards |
| All areas | | |
| (A23) Permitted activities in Table E15.4.1 that do not comply with<br>one or more of the standards in E15.6 | RD | N/A |

### Auckland Unitary Plan – E26 Infrastructure - Earthworks

The table below is relevant for considering effects of activities over and above those that are permitted and recommending mitigation in relation to earthworks.

**Table E26.5.3.1 Activity table - Earthworks all zones and roads [dp]**

| Activity | Activity Status | Permitted Standards |
|---|---|---|
| (A95) Earthworks up to 2500 $m^2$ other than for maintenance, repair, renewal, minor infrastructure upgrading | P | Refer to E26.5.5.2. General standards (District) |
| (A96) Earthworks up to 2500 $m^3$ other than for maintenance, repair, renewal, minor infrastructure upgrading | P | Refer to E26.5.5.2. General standards (District) |
| (A97) Earthworks greater than 2500 $m^2$ other than for maintenance, repair, renewal, minor infrastructure upgrading | RD | |
| (A97A) Earthworks greater than 2500 $m^3$ other than for maintenance, repair, renewal, minor infrastructure upgrading | RD | |

# 3 Appendix 3 – Regional Plan, District Plan and Wildlife Act Matters

**Table 12-7 Ecological effects of road infrastructure construction broken down into AUP:OP Regional and District Plan matters**

| Ecological feature | Activity | Ecological Effect | AUP:OP District Plan provisions | AUP:OP Regional Plan provisions | Wildlife Act (1953) |
|---|---|---|---|---|---|
| **Construction** | | | | | |
| **Terrestrial habitat** | Vegetation removal (including trees) outside of roads and public spaces in:<br>a) a rural zone<br>b) riparian margins<br>c) coastal areas<br>d) SEAs<br>This also includes other terrestrial habitat of value identified in the EcIA. | Permanent loss of habitat/ecosystem, fragmentation and edge effects. | | ✓ | |
| | Vegetation removal (including trees) in:<br>a) Roads<br>b) Public spaces<br>c) ONFs<br>d) ONLs<br>e) HNCs<br>f) ONCs | Permanent loss of habitat/ecosystem, fragmentation and edge effects. | ✓ | | |
| | Earthworks – leading to invasion of bare earth surfaces with weeds and transfer of weeds (seeds and fragments) between earthworks areas. | Weed dispersal to previously unaffected areas of indigenous vegetation, reduction in terrestrial biodiversity. | | ✓ | |
| **Bats** | Vegetation removal. | Roost loss. | | ✓ | ✓ |
| | Vegetation removal. | Kill or injure individual. | | | ✓ |
| | Vegetation removal. | Loss of foraging habitat. | | ✓ | |
| | Construction activities (Noise, light, dust etc.). | Disturbance and displacement to roosts and to individuals (existing). | ✓ | | ✓ |
| **Birds (native)** | Vegetation removal. | Nest loss. | | ✓ | ✓ |
| | Vegetation removal. | Kill or injure individual. | | | ✓ |
| | Vegetation removal. | Loss of foraging habitat. | | ✓ | |

| Ecological feature | Activity | Ecological Effect | AUP:OP District Plan provisions | AUP:OP Regional Plan provisions | Wildlife Act (1953) |
|---|---|---|---|---|---|
| | Construction activities (noise, light, dust etc). | Disturbance and displacement of roosts and individuals (existing). | ✓ | | ✓ |
| **Herpetofauna (native)** | Vegetation removal. | Lizard habitat loss | | ✓ | |
| | Vegetation removal. | Kill or injure individual | | | ✓ |
| | Construction activities (noise, light, dust etc). | Disturbance and displacement of individuals (existing). | ✓ | | ✓ |
| | Reclamation/culverting/other structures e.g., bank armouring. | Permanent loss/modification of habitat/ecosystem. | | ✓ | |
| **Freshwater habitat – wetland or stream (including riparian margins)** | Vegetation removal. | Permanent loss of habitat/ecosystem, fragmentation and edge effects. | | ✓ | |
| | Construction activities – earthworks (leading to sediment discharge), machinery use and chemical storage (leading to leaks/spills). | Uncontrolled discharge leading to habitat and water quality degradation. | | ✓ | |
| | Diversion, abstraction or bunding of watercourses and water level/flow/ periodicity changes. | Detrimental effects on habitats including plant composition and fauna. | | ✓ | |
| **Fish (native)** | Reclamation/diversion /other structures e.g., bank armouring. | Loss of aquatic habitat. | | ✓ | |
| | Reclamation/diversion /culverting/other structures e.g., bank armouring. | Kill or injure individual. | | | ✓ |
| **Operation** | | | | | |
| **Terrestrial habitat** | Presence of the road - use of road edges as dispersal corridors by invasive plant species. | Weed dispersal to previously unaffected areas of indigenous vegetation, reduction in terrestrial biodiversity. | | ✓ | |
| | Road maintenance - increased use of herbicides. | Increased weed incursion, unintentional spray of indigenous vegetation. | | ✓ | |
| **Bats** | Vehicle movement. | Kill or injure individual. | | | ✓ |
| | Presence of the road. | Loss in connectivity due to permanent habitat | ✓ | | ✓ |

| Ecological feature | Activity | Ecological Effect | AUP:OP District Plan provisions | AUP:OP Regional Plan provisions | Wildlife Act (1953) |
|---|---|---|---|---|---|
| | | loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat. | | | |
| | Lighting and noise/vibration. | Disturbance and displacement of (new and existing) roosts and individuals. | ✓ | | ✓ |
| **Birds (native)** | Vehicle movement. | Kill or injure individual. | | | ✓ |
| | Presence of the road. | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat. | ✓ | | ✓ |
| | Lighting and noise/vibration. | Disturbance and displacement of (new and existing) nests and individuals. | ✓ | | ✓ |
| **Herpetofauna (native)** | Vehicle movement. | Kill or injure individual. | | | ✓ |
| | Presence of the road. | Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat. | ✓ | | ✓ |
| | Lighting. | Disturbance of nocturnal lizard behaviour. | ✓ | | ✓ |
| **Freshwater habitat – wetland or stream (including riparian margins)** | Vehicle (cartage) movement - risk of spills of potential toxins (oil, milk, chemicals). | Temporary degradation of instream/wetland habitat and water quality. | | ✓ | |
| | Presence of bridge. | Shading leading to change in ecosystem structure. | | ✓ | |
| | Gradual change in hydrology from presence of the road/stormwater, including reclamations. | Effect on downstream habitat (including erosion/sediment discharge) due to change in hydrology (increase or decrease). | | ✓ | |
| | Stormwater discharges - pollutants (such as heavy metals and herbicides). | Permanent degradation of wetland or instream habitat and water quality. | | ✓ | |

| Ecological feature | Activity | Ecological Effect | AUP:OP District Plan provisions | AUP:OP Regional Plan provisions | Wildlife Act (1953) |
|---|---|---|---|---|---|
| **Fish (native)** | Presence of culvert. | Loss of connectivity due to culvert preventing fish passage up and downstream. | | ✓ | |

# 4 Appendix 4 - Desktop Bird Records

**Table 12-8 Desktop bird records within 5 km of each NoR**

| Common Name | Maori Name | Scientific Name | Conservation Status | Record Source |
|---|---|---|---|---|
| Barbary dove | - | *Streptopelia risoria* | Introduced and Naturalised | eBird (Bird Atlas) |
| Black shag | Kawau | *Phalacrocorax carbo novaehollandiae* | At Risk - Naturally Uncommon | eBird (Bird Atlas) |
| Black-billed gull | Tarāpuka | *Larus bulleri* | Threatened - Nationally Critical | eBird (Bird Atlas) |
| Blackbird | Manu pango | *Turdus merula* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| California quail | - | *Callipepla californica* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| Canada goose | - | *Branta canadensis* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| Caspian tern | Taranui | *Hydroprogne caspia* | Threatened - Nationally Vulnerable | eBird (Bird Atlas) |
| Chaffinch | Pahirini | *Fringilla coelebs* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| Common pheasant | Peihana | *Phasianus colchicus* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| Cook's petrel | Tītī | *Pterodroma cookii* | At Risk - Relict | eBird (Bird Atlas) |
| Dunnock | - | *Prunella modularis* | Introduced and Naturalised | eBird (Bird Atlas) |
| Eastern rosella | - | *Platycercus eximius* | Introduced and Naturalised | eBird (Bird Atlas) |
| Fantail | Pīwakawaka | *Rhipidura fuliginosa placabilis* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| Goldfinch | - | *Carduelis carduelis* | Introduced and Naturalised | eBird (Bird Atlas) |
| Greenfinch | - | *Carduelis chloris* | Introduced and Naturalised | eBird (Bird Atlas) |
| Grey duck | Pārera | *Anas superciliosa* | Threatened - Nationally Critical | eBird (Bird Atlas) |

| Common Name | Maori Name | Scientific Name | Conservation Status | Record Source |
|---|---|---|---|---|
| Grey warbler | Riroriro | *Gerygone igata* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| House sparrow | Tiu | *Fringilla coelebs* | Introduced and Naturalised | eBird (Bird Atlas) |
| Kingfisher | Kōtare | *Todiramphus sanctus vagans* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| Little black shag | Kawau tūī | *Phalacrocorax sulcirostris* | At Risk - Naturally Uncommon | eBird (Bird Atlas), iNaturalist |
| Little pied cormorant | Kawau paka | *Phalacrocorax melanoleucos melanoleucos* | Vagrant | eBird (Bird Atlas) |
| Magpie | Makipae | *Gymnorhina tibicen* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| Mallard | - | *Anas platyrhynchos* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| Morepork | Ruru | *Ninox novaeseelandiae novaeseelandiae* | Not Threatened | eBird (Bird Atlas) |
| Muscovy duck | - | *Cairina moschata* | Introduced, not established | eBird (Bird Atlas), iNaturalist |
| Myna | - | *Acridotheres tristis* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| New Zealand pigeon | Kereru | *Hemiphaga novaeseelandiae* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| Northern New Zealand dotterel | Tūturiwhatu | *Charadrius obscurus aquilonius* | At Risk - Recovering | eBird (Bird Atlas), iNaturalist |
| Paradise shelduck | Pūtangitangi | *Tadorna variegata* | Not Threatened | eBird (Bird Atlas) |
| Pied shag | Kāruhiruhi | *Phalacrocorax varius varius* | At Risk - Recovering | eBird (Bird Atlas), iNaturalist |
| Pied stilt | Poaka | *Himantopus himantopus leucocephalus* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| Pūkeko | Pūkeko | *Porphyrio melanotus melanotus* | Not Threatened | eBird (Bird Atlas), iNaturalist |

| Common Name | Maori Name | Scientific Name | Conservation Status | Record Source |
|---|---|---|---|---|
| Red-billed gull | Tarāpunga | *Larus novaehollandiae scopulinus* | At Risk - Declining | eBird (Bird Atlas), iNaturalist |
| Rock pigeon | - | *Columba livia* | Introduced and Naturalised | eBird (Bird Atlas) |
| Royal spoonbill | Kōtuku ngutupapa | *Platalea regia* | At Risk - Naturally Uncommon | eBird (Bird Atlas) |
| Shining cuckoo | Pīpīwharauroa | *Chrysococcyx lucidus lucidus* | Not Threatened | eBird (Bird Atlas) |
| Silvereye | Tauhou | *Zosterops lateralis lateralis* | Not Threatened | eBird (Bird Atlas) |
| Skylark | Kaireka | *Alauda arvensis* | Introduced and Naturalised | eBird (Bird Atlas) |
| Song thrush | - | *Turdus philomelos* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| South Island pied oystercatcher | Tōrea | *Haematopus finschi* | At Risk - Declining | eBird (Bird Atlas), iNaturalist |
| Southern black-backed gull | Karoro | *Larus dominicanus dominicanus* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| Spotted dove | - | *Streptopelia chinensis tigrina* | Introduced and Naturalised | eBird (Bird Atlas) |
| Spur winged plover | - | *Vanellus miles novaehollandiae* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| Starling | - | *Sturnus vulgaris* | Introduced and Naturalised | eBird (Bird Atlas), iNaturalist |
| Swamp harrier | Kāhu | *Circus approximans* | Not Threatened | eBird (Bird Atlas) |
| Tomtit | Ngirungiru | *Petroica macrocephala* | Not Threatened | eBird (Bird Atlas) |
| Tūī | Tūī | *Prosthemadera novaeseelandiae novaeseelandiae* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| Variable oystercatcher | Tōrea pango | *Haematopus unicolor* | At Risk - Recovering | eBird (Bird Atlas) |
| Welcome swallow | Warou | *Hirundo neoxena neoxena* | Not Threatened | eBird (Bird Atlas) |

| Common Name | Maori Name | Scientific Name | Conservation Status | Record Source |
|---|---|---|---|---|
| White-faced heron | Matuku moana | *Egretta novaehollandiae* | Not Threatened | eBird (Bird Atlas), iNaturalist |
| White-fronted tern | Tara | *Sterna striata striata* | At Risk - Declining | eBird (Bird Atlas) |
| Wrybill | Ngutuparore | *Anarhynchus frontalis* | Threatened - Nationally Vulnerable | eBird (Bird Atlas) |
| Yellowhammer | - | *Emberiza citrinella* | Introduced and Naturalised | eBird (Bird Atlas) |

# 5 Appendix 5 - Riverhead Redhills Ecological Habitat Maps

## 5.1 NoR RE1: Don Buck Road FTN Upgrade

### 5.1.1 Terrestrial Vegetation


Path: P:\381\3810934\TGI\02 Data\1 Data Processing 550 Plus\598_Ecology_Mapping_NW_Strategic\SGA_NW_Strategic_Impacted_Habitats.aprx

**LEGEND**

- Route Options
- Designation
- BF
- EG
- PL.1
- PL.3
- TL.3

0 80 160
Metres

### 5.1.2 Terrestrial Vegetation (District Plan Vegetation)

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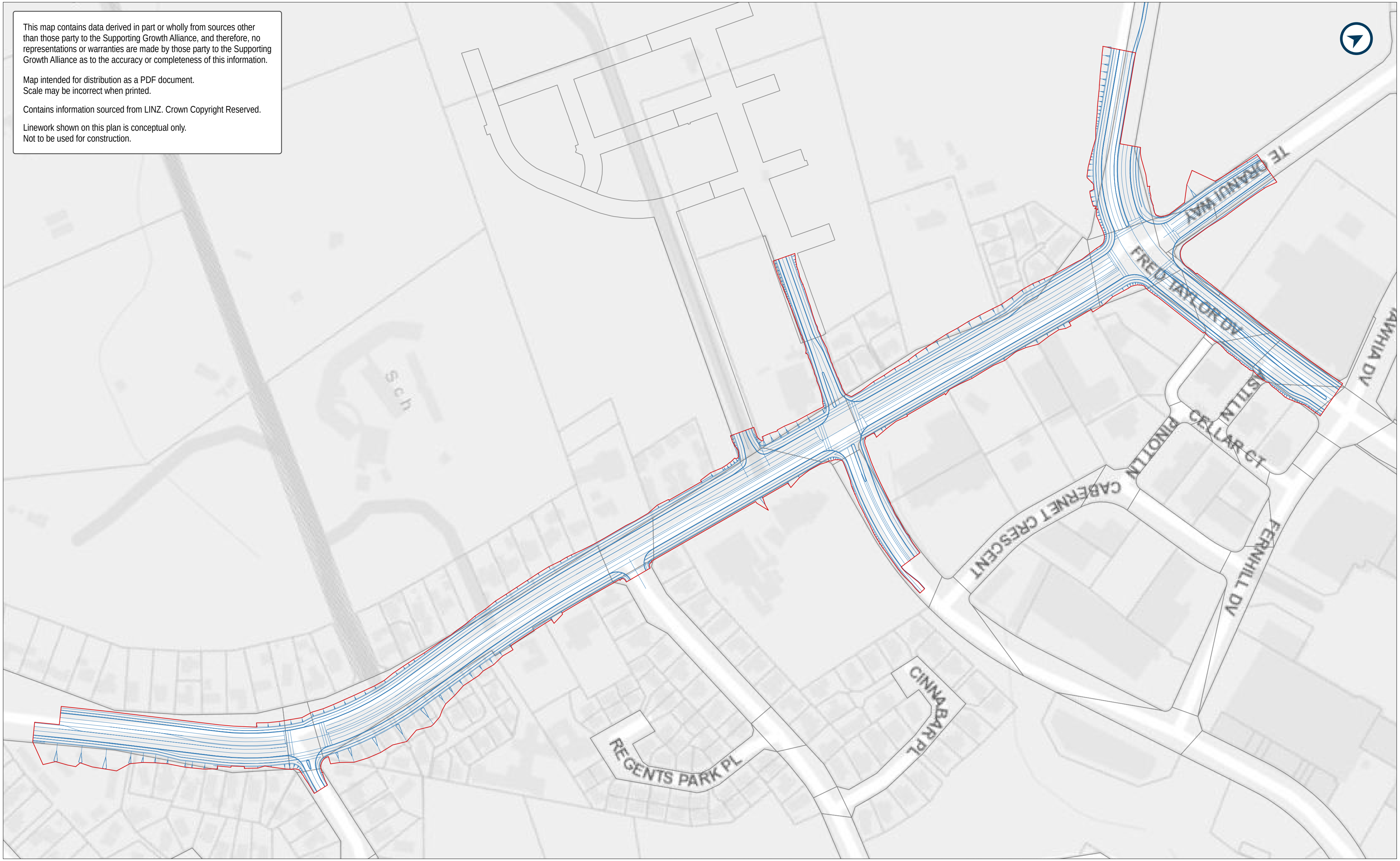
Name of Map: Don Buck Road

Path: P:\381\3810934\TG\02 Data\1 Data Processing\527_North West (Strategic) - District Plan trees\NW_District Plan Trees.aprx

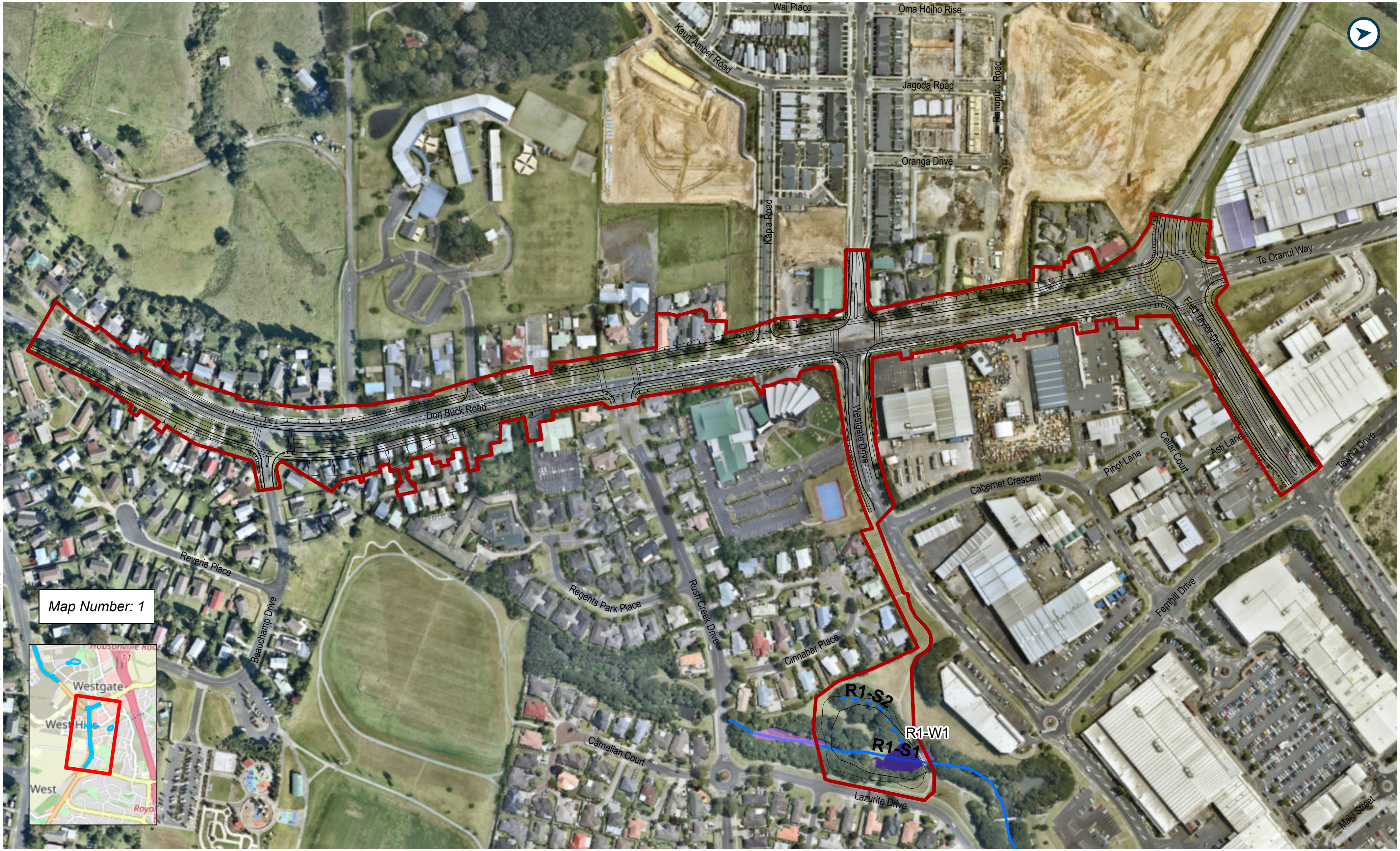



## LEGEND

Route Option
Design Boundary
Road

0 0.1 0.1
Kilometres

### 5.1.3 Freshwater Streams and Wetland Habitat




## LEGEND

Route Options

Designation

Intermittent

Permanent

EW

OW

0 70 140

Metres

## 5.2 NoR RE2: Fred Taylor Drive FTN Upgrade

### 5.2.1 Terrestrial Vegetation


Path: P:\381\3810934\TGI02 Data\1 Data Processing 550 Plus\598_Ecology_Mapping_NW_Strategic\SGA_NW_Strategic_Impacted_Habitats.aprx

**LEGEND**

- Route Options
- Designation
- BF
- EG
- ES
- PL.3
- TL.2

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Aerial imagery supplied by Near Map Australia Pty Ltd


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## LEGEND

Route Options
Designation

BF
EG
PL.1
PL.3
TL.2
TL.3

0 80 160
Metres

### 5.2.2 Terrestrial Vegetation (District Plan Vegetation)


| Type | Total Area (m2) |
|---|---|
| TL.2 | 12.06 |
| TL.3 | 21.89 |

Name of Map: Fred Taylor Drive

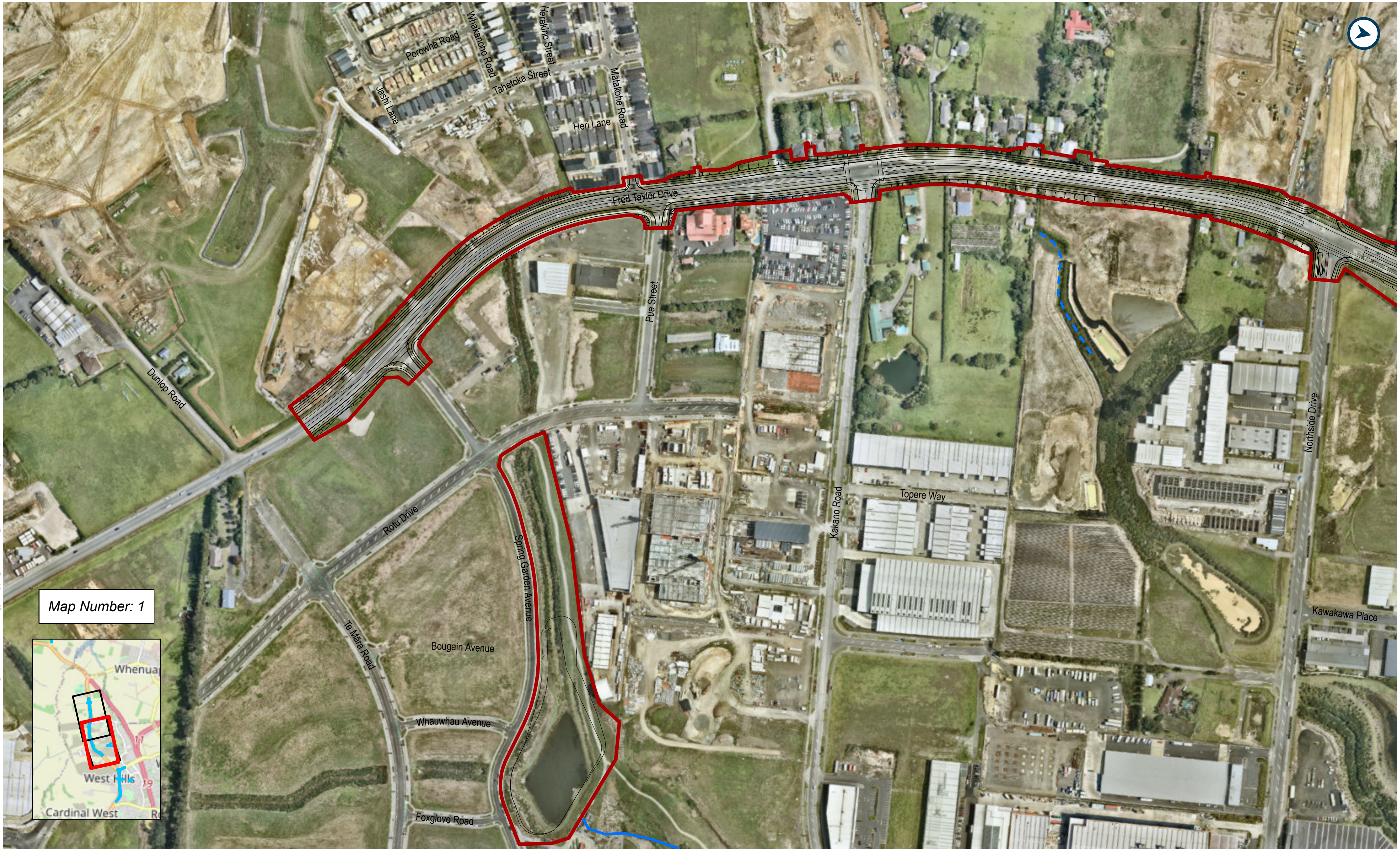
Path: P:\381\3810934\TGI\02 Data\1 Data Processing\527_North West (Strategic) - District Plan trees\NW_District Plan Trees.aprx

0 0.1 0.1
Kilometres

## LEGEND

- TL.2_DPT
- TL.3_DPT
- Route Option
- Design Boundary
- Road

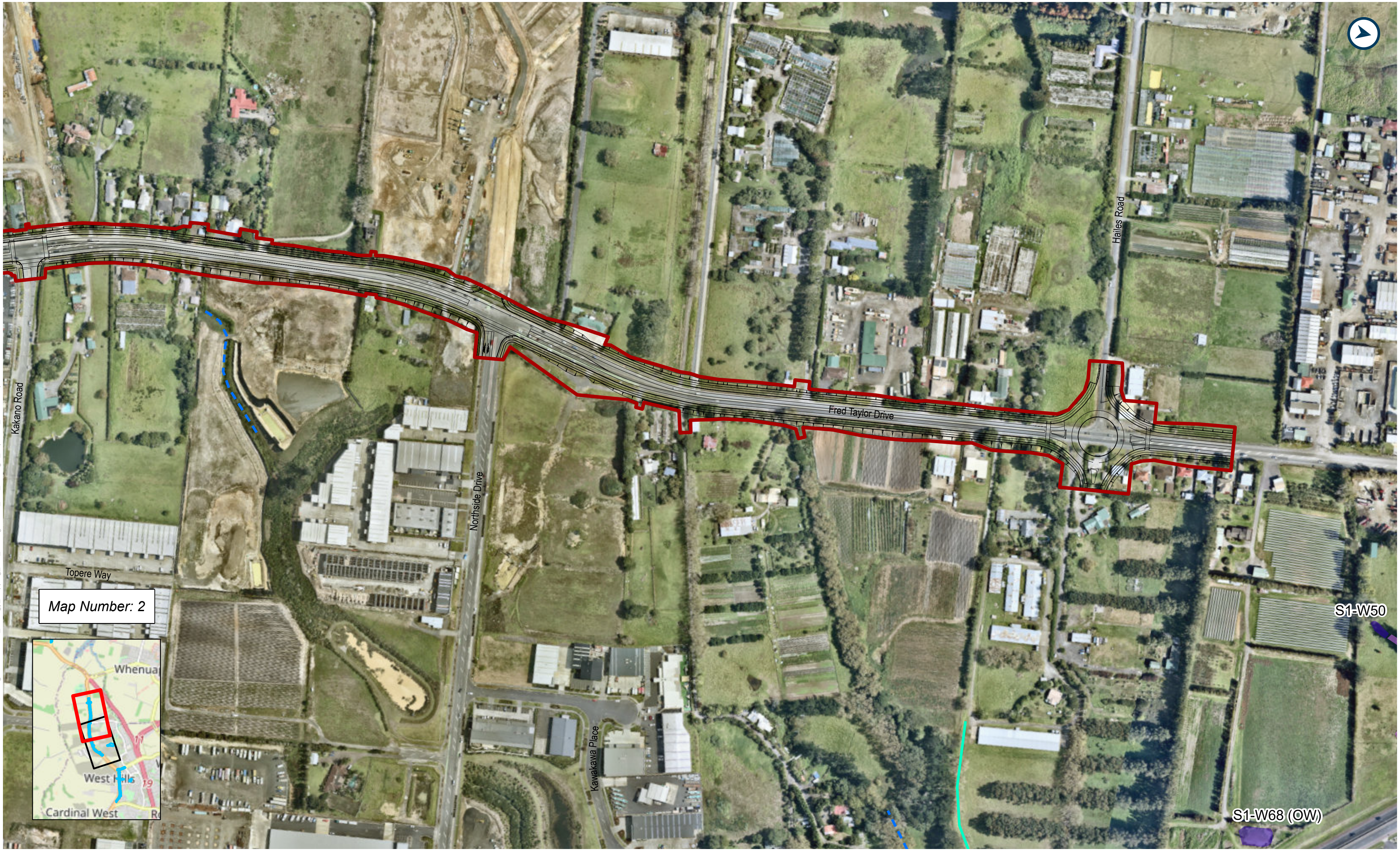
### 5.2.3 Freshwater Streams and Wetland Habitat




## LEGEND

Route Options
Designation
Intermittent
Permanent

0 80 160
Metres

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## LEGEND

Route Options

Designation

Artificial swale/drainage ditch

Intermittent

EW

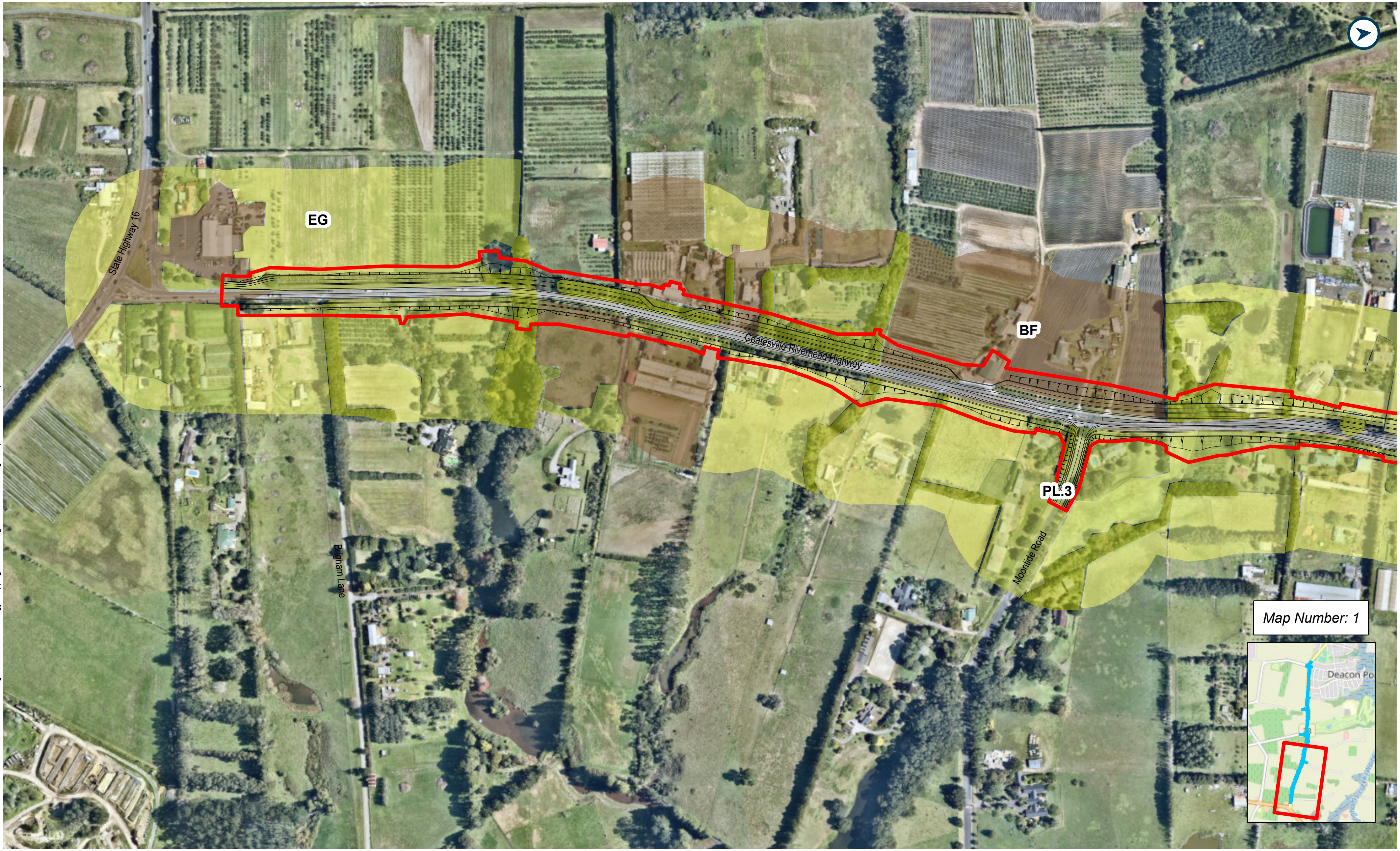
OW

0 80 160

Metres

## 5.3 NoR R1: Coatesville-Riverhead Highway Upgrade

### 5.3.1 Terrestrial Vegetation

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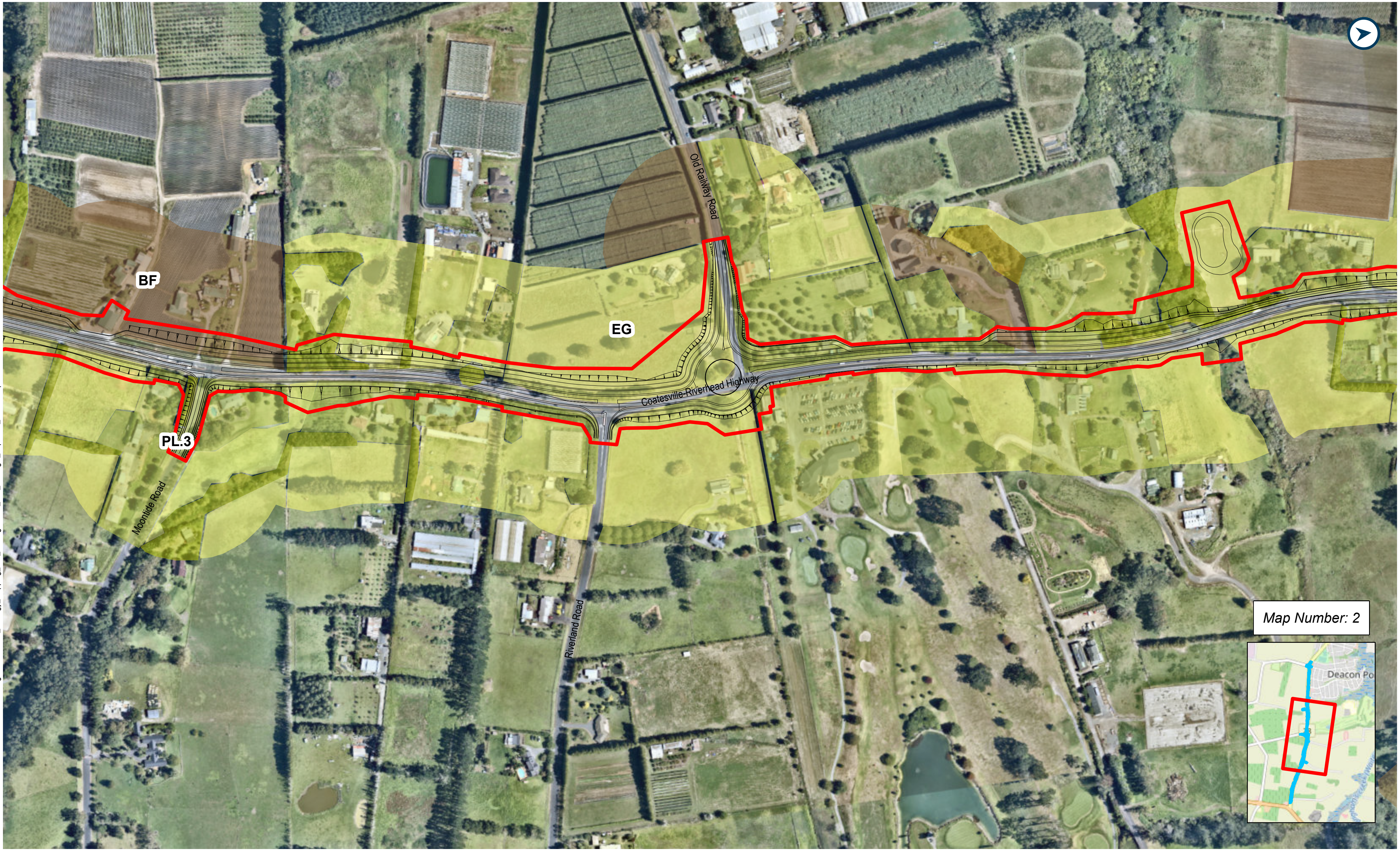
## LEGEND

Route Options
Designation

Habitat mapping
BF
EG
PL.3
TL.3

0 80 160
Metres

Path: P:\381\3810934\TG\02 Data\1 Data Processing 550 Plus\598_Ecology_Mapping_NW_Strategic\SGA_NW_Strategic_Impacted_Habitats.aprx




LEGEND

Route Options
Designation

Habitat mapping
BF
EG
ES
PL.3
TL.3
VS5

0 80 160
Metres

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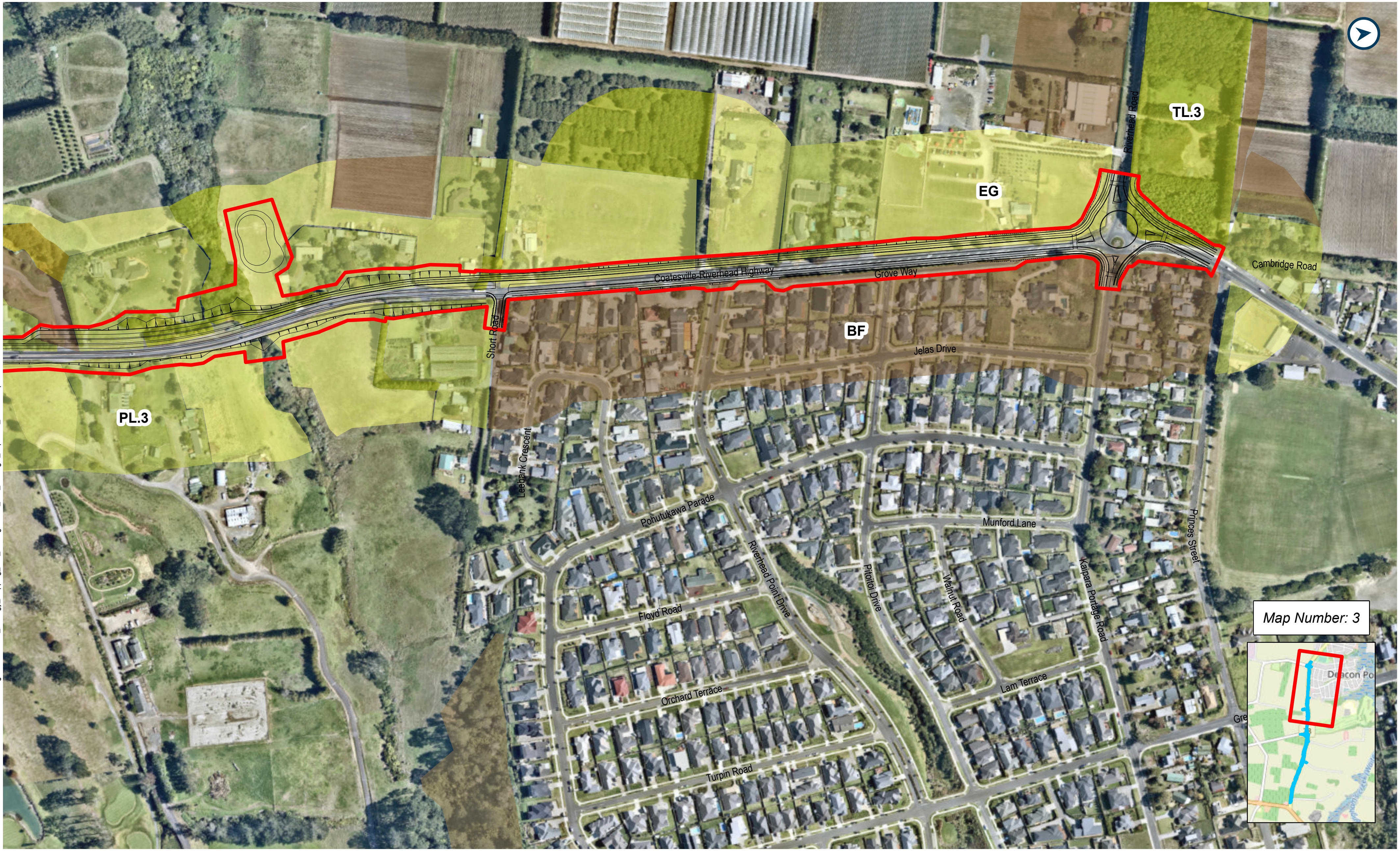


Path: P:\381\3810934\TGI\02 Data\1 Data Processing 550 Plus\598_Ecology_Mapping_NW_Strategic\SGA_NW_Strategic_Impacted_Habitats.aprx

**LEGEND**

Route Options
Designation

Habitat mapping
BF
EG
ES
PL.3
TL.3
VS5

0 80 160
Metres

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### 5.3.2 Terrestrial Vegetation (District Plan Vegetation)

Name of Map: Coatesville-Riverhead Hwy

Path: P:\381\3810934\TGIG02 Data\1 Data Processing\527_North West (Strategic) - District Plan trees\NW_District Plan Trees.aprx

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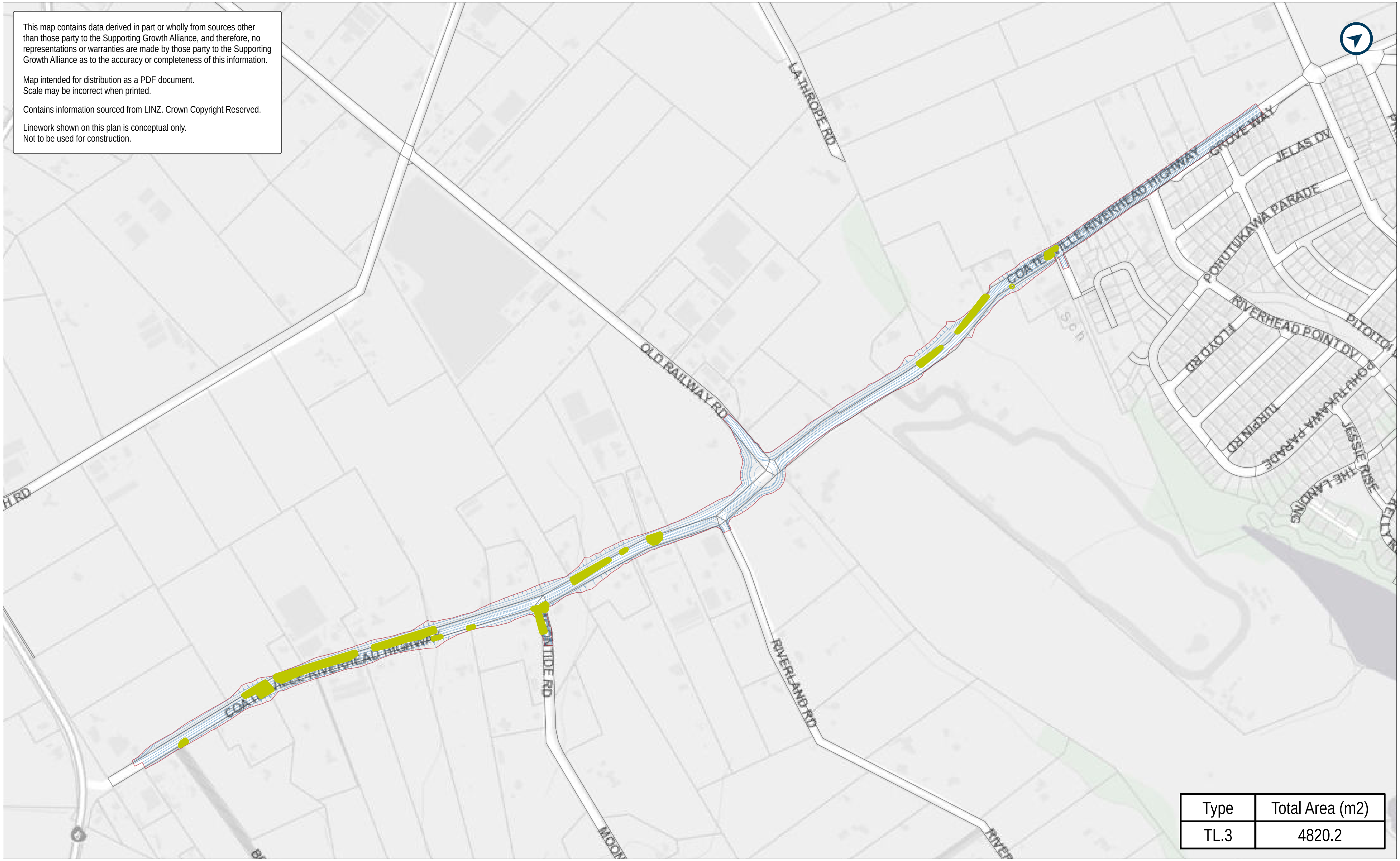


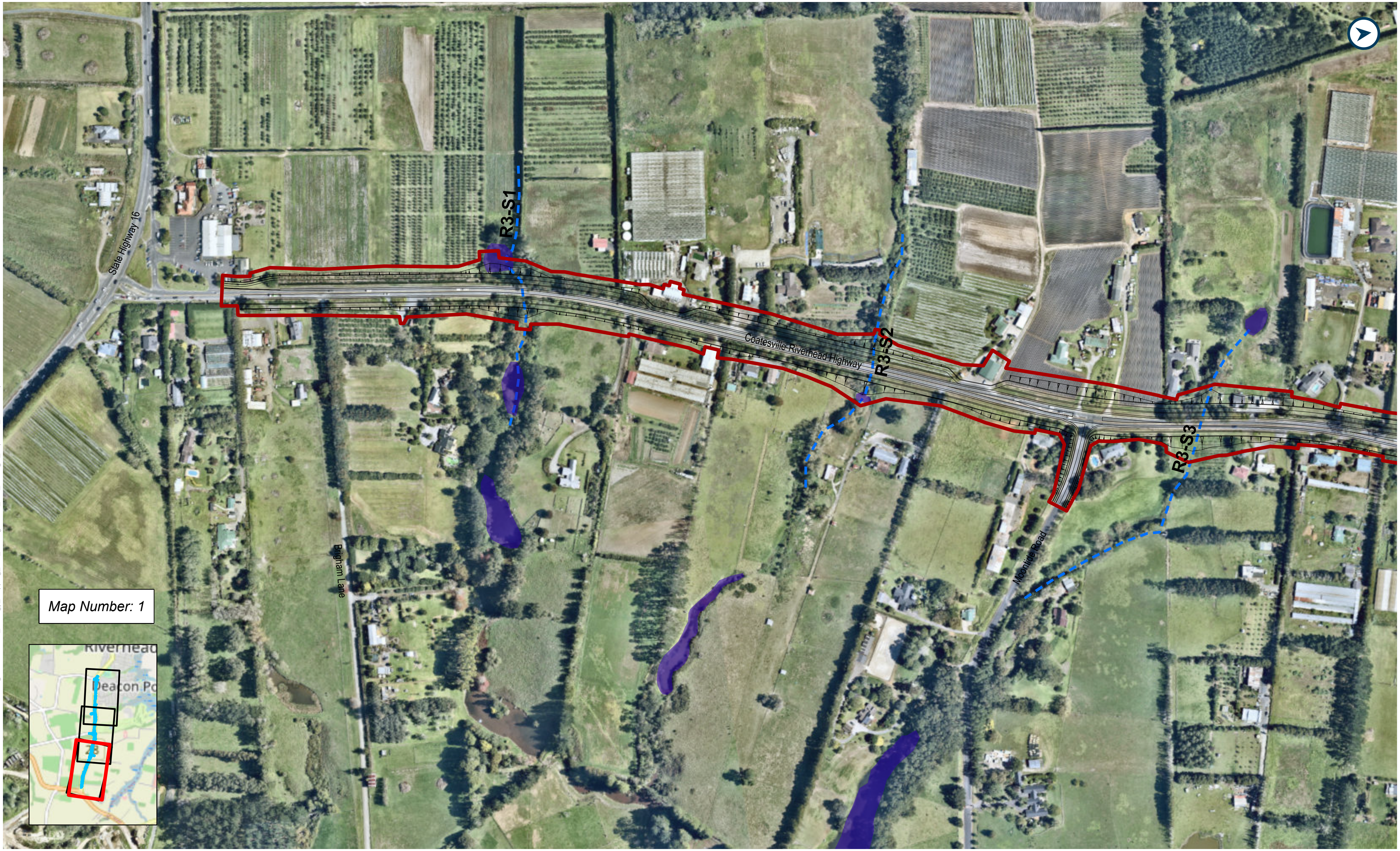

| Type | Total Area (m2) |
|---|---|
| TL.3 | 4820.2 |

0 0.1 0.2
Kilometres

**LEGEND**

- TL.3_DPT
- Route Option
- Design Boundary
- Road

### 5.3.3 Freshwater Streams and Wetland Habitat




## LEGEND

Route Options

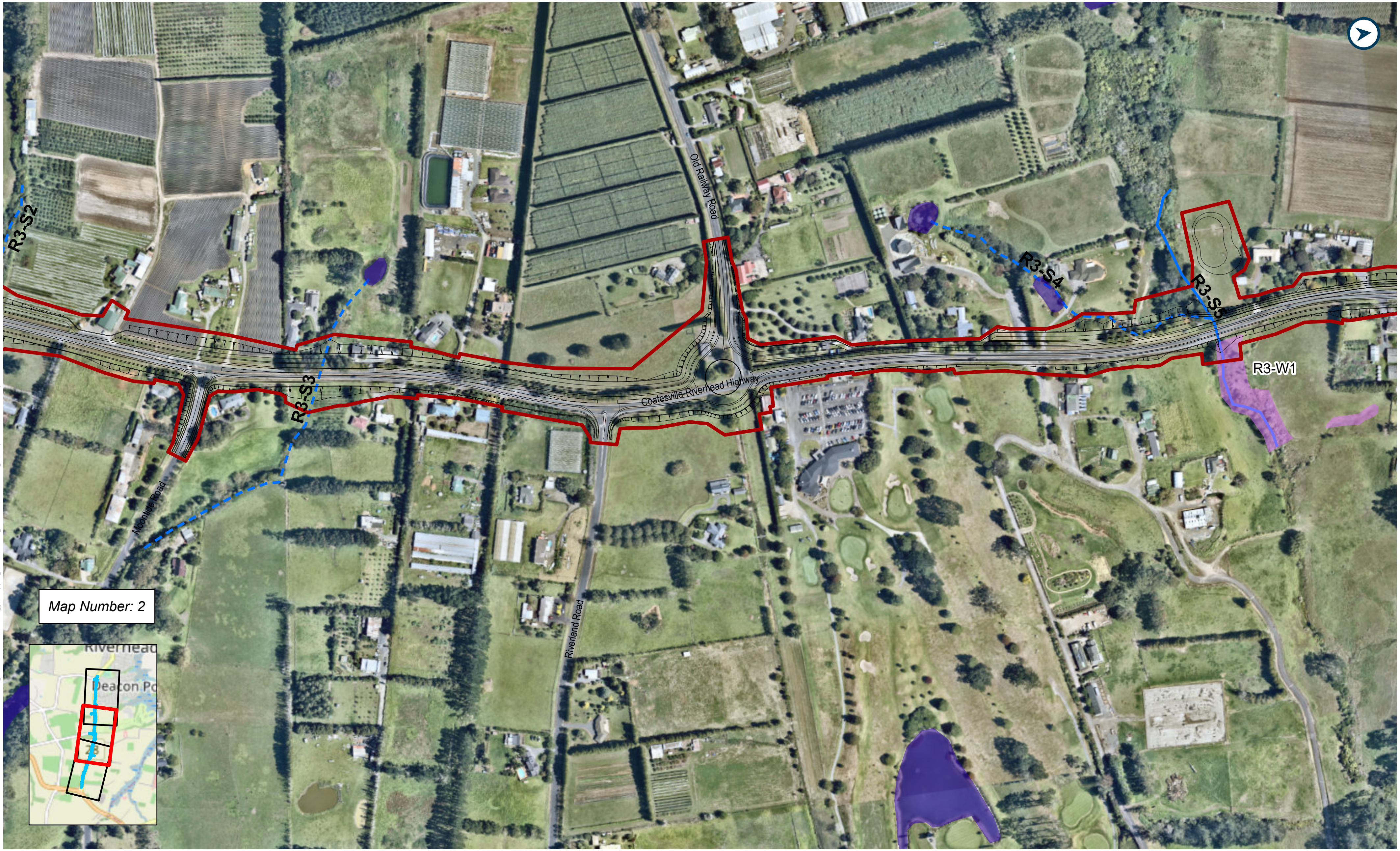
Designation

Intermittent

OW

0 80 160
Metres

This map contains data derived in part or wholly from sources other than Supporting Growth Alliance, and therefore, no representations or warranties are made by Supporting Growth Alliance as to the accuracy or completeness of this information.
Map intended for distribution as a PDF document.
Scale may be incorrect when printed.




LEGEND

Route Options
Designation
Intermittent
Permanent
EW
OW

0 80 160
Metres

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## LEGEND

- Route Options
- Designation
- Intermittent
- Permanent
- EW
- OW

0 80 160
Metres

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Scale may be incorrect when printed.

Aerial imagery supplied by Near Map Australia Pty Ltd

# 6 Appendix 6 - Terrestrial Value Assessment Tables

## 6.1 NoR RE1: Don Buck Road FTN Upgrade

**Table 12-9 Assessment of ecological value for terrestrial ecology features for NoR RE1**

| Attributes to be considered | R1-EG | R1-PL.3 | R1-TL.3 | R1-PL.1 | R1-Bats | R1-Non-TAR Birds | R1-TAR Birds | R1-Lizard | R1-District Plan Trees | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| **Representativeness** | **1** | **2** | **2** | **3** | **0** | **0** | **0** | **0** | **2** | |
| Typical structure and composition | 1 | 2 | 2 | 3 | - | - | - | - | 3 | Generally poor for exotic dominated vegetation units, however PL.3 will provide more vertical structure and may reflect an increase in native animals. PL.1 relates to mature native planting around Rush Creek. |
| Indigenous representation | 1 | 2 | 2 | 3 | - | - | - | - | 3 | Higher scores associated with an increase in proportion of native plants and animals. |
| **Rarity/distinctiveness** | **1** | **1** | **0** | **3** | **4** | **2** | **2** | **3** | **0** | |
| Species of conservation significance (fauna only) | - | - | - | - | 4 | 2 | 4 | 3 | - | - |
| Species of conservation significance | - | - | - | - | - | - | - | - | - | - |
| Distinctive ecological values | 1 | 1 | - | 3 | - | - | - | - | 3 | Scores reflect increase value for native animals (excluding TAR species). |
| **Diversity and pattern** | **1** | **2** | **2** | **3** | **0** | **2*** | **0** | **0** | **2** | |

| Attributes to be considered | R1-EG | R1-PL.3 | R1-TL.3 | R1-PL.1 | R1-Bats | R1-Non-TAR Birds | R1-TAR Birds | R1-Lizard | R1-District Plan Trees | Justification |
|---|---|---|---|---|---|---|---|---|---|---|
| Habitat diversity | 1 | 1 | 2 | 3 | - | 2* | - | - | 3 | Score reflects the value of terrestrial habitats present. |
| Species diversity | 1 | 2 | 2 | 3 | - | - | - | - | 3 | Lowest for EG and highest for native planting around Rush Creek. |
| Patterns in habitat use | 1 | 1 | 1 | - | - | - | - | - | - | Habitat not important for lifecycle completion or periodic habitat utilisation at any scale. |
| **Ecological context** | **1** | **2** | **2** | **3** | **0** | **2*** | **0** | **0** | **2** | |
| Size, shape and buffering | 1 | 1 | 2 | 3 | - | 2* | - | - | 3 | Scores reflect buffering value of exotic dominated vegetation, which is higher for mature native planting in Rusk Creek reserve. |
| Sensitivity to change | 1 | 1 | 1 | - | - | - | - | - | - | Habitat generally modified with no residual receptors sensitive to change. |
| Ecological networks (linkages, pathways, migration) | 1 | 2 | 2 | 3 | - | - | - | - | 3 | Woody structure of PL.3, TL.3 and PL.1 increase steppingstone value connecting other areas of ecological value. Highest for PL.1 which are associated with a stream network and wetlands around Rush Creek. |
| **Combined value** | **N** | **L** | **L** | **M** | **VH** | **L** | **VH** | **H** | **M** | |

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce ‘Low’ or ‘Moderate’ combined value.

## 6.2 NoR RE2: Fred Taylor Drive FTN Upgrade

**Table 12-10 Assessment of ecological value for terrestrial ecology features for NoR RE2**

| Attributes to be considered | R2-EG | R2-ES | R2-PL.3 | R2-PL.2 | R2-TL.3 | R2-TL.2 | R2-Bats | R2-Birds | R2-Lizard | R2-District Plan Trees | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Representativeness** | **1** | **2** | **2** | **3** | **2** | **3** | **0** | **0** | **0** | **2** | |
| Typical structure and composition | 1 | 1 | 2 | 3 | 2 | 3 | - | - | - | 2 | Generally poor for exotic dominated vegetation units, however PL.3, PL.2, TL.3 and TL.1 will provide more vertical structure and may reflect an increase in native animals |
| Indigenous representation | 1 | 2 | 2 | 3 | 2 | 3 | - | - | - | 2 | Higher scores associated with an increase in proportion of native plants and animals. |
| **Rarity/distinctiveness** | **1** | **1** | **1** | **2** | **3** | **3** | **4** | **2** | **3** | **2** | |
| Species of conservation significance (fauna only) | - | - | - | - | - | - | 4 | 2 | 3 | - | - |
| Species of conservation significance | - | - | - | - | - | - | - | - | - | - | - |
| Distinctive ecological values | 1 | 1 | 1 | 2 | 3 | 3 | - | - | - | 2 | Scores reflect increase value for native animals (excluding TAR species). |
| **Diversity and pattern** | **1** | **2** | **2** | **2** | **3** | **3** | **0** | **2*** | **0** | **2** | |
| Habitat diversity | 1 | 1 | 1 | 2 | 3 | 3 | - | 2* | - | 2 | Score reflects the value of terrestrial habitats present. |
| Species diversity | 1 | 2 | 2 | 2 | 2 | 2 | - | - | - | 2 | Lowest for EG. |

| Attributes to be considered | R2-EG | R2-ES | R2-PL.3 | R2-PL.2 | R2-TL.3 | R2-TL.2 | R2-Bats | R2-Birds | R2-Lizard | R2-District Plan Trees | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Patterns in habitat use | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - | 1 | Habitat not important for lifecycle completion or periodic habitat utilisation at any scale. |
| **Ecological context** | **1** | **1** | **2** | **3** | **3** | **3** | **0** | **2*** | **0** | **1** | |
| Size, shape and buffering | 1 | 1 | 1 | 3 | 1 | 3 | - | 2* | - | 1 | Scores reflect buffering value of exotic dominated vegetation. |
| Sensitivity to change | 1 | 1 | 1 | 1 | - | - | - | - | - | - | Habitat generally modified with no residual receptors sensitive to change. |
| Ecological networks (linkages, pathways, migration) | 1 | 1 | 2 | 2 | 3 | 3 | - | - | - | 1 | Woody structure of PL.3, PL.2, TL.3 and TL.1 increase steppingstone value connecting other areas of ecological value. |
| **Combined value** | **N** | **L** | **L** | **M** | **M** | **M** | **VH** | **L** | **H** | **L** | |

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce 'Low' or 'Moderate' combined value.

## 6.3 NoR R1: Coatesville-Riverhead Highway Upgrade

**Table 12-11 Assessment of ecological value for terrestrial ecology features for NoR R1**

| Attributes to be considered | R3-EG | R3-ES | R3-PL.3 | R3-TL.3 | R3-Bats | R3-Non-TAR Birds | R3-TAR Birds (High) | R3-TAR Birds (Very High) | R3-Lizard | R3-District Plan Trees | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Representativeness** | **1** | **2** | **2** | **2** | **0** | **0** | **0** | **0** | **0** | **2** | |

| Attributes to be considered | R3-EG | R3-ES | R3-PL.3 | R3-TL.3 | R3-Bats | R3-Non-TAR Birds | R3-TAR Birds (High) | R3-TAR Birds (Very High) | R3-Lizard | R3-District Plan Trees | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Typical structure and composition | 1 | 1 | 2 | 2 | - | - | - | - | - | 2 | Exotic dominated for EG, ES, PL3 and TL.3. However, PL.3 and TL.3 may support more native species. |
| Indigenous representation | 1 | 2 | 2 | 2 | - | - | - | - | - | 2 | Lowest for EG. Native representation expected to be higher for woody habitat. |
| **Rarity/distinctiveness** | **3** | **3** | **3** | **4** | **4** | **2** | **3** | **4** | **3** | **4** | |
| Species of conservation significance (fauna only) | - | - | - | - | 4 | 2 | 3 | 4 | 3 | - | Open water associated with R3-S1. Opposite 1384 Coatesville-Riverhead HW and R3-W1 (1229 Coatesville-Riverhead HW) provide habitat for TAR birds (spotless crake, dab chick). |
| Species of conservation significance | 3 | 3 | 3 | 4 | - | - | - | - | - | 4 | Copper skink habitat associated with EG, ES and PL.3 and bat habitat associated with TL.3. |
| Distinctive ecological values | 1 | 1 | 2 | 3 | - | - | - | - | - | 1 | Scores reflect increase value for native animals (excluding TAR species). Score considers the size and location of each habitat feature. |
| **Diversity and pattern** | **1** | **1** | **2** | **3** | **0** | **2*** | **0** | **0** | **0** | **1** | |
| Habitat and species diversity | 1 | 1 | 2 | 3 | - | 2* | - | - | - | 1 | Structural diversity lowest for EG and ES and higher for PL.3 and TL.3 |
| Patterns in habitat use | 1 | 1 | 1 | 3 | - | - | - | - | - | 1 | TL.3 associated with stream may play an important role seasonal influenced bat behaviour. TL.3 features may also be important in controlling instream and stream margin habitat for seasonal spawners |

| Attributes to be considered | R3-EG | R3-ES | R3-PL.3 | R3-TL.3 | R3-Bats | R3-Non-TAR Birds | R3-TAR Birds (High) | R3-TAR Birds (Very High) | R3-Lizard | R3-District Plan Trees | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ecological context** | **3** | **1** | **3** | **3** | **0** | **2*** | **0** | **0** | **0** | | |
| Size, shape and buffering | 3 | 1 | 3 | 3 | - | 2* | - | - | - | 3 | EG is the most abundant habitat template associated with the study area, while PL.3 and TL.3 likely provide some buffering from the existing Coatesville-Riverhead HW and surrounding rivers and streams. |
| Sensitivity to change | 1 | 1 | 1 | 1 | - | - | - | - | - | 1 | Largely modified habitat associated with pre-existing fragmentation with low or negligible residual sensitivities. |
| Ecological networks (linkages, pathways, migration) | 1 | 1 | 1 | 3 | - | - | - | - | - | 3 | More mature woody structure associated with TL.3 likely to play a role in ecological connectivity along several steam corridors. |
| **Combined value** | **L** | **L** | **M** | **M** | **VH** | **L** | **H** | **VH** | **H** | **M** | |

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High. * = Scores not representative of corresponding row, scores required to produce ‘Low’ or ‘Moderate’ combined value.

# 7 Appendix 7 - Freshwater Value Assessment Tables

## 7.1 NoR RE1: Don Buck Road FTN Upgrade

**Table 12-12 Assessment of ecological value for freshwater ecology features for NoR RE1**

| Attributes to be considered | R1-S1 | R1-S2 | Justification |
|---|---|---|---|
| **Representativeness** | **3** | **3** | |
| Riparian habitat modification | 3 | 3 | - |
| **Rarity/distinctiveness** | **3** | **3** | |
| Species of conservation significance | 3 | 3 | - |
| **Diversity and pattern** | **2** | **1** | |
| Level of natural diversity | 2 | 1 | - |
| **Ecological context** | **4** | **3** | |
| Stream order | 2 | 1 | - |

| Attributes to be considered | R1-S1 | R1-S2 | Justification |
|---|---|---|---|
| Hydroperiod | 4 | 3 | - |
| **Combined value** | **M** | **M** | |

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

## 7.2 NoR R1: Coatesville-Riverhead Highway Upgrade

**Table 12-13 Assessment of ecological value for freshwater ecology features for NoR R1**

| Attributes to be considered | R3-S1 | R3-S2 | R3-S3 | R3-S4 | R3-S5 | Justification |
|---|---|---|---|---|---|---|
| **Representativeness** | **2** | **2** | **1** | **2** | **2** | |
| Riparian habitat modification | 2 | 2 | 1 | 2 | 2 | All streams riparian habitat has been affected by activity. Channel shade and woody structure present for most streams (with the exception of R3-S3 and R3-S8). Downslope riparian integrity associated with R3-S3 is poor. |
| **Rarity/distinctiveness** | **3** | **3** | **2** | **3** | **3** | |
| Species of conservation significance | 3 | 3 | 2 | 3 | 3 | At Risk Declining species likely to be associated with most streams. Downslope connectivity associated with R3-S3 is poor. |

| Attributes to be considered | R3-S1 | R3-S2 | R3-S3 | R3-S4 | R3-S5 | Justification |
|---|---|---|---|---|---|---|
| **Diversity and pattern** | **2** | **2** | **2** | **3** | **4** | |
| Level of natural diversity | 2 | 2 | 2 | 3 | 4 | All streams have moderate levels of natural diversity. Stream S2-S5 is associated with relatively large wetlands areas (including seeps and valley bottom sections with raupō). |
| **Ecological context** | **3** | **3** | **3** | **4** | **4** | |
| Stream order | 2 | 2 | 2 | 2 | 2 | Stream S6 is an order 2 stream, the rest are order 1. |
| Hydroperiod | 3 | 3 | 3 | 4 | 4 | Streams S4-S8 are permanent, the rest are intermittent. |
| Other ecological context | | | | | 4 | S3-S5 stream and riparian corridor connect two ecological nodes associated with VS5 vegetation (Harkin Point going into Harbour) and native vegetation, stream and wetland habitat on 1244 and 1210 Coatesville-Riverhead HW. |
| **Combined value** | **M** | **M** | **L** | **M** | **H** | |

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

# 8 Appendix 8 - Wetland Value Assessment Tables

## 8.1 NoR R1: Coatesville-Riverhead Highway Upgrade

**Table 12-14 Assessment of ecological value for wetland ecology features for NoR R1**

| Attributes to be considered | R3-W1 | Justification |
|---|---|---|
| **Representativeness** | 3 | |
| Hydrological modification | 3 | Exotic wetlands, modified. |
| **Rarity/distinctiveness** | 3 | |
| Species of conservation significance | 3 | |
| Vegetation type of conservation significance | 3 | Portions of wetland consists of raupō. |
| **Diversity and pattern** | 4 | |
| Diversity of habitat types | 4 | Relatively large wetland with hillslope seeps and valley bottom features associated with seasonal and permanent wetland hydrology. |
| **Ecological context** | 3 | |
| Flood attenuation | 3 | Wetland is relatively large in relation to upslope catchment. |
| Streamflow augmentation | 3 | Lateral seeps and areas of permanent wetland hydrology likely to contribute to stream flows. |
| Sediment trapping | 3 | Direct catchment with moderate sediment yield. |

| Attributes to be considered | R3-W1 | Justification |
|---|---|---|
| Water purification | 3 | Direct catchment potential source of agrichemicals and herbicide. |
| **Combined value** | **H** | |

Notes: N = Negligible, L = Low, M = Moderate, H = High, VH = Very High

# 9 Appendix 9 – Impact Assessment Tables

| NoR R1: Don Buck Road FTN Upgrade | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase | Project Activity | Resource | Ecological Value | Main Effect Description | Detailed Effect Description | Type | Extent (ZOI) | Duration | Frequency | Likelihood | Reversibility | Magnitude (pre-mitigation) | Level of Effect (pre-mitigation) |
| Construction | Noise/vibration/dust | R1-Birds (Non-TAR) | Low | Construction- Birds | Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) | Direct | Local | Short-term (<5 years) | Frequently | Highly Likely | - | Low | Very Low |
| Construction | Noise/vibration/dust | R1-Birds TAR | Very High | Construction- Birds | Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) | Direct | Local | Short-term (<5 years) | Frequently | Highly Likely | - | Low | Moderate |
| Construction | Noise/vibration/dust | R1-Lizards | High | Construction- Herpetofauna (native) | Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.) | Direct | Local | Short-term (<5 years) | Infrequently | Likely | - | Negligible | Very Low |
| Operation | Vehicle movement/ Presence of the road | R1-Birds (Non-TAR) | Low | Operation- Birds (native) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | Infrequently | Likely | - | Low | Very Low |
| Operation | Vehicle movement/ Presence of the road | R1-Lizards | High | Operation- Herpetofauna (native) | Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | Infrequently | Unlikely | - | Negligible | Very Low |
| Operation | Vehicle movement/ Presence of the road | R1-Birds (Non-TAR) | Low | Operation- Birds (native) | Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration | Direct | Local | Permanent (>25 years) | Infrequently | Likely | - | Low | Very Low |
| Operation | Vehicle movement/ Presence of the road | R1-Lizards | High | Operation- Herpetofauna (native) | Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use | Direct | Local | Permanent (>25 years) | Infrequently | Unlikely | - | Negligible | Very Low |
| Operation | Vehicle movement/ Presence of the road | R1-Birds TAR | Very High | Operation- Birds (native) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Low |
| Construction | Vegetation removal | R1-Trees>4m | Moderate | Construction- Terrestrial habitat | Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Likely | - | Low | Low |
| Construction | Vegetation removal | R1-Trees>4m | Moderate | Construction- Birds | Kill or injure individual bats due to vegetation removal | Direct | Local | Temporary (days or months) | - | Unlikely | - | Negligible | Very Low |
| Construction | Vegetation removal | R1-Trees>4m | Moderate | Construction- Birds | Loss of foraging habitat due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Very Low |

| NoR R2: Fred Taylor Drive FTN Upgrade | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phase | Project Activity | Resource | Ecological Value | Main Effect Description | Detailed Effect Description | Type | Extent (ZOI) | Duration | Frequency | Likelihood | Reversibility | Magnitude (pre-mitigation) | Level of Effect (pre-mitigation) |
| Construction | Vegetation removal | R2-Trees>4m | Low | Construction - Terrestrial habitat | Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Very Low |
| Construction | Vegetation removal | R2-Birds | Low | Construction - Birds | Kill or injure individual due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Very Low |
| Construction | Noise/vibration/dust | R2-Birds | Low | Construction - Birds | Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) | Direct | Local | Short-term (<5 years) | Frequently | Highly Likely | - | Low | Very Low |
| Construction | Noise/vibration/dust | R2-Lizards | High | Construction - Herpetofauna (native) | Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.) | Direct | Local | Short-term (<5 years) | Frequently | Unlikely | - | Negligible | Very Low |
| Operation | Vehicle movement | R2-Birds | Low | Operation - Birds (native) | Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration | Direct | Local | Permanent (>25 years) | Infrequently | Likely | - | Low | Very Low |
| Operation | Vehicle movement | R2-Lizards | High | Operation - Herpetofauna (native) | Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use | Direct | Local | Long-term (15-25 years) | Infrequently | Unlikely | - | Negligible | Very Low |
| Operation | Vehicle movement | R2-Birds | Low | Operation - Birds (native) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | Infrequently | Likely | - | Low | Very Low |
| Operation | Vehicle movement | R2-Lizards | High | Operation - Herpetofauna (native) | Loss in connectivity due to permanent habitat loss, light and noise/vibration effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | Infrequently | Unlikely | - | Negligible | Very Low |
| Construction | Vegetation removal | R2-Birds | Low | Construction - Birds | Nest loss due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Very Low |
| Construction | Vegetation removal | R2-Birds | Low | Construction - Birds | Loss of foraging habitat due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Very Low |

| NoR R3: Coatesville-Riverhead Highway Upgrade | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Phase** | **Project Activity** | **Resource** | **Ecological Value** | **Main Effect Description** | **Detailed Effect Description** | **Type** | **Extent (ZOI)** | **Duration** | **Frequency** | **Likelihood** | **Reversibility** | **Magnitude (pre-mitigation)** | **Level of Effect (pre-mitigation)** |
| Construction | Vegetation removal | R3-Trees>4m | Moderate | Construction - Terrestrial habitat | Permanent loss of habitat/ecosystem, fragmentation and edge effects due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Likely | - | Low | Low |
| Construction | Vegetation removal | R3-Bats | Very High | Construction - Bats | Kill or injure individual bats due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Likely | - | Low | Moderate |
| Construction | Vegetation removal | R3-Birds (Non-TAR) | Low | Construction - Birds | Kill or injure individual due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Highly Likely | - | Moderate | Low |
| Construction | Noise/vibration/dust | R3-Bats | Very High | Construction - Bats | Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) | Direct | Local | Short-term (<5 years) | Frequently | Likely | - | Low | Moderate |
| Construction | Noise/vibration/dust | R3-TAR Birds (Very High) | Very High | Construction - Birds | Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) | Direct | Local | Short-term (<5 years) | Continuously | Highly Likely | - | Moderate | High |
| Construction | Noise/vibration/dust | R3-Birds (Non-TAR) | Low | Construction - Birds | Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) | Direct | Local | Short-term (<5 years) | Frequently | Definite | - | Moderate | Low |
| Construction | Noise/vibration/dust | R3-Lizards | High | Construction - Herpetofauna (native) | Disturbance and displacement of individuals (existing) due to construction activities (noise, dust etc.) | Direct | Local | Short-term (<5 years) | Infrequently | Likely | - | Negligible | Very Low |
| Operation | Vehicle movement/ Presence of the road | R3-Bats | Very High | Operation - Bats | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | Continuously | Unlikely | - | Low | Moderate |
| Operation | Vehicle movement/ Presence of the road | R3-Birds (Non-TAR) | Low | Operation - Birds (native) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | Continuously | Likely | - | Low | Very Low |
| Operation | Vehicle movement/ Presence of the road | R3-Lizards | High | Operation - Herpetofauna (native) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Very Low |
| Operation | Vehicle movement/ Presence of the road | R3-Bats | Very High | Operation - Bats | Disturbance and displacement of (new and existing) roosts and individuals due to lighting and noise/vibration | Direct | Local | Permanent (>25 years) | Infrequently | Unlikely | - | Negligible | Low |
| Operation | Vehicle movement/ Presence of the road | R3-Birds (Non-TAR) | Low | Operation - Birds (native) | Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration | Direct | Local | Permanent (>25 years) | Continuously | Likely | - | Low | Very Low |
| Operation | Vehicle movement/ Presence of the road | R3-Lizards | High | Operation - Herpetofauna (native) | Disturbance of nocturnal lizard behaviour due to lighting associated with the infrastructure use | Direct | Local | Long-term (15-25 years) | - | Unlikely | - | Negligible | Very Low |
| Construction | Noise/vibration/dust | R3-TAR Birds (High) | High | Construction - Birds | Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.) | Direct | Local | Short-term (<5 years) | Continuously | Highly Likely | - | Moderate | High |
| Operation | Vehicle movement/ Presence of the road | R3-TAR Birds (High) | High | Operation - Birds (native) | Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration | Indirect | Local | Permanent (>25 years) | Continuously | Unlikely | - | Low | Low |
| Operation | Vehicle movement/ Presence of the road | R3-TAR Birds (High) | High | Operation - Birds (native) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | Continuously | Unlikely | - | Low | Low |
| Operation | Vehicle movement/ Presence of the road | R3-TAR Birds (Very High) | Very High | Operation - Birds (native) | Disturbance and displacement of (new and existing) nests and individuals due to lighting and noise/vibration | Indirect | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Low |
| Operation | Vehicle movement/ Presence of the road | R3-TAR Birds (Very High) | Very High | Operation - Birds (native) | Loss in connectivity due to permanent habitat loss, light and noise effects from the road, leading to fragmentation of terrestrial, wetland and riparian habitat due to the presence of the infrastructure | Indirect | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Low |
| Construction | Vegetation removal | R3-Birds (Non-TAR) | Low | Construction - Birds | Nest loss due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Highly Likely | - | Moderate | Low |
| Construction | Vegetation removal | R3-Birds (Non-TAR) | Low | Construction - Birds | Loss of foraging habitat due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Very Low |
| Construction | Vegetation removal | R3-Bats | Very High | Construction - Bats | Loss of foraging habitat due to vegetation removal | Direct | Local | Permanent (>25 years) | - | Unlikely | - | Negligible | Low |

# 10 Appendix 10 - Rapid Habitat Assessment Results

**Table 12-15 Summary of RHA values from NoR R1**

| Stream | Deposited Sediment | Invertebrate habitat diversity | Invertebrate habitat abundance | Fish cover diversity | Fish cover abundance | Hydraulic heterogeneity | Bank erosion | Bank vegetation | Riparian width | Riparian shade | RHA Habitat Quality Score | Corresponding Habitat Value* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R3-S1 | 2 | 2 | 1 | 2 | 3 | 1 | 7 | 4 | 3 | 6 | **31** | **P** |
| R3-S4 | 1 | 3 | 2 | 3 | 3 | 2 | 8 | 6 | 5 | 9 | **42** | **M** |
| R3-S5 | 1 | 3 | 2 | 3 | 3 | 2 | 8 | 6 | 5 | 9 | **42** | **M** |
| R3-S7 | 2 | 2 | 1 | 3 | 3 | 1 | 7 | 4 | 4 | 6 | **33** | **P** |

# 11 Appendix 11 – Long-Tailed Bat Acoustic Monitoring Report (2021-2022)

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Long-Tailed Bat Acoustic Monitoring Report 2021-2022

July 2022

Version 1

# Table of Contents



# Appendices



# Table of Figures

## Table of Tables

# 1 Executive Summary

As part of the Supporting Growth Programme, Te Tupu Ngātahi Supporting Growth (SG) is preparing Notices of Requirement (NoRs), on behalf of Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT), to designate land, under the Resource Management Act 1991 (RMA), for the purpose of constructing, operating and maintaining a proposed strategic and local arterial transport network in the North West (NW) of Auckland, hereinafter referred to as the 'Project'.

Long-tailed bats (pekapeka) (*Chalinolobus tuberculatus*) are considered 'Threatened – Nationally Critical' (O'Donnell et al., 2018) and are known to be present within the Northwest of Auckland. Although desktop records confirm their presence within a 10 km radius of the Project area, the understanding of how bats use the wider landscape is limited. To gain an understanding of the habitat features that are of value to long-tailed bats it is necessary to monitor the landscape in a manner that reflects how they use it. Therefore, to establish an ecological baseline and identify if there are vegetated corridors that bats are using frequently to move through the landscape, acoustic monitoring for bats was undertaken at an areawide level.

Automatic Bat Monitors (ABM)s were deployed across the Project area in two separate survey sessions. The first (December 2021) was completed within the bat maternity period (December - February) and the second (April 2022) within the bat mating season (March - May). ABMs were placed in a network within habitats that would be affected by the Project and would provide suitable habitat for bat roosting, foraging, and commuting. Specifically, pre-determined survey locations were selected based on the current understanding of habitats that are favoured by bats.

During the December 2021 survey, seven of the 32 ABM sites (December sites #2, #11, #17, #21, #23, #25, and #27) detected bat activity. The site with the greatest number of bat passes was December site #27. No foraging calls or social calls were recorded, and no bat passes were recorded within 30 minutes of sunset or sunrise.

During the April 2022 survey, 16 of the 21 ABM sites (April sites #1, #2, #4, #5, #6, #7, #8, #9, #10, #11, #13, #14, #15, #16, #17, and #20) detected bat activity. The site with the greatest number of bat passes was April site #17 with 1370 bat passes recorded during the survey. Foraging calls were recorded at 10 of the ABM sites, with the greatest number recorded at April site #17. No social calls were recorded, and no bat passes were recorded within 30 minutes of sunset or sunrise.

The results suggest that bats are active in the North West Project area. Specifically, the results suggests that bats are active in both the Local Arterials Package area (Whenuapai Arterials, Redhills Arterials, and Riverhead Arterials), and the Strategic Projects and Kumeū Huapai Local Arterials Package area, with the highest bat activity recorded in the Alternative State Highway (ASH) NoR.

# 2 Introduction

## 2.1 Background

As part of the Supporting Growth Programme, Te Tupu Ngātahi Supporting Growth (SG) is preparing Notices of Requirement (NoRs), on behalf of Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT), to designate land, under the Resource Management Act 1991 (RMA), for the purpose of constructing, operating and maintaining a proposed strategic and local arterial transport network in the North West (NW) of Auckland, hereinafter referred to as the 'Project'.

SG is preparing the NoRs for the individual projects within the NW and the projects have been split into two lodgement packages:

- **Lodgement Package 1** is the **Local Arterial Package** and consists of three area-based assessment volumes (Whenuapai, Redhills and Riverhead) (Table 2-1).
- **Lodgement Package 2** is the **Strategic and Kumeū-Huapai Package**. The assessments have been grouped based upon their strategic role, or in the case of Access and Station Road the relationship with the strategic projects (Table 2-2).

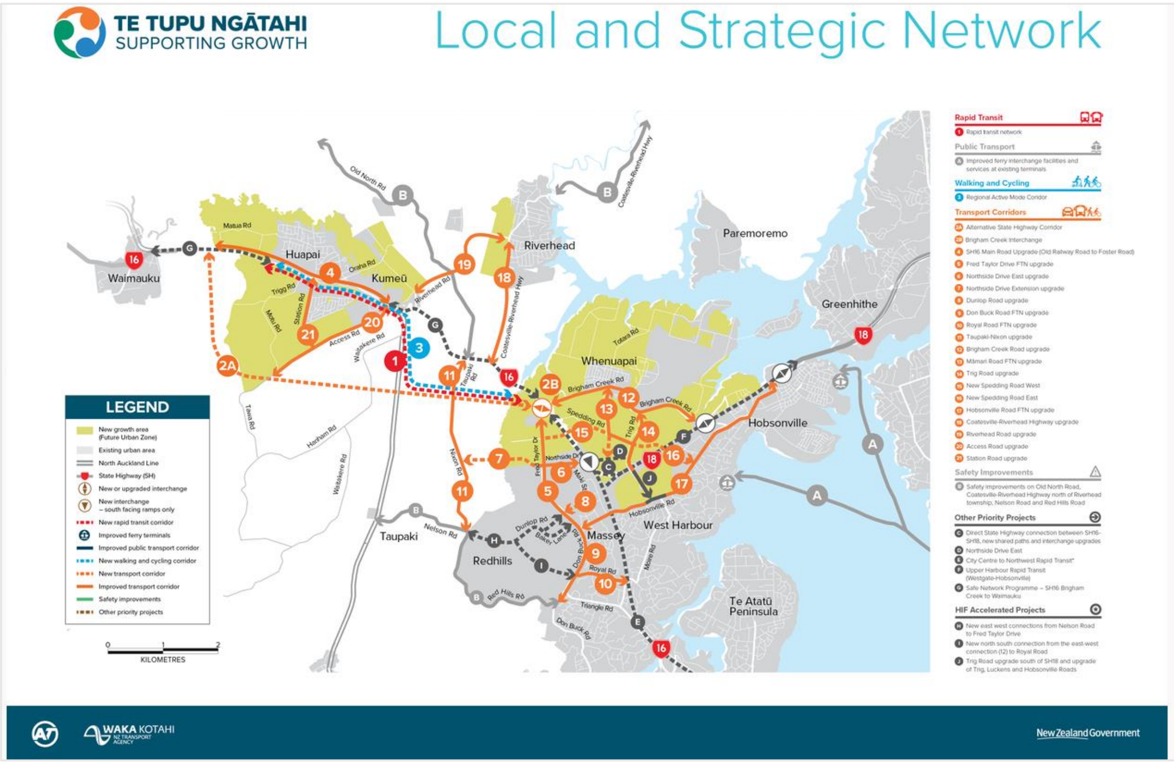


Figure 2-1 North West Growth Area Local and Strategic Network

Table 2-1 Local Arterial Package

| Package | Assessment Volume | Proposed NoRs |
|---|---|---|
| **Local Arterial Package** | **Whenuapai Arterials** | Proposed NoRs:<br>• Brigham Creek Road upgrade<br>• Māmari Road FTN upgrade |

| Package | Assessment Volume | Proposed NoRs |
|---|---|---|
| | | • Trig Road North upgrade<br>• Spedding Road East and West |
| | | Proposed alternations to existing designations:<br>• Hobsonville Road FTN upgrade |
| | **Redhills Arterials** | Proposed NoRs:<br>• Northside Drive East extension<br>• Don Buck Road FTN upgrade<br>• Royal Road FTN upgrade |
| | | Proposed alternations to existing designations:<br>• Fred Taylor Drive Frequent Transport Network (FTN) upgrade |
| | **Riverhead Arterials** | • Coatesville – Riverhead Highway Upgrade<br>• Riverhead Road Upgrade |

**Table 2-2 Strategic Package**

| Package | Proposed NoRs |
|---|---|
| **Strategic Projects and Kumeū Huapai Local Arterials** | Proposed NoRs:<br>• Rapid Transit Corridor (RTC), including Regional Active Mode Corridor (RAMC)<br>• Alternative State Highway (ASH), including Brigham Creek Interchange<br>• Access Road upgrade<br>• Station Road upgrade |
| | Proposed alternations to existing designations:<br>• SH16 Main Road upgrade |

## 2.2 Acoustic Monitoring

Long-tailed bats (pekapeka) (*Chalinolobus tuberculatus*) are considered 'Threatened – Nationally Critical' (O'Donnell *et al.,* 2018) and are known to be present within the Northwest of Auckland (Waitakere Ranges, Riverhead Forest etc) (DOC, 2022). Although desktop records confirm their presence within a 10 km radius of the NoRs, the understanding of how bats use the wider landscape is limited.

To gain an understanding of the habitat features that are of value to long-tailed bats it is necessary to monitor the landscape in a manner that reflects how they use it. Therefore, to establish an ecological baseline and identify if there are vegetated corridors that bats are using frequently to move through the landscape, acoustic monitoring for bats was undertaken at an areawide level.

# 3 Methodology

## 3.1 Acoustic Monitoring

Automatic Bat Monitors (ABM)s (Song Meter SM4BAT-FS Ultrasonic Bat Detectors with SMM-U2 microphones) were deployed across the Project area. ABMs were deployed in two separate survey sessions. The first (December 2021) was completed within the bat maternity period (December - February) and the second (April 2022) within the bat mating season (March - May). The intent of surveying in two sessions was to cover any potential changes in bat activity patterns between the maternity and mating seasons.

Once deployed, ABMs were pre-set to start recording 60 minutes before sunset, and cease recording 60 minutes after sunrise (a 'night'). Each ABM was left *in-situ* for at-least 14 nights with suitable weather conditions (O'Donnell & Sedgeley, 2001). For the purposes of this report suitable weather conditions have been defined as:

- Air temperatures dropped below 10°C in the first four hours after sunset.
- Mean overnight wind speed was considered 'strong breeze' on the Beaufort Scale (39-49 km/h) (Royal Meteorological Society, 2021).
- Maximum overnight wind gust exceeded 60 km/h; and/or
- Persistent heavy rain in the first two hours after sunset (heavy rain is described as >4 mm/h) (United States Geological Survey, 2016).

### 3.1.1 December 2021 Survey

ABMs were placed in a network within habitats that would be affected by the Project and would provide suitable habitat for bat roosting, foraging, and commuting. Specifically, pre-determined survey locations were selected based on the current understanding of habitats that are favoured by bats, drawing information from recent radio tracking that AECOM has completed on the urban fringe of the Waitakere Ranges, existing bat records (Department of Conservation and Auckland Council), and a heat map produced by Auckland Council (Crewther, 2016).

32 ABMs were left in-situ at various times during the period 17 November 2021 until 23 December 2021. The locations of the December 2021 survey sites are detailed in Table 3-1 and presented in Figure 3-1.

**Table 3-1 December 2021 ABM survey locations**

| Site | NZTM Easting (X) | NZTM Northing (Y) |
|---|---|---|
| #1-Dec | 1739214 | 5926273 |
| #2-Dec | 1740072 | 5926623 |
| #3-Dec | 1735355 | 5928284 |
| #4-Dec | 1733209 | 5929146 |
| #5-Dec | 1736714 | 5929643 |
| #6-Dec | 1734977 | 5929358 |

| Site | NZTM Easting (X) | NZTM Northing (Y) |
|---|---|---|
| #7-Dec | 1742885 | 5926156 |
| #8-Dec | 1738312 | 5927722 |
| #9-Dec | 1745935 | 5926209 |
| #10A-Dec | 1738213 | 5928889 |
| #10B-Dec | 1738211 | 5928832 |
| #11-Dec | 1741815 | 5924338 |
| #12A-Dec | 1736983 | 5926448 |
| #12B-Dec | 1736912 | 5926867 |
| #13-Dec | 1742972 | 5926641 |
| #14-Dec | 1741756 | 5931165 |
| #15-Dec | 1736431 | 5930302 |
| #16-Dec | 1738242 | 5929512 |
| #17-Dec | 1741693 | 5922045 |
| #18-Dec | 1735617 | 5930473 |
| #19-Dec | 1739393 | 5928689 |
| #20-Dec | 1738140 | 5930302 |
| #21-Dec | 1741241 | 5921934 |
| #22-Dec | 1741983 | 5926912 |
| #23-Dec | 1740244 | 5920178 |
| #24-Dec | 1741618 | 5926346 |
| #25-Dec | 1738270 | 5923934 |
| #26-Dec | 1738146 | 5928249 |
| #27-Dec | 1735631 | 5926833 |
| #28-Dec | 1738928 | 5929152 |
| #29-Dec | 1736737 | 5930863 |
| #30-Dec | 1734194 | 5928226 |

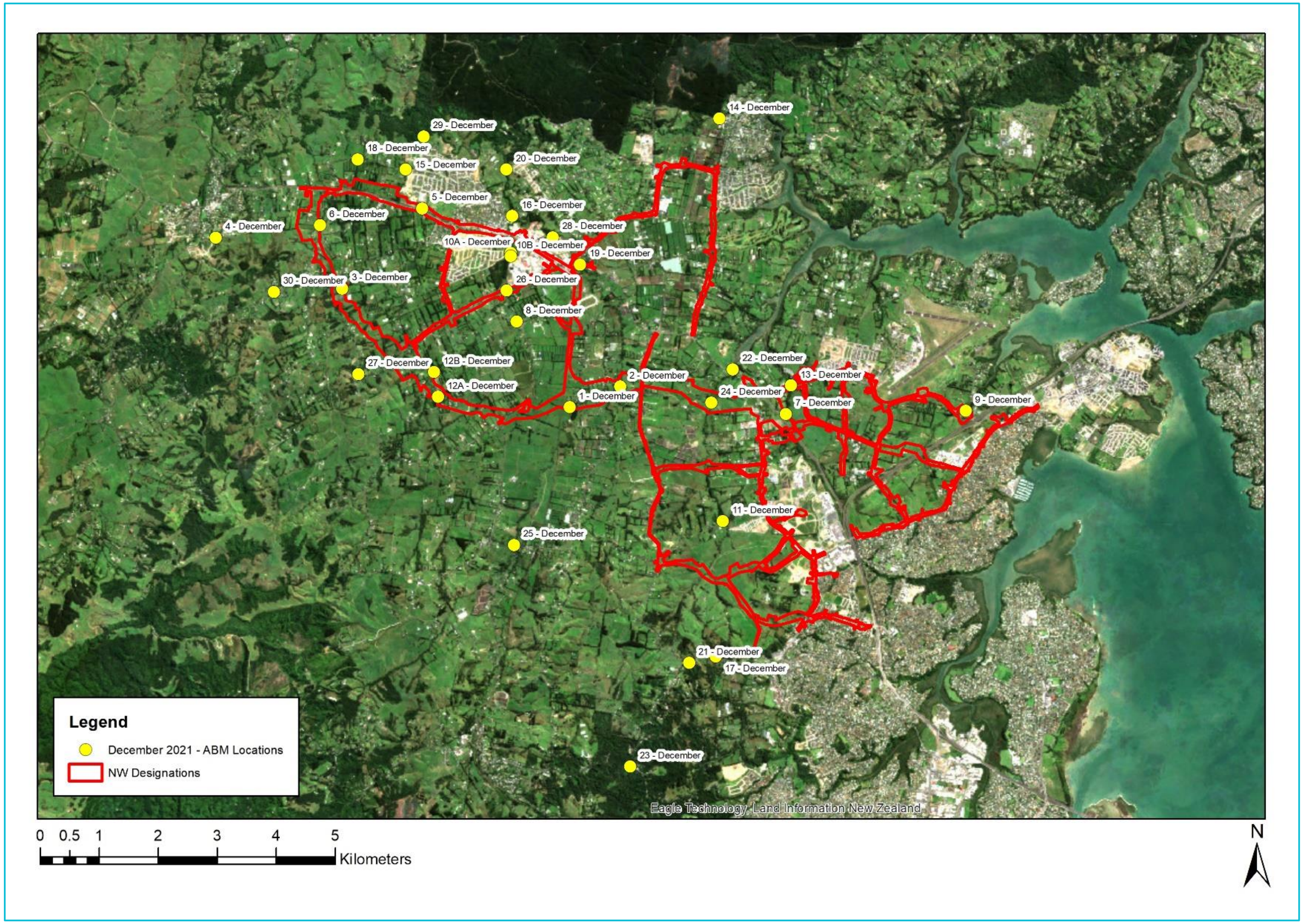


Figure 3-1 ABM locations (December 2021 survey).

### 3.1.2 April 2022 Survey

Based on the results of the first survey, ABMs locations were specific to the stream and river corridors associated with the proposed Strategic alignment and specifically the Alternative State Highway (ASH).

A total of 21 ABMs were left *in-situ* from 6-7 April 2022 until 3 May 2022. The locations of the April 2022 survey sites are detailed in Table 3-2 and presented in Figure 3-2.

**Table 3-2 April 2022 ABM survey locations**

| Site | NZTM Easting (X) | NZTM Northing (Y) |
|---|---|---|
| #1-Apr | 1741497 | 5926010 |
| #2-Apr | 1741627 | 5926348 |
| #3-Apr | 1738298 | 5927729 |
| #4-Apr | 1740062 | 5926649 |
| #5-Apr | 1739242 | 5926255 |
| #6-Apr | 1736563 | 5925866 |
| #7-Apr | 1737764 | 5926415 |
| #8-Apr | 1737011 | 5926448 |
| #9-Apr | 1738151 | 5928249 |
| #10-Apr | 1735633 | 5926835 |
| #11-Apr | 1737116 | 5926987 |
| #12-Apr | 1736235 | 5926691 |
| #13-Apr | 1736074 | 5927368 |
| #14-Apr | 1735449 | 5927854 |
| #15-Apr | 1737326 | 5926729 |
| #16-Apr | 1735364 | 5928281 |
| #17-Apr | 1735701 | 5928158 |
| #18-Apr | 1734931 | 5928655 |
| #19-Apr | 1734952 | 5929326 |
| #20-Apr | 1739706 | 5926337 |
| #21-Apr | 1739953 | 5926092 |

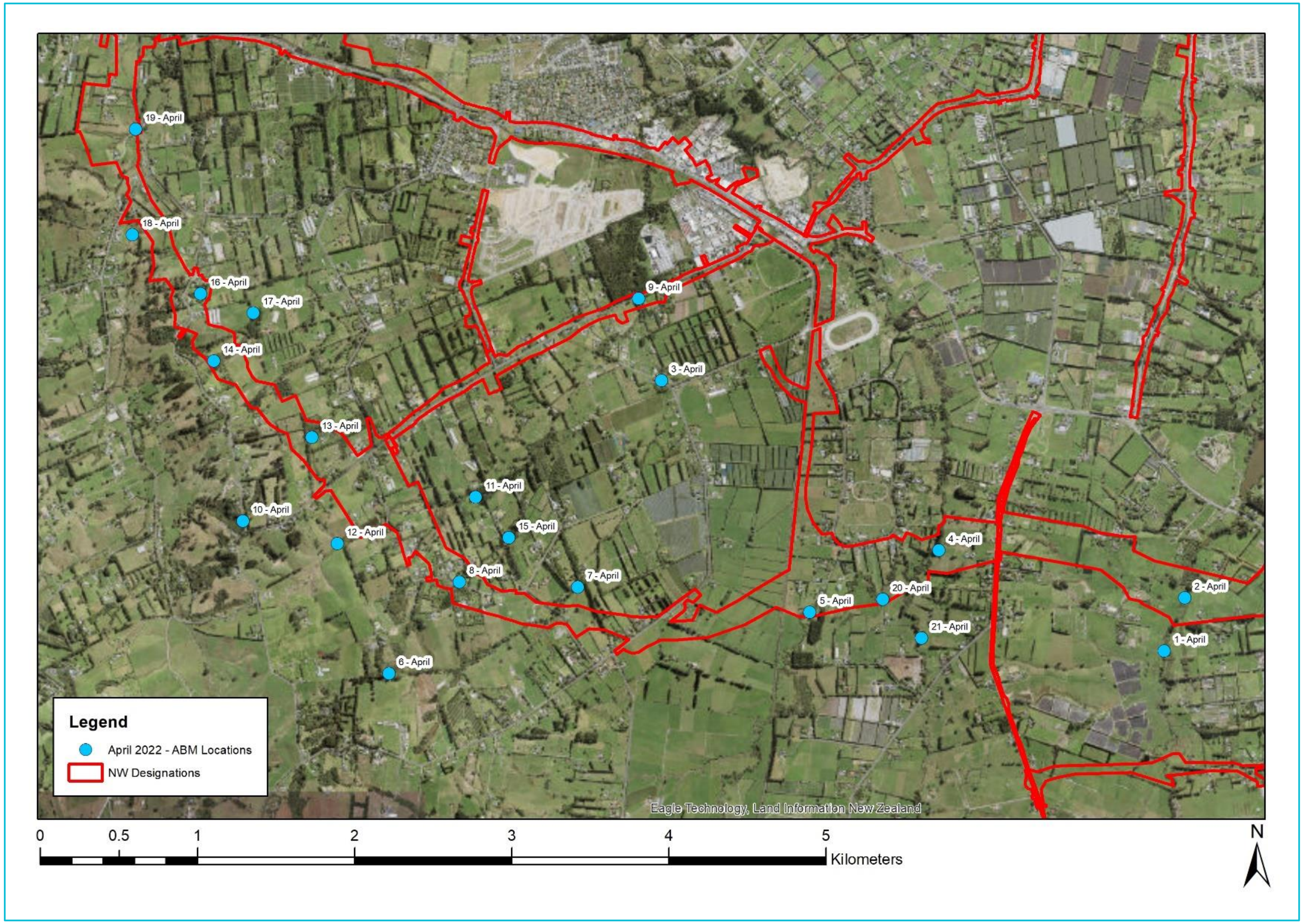


Figure 3-2 ABM locations (April 2022 survey)

## 3.2 Data Analysis

### 3.2.1 Long-tailed bat detection and behaviour

The ABM recordings were analysed by an experienced ecologist using Kaleidoscope Pro Analysis[1] software. Confirmed bat recordings (several bat echolocation calls recorded in a sound file) were further classified into:

- Echolocation calls i.e. regularly-spaced calls;
- Echolocation calls with foraging calls (feeding buzzes); and
- Echolocation calls with social calls.

The ABM data was removed from the analysis of trends if there was instrument error or weather conditions overnight were suboptimal for bat activity. Weather data for the survey period was provided by the nearest NIWA CliFlo weather station with relevant data available (North Shore Albany Ews, Agent 37852)[2] and the weather conditions during this period are included in Appendix 1.

### 3.2.2 First and Last Bat Pass

A review of the ABM data was undertaken to determine when the first and last bat pass was detected in comparison with sunset or sunrise time (data collected from the Time and Date website[3]). The purpose of this analysis was to gain an understanding as to whether bats could potentially be roosting in close proximity to an ABM site. Griffiths (2007) found that long-tailed bats emerged on average 30.1 ± 1.5 minutes after sunset and between January – February bats returned to their roost just before sunrise. However, by March bats were observed to be returning earlier to their roosts and by the end of May they returned as early as 40 minutes after emerging.

The following information was reviewed:

- Percentage of nights at each site where first/last bat pass is recorded within 30 minutes of sunset/sunrise;
- First and last bat pass recorded at each site during the survey period; and
- Minimum time difference between sunset/sunrise and the first/last bat pass.

[1] https://www.wildlifeacoustics.com/download/kaleidoscope-software.
[2] https://cliflo.niwa.co.nz/
[3] https://www.timeanddate.com

# 4 Results

## 4.1 December 2021

Table 4-1 and Figure 2-1 present the overall results of the bat surveys completed for the North West during the December 2021 survey. Raw survey data is included in Appendix 2.

Seven of the 32 ABM sites (December sites #2, #11, #17, #21, #23, #25, and #27) detected bat activity during the survey period. The site with the greatest number of bat passes was December site #27, all other sites had similarly low numbers of bat passes (Figure 4-2). No foraging calls or social calls were recorded during the survey.

No bat passes were recorded within 30 minutes of sunset or sunrise (Appendix 3). The site with the lowest minimum time difference between sunset and first bat pass was at December site #17, with a time of one hour 37 minutes. The site with the lowest minimum time difference between sunrise and last bat pass was at December site #25, with a time of 3 hours 9 minutes.

**Table 4-1 December 2021 survey results of sites with bat activity**

| Site | Total Number of Echolocation Calls | Total Number of Foraging Calls | Total Number of Social Calls |
|---|---|---|---|
| #2-Dec | 1 | 0 | 0 |
| #11-Dec | 3 | 0 | 0 |
| #17-Dec | 2 | 0 | 0 |
| #21-Dec | 1 | 0 | 0 |
| #23-Dec | 1 | 0 | 0 |
| #25-Dec | 3 | 0 | 0 |
| #27-Dec | 42 | 0 | 0 |

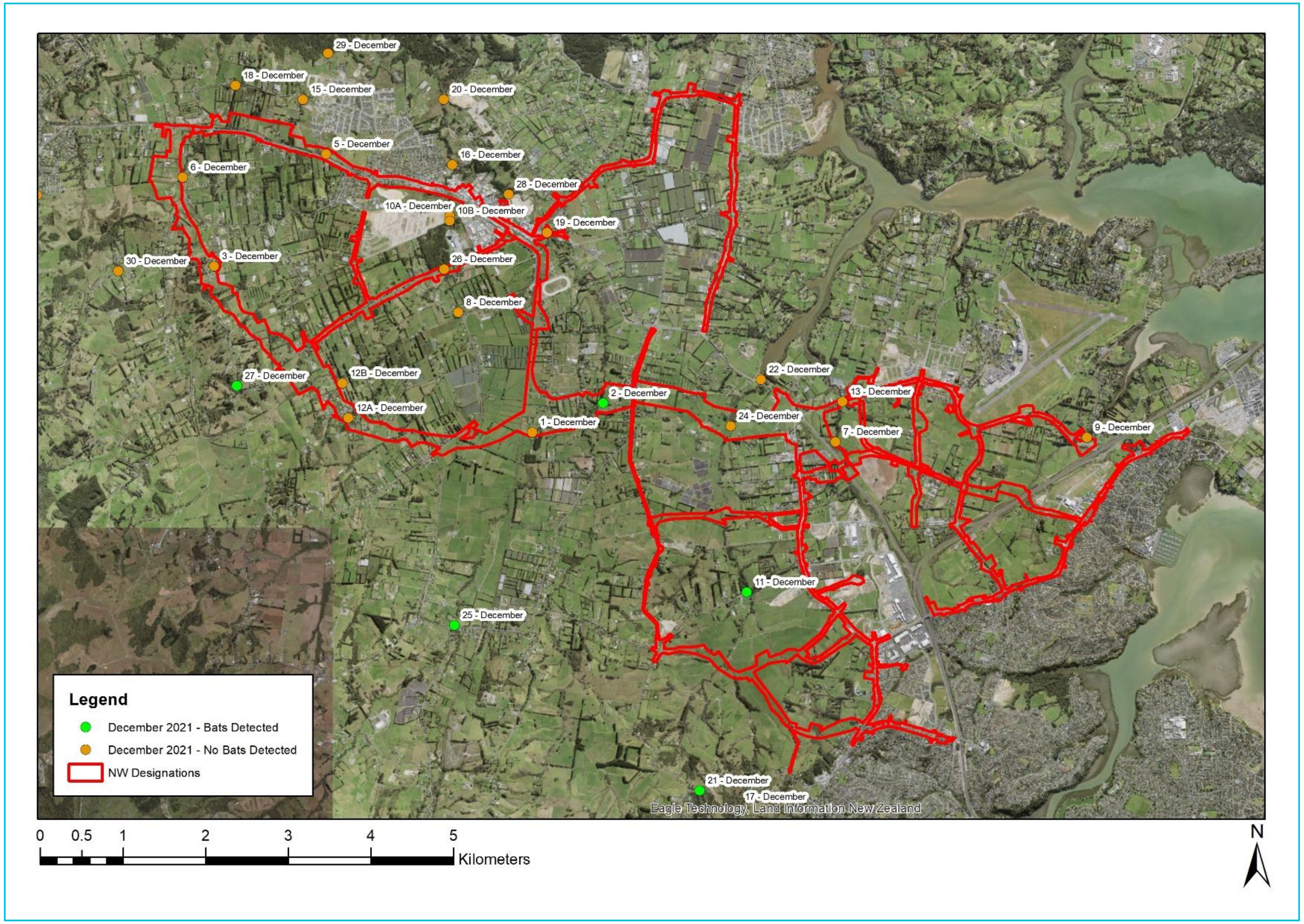


**Figure 4-1 Long-tailed bat presence/absence (December 2021 survey)**

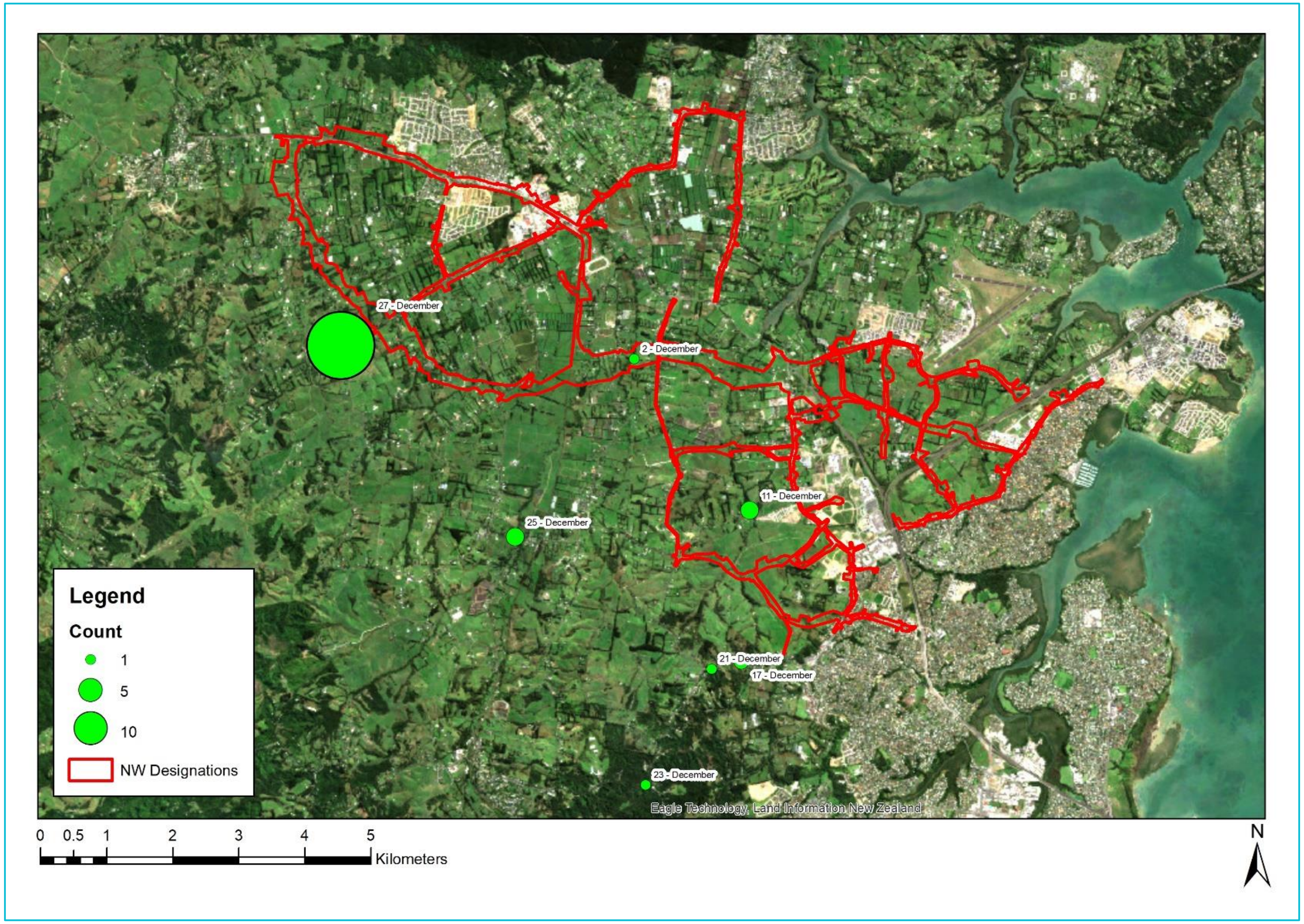


**Figure 4-2 Sites with confirmed long-tailed bat presence (December 2021 survey). Proportional symbology indicates the relative proportion of bat passes in relation to the site with the highest number of bat passes (#27-December).**

## 4.2 April 2022

Table 4-2 and Figure 4-3 present the overall results of the bat surveys completed for the North West during the April 2022 survey. Raw survey data is included in Appendix 2.

A total of 16 of the 21 ABM sites detected bat activity during the survey period (April sites #1, #2, #4, #5, #6, #7, #8, #9, #10, #11, #13, #14, #15, #16, #17, and #20). The site with the greatest number of bat passes was April site #17 with 1370 bat passes recorded during the survey (Figure 4-4). Foraging calls were recorded at 10 of the ABM sites, with the greatest number recorded at April site #17, and no social calls were recorded during the survey.

No bat passes were recorded within 30 minutes of sunset or sunrise (Appendix 3). The site with the lowest minimum time difference between sunset and first bat pass was at April site #11, with a time of 46 minutes. The site with the lowest minimum time difference between sunrise and last bat pass was at April site #17, with a time of 1 hour 2 minutes.

**Table 4-2 April 2022 survey results of sites with bat activity**

| Site | Total Number of Echolocation Calls | Total Number of Foraging Calls | Total Number of Social Calls |
|---|---|---|---|
| #1-Apr | 1 | 0 | 0 |
| #2-Apr | 2 | 0 | 0 |
| #4-Apr | 29 | 4 | 0 |
| #5-Apr | 21 | 2 | 0 |
| #6-Apr | 346 | 15 | 0 |
| #7-Apr | 103 | 14 | 0 |
| #8-Apr | 35 | 3 | 0 |
| #9-Apr | 2 | 0 | 0 |
| #10-Apr | 231 | 5 | 0 |
| #11-Apr | 162 | 15 | 0 |
| #13-Apr | 37 | 1 | 0 |
| #14-Apr | 21 | 1 | 0 |
| #15-Apri | 18 | 0 | 0 |
| #16-Apr | 5 | 0 | 0 |
| #17-Apr | 1370 | 265 | 0 |
| #20-Apr | 1 | 0 | 0 |

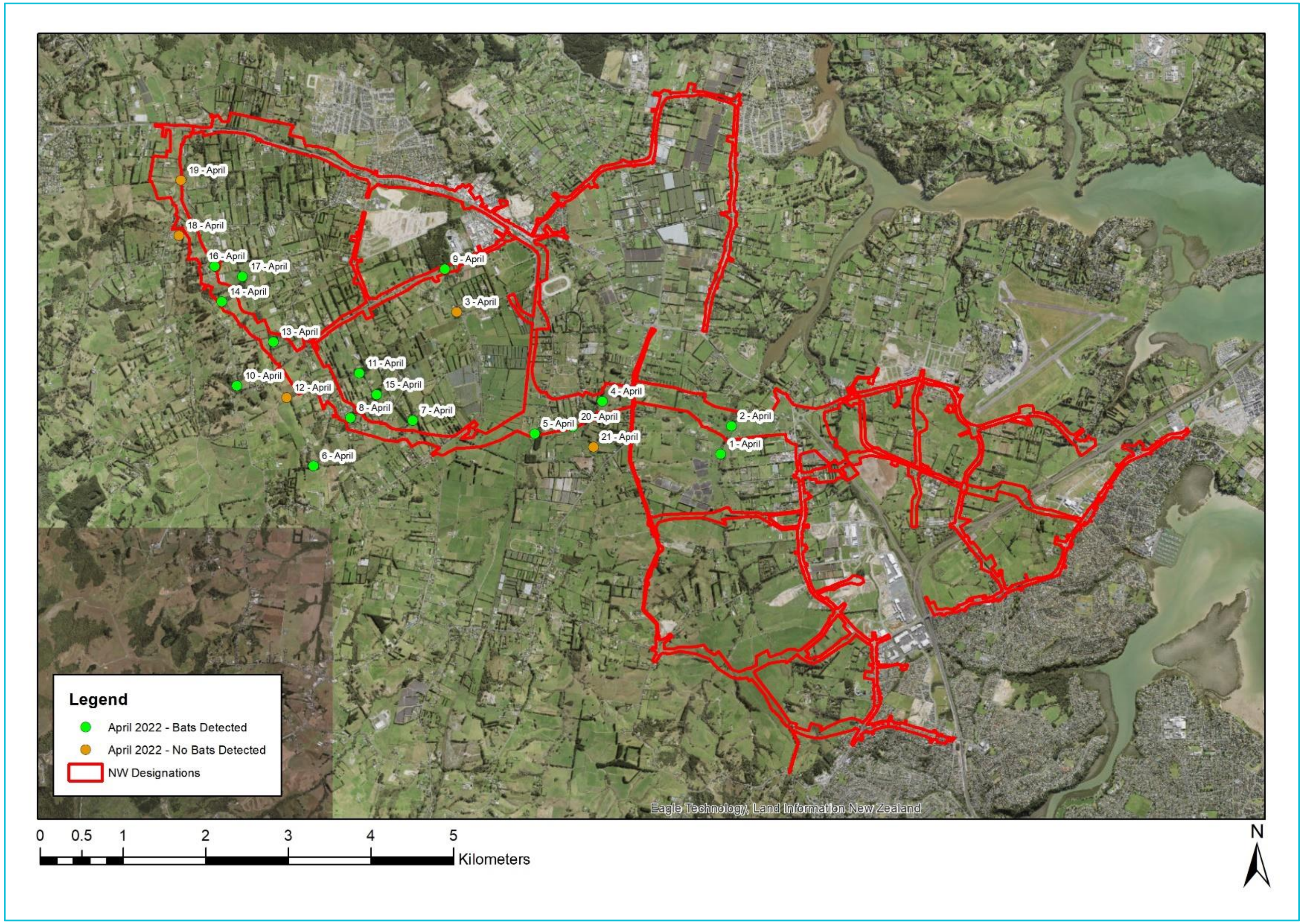


**Figure 4-3 Long-tailed bat presence/absence (April 2022 survey)**

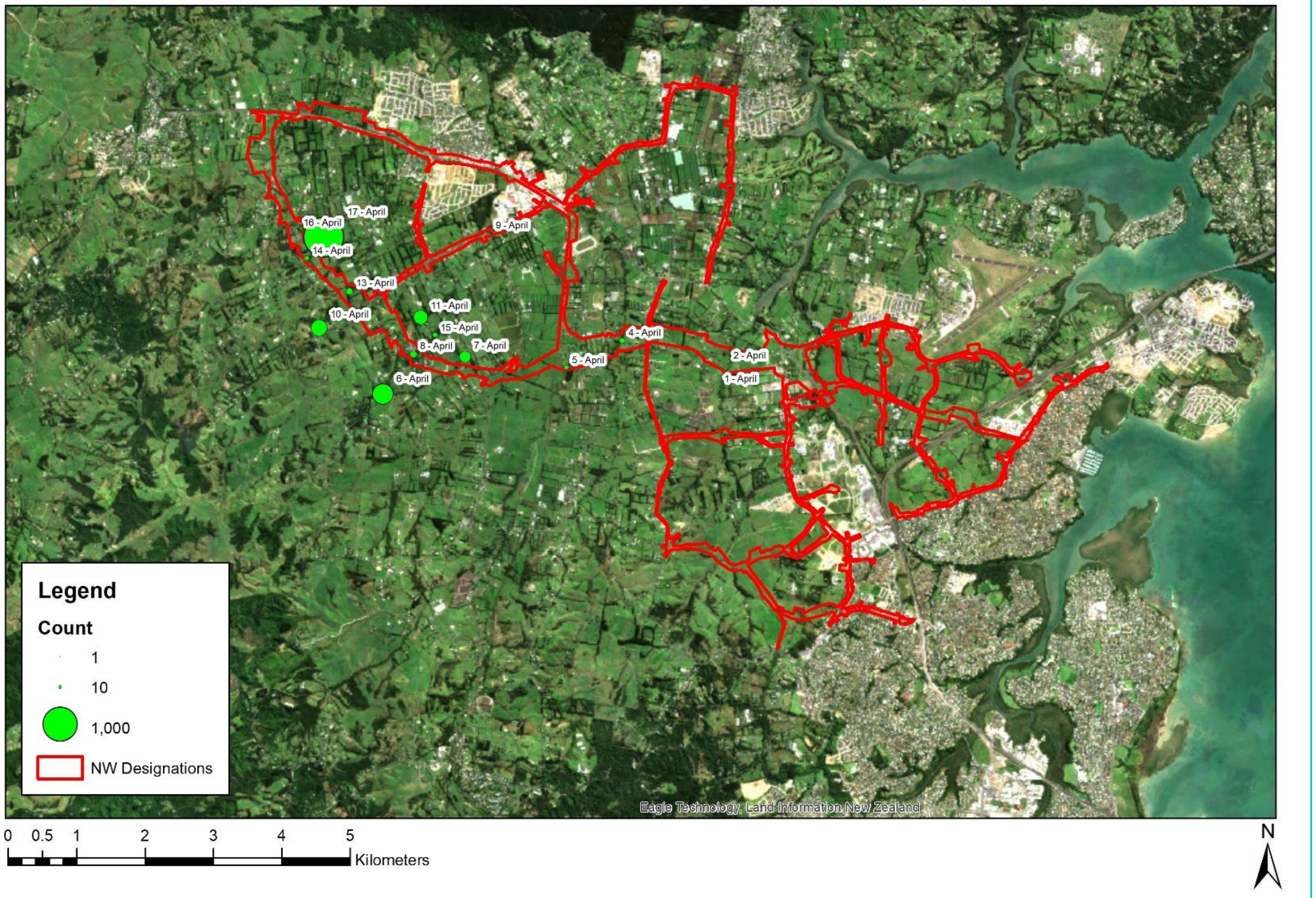


**Figure 4-4 Sites with confirmed long-tailed bat presence (April 2022 survey). Proportional symbology indicates the relative proportion of bat passes in relation to the site with the highest number of bat passes (#17-April).**

## 4.3 Survey Limitations

Some survey locations were limited by access to private property. If access was not available for a pre-determined survey location, then an alternative survey location as close as possible to the original survey site was used.

Instrument error was recorded during both the December 2021 and April 2022 surveys. An overview of when and where instrument error occurred is included in Appendix 2.

# 5 Conclusion

Both the December 2021 and April 2022 surveys found evidence of long-tailed bat activity in the Project area. Bats were observed to be most active during the April 2022 survey (bat mating season) with the highest mean number of 53 nightly bat passes recorded at April site #17. During the December 2021 survey, the highest mean number of bat passes was 1 nightly bat pass at December site #27.

Foraging calls were recorded during the April 2022 survey, with the highest number of foraging calls recorded at April site #17, with a total of 265 calls (19% of the total calls recorded at this site). Foraging calls were not recorded during the December 2021 survey, and social calls were not recorded during either survey.

Analysis of the first and last bat pass suggests that there are no bat roosts within the immediate vicinity of each ABM location. It is possible that bats may be roosting in the vicinity of April sites #6, #8, #11, #15, and #17 with first bat passes recorded within an hour of sunset.

Using the information obtained from the surveys, the results suggest that bats are active in the North West Project area. Specifically, the results suggests that bats are active in both the Local Arterials Package area (Whenuapai Arterials, Redhills Arterials, and Riverhead Arterials), and the Strategic Projects and Kumeū Huapai Local Arterials Package area, with the highest bat activity recorded in the Alternative State Highway (ASH) NoR.

# 6 References

Crewther, K. 2016. Report on modelled distribution of long-tailed bats in the Auckland Region. Prepared for Auckland Council, April 2016

Department of Conservation. (2022). Bioweb results for bats

Griffiths (2007). Activity patterns of long-tailed bats (Chalinolobus tuberculatus) in a rural landscape, South Canterbury, New Zealand. New Zealand Journal of Zoology, 34(3), 247-258. DOI 10.1080/0301422070951008.

O'Donnell, C. F. J. & Sedgeley, J. A. (2001). Guidelines for surveying and monitoring long-tailed bat populations using line transects. DOC science internal series 12. New Zealand Department of Conservation.

O'Donnell, C. F. J., Borkin, K. M., Christie, J. E., Lloyd, B., Parsons, S. & Hitchmough, R. A. (2018). Conservation status of New Zealand bats, 2017. New Zealand Threat Classification Series 21. Department of Conservation, Wellington. 4 p.

Royal Meteorological Society. (2019, September 10). The Beaufort Scale. https://www.rmets.org/metmatters/beaufort-scale.

Smith, D., Borkin, K., Jones, C., Lindberg, S., Davies, F. & Eccles, G. (2017). Effects of land transport activities on New Zealand's endemic bat populations: reviews of ecological and regulatory literature. Research report 623, 249 p. NZ Transport Agency: Wellington; New Zealand.

United States Geological Survey. (2016, January 2). Rainfall calculator. https://water.usgs.gov/edu/activity-howmuchrain-metric.html.

# 1 Appendix 1 - Weather Conditions

Analysis of the nightly weather against the criteria described in Section 3 led to the exclusion of data whilst the ABMs were in situ during the 2021-2022 surveys. The dates that met weather criteria and were selected for data analysis are presented in Table 1 and Table 2.

**Table 1 Weather conditions during the December 2021 survey**

| Date | Maximum overnight wind gust (km/h) | Average Nightly Windspeed (km/h) | Minimum temperature in first four hours after sunset (°C) | Total rainfall in first two hours after sunset (mm) | Suitable Weather Conditions? |
|---|---|---|---|---|---|
| 17 Nov 2021 | 13.7 | 2.62 | 13.0 | 0.0 | ✓ |
| 18 Nov 2021 | 15.8 | 2.57 | 11.1 | 0.0 | ✓ |
| 19 Nov 2021 | 15.5 | 3.08 | 13.2 | 0.0 | ✓ |
| 20 Nov 2021 | 26.3 | 10.3 | 17.4 | 0.0 | ✓ |
| 21 Nov 2021 | 23.4 | 5.92 | 18.9 | 0.0 | ✓ |
| 22 Nov 2021 | 21.6 | 7.01 | 16.6 | 0.0 | ✓ |
| 23 Nov 2021 | 28.4 | 7.76 | 17.0 | 0.0 | ✓ |
| 24 Nov 2021 | 11.9 | 2.88 | 15.0 | 0.0 | ✓ |
| 25 Nov 2021 | 13.0 | 2.58 | 14.4 | 0.0 | ✓ |
| 26 Nov 2021 | 9.4 | 1.66 | 13.2 | 0.0 | ✓ |
| 27 Nov 2021 | 17.3 | 2.77 | 17.0 | 0.0 | ✓ |
| 28 Nov 2021 | 10.8 | 2.03 | 17.3 | 0.0 | ✓ |
| 29 Nov 2021 | 16.6 | 2.23 | 15.4 | 0.0 | ✓ |
| 30 Nov 2021 | 11.2 | 1.80 | 16.4 | 0.0 | ✓ |
| 1 Dec 2021 | 20.2 | 4.09 | 18.7 | 0.3 | ✓ |
| 2 Dec 2021 | 32.8 | 14.56 | 18.9 | 0.0 | ✓ |
| 3 Dec 2021 | 40.0 | 16.56 | 19.6 | 0.0 | ✓ |
| 4 Dec 2021 | 33.1 | 14.81 | 19.2 | 0.3 | ✓ |
| 5 Dec 2021 | 36.4 | 15.45 | 19.7 | 0.0 | ✓ |
| 6 Dec 2021 | 31.7 | 12.96 | 20.3 | 0.0 | ✓ |
| 7 Dec 2021 | 20.2 | 5.37 | 19.8 | 0.0 | ✓ |
| 8 Dec 2021 | 16.2 | 2.53 | 18.6 | 0.0 | ✓ |

| Date | Maximum overnight wind gust (km/h) | Average Nightly Windspeed (km/h) | Minimum temperature in first four hours after sunset (°C) | Total rainfall in first two hours after sunset (mm) | Suitable Weather Conditions? |
|---|---|---|---|---|---|
| 9 Dec 2021 | 12.2 | 2.42 | 19.1 | 0.0 | ✓ |
| 10 Dec 2021 | 19.8 | 5.22 | 18.8 | 0.0 | ✓ |
| 11 Dec 2021 | 17.3 | 4.82 | 19.8 | 0.4 | ✓ |
| 12 Dec 2021 | 20.9 | 5.67 | 19.3 | 0.4 | ✓ |
| 13 Dec 2021 | 38.9 | 16.14 | 19.2 | 2 | ✓ |
| 14 Dec 2021 | 65.5 | 21.11 | 18.8 | 4.5 (did not exceed >4mm/hr) | X |
| 15 Dec 2021 | 26.3 | 7.37 | 17.7 | 0.0 | ✓ |
| 16 Dec 2021 | 33.8 | 6.08 | 17.3 | 0.2 | ✓ |
| 17 Dec 2021 | 32.0 | 4.22 | 14.6 | 0.0 | ✓ |
| 18 Dec 2021 | 26.3 | 3.71 | 15.2 | 0.0 | ✓ |
| 19 Dec 2021 | 19.4 | 2.85 | 13.8 | 0.0 | ✓ |
| 20 Dec 2021 | 14.8 | 2.62 | 17.0 | 0.0 | ✓ |
| 21 Dec 2021 | 17.3 | 4.30 | 19.0 | 0.0 | ✓ |
| 22 Dec 2021 | 28.1 | 7.89 | 18.2 | 0.0 | ✓ |
| 23 Dec 2021 | 28.1 | 8.74 | 19.5 | 0.0 | ✓ |

**Table 2 Weather conditions during the April 2022 survey**

| Date | Maximum overnight wind gust (km/h) | Average Nightly Windspeed (km/h) | Minimum temperature in first four hours after sunset (°C) | Total rainfall in first two hours after sunset (mm) | Suitable Weather Conditions? |
|---|---|---|---|---|---|
| 6 Apr 2022 | 28.4 | 6.56 | 19.0 | 0.0 | ✓ |
| 7 Apr 2022 | 28.1 | 6.20 | 15.8 | 0.0 | ✓ |
| 8 Apr 2022 | 18.4 | 3.56 | 13.9 | 0.0 | ✓ |
| 9 Apr 2022 | 22.0 | 7.02 | 18.7 | 0.0 | ✓ |
| 10 Apr 2022 | 14.8 | 2.26 | 15.0 | 0.0 | ✓ |

| Date | Maximum overnight wind gust (km/h) | Average Nightly Windspeed (km/h) | Minimum temperature in first four hours after sunset (°C) | Total rainfall in first two hours after sunset (mm) | Suitable Weather Conditions? |
|---|---|---|---|---|---|
| 11 Apr 2022 | 31.7 | 12.99 | 19.1 | 0.0 | ✓ |
| 12 Apr 2022 | 32.4 | 11.85 | 18.4 | 0.0 | ✓ |
| 13 Apr 2022 | 31.7 | 8.29 | 17.9 | 0.0 | ✓ |
| 14 Apr 2022 | 28.8 | 4.02 | 12.7 | 0.0 | ✓ |
| 15 Apr 2022 | 14.0 | 2.48 | 14.2 | 0.0 | ✓ |
| 16 Apr 2022 | 16.6 | 4.69 | 16.6 | 0.0 | ✓ |
| 17 Apr 2022 | 54.7 | 24.78 | 19.1 | 0.0 | ✓ |
| 18 Apr 2022 | 55.1 | 26.12 | 17.5 | 0.8 | ✓ |
| 19 Apr 2022 | 41.8 | 15.4 | 19.4 | 4 (did not exceed >4mm/hr) | ✓ |
| 20 Apr 2022 | 36.4 | 13.86 | 19.6 | 0.0 | ✓ |
| 21 Apr 2022 | 31.7 | 9.81 | 19.9 | 0.0 | ✓ |
| 22 Apr 2022 | 43.9 | 12.42 | 15.8 | 0.0 | ✓ |
| 23 Apr 2022 | 27.7 | 3.71 | 12.1 | 0.0 | ✓ |
| 24 Apr 2022 | 39.6 | 4.94 | 14.5 | 1.5 | ✓ |
| 25 Apr 2022 | 23.0 | 2.54 | 12.5 | 0.0 | ✓ |
| 26 Apr 2022 | 22.7 | 3.11 | 15.7 | 0.0 | ✓ |
| 27 Apr 2022 | 32.8 | 6.06 | 14.5 | 0.0 | ✓ |
| 28 Apr 2022 | 19.1 | 8.16 | 17.5 | 0.0 | ✓ |
| 29 Apr 2022 | 27.4 | 8.14 | 16.3 | 0.0 | ✓ |
| 30 Apr 2022 | 29.2 | 10.32 | 15.8 | 0.0 | ✓ |
| 1 May 2022 | 22.3 | 4.01 | 15.7 | 0.0 | ✓ |
| 2 May 2022 | 19.8 | 2.36 | 14.7 | 0.0 | ✓ |
| 3 May 2022 | 12.6 | 1.91 | 15.0 | 0.0 | ✓ |

# 2 Appendix 2 - Survey Results

## 2.1 December 2021

| Date | Site | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #1-Dec | #2-Dec | #3-Dec | #4-Dec | #5-Dec | #6-Dec | #7-Dec | #8-Dec | #9-Dec | #10A - Dec | #10B - Dec | #11-Dec | #12A - Dec | #12B - Dec | #13-Dec | #14-Dec | #15-Dec | #16-Dec | #17-Dec | #18-Dec | #19-Dec | #20-Dec | #21-Dec | #22-Dec | #23-Dec | #24-Dec | #25-Dec | #26-Dec | #27-Dec | #28-Dec | #29-Dec | #30-Dec |
| **17-Nov-21** | N/A | N/A | N/A | 0 | 0 | 0 | 0 | N/A | N/A | N/A | N/A | 0 | 0 | 0 | N/A | N/A | N/A | 0 | N/A | N/A | 0 | 0 | N/A | N/A | N/A | E | 1 | 0 | 0 | N/A | 0 | 0 |
| **18-Nov-21** | N/A | N/A | N/A | 0 | 0 | 0 | 0 | N/A | N/A | N/A | N/A | 0 | 0 | 0 | N/A | N/A | N/A | 0 | N/A | N/A | 0 | 0 | N/A | N/A | N/A | E | 0 | 0 | 0 | N/A | 0 | 0 |
| **19-Nov-21** | N/A | N/A | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **20-Nov-21** | N/A | N/A | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **21-Nov-21** | N/A | N/A | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **22-Nov-21** | N/A | N/A | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **23-Nov-21** | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **24-Nov-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **25-Nov-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **26-Nov-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | E | 0 | 0 |
| **27-Nov-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 1 | 0 | 3 | E | 0 | 0 |
| **28-Nov-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 7 | E | 0 | 0 |
| **29-Nov-21** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 13 | E | 0 | 0 |
| **30-Nov-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | E | 0 | 0 | 10 | E | 0 | 0 |
| **1-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | E | 0 | 0 |
| **2-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 |
| **3-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| **4-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| **5-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | E | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **6-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | E | 0 | N/A | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 |
| **7-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | N/A | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **8-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **9-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **10-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **11-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **12-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Date | Site | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #1-Dec | #2-Dec | #3-Dec | #4-Dec | #5-Dec | #6-Dec | #7-Dec | #8-Dec | #9-Dec | #10A - Dec | #10B - Dec | #11-Dec | #12A - Dec | #12B - Dec | #13-Dec | #14-Dec | #15-Dec | #16-Dec | #17-Dec | #18-Dec | #19-Dec | #20-Dec | #21-Dec | #22-Dec | #23-Dec | #24-Dec | #25-Dec | #26-Dec | #27-Dec | #28-Dec | #29-Dec | #30-Dec |
| **13-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 | 0 |
| **14-Dec-21** | Weather conditions unsuitable. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **15-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 | 0 |
| **16-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 | 0 |
| **17-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | E | 1 | 0 | 0 | 0 | 0 | 0 |
| **18-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 | 0 |
| **19-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | 0 | 0 |
| **20-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | E | 0 | 0 | 0 | 0 | 0 | 0 |
| **21-Dec-21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | E | 0 | 0 | 0 | 0 | N/A | 0 |
| **22-Dec-21** | 0 | 0 | 0 | N/A | N/A | N/A | N/A | E | N/A | N/A | 0 | N/A | 0 | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 0 | E | N/A | N/A | 0 | N/A | N/A | N/A |
| **Total Count of Bat Passes** | **0** | **1** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **3** | **0** | **0** | **0** | **0** | **0** | **0** | **2** | **0** | **0** | **0** | **1** | **0** | **1** | **0** | **3** | **0** | **42** | **0** | **0** | **0** |
| **# Suitable Nights Recorded** | **29** | **28** | **29** | **34** | **34** | **34** | **34** | **27** | **29** | **18** | **15** | **34** | **35** | **35** | **30** | **32** | **32** | **34** | **32** | **32** | **34** | **34** | **32** | **32** | **33** | **12** | **33** | **34** | **35** | **18** | **33** | **34** |
| **Mean # Nightly Bat Passes** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **0** |

Notes: N/A = ABM not deployed. E = Instrument error. Highlighted blue cells = Number of bat calls.

## 2.2 April 2022

| Date | Site | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #1-Apr | #2-Apr | #3-Apr | #4-Apr | #5-Apr | #6-Apr | #7-Apr | #8-Apr | #9-Apr | #10-Apr | #11-Apr | #12-Apr | #13-Apr | #14-Apr | #15-Apr | #16-Apr | #17-Apr | #18-Apr | #19-Apr | #20-Apr | #21-Apr |
| 6-Apr-22 | N/A | 0 | 0 | N/A | 0 | N/A | N/A | 1 | 0 | 1 | N/A | Error | 2 | 0 | 9 | 1 | N/A | 0 | 0 | 0 | Error |
| 7-Apr-22 | 1 | 1 | 0 | 0 | 0 | 27 | 15 | 1 | 0 | 21 | 0 | Error | 2 | 0 | 0 | 0 | 44 | 0 | 0 | 0 | Error |
| 8-Apr-22 | 0 | 0 | 0 | 3 | 1 | 46 | 58 | 1 | 0 | 4 | 4 | Error | 7 | 1 | 0 | 0 | 56 | 0 | 0 | 0 | Error |
| 9-Apr-22 | 0 | 0 | 0 | 3 | 3 | 62 | 3 | 3 | 0 | 7 | 1 | Error | 1 | 0 | 0 | 0 | 44 | 0 | 0 | 0 | Error |
| 10-Apr-22 | 0 | 0 | 0 | 8 | 0 | 17 | 3 | 4 | 2 | 5 | 7 | Error | 0 | 0 | 0 | 0 | 41 | 0 | 0 | 0 | Error |
| 11-Apr-22 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 23 | 26 | Error | 1 | 7 | 3 | 0 | 190 | 0 | 0 | 0 | Error |

| Date | Site | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #1-Apr | #2-Apr | #3-Apr | #4-Apr | #5-Apr | #6-Apr | #7-Apr | #8-Apr | #9-Apr | #10-Apr | #11-Apr | #12-Apr | #13-Apr | #14-Apr | #15-Apr | #16-Apr | #17-Apr | #18-Apr | #19-Apr | #20-Apr | #21-Apr |
| 12-Apr-22 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 1 | 0 | 17 | 4 | Error | 3 | 4 | 3 | 1 | 113 | 0 | 0 | 0 | Error |
| 13-Apr-22 | 0 | 0 | 0 | 5 | 0 | 2 | 0 | 2 | 0 | 2 | 7 | Error | 2 | 0 | 0 | 1 | 16 | 0 | 0 | 0 | Error |
| 14-Apr-22 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 3 | 0 | 11 | 3 | Error | 0 | 0 | 0 | 0 | 68 | 0 | 0 | 0 | Error |
| 15-Apr-22 | 0 | 0 | 0 | 1 | 0 | 7 | 0 | 0 | 0 | 2 | 3 | Error | 2 | 0 | 0 | 0 | 45 | 0 | 0 | 0 | Error |
| 16-Apr-22 | 0 | 0 | 0 | 1 | 5 | 22 | 0 | 0 | 0 | 22 | 43 | Error | 2 | 0 | 0 | 0 | 71 | 0 | 0 | 0 | Error |
| 17-Apr-22 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 2 | 0 | Error | 0 | 0 | 0 | 0 | 181 | 0 | 0 | 0 | Error |
| 18-Apr-22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Error | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | Error |
| 19-Apr-22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Error | 0 | 0 | 0 | 0 | 66 | 0 | 0 | 0 | Error |
| 20-Apr-22 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 7 | 2 | Error | 0 | 3 | 0 | 0 | 17 | 0 | 0 | 0 | Error |
| 21-Apr-22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Error | 0 | 1 | 0 | 0 | 72 | 0 | 0 | 0 | Error |
| 22-Apr-22 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | Error | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Error |
| 23-Apr-22 | 0 | 0 | 0 | 0 | 3 | 9 | 0 | 1 | 0 | 1 | 1 | Error | 4 | 0 | 2 | 0 | 35 | 0 | 0 | 0 | Error |
| 24-Apr-22 | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | Error | 0 | 0 | 1 | 0 | 21 | 0 | 0 | 0 | Error |
| 25-Apr-22 | 0 | 0 | 0 | 0 | 0 | 10 | 3 | 1 | 0 | 8 | 3 | Error | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 0 | Error |
| 26-Apr-22 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 2 | 0 | 4 | 5 | Error | 0 | 1 | 0 | 0 | 113 | 0 | 0 | 0 | Error |
| 27-Apr-22 | 0 | 0 | 0 | 5 | 7 | 3 | 0 | 2 | 0 | 14 | 15 | Error | 0 | 1 | 0 | 1 | 37 | 0 | 0 | 0 | Error |
| 28-Apr-22 | 0 | 1 | 0 | 1 | 0 | 12 | 0 | 0 | 0 | 12 | 18 | Error | 3 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | Error |
| 29-Apr-22 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 6 | 0 | Error | 0 | 1 | 0 | 1 | 29 | 0 | 0 | 1 | Error |
| 30-Apr-22 | 0 | 0 | 0 | 1 | 0 | 27 | 10 | 0 | 0 | 18 | 10 | Error | 1 | 1 | 0 | 0 | 15 | 0 | 0 | 0 | Error |
| 1-May-22 | 0 | 0 | 0 | 0 | 0 | 25 | 11 | 2 | 0 | 34 | 6 | Error | 1 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | Error |
| 2-May-22 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 7 | 0 | 10 | 3 | 0 | 5 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | Error |
| **Total Count of Bat Passes** | **1** | **2** | **0** | **29** | **21** | **346** | **103** | **35** | **2** | **231** | **162** | **0** | **37** | **21** | **18** | **5** | **1370** | **0** | **0** | **1** | **N/A** |
| **# Suitable Nights Recorded** | **26** | **27** | **27** | **26** | **27** | **26** | **26** | **27** | **27** | **27** | **26** | **1** | **27** | **27** | **27** | **27** | **26** | **27** | **27** | **27** | **N/A** |
| **Mean # Nightly Bat Passes** | **0** | **0** | **0** | **1** | **1** | **13** | **4** | **1** | **0** | **9** | **6** | **0** | **1** | **1** | **1** | **0** | **53** | **0** | **0** | **0** | **N/A** |

Notes: N/A = ABM not deployed. E = Instrument error. Highlighted blue cells = Number of bat calls.

# 3 Appendix 3 - First and Last Bat Pass Results

**Table 3 Times in which the first and last bat call was recorded each night, in relation to sunset and sunrise times (December 2021 survey)**

| Site | Sunset | | | Sunrise | | |
|---|---|---|---|---|---|---|
| | First bat pass recorded during the survey period (hh:mm) | Minimum time difference between sunset and first bat pass (h:mm) | Percentage of nights where first bat pass is within 30 minutes of sunset (%) | Last bat pass recorded during the survey period (hh:mm) | Minimum time difference between last bat pass and sunrise (h:mm) | Percentage of nights where last bat pass is within 30 minutes of sunrise (%) |
| #2-Dec | 02:14 | 5:50 | 0.00 | 02:14 | 3:40 | 0.00 |
| #11-Dec | 01:07 | 4:44 | 0.00 | 02:00 | 3:53 | 0.00 |
| #17-Dec | 01:42 | 1:37 | 0.00 | 01:42 | 4:13 | 0.00 |
| #21-Dec | 02:01 | 5:38 | 0.00 | 02:01 | 3:53 | 0.00 |
| #23-Dec | 22:26 | 2:13 | 0.00 | 22:26 | 7:32 | 0.00 |
| #25-Dec | 01:19 | 4:42 | 0.00 | 02:51 | 3:09 | 0.00 |
| #27-Dec | 23:55 | 3:33 | 0.00 | 02:10 | 3:44 | 0.00 |

**Table 4 Times in which the first and last bat call was recorded each night, in relation to sunset and sunrise times (April 2022 survey)**

| Site | Sunset | | | Sunrise | | |
|---|---|---|---|---|---|---|
| | First bat pass recorded during the survey period (hh:mm) | Minimum time difference between sunset and first bat pass (h:mm) | Percentage of nights where first bat pass is within 30 minutes of sunset (%) | Last bat pass recorded during the survey period (hh:mm) | Minimum time difference between last bat pass and sunrise (h:mm) | Percentage of nights where last bat pass is within 30 minutes of sunrise (%) |
| #1-April | 19:26 | 1:20 | 0.00 | 19:26 | 11:11 | 0.00 |
| #2-April | 19:27 | 1:21 | 0.00 | 00:39 | 6:18 | 0.00 |
| #4-April | 18:55 | 1:15 | 0.00 | 23:27 | 7:15 | 0.00 |
| #5-April | 19:06 | 1:16 | 0.00 | 00:46 | 5:53 | 0.00 |
| #6-April | 18:35 | 0:53 | 0.00 | 03:43 | 3:00 | 0.00 |
| #7-April | 19:02 | 1:01 | 0.00 | 21:24 | 9:17 | 0.00 |

| Site | Sunset | | | Sunrise | | |
|---|---|---|---|---|---|---|
| | First bat pass recorded during the survey period (hh:mm) | Minimum time difference between sunset and first bat pass (h:mm) | Percentage of nights where first bat pass is within 30 minutes of sunset (%) | Last bat pass recorded during the survey period (hh:mm) | Minimum time difference between last bat pass and sunrise (h:mm) | Percentage of nights where last bat pass is within 30 minutes of sunrise (%) |
| #8-April | 19:01 | 0:58 | 0.00 | 02:07 | 4:32 | 0.00 |
| #9-April | 19:46 | 1:44 | 0.00 | 19:52 | 10:50 | 0.00 |
| #10-April | 19:06 | 1:10 | 0.00 | 03:43 | 2:56 | 0.00 |
| #11-April | 18:26 | 0:46 | 0.00 | 01:38 | 5:03 | 0.00 |
| #13-April | 18:53 | 1:17 | 0.00 | 03:27 | 3:11 | 0.00 |
| #14-April | 19:52 | 2:16 | 0.00 | 02:34 | 4:16 | 0.00 |
| #15-April | 18:42 | 0:57 | 0.00 | 01:33 | 5:05 | 0.00 |
| #16-April | 20:18 | 2:19 | 0.00 | 02:51 | 3:53 | 0.00 |
| #17-April | 18:31 | 0:52 | 0.00 | 05:44 | 1:02 | 0.00 |
| #20-April | 19:16 | 1:38 | 0.00 | 19:16 | 11:42 | 0.00 |

# ATTACHMENT 63

## NORTH-WEST REDHILLS AND RIVERHEAD ASSESSMENT OF LANDSCAPE EFFECTS

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Redhills and Riverhead

# Assessment of Landscape Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY



New Zealand Government

## Document Status

| Responsibility | Name |
| --- | --- |
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## Revision Status

| Version | Date | Reason for Issue |
| --- | --- | --- |
| 1 | 16/12/2022 | Notice of Requirement Lodgement |

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## Appendices

No table of contents entries found.

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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AEE** | Assessment of Effects on the Environment |
| **ASH** | Alternative State Highway |

| Acronym/Term | Description |
|---|---|
| **AT** | Auckland Transport |
| **AUP:OP** | Auckland Unitary Plan Operative in Part |
| **CC2W** | City Centre to Westgate |
| **FTN** | Frequent Transit Network |
| **FULSS** | Future Urban Land Supply Strategy |
| **FUZ** | Future Urban Zone |
| **NAL** | North Auckland Line |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **RMA** | Resource Management Act 1991 |
| **RTC** | Rapid Transit Corridor |
| **RAMC** | Regional Active Mode Corridor |
| **RUB** | Rural Urban Boundary |
| **SG** | Te Tupu Ngātahi Supporting Growth |
| **SH16** | State Highway 16 |
| **The Council** | Auckland Council |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |

# Glossary of Acronyms / Terms

| Acronym/Term | Description |
|---|---|
| **Auckland Council** | Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010. |
| **Redhills Riverhead Assessment Package** | Two Notices of Requirement (for Don Buck Road and Coatesville-Riverhead Road) and one alteration to an existing designation (Fred Taylor Drive) for the Redhills Riverhead Package of Projects for Auckland Transport. |

# 1 Executive Summary

***Assessment undertaken***

The Landscape Effects Assessments (LEAs) have been undertaken with reference to Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines[1]. It assesses the effects on the landscape which comprise landscape character, visual and natural character. Landscape impacts are a result of natural or induced changes in the landscape. Natural character impacts relate to the changes to streams, wetlands and their margins as outlined in the NZCPS[2].

Effects arise from change in the values associated with the landscape, not as simply as a result of the change itself. Visual impacts are the result of change to the landscape and are a consequence of that change.

Changes during the construction process and/or activities associated with the development are considered separately to those generated by a completed development.

***Project context summaries***

**NoR RE1 Don Buck Road FTN Upgrade**

This project is set in an existing two-lane arterial which runs from Fred Taylor Drive to the north and Swanson Road and Universal Drive to the south. The proposed road upgrade is from Fred Taylor Drive south to Royal Road. The road is proposed to be upgraded from a corridor width of 27-35m to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor. Intersections located along the corridor are proposed to be signalised.

**NoR RE2 Fred Taylor Drive (alteration to existing designation 1433)**

This project is set in an existing rural and semi-rural road two-lane arterial corridor which extends from the existing Brigham Creek Interchange in the north to SH16 in the south (via an intersection with Don Buck Road). The proposed upgrade will require the existing road corridor to be widened in places to facilitate the proposed corridor will also support an active mode shift with separated cycle lanes and footpath on either side and public transport priority lanes. The northern extent of the route is surrounded by FUZ and the southern extent is urban zoned residential and business zoned land.

**NoR R1 Coatesville-Riverhead Highway Upgrade**

The project is set within an existing arterial extending from SH16 in the south to its intersection with Dairy Flat Highway in the north east, with the extent of the proposed upgrade from SH16 in the south to its intersection with Riverhead Road in the north. The southern section of the alignment from SH16 to Short Road runs through rural land uses which are expected to remain. The northern section (close to and within the Riverhead township) runs through low-medium density residential land uses on the east and future urban zoned land on the west.

***Potential Positive Effects***

A number of positive landscape and visual effects are anticipated as a result of the operation of the Projects (including proposed mitigation).

[1] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines', [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]

[2] 'New Zealand Coastal Policy Statement' [issued 4 November 2010]. Accessed online 24.11.2021 (https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/coastal-management/nz-coastal-policy-statement-2010.pdf)

Positive effects are likely to include:

- A streetscape to support emerging urban form within adjacent land in the Riverhead FUZ and the emerging urban form of Redhills; and;
- Slower speed limits adjacent to existing dwellings and commercial activities improving the experiential qualities of the corridor for users and well as private properties adjacent to the road corridor.

### *Construction Effects*

Construction effects are expected to be primarily related to the presence of construction plant within existing road corridors, lighting of night works, construction sites and the construction of wetlands. The phasing of the Projects will increase the intensity of construction traffic moving along the Project routes throughout the construction period. The phasing of the works along the corridor reduces the length of time audiences are expected to experience adverse effects. Mitigation measures are proposed to reduce the impacts of these construction effects.

### *Operational Effects*

Operational effects are expected to be result of a widened or introduced road corridor; changes in landform and alteration of watercourses. It is proposed that during the detailed design processes these are addressed in the ULDMP.

### *Proposed mitigation measures*

Mitigation measures are recommended to reduce potential effects of a low-moderate and above rating to reduce effects to a lower degree.

#### *For Construction effects*

The mitigation measures for all activities and built elements during construction for all NoR Project Areas in this package are outlined below. An Urban and Landscape Design Management Plan (ULDMP) is recommended as a condition on the designation which should include the following matters:

- Provide hoarding around the boundaries of site compounds that face on to adjacent residential properties.
- Interpretation - where practicable, during construction, install construction hoardings with interpretive panels in selected areas which are in close proximity and visible to the public, to provide information about the Project and its progress.
- Reinstate earthworked areas at the completion of works.
- Vegetation clearance: wherever practicable, limit the removal of mature trees and indigenous vegetation.
- Where topsoil is to be stored on site we recommend that these are grassed to better integrate with the surrounding landscape.
- Wherever practicable consideration should be given to locating stockpiles at the edge of site compounds to provide visual screening.
- Wherever practicable retain, stockpile and re-use top soil from existing pastoral land within the Project area to reduce the amount of truck movements, and associated visual effect.
- Mitigate effects related to lighting during night time works by using directional lighting to prevent sky glow and glare/spill light falling on residential properties.

#### *For Operational effects*

The mitigation measures for all activities and built elements during operation for all NoR Project Areas for this package are outlined below. The measures to remedy and mitigate the adverse operational effects of the Project on the natural and urban landscape will be addressed under a ULDMP, which will lay out the main design themes, principles and outcomes of the Project.

- **Cut and Fill Batters (General areas)** - All cut and fill slopes to be shaped to a natural profile to integrate into the surrounding natural landform, benching and geometric angles should be avoided where practicable. These areas may be grassed or landscaped, to integrate into the adjacent land use.
- **Site Compounds and Construction Yards** - Reinstate construction and site compound areas by removing any left-over fill and shaping ground to integrate with surrounding landform.
- **Impacts on private property** – the Project could potentially impact on existing property features in the following ways:
  - Encroachment into some private yards, impacting on residential amenity and existing entrance way design;
  - Surface level changes between private property and the upgraded road corridor and subsequent regarding of some driveways and private accessways;
  - Greater proximity of the carriageway and footpath/cycleway to property boundaries and increased traffic volumes.
- For partially affected properties, where existing dwellings are assumed to remain, it is recommended that boundary fences and garden plantings (removed through the Project works) are reinstated on completion of the works affecting the property, unless other arrangements are requested by land owners.
- Noise mitigation measures and/or retaining walls (if proposed) are recommended to integrate with private boundary fencing reinstatement and any reinstatement planting required to replace vegetation lost through the Project works (i.e. to avoid double layering of noise walls and boundary fences). These features should be designed to minimise adverse visual amenity effects on residents, integrate with the layout and design of outdoor living spaces and in consideration of streetscape character.
- A planting plan is recommended to be included in the ULDMP which will be developed as part of the detailed design of the Project. It is recommended that any planting proposed as mitigation for activities that require regional consents process is integrated with the planting plan as recommended.

***Conclusions***

Across all NoRs the adverse landscape and visual effects without the implementation of mitigation proposals will range from **moderate-high** adverse to **very low** adverse during the construction phase. Landscape and visual effects during the operational phase, without mitigation are anticipated to range from **moderate-high** adverse to very **low** adverse

It is anticipated that across all of the NoRs, where mitigation measures are undertaken landscape and visual effects will range from **low moderate** adverse to **very low-** adverse during the construction phase of works. With the project information currently available during the operational phase of works it is anticipated that landscape and visual effects will range from **low-moderate** adverse to **very low** adverse. Across all NoRs the proposed operational effects are assessed approximately 3-5 years after implementation when proposed planting has become established. After implementation it is expected that landscape effects will diminish over time until planting is established;

The highest level of anticipated adverse landscape effects with or without mitigation are related to the potential loss of riparian vegetation within established wetlands (NoR RE1), the loss of screening vegetation and front yard space of enduring rural landscapes along the Coastesville-Riverhead highway (NoR R1) and the loss of screening vegetation and front yard space within established rural residential dwellings (NoRs R1 and R3). The highest level of anticipated adverse visual landscape effects across all NoRs are related to retained residential properties where existing screening and filtering vegetation is removed and/or the road corridor moves closer to the audience. For all of the NoRs it is anticipated that adverse effects can mitigated and will become amalgamated into the emerging urban development.

# 2 Introduction

This landscape assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "**Redhills Riverhead Assessment Package**"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

This report assesses the landscape effects of the North West Redhills Riverhead Assessment Package identified in Section 5 and Table 2-1 below.

Refer to the main AEE for a more detailed project description.

**Table 2-1: North West Redhills Riverhead Assessment Package – Notices of Requirement and Projects**

| Notice | Project |
|---|---|
| **NoR RE1** | Don Buck Road FTN Upgrade |
| **NoR RE2** | Fred Taylor Drive (alteration to existing designation 1433) |
| **NoR R1** | Coatesville-Riverhead Highway Upgrade |

# 3 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Redhills Riverhead Assessment Package. Its purpose is to inform the AEE that accompanies the Redhills Riverhead Assessment Package sought by Waka Kotahi and AT.

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Redhills Riverhead Assessment Package on the existing and likely future environment as it relates to landscape 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:

a) Identify and describe the landscape context of the Redhills Riverhead Assessment Package area;
b) Identify and describe the actual and potential landscape effects of each Project corridor within the Redhills Riverhead Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential landscape effects (including any conditions/management plan required) for each Project corridor within the Redhills Riverhead Assessment Package; and
d) Present an overall conclusion of the level of actual and potential landscape effects for each Project corridor within the Redhills Riverhead Assessment Package after recommended measures are implemented.

## 3.1 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each Project corridor and project features within the Riverhead Assessment Package as it relates to landscape;
c) Identification and description of the existing and likely future landscape environment;
d) Description of the actual and potential positive effects of the Project;
e) Description of the actual and potential adverse landscape character,  effects of construction of the Project;
f) Description of the actual and potential adverse landscape effects of operation of the Project;
g) Recommended measures to avoid, remedy or mitigate potential adverse landscape effects; and
h) Overall conclusion of the level of potential adverse landscape effects of the Project after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised for the Project, 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 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.

## 3.2 Preparation for this Report

The assessment is derived from the following data collection and field work:

- Online data collection of aerial maps and AUP:OP / GIS overlays, including, but not limited to:
    - Significant Ecological Areas (SEAs)
    - Outstanding Natural Features (ONF)and Outstanding Natural Landscapes (ONL)
    - Outstanding Natural Character (ONC)
    - High Natural Character (HNC)
    - Land Cover Data Base (LCDB)
    - AUP:OIP zones; and
    - Catchments and hydrology
- Desktop analysis of the roads, urban areas / future urban areas with Google Maps and Google Streetview
- Site Visits to each of the Project areas, was undertaken in July 2020, March 2021 and June 2022.
    - The purpose of these site visits were to understand and evaluate the existing baseline as part of determining the physical and sensory effects the Projects would have on the site and the broader landscape, in addition to the identification of the Projects' viewing audiences.
- A study of aerial photography including land use, landform and vegetation patterns was undertaken, in addition to the site visit, to determine the visual catchment and viewing audience of the proposal.
- Private properties which are likely to be affected have been visually surveyed from nearby publicly accessible locations where possible, with further reference to aerial imagery to understand the nature of these potential viewing audiences.

Review of related specialist reports including Ecology, Arboriculture and Urban Design.

# 4 Assessment Methodology

## 1.1 Overview

This Landscape Effects Assessment (LEA) has been undertaken with reference to Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines[3]. The same methodology applies to the construction and operational stages of the works and for NoRs (R1, R2, and R3). These guidelines have been developed to relate to the Aotearoa New Zealand environmental planning context and align with te ao Māori and te ao Pākehā concepts of landscape.

## 4.1 Scale of Effects

In determining the magnitude of potential and actual landscape and visual effects of the Project, a consistent 7-point rating scale has been used that is based on the recommendations in the Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines. The effects ratings referred to in this assessment are based upon a seven-point scale which ranges from 'very low' to 'very high' (a detailed description of these scales is available in Appendix 3 of this assessment).

## 4.2 Landscape Values, Landscape Sensitivity

Landscape values consider any scheduled high value landscape areas (ONLs, ONFs. HNCs or ONCs) at a national, regional or district level within or directly adjacent to the Project areas.

The sensitivity of landscape is influenced by the existing land use, future landscape direction (AUPOIP and also the Whenuapai Structure Plan). The interfaces between lands and water (riparian margins) are particularly sensitive to landscape change. Other landscape attributes may also be sensitive to the effects of landscape change such as topographical and landform features, vegetation, landmarks and landscape features in the contextual landscape.

## 4.3 Landscape and Natural Character Effects

Landscape effects are a result of physical change in the landscape, which may change the character of the landscape over time. Landscape effects relate to biophysical: abiotic (geophysical processes (landform) and drainage patterns), biophysical: biotic (vegetation cover, quality and pattern) and human attributes (land uses, active and passive recreation, amenity and built form).

Effects will be assessed in terms of:

- Temporary/construction effects, which relate to the construction activities required to implement the Project.
- Permanent/operational effects, the effects on the landscape of completed works (including integrated landscape mitigation measures).

Natural character effects pertains to changes to the coastal environment (including the coastal marine area), wetlands, and lakes and rivers[4] and their margins. Effects are primarily concerned with the

[3] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines', [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]

[4] A 'river' is defined in the RMA as a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse.

degree to which natural processes, natural patterns and natural elements have undergone human modification

The natural character assessment for this Project applies to the existing water bodies and wetlands associated with the Sinton Stream, Pikau Stream, Totara Creek, Waiarohia Stream, Rawiri Stream and Trig Stream.

## 4.4 Visual Effects

Visual effects relate to the changes that arise in the composition of available views as a result of changes to the landscape. Visual effects are considered for both temporary (construction effects) and permanent (operational effects) of the Projects.

Assessment photography was obtained during the project site visit in November and December 2021. The outlook from viewpoints that were captured onsite were photographed and assessed in variable weather conditions and at standing eye level.

## 4.5 Limitations and Project Assumptions

This landscape assessment does not specifically address and respond to Mana whenua values from a landscape planning perspective. This report references the latest data available in respect of these matters at the time of issue.

All site assessments have been undertaken from public land and supported through detailed desktop GIS mapping and aerial photograph information.

A range of assumptions have been made in order to establish a consistent approach across the projects and to clearly define the parameters of the context of the construction and operational phases. Detailed list of the Project Assumptions is available in Appendix 3 of this assessment.

The findings of this landscape effects assessment are underpinned by the following assumptions:

## 4.6 Statutory Guidance

### 4.6.1 Notice of Requirement

This assessment has been prepared to support the NoRs for the projects. The process for consideration of a NOR is set out in section 168 of the RMA. This includes consideration of the actual or potential effects (including positive effects) on the environment of allowing the requirement under the Resource Management Act (RMA).

## 4.7 Non-Statutory Guidance

The Whenuapai Structure Plan indicates how the future urban environment may develop over time, subject to future plan change processes.

### 4.7.1 Spatial Land Use Strategy - Kumeū-Huapai, Riverhead, and Redhills North.

The Kumeū-Huapai / Riverhead area has not been structure planned. Land release for the Kumeū-Huapai/Riverhead area is identified in the FULSS to occur between 2028 and 2032. Council's current view is that structure planning must occur prior to the release of land currently zoned FUZ. This is indicatively programmed for Kumeū-Huapai / Riverhead in 2025.

The project team is working closely with Auckland Council to support desired outcomes for the Kumeū-Huapai / Riverhead area.

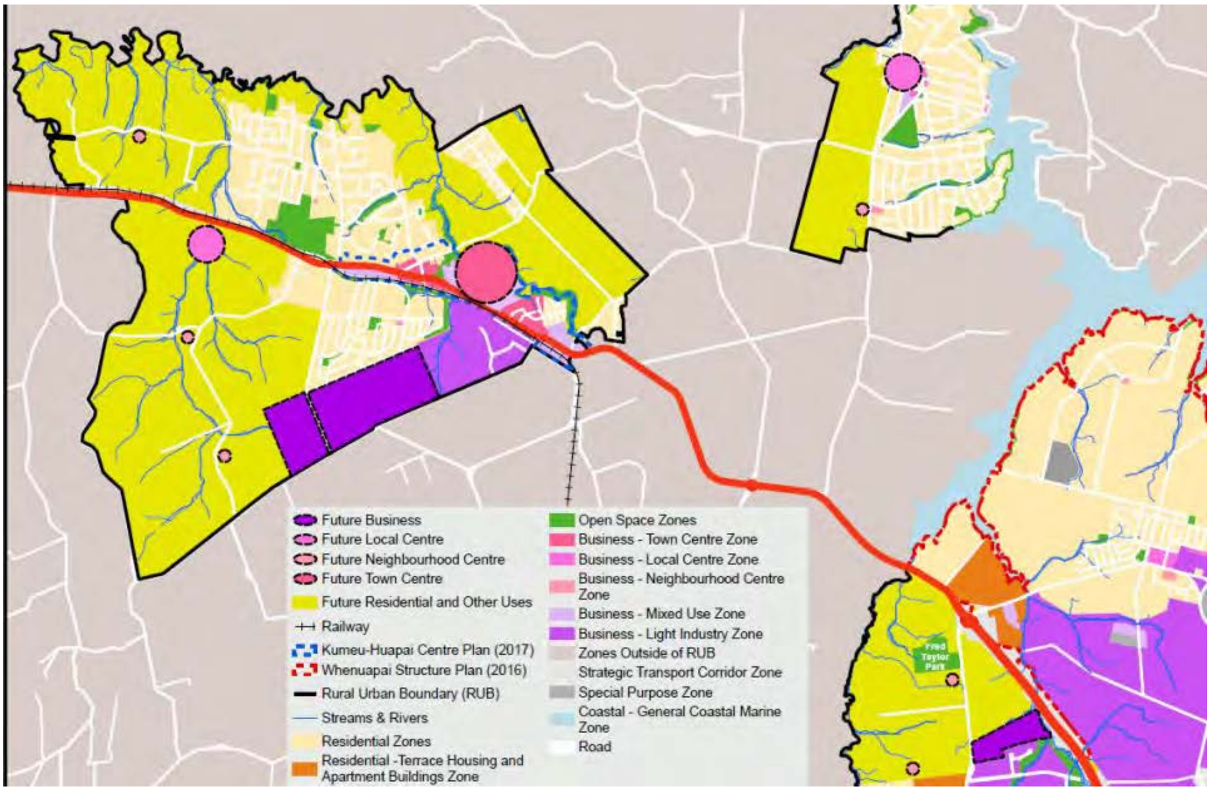


Figure 4-1: Spatial Land Use Strategy - Kumeū-Huapai, Riverhead, and Redhills North.

**Note: The Spatial Land Use Strategy is not a detailed structure plan and is only intended to be a high-level outline of the future land uses in the Future Urban zone.**

### 4.7.2 National Policy Statement on Urban Development – NPS UD

The National Policy Statement-Urban Development (NPS-UD) came into effect on 20 August 2020 and sets out a list of things that local authorities must do to give effect to the objectives and policies defined within the policy statement.

Detailed analysis of the NPS UD is available in Appendix 3 of this assessment.

# 5 Redhills Riverhead Assessment Package Overview

An overview of the Redhills Riverhead Assessment Package is provided in below Figure 5-1.


**Figure 5-1: Redhills and Riverhead Assessment upgrades**

A brief summary of the Redhills Riverhead Assessment Package projects is provided in Table 5-1 below.

**Table 5-1: Redhills Riverhead Assessment Package Project Summary**

| Corridor | NOR | Description | Requiring Authority |
|---|---|---|---|
| **Don Buck Road FTN Upgrade** | RE1 | Upgrade of Don Buck Road corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Fred Taylor Drive FTN Upgrade** | RE2 | Upgrade of Fred Taylor Drive corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| **Coatesville-Riverhead Highway Upgrade** | R1 | Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial cross-section with active mode facilities on the western side; and<br>Upgrading the northern section of the corridor to a 24m two-lane urban arterial cross-section with active mode facilities on both sides of the corridor. | Auckland Transport |

Please refer to the AEE for further information on these projects, including a project description, key project features and the planning context.

# 6 Redhills Riverhead Positive Effects

Positive effects in relation to landscape and visual elements are primarily associated with the provision or improved streetscapes resulting in improved visual amenity and enhancements to the landscape.

Although infrastructure projects often introduce or expand a transportation corridor, there are opportunities to improve the visual amenity, landscape legibility and improve landscape character features, improve streetscape amenity and enable active transportation modalities. Positive landscape effects may result from general landscape improvements associated with the project and / or specific measures designed to improve anticipated landscape and / or visual effects.

A number of positive landscape and visual effects are anticipated as a result of the operation of the

- Projects (including proposed mitigation).
- Positive effects are likely to include:
- A streetscape to support emerging urban form within adjacent land in the Riverhead FUZ and the emerging urban form of Redhills; and;
- Slower speed limits adjacent to existing dwellings and commercial activities improving the experiential qualities of the corridor for users and well as private properties adjacent to the road corridor.

# 7 Redhills Riverhead Construction and Operational Effects and Proposed Mitigation

### 7.1.1 Site Enabling Works

**Construction Areas**

Construction compounds, laydowns, construction machinery, earthworks, material storage will be present across both Projects in this Package. Night works, where required, will introduce light into an existing sparsely lit environment. Landscape effects related to activities across this package of work will be;

- the widening of an existing road corridor into undeveloped and developed land (all NoRs);
- wetland/dry pond construction (all NoRs);
- construction within the proximity to retained private property; and;
- removal of existing buildings and development (all NoRs).

**Vegetation Clearance**

Broad areas of roadside vegetation are proposed to be removed to accommodate the wider road corridors and batter slopes for all NoRs. Within urban areas this is a permitted activity and is expected as a requirement for the expansion of the road corridor. Vegetation removal in rural areas is subject to consent as a regional matter.

This consists of trees and shrubs located within the road-side boundaries and private properties within the Project area. Rural vegetation including exotic pasture, trees, shelterbelt plantings, private gardens and cropland make up the majority of vegetation to be removed for all NoRs.

### 7.1.2 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

The mitigation measures for all activities and built elements during construction for all NoR Project Areas in this package are outlined below. An Urban and Landscape Design Management Plan (ULDMP) is recommended as a condition on the designation which should include the following matters:

- Provide hoarding around the boundaries of site compounds that face on to adjacent residential properties.
- Interpretation - where practicable, during construction, install construction hoardings with interpretive panels in selected areas which are in close proximity and visible to the public, to provide information about the Project and its progress.
- Reinstate earthworked areas at the completion of works.
- Vegetation clearance: wherever practicable, limit the removal of mature trees and indigenous vegetation.
- Where topsoil is to be stored on site we recommend that these are grassed to better integrate with the surrounding landscape.
- Wherever practicable consideration should be given to locating stockpiles at the edge of site compounds to provide visual screening.

- Wherever practicable retain, stockpile and re-use top soil from existing pastoral land within the Project area to reduce the amount of truck movements, and associated visual effect.
- Mitigate effects related to lighting during night time works by using directional lighting to prevent sky glow and glare/spill light falling on residential properties.

### 7.1.3 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The mitigation measures for all activities and built elements during operation for all NoR Project Areas for this package are outlined below. The measures to remedy and mitigate the adverse operational effects of the Project on the natural and urban landscape will be addressed under a ULDMP, which will lay out the main design themes, principles and outcomes of the Project.

- **Cut and Fill Batters (General areas)** - All cut and fill slopes to be shaped to a natural profile to integrate into the surrounding natural landform, benching and geometric angles should be avoided where practicable. These areas may be grassed or landscaped, to integrate into the adjacent land use.
- **Site Compounds and Construction Yards** - Reinstate construction and site compound areas by removing any left-over fill and shaping ground to integrate with surrounding landform.
- **Impacts on private property** – the Project could potentially impact on existing property features in the following ways:
  - Encroachment into some private yards, impacting on residential amenity and existing entrance way design;
  - Surface level changes between private property and the upgraded road corridor and subsequent regarding of some driveways and private accessways;
  - Greater proximity of the carriageway and footpath/cycleway to property boundaries and increased traffic volumes.
- For partially affected properties, where existing dwellings are assumed to remain, it is recommended that boundary fences and garden plantings (removed through the Project works) are reinstated on completion of the works affecting the property, unless other arrangements are requested by land owners.
- Noise mitigation measures and/or retaining walls (if proposed) are recommended to integrate with private boundary fencing reinstatement and any reinstatement planting required to replace vegetation lost through the Project works (i.e. to avoid double layering of noise walls and boundary fences). These features should be designed to minimise adverse visual amenity effects on residents, integrate with the layout and design of outdoor living spaces and in consideration of streetscape character.
- A planting plan is recommended to be included in the ULDMP which will be developed as part of the detailed design of the Project. It is recommended that any planting proposed as mitigation for activities that require regional consents process is integrated with the planting plan as recommended.

# 8 NoR RE1: Don Buck Road FTN Upgrade

## 8.1 Project Corridor Features

Don Buck Road is an existing two-lane arterial which runs from Fred Taylor Drive to the north and Swanson Road and Universal Drive to the south. The proposed road upgrade is from Fred Taylor Drive south to Royal Road. The corridor is anticipated to facilitate the future growth in Redhills, whilst also providing a connection to rapid transit stations, regional active mode corridors and the SH16 motorway interchanges.

This section of Don Buck Road is proposed to be upgraded from a corridor width of 27-35m to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor. Intersections located along the corridor are proposed to be signalised. An overview of the proposed design is provided in Figure 8-1 below.


**Figure 8-1: Overview of the Don Buck Road FTN Upgrade**

Key features of the proposed new corridor include the following:

- Widening of Don Buck Road to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor (See Figure 8-2).
- The upgrade to the intersections with Fred Taylor Drive, Westgate Drive, Rush Creek Drive and Beauchamp Road.
- The proposed upgrade is expected to remain within the existing corridor to the extent possible with localised widening occurring near intersections.

- Tie-ins with existing roads, stormwater dry ponds, wetlands and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor.

Figure 8-2: Don Buck Road Upgrade Typical Cross Section

## 8.2 Existing and Likely Future Environment

### 8.2.1 Planning context

The land adjacent to Don Buck Road is comprised of various business, residential and open space zoning. The following outlines the key elements of the planning context for the Don Buck Road FTN Upgrade:

- The eastern side of Don Buck Road above Westgate Drive is zoned under the AUP:OP as Business – Light Industry. To the south of Westgate Drive, the eastern side of Don Buck Road contains an Open Space – Community Zone (occupied by Massey Leisure Centre), with the remaining land zoned as Residential – Mixed Housing Zone.
- The western side of Don Buck Road is within the I610 Redhills Precinct and is predominantly zoned Residential – Mixed Housing Urban, with a portion of land in the northern section of the corridor zoned Residential – Terraced Housing and Apartment Buildings Zone (**THAB**). Land further to the west of Don Buck Road forms part of the Redhills Precinct.

Table 8-1 below provides a summary of the existing and likely future environment as it relates to the Don Buck Road FTN Upgrade.

Table 8-1: Don Buck Road FTN Upgrade Existing and Likely Future Environment

| Environment today | Zoning | Likelihood of Change for the environment[5] | Likely Future Environment[6] |
|---|---|---|---|
| **Business** | Business (Industrial) | Low | Business |
| **Residential** | Residential – Mixed Housing Urban Zone | Low | Residential |

[5] Based on AUP:OP zoning/policy direction
[6] Based on AUP:OP zoning/policy direction

| Environment today | Zoning | Likelihood of Change for the environment[5] | Likely Future Environment[6] |
|---|---|---|---|
| | Residential – Terraced Housing and Apartment Zone | | |
| **Open Space** | Open Space – Community Zone | Low | Open Space |

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

### 8.2.2 Baseline / Existing Landscape

#### 8.2.2.1 Baseline Landscape

The Project is situated within the existing Don Buck Road corridor and extends into adjacent land that is characterised by urban residential and light industry.

The local landscape character of Don Buck Road is summarised below:

- Vegetation cover comprising stand-alone elements of urban trees, predominantly within private property boundaries. The majority of the road reserve comprises amenity grass with standalone and clumps of native and non-native trees appearing intermittently along the road reserve. The largest band of vegetation is at the southern end of the scheme on the eastern side of the road corridor.
- The landscape is characterised by land modification associated with developed urban land on the urban fringe.
- The landscape character value is very low within the context of the existing road reserve. There is the potential to enhance this aspect of the landscape.

**Landform and Hydrology**

Don Buck Road is situated on along a north south ridgeline that gently rises from the north to the south with a highpoint close to the Royal Road intersection. The main road corridor does not traverse existing streams and wetlands, however the Wetland 2 upgrade to the east is within the Tihema Stream valley.

**Landcover**

The landscape east and west of Don Buck Road is characterised by a wide roadside verge that borders predominantly residential properties that front or back on to the road corridor. The northern end of the site is bordered to the east by a large sealed area used for light industry. To the south of the business - light industry zoned land the Massey Leisure centre is designated as an open space conservation zone. St Paul's Primary School to the west of the site is set approximately 40m back from the proposed designation, but has an access directly onto Don Buck Road.

Standalone and small clumps of mature native trees located within the road reserve and within the roadside boundaries of private properties contribute to the landscape character of the surrounding landscape. A dense linear belt of native vegetation has been planted along an approximately 80m stretch of an embankment at the southern end of the Project corridor on the eastern side (Figure 9-3 below).

No scheduled notable trees are present within proximity of the Project.

**Figure 8-3:. Existing view of the existing vegetation looking north along Don Buck Road from the intersection with Beauchamp Drive.**

### Land Use

The existing Don Buck Road corridor is approximately 32m wide and zoned as ‘Road under the AUP:OP, the carriageway is approximately 15m wide.

Land use either side of the existing road urban and comprises residential properties along the majority of the route and large lot light industrial use to the north west of the route (Figure 9-4 below).


Figure 8-4: View south down Don Buck Road from 560 Don Buck Road showing residential and light industrial land uses.

#### Scheduled Landscape and Ecological Features

There are no scheduled landscape or ecological features within or proximate to the Project area.

#### Historical and Cultural Associations

There are no scheduled historical features within or proximate to the Project area.

### 8.2.2.2 Likely Future Environment

#### Overview

The land surrounding the Project will undergo a localised change with some of the vacant lots being developed for residential uses. Rural land within the Redhills Precinct beyond the first line of existing residential lots will be urbanised for residential purposes over the next 10 years. It is anticipated that the abiotic features of the landscape will be altered over time as the landscape is urbanised.

It is anticipated that the limited biotic (land cover) features within the landscape will be required to be removed to develop the some of the vacant lots within the immediate vicinity. Although land further to the west will experience substantial change from rural to urban, the land immediately abutting the Project corridor will continue to be predominantly urban residential in nature.

## 8.3 Extent of Visibility and Viewing Audience

The visual catchment is the area of land from which part or all of the Project area is visible. This is largely determined by landform, land cover and built elements, which in combination may obscure or filter views. The extent of visibility of the proposed road corridor is contained by the existing surrounding built form, in addition to some changes in topography. Some vantage points within proximity to the Project area are likely to witness heightened adverse visual effects. In summary the viewing audience for the Project includes:

- *Public Views:* Transient public audience (vehicle users). Key roads where views can be obtained from include Fred Taylor Drive, Westgate Drive, Rush Creek Drive and Beuachamp Drive. Views include:
  - Travellers (cars, pedestrians and cyclists) along Fred Taylor Drive, Westgate Drive, Rush Creek Drive and Beuachamp Drive which bisects the Project corridor (Refer Appendix 2 Site Photo 1, Site Photo 2, Site Photo 3);
  - Travellers (cars, pedestrians, and cyclists) along Don Buck Road (Refer Appendix 2 Site Photo 4 and Site Photo 5); and
- *Private Views:* The viewing context also includes a residential viewing audience that borders the majority of the Project corridor. The north east of the corridor abuts large lot light industrial and commercial properties. Specifically:
  - Views from the residential properties with short driveways that front on to Don Buck Road (Appendix 2 Site Photo 6); and;
  - Occupants of nearby commercial buildings along Don Buck Road adjacent to the proposed corridor.

Views are well contained within the immediate area surrounding the road corridor due to density of development that borders the existing road corridor.

## 8.4 Landscape Values

There are no regionally or nationally significant landscapes (ONLs, ONFs or ONCs) within or proximate to the proposed designation boundary.

The gently sloping topography and the mature streetscape vegetation contribute to the visual amenity of the landscape. The highly modified landscape has limited natural features, which are restricted to vegetation. An open space conservation zone is located to the south of the Westgate Drive to the east of the Project corridor, and contains a library, leisure centre and place of worship. The wetland 2 upgrade is located within Rush Creek Reserve which is zoned as an open space – informal recreation zone, the wetland upgrade is approximately 200m from the Project corridor main works.

## 8.5 Landscape Sensitivity

This corridor is situated within a broader landscape that has been assessed within the AUP:OP as being suitable for urbanisation. The proposed urbanisation of the surrounding landscape as indicated by the Whenuapai Structure Plan will be primarily industrial, retail and service buildings. The Project area is assessed as having a low sensitivity to landscape change.

## 8.6 Assessment of Landscape Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

### 8.6.1 Positive Effects

Generalised positive effects related to the Project are covered in Section 5 of this report. Additional positive effects related specifically to this Project include:

- New opportunities for active modes of transport along Don Buck Road and connections with Royal Reserve and Rush Creek Reserve.
- Structured and consistent vegetation along the road corridor.

### 8.6.2 Assessment of Construction Effects

**Construction Areas**

Site compound and construction areas are to be established within the existing road designation and distributed along the corridor dependent on the stage of the project. These construction compounds will be contained by traffic management.

Overall, it is anticipated that with or without the implementation measures the physical landscape effects resulting from establishment and use of the construction work areas within the Project area are assessed to be **very low** adverse.

**Vegetation Clearance**

The majority of existing road side vegetation is proposed to be removed to accommodate the wider proposed Project corridor including adjacent batter slopes. This consists entirely of trees and shrubs located within the road-side boundaries and private properties, within the Project area.

Without the implementation of proposed mitigation measures it is anticipated that physical landscape effects are expected to be **low** adverse to **low-moderate** adverse. Overall, the physical landscape effects anticipated to arise from vegetation clearance, with the provision of mitigation measures are assessed as **low** adverse. Although an area of mature specimen trees which provide screening will be removed, these are not covered by any protections, can be removed as a permitted activity and are detached from a larger contiguous habitat.

**Structures and Earthworks**

Approximately 24,500m$^3$ cut and 20,000m$^3$ of fill earthworks are anticipated to be undertaken over the site at a minimum. Imported brown rock will be required to construct the road. Some of these earthworks will occur on land that is currently occupied by built form, which has a lower sensitivity to change.

The impacts and potential landscape effects of the proposed earthworks include the modification of and permanent changes to the underlying landform, surface level changes in close proximity to retained urban private properties. The proposed cut and fill slopes range in scale from 1m to 16m wide and will alter the form and width of the existing road corridor and the immediate surrounding urban landscape.

Retaining walls are included in the interim design within the retained industrial, commercial and residential properties in proximity to the project corridor. The longest length of contiguous wall which is approximately 165m in length is adjacent to the Massey Library, Massey Leisure Centre and the residential property at 2 Rush Creek Drive.

Overall, the earthworks and retaining walls are considered to be of a scale and quantity that is reasonably anticipated with a project of this scope and size and all cut and fill slopes are expected to be integrated within the existing modified environment. With or without mitigation measures the expected to result in **low** adverse to **very low** adverse effects.

**Dry Ponds and features**

All of the storm water to be redirected into the wetland  upgrade located away from the Project corridor within the Rush Creek Reserve stormwater ponds. Wetland 2 will require the removal of existing established native vegetation within the existing stormwater ponds.


The proposed wetland will require earthworks to re-shape the land and achieve optimal depths and edge profiles, which will be determined as part of the resource consent phase.

We anticipate that effects on the physical landscape to implement the proposed dry pond to be between **low** adverse and **low-moderate** adverse without or without the implementation of mitigation measures. This is due to the unavoidable amount of vegetation required to be removed to establish the wetland.

**Private Properties**

Residential properties within and adjacent to the Project area (including those which are partially designated) will be impacted by the Project in the following ways:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;
- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences;
- Potential construction of noise mitigation measures and retaining walls;
- Demolition of existing dwellings and ancillary buildings (required properties)

Approximately 12 existing dwellings are proposed to be impacted by the project works. Landscape mitigation measures are proposed under 7.6.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects below.

With the information currently available and with or without the inclusion of mitigation measures, it is anticipated that the physical landscape effects on the physical landscape on private properties is **low-moderate**, as a result of the proximity of the proximity of the works to audiences and the proposed changes.

### 8.6.2.1 Site Finishing Works

Finishing works are expected to include grassing of exposed earth, lighting, signage, line markings, footpath/cycleway details and reinstatement of private property fences and gardens. Streetscape elements and landscaping, including those required as mitigation will also be implemented. These activities are to be determined by detailed design and will occur within the already modified areas of the Project. Landscape effects with or without the implementation of mitigation measures are expected to be **very low** adverse.

#### 8.6.2.2 Temporary Visual Effects

The construction of the Project is anticipated to be in two stages along the proposed corridor over a period of approximately 2-3 years, more accurate project timings will be available after the detailed design process. Visual effects are anticipated to occur progressively through the Project area and transient viewing audiences may concurrently experience adverse visual effects from both stages through the construction period.

The consideration of visual effects through the construction phase acknowledges the full range of activities (and their resultant visual impact), required to implement the upgraded road corridor.

It is anticipated that construction activities required to implement the Project will be generally consistent in nature and scale to road works and infrastructure activities commonly anticipated by transient viewing audiences within a main arterial corridor. Another important consideration is that landscape change by way of vegetation is in the context of an existing urban landscape and road corridor.

Notwithstanding the above, some vantage points within the Project area are likely to witness heightened adverse visual effects through the construction phase due to the magnitude of vegetation removal and/or earthworks proposed. These areas are outlined below:

- Private properties where physical landscape effects will occur within private gardens.
- Private properties along Don Buck Road in proximity to the on road construction works under traffic management.
- Private properties in proximity to the wetland within the Rush Creek Reserve.

The nature and significance of the potential adverse visual effects is considered to be moderated through the Project area by the following aspects:

- Road works and construction activities can generally be expected to occur within arterial roads;
- Don Buck Road is already a central element within the visual composition of the Project area;
- The existing road corridor landscape has already been modified by previous works required to shape the existing road corridor.
- The construction phase is expected to be implemented in two main phases which are expected to allow efficient access to the construction zones while maintaining continued access for the intersecting roads and existing private and commercial driveways.

With the information available, without the implementation of mitigation measures, it is anticipated that transient public viewing audiences will be range from **moderate** adverse to **low-moderate** adverse. With the provision of mitigation measures visual effects for the transient public viewing audience are anticipated to be between **low** adverse and **low-moderate** adverse through the construction phase, taking into account those vantage points listed above where adverse effects are likely to be heightened during the temporary construction period.

Adverse visual effects during the construction phase are likely to be heightened for private viewing audiences directly adjacent to the Project area on the basis of more direct and prolonged engagement and proximity to the construction activities of the Project. This will include the presence of heavy machinery and the visible disturbance of both the road corridor and also individual private interfaces with the road.

Without the implementation of mitigation measures it is anticipated that the visual effects on private viewing audiences are anticipated to range from **moderate** adverse to **low-moderate** adverse. With the implementation of mitigation measures visual effects are anticipated to range between **low-moderate** adverse and **low** adverse during the construction phase for private viewing audiences, depending on their location, proximity to the works and outlook.

### 8.6.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

Recommendations are in line with the general recommendations in Section 6.1.2.

### 8.6.4 Assessment of Operational Effects

#### 8.6.4.1 Natural Character Effects

Within the footprint of the road corridor and the proximate surrounding landscape, there are no existing watercourses or water bodies. However, the Wetland 2 upgrade is positioned within the Rush Creek Reserve open space and will require the alteration of the of the existing stream and wetland. This will be reinstated as part of the construction period. Without proposed mitigation and particularly, in this instance the reinstatement of riparian vegetation, it is anticipated that effects will be **moderate** adverse. The implementation of the mitigation we anticipate that the natural character effects will be low-moderate adverse on natural character forming elements, features and processes. This will reduce to **very low** adverse effects as mitigation planting is establishes over 3-5 years after implementation.

#### 8.6.4.2 Visual Amenity Effects

Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to their proximity to the corridor. For existing properties set back from the Project area by up to approximately 70m, the visual amenity effects are anticipated to be **very low** with or without the implementation of mitigation measures. This is primarily a result of the distance of the audiences and the anticipated intervening built form that will screen and filter views of the Project.

**Very low** residual adverse visual effects are anticipated for some private residents, as a direct result of the Project, residents may experience some level of material change to the visual composition and residential amenity of the road corridor as perceived from their private property.

From some properties directly adjacent to the Project area (from which land is required), visual amenity and residential character effects will be heightened as a result of the construction impacts including driveway regrading, potential loss of yard space, removal of existing screening vegetation and by grater proximity of the carriageway and footpaths/cycleways to private dwellings.

Without the implementation of mitigation measures, some of these audiences will experience short distance views of the proposal. It is anticipated that there visual amenity effects will range from **moderate-high** adverse to **low-moderate** adverse.

It is recommended that boundary fences and garden plantings (removed through the Project works) are reinstated on completion of the works affecting the property. These mitigation measures should be considered within the ULDMP under the lens of neighbourhood character and as such are discussed further in the following section. It is expected that during the operational phase of works residential properties that front directly on to the project will experience **low** adverse effects once mitigation planting has established. It is anticipated that landscape planting will take approximately 3-5 years to establish, to integrate into the landscape and provide sufficient screening and filtering.

Public viewing audiences will continue to engage with a similar transport environment, within the context of an increasingly urban neighbourhood character. Without mitigation measures being implemented it is anticipated that effects on this audience will be **low-moderate** adverse to **low** adverse.

Assuming that mitigation planting is implemented visual effects are expected to be between **low** adverse and **very-low** adverse. Over time, visual effects are anticipated to be neutral for the public viewing audience, based on visual amenity for users associated with streetscape being replaced with a similar landscape and increased accessibility to active modes of transport.

Overall, visual effects are anticipated to be partially or fully mitigated by measures implemented during the finishing phase of the construction period (within the road corridor and private property boundaries), that will mature through the operational phase of the Project to adequately reduce any potential long-term residual visual effects of the Project.

#### 8.6.4.3 Landscape Character Effects

The principal elements of the Project will generally be in accordance with the existing urban arterial road. At the completion of the Project, the upgraded corridor will resemble that of an urban arterial road with active modes of transport, structured street tree planting, integrated stormwater management and engineered roading elements.

Although clearance of vegetation is expected as part of the required works, a structured landscape planting design will improve the landscape character along the project corridor, once implemented. This will alter the character of the surroundings immediately after construction as mature trees and shrubs will have been replaced with smaller less developed vegetation.

**Figure 8-5: Don Buck Road indicative 30m cross section**

The cross section above (Figure 9-5) illustrates the proposed upgrade to the road and the expected future use. Although indicative, there is available space within the road corridor for green infrastructure elements such as street trees and berms where low impact stormwater devices and associated planting can be accommodated These features are expected to match the existing or improve landscape and urban amenity within the corridor.

The proposed street tree plantings, in conjunction with stormwater management and berm plantings, will provide landscape amenity and positively contribute to the landscape character of the Project area within the context of the urban environment.

With the information available, without the implementation of mitigation landscape character effects are anticipated to be **low-moderate** adverse. Allowing for future landscape mitigation, which is expected to take 3-5 years to establish, adverse landscape character effects are anticipated to be **low** adverse.

### 8.6.5 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Recommendations are in line with the general recommendations in Section 6.1.3

## 8.7 Conclusions

Overall, landscape and visual effects without mitigation are expected to range from **moderate** adverse to **very-low** adverse and **low-moderate** adverse to **very low** adverse during the operational phase. Landscape and visual effects assuming that mitigation measures are implemented will range from **low-moderate** to **very low** for the construction phase and **low** to **very low** for the operational phase. Natural Character effects are expected to be **moderate** adverse without mitigation and **low** adverse with the implementation of mitigation measures. Overall, the adverse effects can be mitigated and there are a number of positive landscape and visual effects that can ensue.

# 9 NoR RE2: Fred Taylor Drive FTN Upgrade

## 9.1 Project Corridor Features

Fred Taylor Drive is an existing rural and semi-rural road two-lane arterial corridor which extends from the existing Brigham Creek Interchange in the north to SH16 in the south (via an intersection with Don Buck Road). The proposed upgrade will require the existing road corridor to be widened in places to facilitate the proposed corridor will also support an active mode shift with separated cycle lanes and footpath on either side and public transport priority lanes.

The key landscape matters addressed for the Fred Taylor Drive FTN Upgrade include the following:

- The upgrade of the existing corridor to a 30m wide four-lane FTN arterial with separated walking and cycling. This widening is expected to remain in the existing designation 1433 to the extent possible.
- Localised widening outside the existing designation 1433 occurring at intersections.
- The upgrade of the intersections with Kakano Road and Northside Drive to signalised intersections.
- Additional land for tie-ins with side streets and stormwater wetlands. Refer to the concept design drawings at Appendix 2 or specific locations along the alignment.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities.
- Vegetation removal along the existing road corridor.

## 9.2 Existing and Likely Future Environment

### 9.2.1 Planning context

The existing Fred Taylor Drive corridor runs through a mix of residential and industrial land uses.

The northern section of Fred Taylor Drive is within the Redhills North FUZ, with an area of land zoned under the AUP:OP as Open Space – Sport and Active Recreation Zone (Fred Taylor Park) adjacent the road corridor. The southern section of Fred Taylor Drive is zoned under the AUP:OP as THAB zone on the western side, and forms part of the I610 Redhills Precinct. The eastern side is zoned Business – Light Industry Zone and Business – Mixed Use Zone and forms part of the I615 Westgate Precinct.

Table 9-1 below provides a summary of the existing and likely future environment as it relates to the Fred Taylor Drive FTN Upgrade.

**Table 9-1: Fred Taylor Drive FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[7] | Likely Future Environment[8] |
|---|---|---|---|
| **Business** | Business (Light Industrial) | Low | Business |

[7] Based on AUP:OP zoning/policy direction
[8] Based on AUP:OP zoning/policy direction

| Environment today | Zoning | Likelihood of Change for the environment[7] | Likely Future Environment[8] |
|---|---|---|---|
| | Business (Mixed Use) | Low | |
| **Residential** | Residential – Terraced Housing and Apartment Zone | Low | Residential |
| **Open Space** | Open Space – Sport and Active Recreation | Low | Open Space |
| **Undeveloped greenfield areas** | Future Urban | **High** | Urban |

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

## 9.2.2 Landscape Environment

### 9.2.2.1 Baseline Landscape

The Project is situated along the existing Fred Taylor Drive rural two-lane arterial road which is undergoing a transition to a urban land use along its length. Residential development to the west of the road and large lot light industrial development to the east are currently under construction, in accordance with the urban zoning.

The existing arterial road corridor is typically rural in nature, without a curb and channel (for long stretches), inconsistent lighting and no active mode lanes or footpaths.

The local landscape character of Fred Taylor Drive is summarised below;

- Vegetation cover comprising indigenous vegetation; hedgerows and shelterbelts along remnant field boundaries; exotic rank grassland; and non-native stand-alone trees within front gardens and streetscape of the existing urban areas.
- The landscape is characterised by rural residential development and agricultural fields to the east and larger agricultural production land to the west.
- The landscape character value is low within the context of the existing arterial road and urbanisation of residential commercial development. There is the potential to enhance the cohesiveness of the landscape through the implementation of this Project.

#### Landform and Hydrology

The Fred Taylor Drive existing arterial road is positioned along a shallow ridgeline with a north south aspect and a gentle slope ascending towards a high point at the southern extent of the route. The lowest point of the Project is at the northern extent of the corridor.

There are no rivers or permanent streams which cross the Project corridor. However, branches of the Totara Creek are within proximity to the designation will be affected by the upgrade to the Kopupaka Reserve wetland (see Figure 10-1 below).

Figure 9-1: View from Kedgley Road of the Kopupaka Reserve wetland which will be expanded.

### Landcover

The northern quadrant of the route is bordered on either side by predominantly rural production land with large light industrial buildings.

Clusters of rural residential properties are present to the west of the existing corridor, however it is recognised that these will most likely be replaced as the land is developed in line with the underlying THAB zoning. To the east of the Project corridor is a combination of rural fields, existing agricultural production properties with some new large lot industrial development.

Either side of the road is bordered by mixed size geometric fields bound in parts by isolated native vegetation, hedgerows and exotic grassland. Large lot light industrial and commercial properties are present and under development on the site of remnant fields to the east. Mature trees within the road reserve and front yards of private development contribute to the character of the landscape (see Figure 10-2 below).

**Figure 9-2: View south from Pua Street of light industrial development of rural fields.**

There are no scheduled notable trees within or proximate to the project boundary, however existing mature Norfolk Pines adjacent to the Pua Street interchange however, are prominent features within the landscape (see Figure 10-3 below).

**Figure 9-3: Norfolk Island Pines opposite the Pua Street and newly built THAB zoned housing that backs on to Fred Taylor Drive.**

### Land Use

The existing Fred Taylor Drive corridor is approximately 10-15m wide and is within land zoned as 'Road' under the AUP:OP that varies in width between 20-30m.

Land on either side of the Project corridor is a mix of rural residential, agricultural production and light industry. The northern extent of the road is a FUZ and will be urbanised as part of the Spatial Land Use Strategy - Kumeū-Huapai, Riverhead, and Redhills North. The western side of the Project corridor is zoned as THAB and the eastern side of the route is predominantly business zoned land.

### Scheduled Landscape and Ecological Features

There are no scheduled landscape or ecological features within or proximate to the Project area.

### Historical and Cultural Associations

There are no scheduled historical or cultural features within or proximate to the Project area.

## 9.2.2.2 Likely Future Environment

### Overview

The FUZ land within the northern quadrant of the Project will witness a substantial change in the transition from a rural to urban land use character over the next 10 years. The live zoned THAB and business zoned land adjacent to the Project corridor is expected to continue being developed in accordance with their zoning. It is anticipated that the abiotic features of the landscape will endure, although these are limited to the existing landform due to the existing amount of modification associated with the rural agricultural land use.

It is anticipated that some of the defining biotic (land cover) features of the landscape will undergo significant change alongside future development, with the removal of vegetation to accommodate proposed commercial and residential development. This will likely involve the implementation of street tree plantings, public open space areas and general landscaping within the private yards of future housing development for public amenity.

#### 9.2.2.3 Kumeū-Huapai / Riverhead area / Redhills

This FUZ area has not undergone a structure planned, it is identified by council that this process will be undertaken before the land is released to be urbanised. This processed is indicatively programmed to be undertaken in 2025 in order for the land to be released between 2028 and 2032 as indicated in the Future Urban Land Supply Strategy (FULSS).

The Spatial Land Use Strategy for Kumeū-Huapai, Riverhead, and Redhills North has been developed with collaboration between Auckland Council and the project team. This provides a high level framework that outlines the distribution of future land use (see Figure 10-4 below).

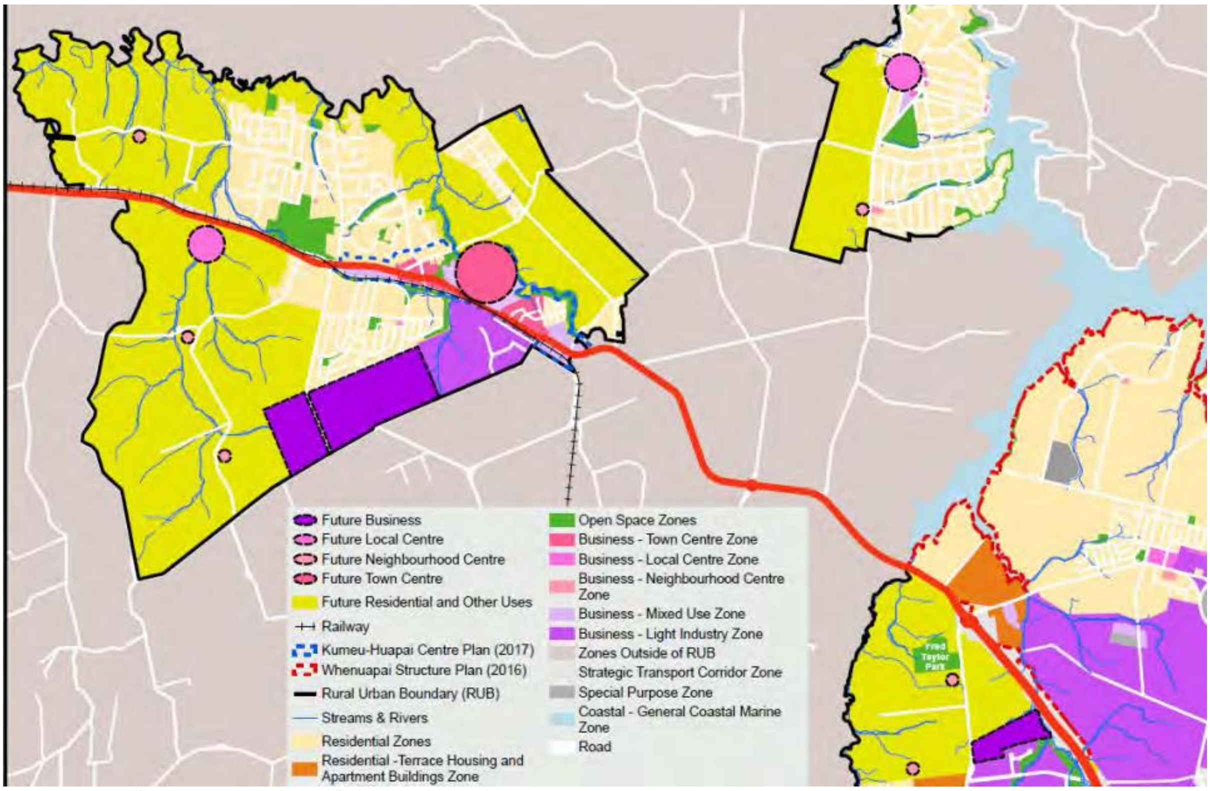


Figure 9-4: Spatial Land Use Strategy - Kumeū-Huapai, Riverhead, and Redhills North.

## 9.3 Extent of Visibility and Viewing Audience

The visual catchment is the area of land from which part or all of the Project area is visible. This is largely determined by landform, land cover and built elements, which in combination may obscure or filter views. The extent of visibility of the proposed road corridor is contained by built form and existing vegetation. Notwithstanding the above, some vantage points within the Project area are likely to witness heightened adverse visual effects. In summary the viewing audience for the Project includes:

- *Public Views:* Transient public audience (vehicle users). Key roads where views can be obtained from include Fred Taylor Drive, Kakano Road, Northside Drive, Pua Street, Matakohe Road, Spring Garden Avenue. Views include:
  - Travellers (cars, pedestrians and cyclists) along Kakano Road, Northside Drive, Pua Street, Matakohe Road, Spring Garden Avenue, which bisect the site and from Fred Taylor Drive (Refer Appendix 2 Site Photo 7, Site Photo 8 and Site Photo 9;
- *Private Views:* The viewing context will include a concentrated urban residential viewing audience, people within commercial and industrial businesses, and a small number of rural properties with private viewing audiences, however these are expected to be removed within the near future. Specifically:
  - Views from the rural residential properties with short driveways that front on to Fred Taylor Drive (75, 75B, 77, 80, 94, 96, 98, 100, 102, 110, 112, 114,116, 118, 120, 130) (Refer Appendix 2 Site Photo 10 and Site Photo 11 );
  - Views from the urban residential properties that immediately border Fred Taylor Drive, and others currently under development (Refer Appendix 2 Site Photo 12; and;
  - Occupants of nearby commercial buildings along Fred Taylor Drive adjacent to are well contained within the immediate area surrounding the road corridor and urban built form due to the relatively flat landscape and intervening vegetation and built form.

Over time, the audience is likely to grow to include residents of future urban developments within the FUZ and the urban zoned land currently under development.

## 9.4 Landscape Values

There are no regionally or nationally significant landscapes (ONLs, ONFs or ONCs) within or proximate to the proposed designation boundary.

The gently sloping topography and small areas of remnant rural mature vegetation contribute to the visual amenity of the landscape. The modified areas of the landscape has limited natural features, which are restricted to individual isolated stands of mature vegetation.

## 9.5 Landscape Sensitivity

This project corridor is situated along an existing arterial road and a developing urban landscape. The FUZ and urban zoned live areas of the landscape has been assessed within the AUP:OP as being suitable for urbanisation. The proposed urbanisation of the surrounding landscape will be developed as high and medium density residential and commercial / industrial. Although there are pockets of mature vegetation within the Project area is assessed as having a very low sensitivity to landscape change.

## 9.6 Assessment of Landscape Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

### 9.6.1 Positive Effects

### 9.6.2 Positive effects related to the Project are covered in Section 5 of this report.

### 9.6.3 Assessment of Construction Effects

**Construction Areas**

Site compound and construction areas are to be established within the road corridor and buffer area provided. This will prevent landscape effects related to the construction compounds on the surrounding green field land.

Without the provision of mitigation measures, it is anticipated that physical landscape effects are likely to result in a **low** adverse level of effects. After implementing mitigation measures it is anticipated that the physical landscape effects resulting from establishment and use of the construction work areas within the Project area is assessed to be **very low** adverse.

**Vegetation Clearance**

Small areas of road side vegetation are proposed to be removed to accommodate the wider road corridors and batter slopes. This consists of trees and shrubs located within the road-side boundaries of private properties, within the Project area. Exotic pasture, trees, shelterbelt plantings, private gardens and exotic stands of trees make up the majority of vegetation to be removed.

Without the implementation of mitigation measure it is anticipated that physical landscape effects will range from **low-moderate** adverse to **low** adverse. Provided that an appropriate amount of revegetation mitigation is undertaken for the removal of indigenous vegetation, the adverse physical landscape effects likely to arise from vegetation clearance within the Project area are assessed as **low** adverse.

**Structures and Earthworks**

The earthworks are anticipated to be in a deficit and additional fill is expected to be required across the site. The majority of the proposed additional fill will comprise imported brown rock for engineering purposes.

The impacts and potential landscape effects of the proposed earthworks include the modification of and permanent changes to the underlying landform and surface level changes in close proximity to private properties. However, it is acknowledged that the majority of existing properties are expected to be removed as a result of the urbanisation of the surrounding landscape that will experience.

The proposed cut and fill slopes range in scale from 1m to 13m wide and will alter the form of the existing landform. Embankments within the Project corridor are primarily fill slopes with only a small section of cut located to the north of the Northside Drive intersection.

Overall, we consider the proposed earthworks to be of a quantity that is reasonably anticipated with a project of this scope and scale and all cut and fill slopes are expected to be integrated with the existing modified environment. The progression from a rural to urban land use within adjacent areas will integrate with the proposed road upgrade over time.

Without the implementation of mitigation measures, it is anticipated that physical landscape effects will range from **low** adverse to very **low adverse**. Provided that the proposed mitigation measures are undertaken we expect that the effects of the earthworks will be **very low**.

**Wetlands and features**

Two wetlands are proposed within this Project area and one existing wetland will be upgraded as part of the Project.

- Wetland 1 upgrade is located approximately 450m to the west of the main project corridor and will expand on an existing manmade wetland within the Kopupaka Reserve;


- Wetland 2 is located to the east of the project corridor at 81 Fred Taylor Drive lot (refer to image in Construction Areas section); and;
- Wetland 3 is located to the east of the project corridor within the 113-115 Fred Taylor Drive arable production (refer to image in Construction Areas section).

These proposed new wetlands will require earthworks to re-shape the land and achieve optimal depths and edge profiles, which will be determined as part of the resource consent phase. These are located within green field sites that are within land that is anticipated to be developed and urbanised in the near future. The Wetland 1 expansion of a recently established wetland area, riparian vegetation has not yet fully established in this location and does not make a substantial contribution to the landscape character.

We consider that without the implementation of mitigation measures the physical landscape effects will range from **low** adverse to **very low** adverse. Provided that the mitigation measures are implemented, the effects on the physical landscape to implement the proposed wetland features to be **very low** adverse**,** with or without the implementation of mitigation measures.

**Private Properties**

Residential properties within and adjacent to the Project area (including those which are partially designated) will be impacted by the Project in the following ways:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;
- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences;
- Potential construction of noise mitigation measures and retaining walls;
- Demolition of existing dwellings and ancillary buildings (required properties) on adjacent properties

Approximately 21 existing rural dwellings are expected to be impacted by the project works. One of these is expected to be removed as part of the works and the balance of these properties are expected to be removed in order to facilitate urban development in live zoned urban areas and FUZ. Approximately new dwellings have been recently developed along Matakohe Road opposite Pua Street, This development is in line with the projected urbanisation, and are expected to be retained through the construction and operational phases.

Landscape mitigation measures are proposed under 8.6.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects below, these will assist in integrating the proposed corridor with the future urban environment.

Without implementing the recommended mitigation measures it is anticipated that physical landscape effects will range from **low-moderate** adverse to **low** adverse. Provided that the recommended mitigation measures are implemented it is assessed that the magnitude of adverse physical landscape effects on private properties will range between **very low** and **low**.

#### 9.6.3.1 Site Finishing Works

Finishing works are expected to include grassing of exposed earth, lighting, signage, line markings, footpath/cycleway details and reinstatement of private property fences and gardens. Streetscape elements and landscaping, including those required as mitigation will also be implemented. These activities are to be determined by detailed design and will occur within the already modified areas of the Project. Physical landscape effects are expected to be **very low** through this final phase of the construction process with or without the inclusion of mitigation measures.

#### 9.6.3.2 Temporary Visual Effects

The construction of the Project is currently anticipated to be in four stages along the proposed corridor over a period of 2-3 years. Visual effects are anticipated to occur progressively through the Project area and transient viewing audiences may concurrently experience adverse visual effects from several stages through the construction period.

The consideration of visual effects through the construction phase acknowledges the full range of activities (and their resultant visual impact), required to implement the upgraded road corridor.

It is anticipated that construction activities required to implement the Project will be generally consistent in nature and scale to road works and infrastructure activities commonly anticipated by transient viewing audiences within a main arterial corridor. Another important consideration is that landscape change by way of vegetation removal and land modification (on private rural property programmed to be urbanised), albeit at a lesser scale, forms part of the expected backdrop and eventual outcome of the existing environment.

Notwithstanding the above, some vantage points within the Project area are likely to witness heightened adverse visual effects through the construction phase due to the magnitude of vegetation removal, proximity to construction compounds and/or earthworks proposed. These include dwellings which have already developed within the emerging urban environment. These areas are outlined below:

- Private properties where physical landscape effects will occur along roadside boundaries to Fred Taylor Drive.
- Recently developed properties as part of the urbanisation at Matakohe Road;

The nature and significance of the potential adverse visual effects we consider to be moderated through the Project area by the following aspects:

- Fred Taylor Drive is already a central element within the visual composition of the Project area;
- The existing road corridor landscape has already been partially modified by previous works required to shape the existing road corridor.
- The construction phase of works is expected to be approximately 2-3 years, however this time frame will be refined further. The construction period is expected to be implemented in six phases which are expected to allow efficient access to the construction zones while maintaining continued access for the intersecting roads and existing private and commercial driveways.

Without mitigation measure it is anticipated that adverse effect have the potential to be **low-moderate**. Provided that mitigation measures are undertaken, adverse visual effects for the transient public viewing audience are anticipated to be **low** through the construction phase, taking into account those areas listed above where adverse effects are likely to be heightened during the construction period.

Adverse visual effects during the construction phase are likely to be heightened for private viewing audiences directly adjacent to the Project area on the basis of more direct and prolonged engagement with the construction activities of the Project. This will include the presence of heavy machinery and the visible disturbance of both the road corridor and also individual private interfaces with the road.

Without mitigation measures in place private viewing audiences have the potential to be **low-moderate** or **moderate** where works are in proximity to residential properties. We consider visual effects are will range between **low** and **very low** during the construction phase for private viewing audience,

Adverse visual effects on the properties already constructed on Matakohe Road are likely to be heightened due to the proximity of the dwellings and that they will remain in perpetuity. Effects on the dwellings that immediately back/front on to the Project corridor without mitigation are anticipated to be **moderate** adverse. Provided that the recommended mitigation measures are implemented it considered that visual effects will be **low-moderate** adverse.

### 9.6.4 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

Recommendations are in line with the general recommendations in Section 6.1.2.

In addition to these measures the following project specific interventions are suggested:

- Provide hoarding or other screening of the dwellings on Matakohe Road (and any other dwellings that share a boundary with the Project corridor that have been developed during the construction phase) to reduce visual effects;
- Coordinate with developers with lots that border the Project corridor to ensure that the proposed developments integrate with the road corridor and;
- The production of a tree protection plan is suggested to be provided within the ULDMP, to indicate protection measures and locations to be protected during construction.

### 9.6.5 Assessment of Operational Effects

#### 9.6.5.1 Natural Character Effects

Natural character forming elements, features and processes within the Project area are limited to the existing manmade wetland that will be expanded as part of the Wetland 1 Upgrade. Without the implementation of mitigation proposals it is anticipated that natural character effects will be **low-moderate** adverse. Provided that mitigation riparian planting are implemented, it is anticipated that the natural character value in the landscape is very low and adverse effects are expected to be **very low** adverse.

#### 9.6.5.2 Visual Amenity Effects

Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to the proximity of the corridor. For existing properties set back from the Project area, the visual amenity effects will be reduced incrementally as the distance from the proposed road increases.

Private properties which have filtered, screened or distant views towards the works are expected to experience a reduced level of change as a result of the works. Whereas residential viewing audiences closer to the proposed corridor will experience more direct levels of material change to the visual composition and residential amenity of the road corridor as perceived from private property. Private properties with an existing short distance view over Fred Taylor Drive including those on Matakohe Road (particularly those that front on to the corridor) will experience very little difference between baseline views and views during operation within the context of the wider urbanised landscape.

For properties directly adjacent to the Project area (from which land is required), visual amenity and residential character effects will be heightened as a result of the construction impacts including driveway regrading, potential loss of yard space and by the introduction of an urban carriageway and footpaths/cycleways to private dwellings. It is recommended that boundary fences and garden plantings (removed through the Project works) are reinstated on completion of the works affecting the property, unless other arrangements are requested by landowners. It would be advantageous if these could be discussed with developers during the detailed design process of the Project. These mitigation measures should be considered within the ULDMP through the lens of neighbourhood character and as such are discussed further in the following section.

Very few rural public viewing audiences in the existing environment have a direct view of the works due to the lack of connectivity to rural land. Over time as the surrounding FUZ and live urban zoned land is developed visual effects are anticipated to be reduced for the public viewing audience, based on improved visual amenity for users associated with streetscape improvements, maturing street trees, berm planting and accessibility to active modes of transport. Public viewing audiences within the urban environment are primarily active mode users along the Fred Taylor Drive Road.

Overall, some visual effects are anticipated to be mitigated by measures implemented during the finishing phase of the construction period (within the road corridor and private property boundaries), that will mature through the operational phase of the Project. These will reduce some of the long-term residual visual effects of the Project, however the 24-30m wide road will be a noticeable feature within the landscape. The road corridor will become less apparent as the surrounding area is urbanised over time.

Without the implementation of recommended mitigation measures, it is anticipated that visual effects on **low** adverse for transient viewers. For private viewing audiences it is anticipated that visual effects for private viewing audiences will range from **low-moderate** adverse to **moderate** adverse .

On the basis that recommended mitigation measures are undertaken, adverse visual effects within the Project area are likely to be **very low** for transient viewers through the operational phase of the Project. For the private viewing audience, the visual effects are anticipated to range from **low** adverse to **very low** adverse, reducing over an extended period of time.

#### 9.6.5.3 Landscape Character Effects

The principal elements of the Project will permanently alter the character of the existing rural (albeit transitional) features either side of Fred Taylor Drive. The remnant rural sections of the road are characterised by the lack of streetscape features, informal intermittent vegetation, shelterbelt and hedgerows along field boundaries and existing rural land uses adjacent to the corridor. At the completion of the Project, the upgraded corridor will resemble that of an urban arterial road on account of the pedestrianisation, active modes of transport, reduced speed limit, structured street tree planting, integrated stormwater management and engineered roading elements that are inherently urban aesthetic.

The Project is anticipated to enter the operational phase within the context of increased urbanisation within rural sections as adjacent THAB and business and developed FUZ land is progressively live-zoned and urbanised. Although it is not possible to anticipate the exact future urban land use pattern within the FUZ the Spatial Land Use Strategy indicates that a Future Neighbourhood Station will be located to the north of the existing THAB. The AUP:OP indicates that is desirable to develop the majority of the western portion of the corridor as for residential development and the east for commercial and industrial uses.

Based on the above the magnitude and nature of landscape change proposed by the Project we consider that the proposed changes will match with those that will likely occur throughout the localised landscape over time.

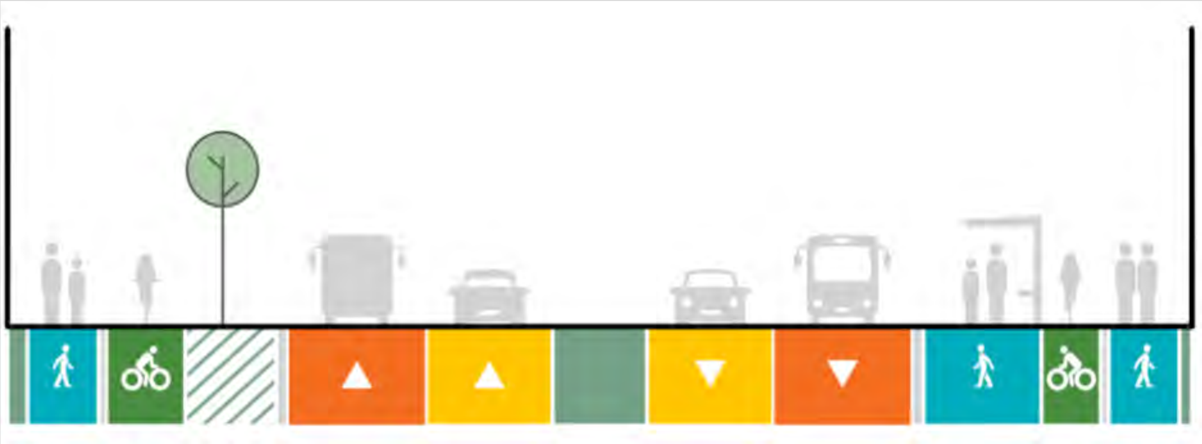


Figure 9-5: Fred Taylor Drive FTN Upgrade Typical Cross Section

The typical cross section above illustrates the proposed upgrade to the road and the expected future use. Although indicative the available space within the road corridor for green infrastructure elements such as street trees and berms where low impact stormwater devices and associated planting can be accommodated. These features are expected to improve landscape and urban amenity within the road corridor.

As outlined earlier broad areas of vegetation along the existing corridor may not be able to be retained within the new corridor. New street tree planting along the length of the corridor will be an appropriate replacement for the vegetation removed, within the context of the anticipated surrounding urban environment (from a landscape character perspective).

Without the implementation of the recommended mitigation measures it is anticipated that physical landscape effects will range from **low-moderate** adverse low adverse.

It is assessed that the new street tree plantings, in conjunction with stormwater management and berm plantings, will provide landscape amenity and positively contribute to the landscape character of the Project area within the context of an urban environment. Overall, it is considered that effects on the landscape are expected to be **very low** adverse.

### 9.6.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Recommendations are in line with the general recommendations in Section 6.1.3. In addition to these measures, specific measures recommended for Fred Taylor Drive are listed below:

- Engage with developers of lots adjacent to the Project corridor to ensure that the ULDMP to ensure that the road corridor integrates with the surrounding land.
- Produce a landscape planting plan for the reinstatement and enhancement of Wetland 1 Upgrade.

## 9.7 Conclusions

Overall, landscape and visual effects without mitigation are expected to range from **moderate** adverse to **very-low** adverse for the construction phase of works and **low-moderate** adverse to **very low** adverse for the operational phase. Landscape and visual effects assuming that mitigation measures are implemented are anticipated to range from **low-moderate** adverse to **very low** adverse for the construction phase and **low** adverse to **very low** adverse for the operational phase.

Without the implementation of mitigation proposals, it is anticipated that natural character effects will be **low-moderate** adverse. Provided that mitigation riparian planting is implemented, it is anticipated that the natural character effects are anticipated to be **very low** adverse.

Overall, the adverse effects can be mitigated and reduced over time in relation to the urbanisation of the surrounding landscape. The surrounding landscape context has a lower level of sensitivity to change due to the existing context of the arterial road and the projected urbanisation and development of time. There are a number of positive landscape and visual effects that will result from the project including the opportunity to formalise the streetscape and amenity provide consistent amenity along the Project corridor.

# 10 NoR R1: Coatesville-Riverhead Highway Upgrade

## 10.1 Project Corridor Features

The Coatesville-Riverhead Highway is an existing arterial extending from SH16 in the south to its intersection with Dairy Flat Highway in the north east, with the extent of the proposed upgrade from SH16 in the south to its intersection with Riverhead Road in the north. The southern section of the alignment from SH16 to Short Road runs through rural land uses which are expected to remain. The northern section (close to and within the Riverhead township) runs through low-medium density residential land uses on the east and future urban zoned land on the west.

The proposed upgrade to the road will provide two modalities:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side; and
- Upgrading the northern section of the corridor to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor.

The proposed upgrade will provide a key north-south connection between Riverhead and Westgate with a reduced speed limit to 50kph and introduce active mode use into the corridor.

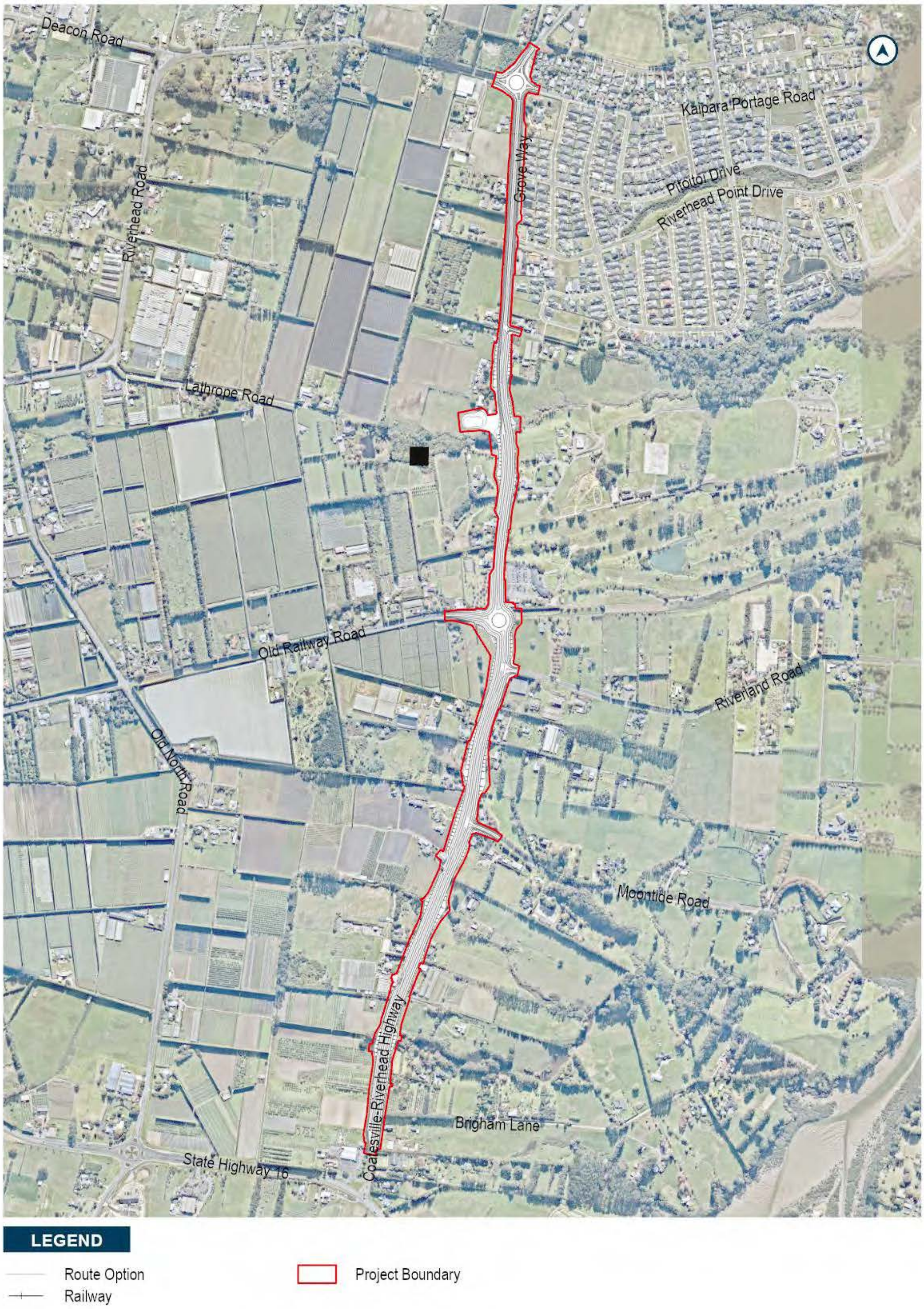



**Figure 10-1: Overview of the Coatesville-Riverhead Highway Upgrade**

Key features of the proposed new corridor include the following:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side and upgrading the northern section of the alignment to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor (See Figure 8-2 below).

- The upgrade of the Coatesville-Riverhead Highway / Old Railway Road intersection to a roundabout.
- The upgrade of the existing Coatesville-Riverhead Highway / Riverhead Road roundabout intersection.
- Tie-ins with existing roads, stormwater wetland and culverts.
- Batter slopes to enable widening of the corridor, and associated cut and fill activities (earthworks).
- Vegetation removal along the existing road corridor

Other construction related activities required outside the permanent corridor including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas.

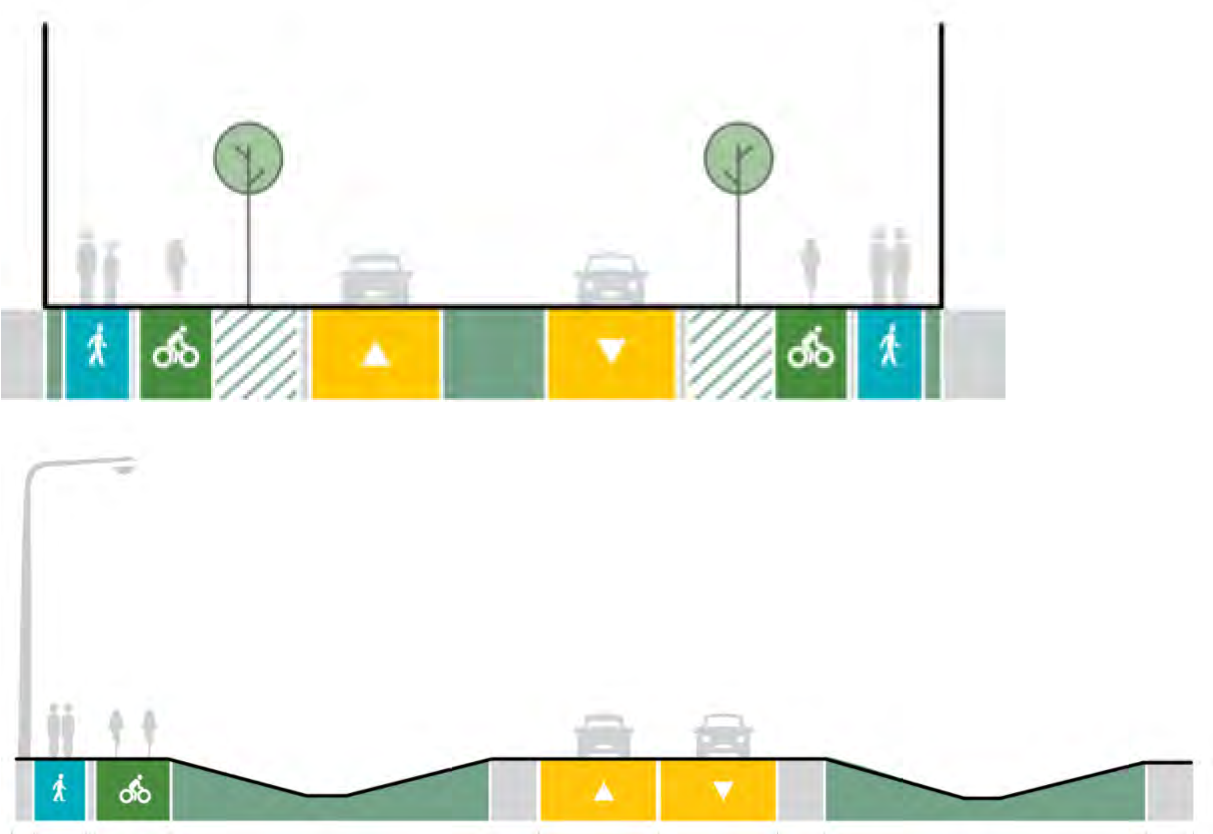


Figure 10-2: Coatesville-Riverhead Highway Cross Section – urban and rural section

## 10.2 Existing and Likely Future Environment

### 10.2.1 Planning context

The southern section of Coatesville-Riverhead Highway from SH16 to Short Road runs through rural land uses predominantly zoned under the AUP:OP as Rural – Mixed Rural Zone on both sides of the existing corridor. The northern section (close to and within the Riverhead township) runs through land zoned as Residential – Single House Zone and to the east and future urban zoned land on the west.

Table 10-1 below provides a summary of the North West existing and likely future environment as it relates to the Coatesville-Riverhead Highway Upgrade.

**Table 10-1: Coatesville-Riverhead Highway Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[9] | Likely Future Environment[10] |
|---|---|---|---|
| **Rural** | Rural | Low | Rural |
| **Residential** | Residential | Low | Residential |
| **Future Urban Zone / Undeveloped greenfield areas** | Future Urban | **High** | Urban |

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

## 10.2.2 Baseline / Existing Landscape

### 10.2.2.1 Baseline Landscape

The Project is situated within the existing Coatesville Riverhead Highway between SH16 to the south and the Riverhead Road / Kaipara Road interchange to the north.

The local landscape character of Coatesville Riverhead Highway is summarised below;

- Vegetation cover comprises stand-alone elements of urban trees, predominantly within the established urban residential development along Grove Way. The majority of the road reserve comprises amenity grass with standalone and stands of native and non-native trees appearing intermittently along the road reserve. The largest band of vegetation is at the southern end of the scheme on the western side of the road corridor, within private rural land.
- The landscape is characterised by land modification associated with activities that have modified the original pattern to accommodate a rural production land use. A small area of the adjacent landscape has been developed as a single house zone to the north east.

#### Landform and Hydrology

Coatesville Riverhead Highway is situated along gently undulating landform that is partially cut into the surrounding landscape to accommodate the existing road. The main road corridor traverses four tributaries of Brigham Creek, no additional watercourses will be impacted by the proposed road upgrade.

#### Landcover

The landscape on either side of the road corridor is characterised by a wide roadside verge that borders rural residential and production land that is predominantly arable in nature. In contrast the northern section of the route corridor is bordered to the east by single house zoned land and to the west by existing rural land with a FUZ overlay. The Hallertau Brewery at the corner Coatesville Riverhead Highway and Riverhead Point Drive is zoned as a Business - Neighbourhood Centre Zone.

[9] Based on AUP:OP zoning/policy direction
[10] Based on AUP:OP zoning/policy direction

Standalone and linear bands of mature native and exotic trees located within the road reserve and within the roadside boundaries of private properties contribute to the landscape character of the surrounding landscape. Dense linear belts of hedgerows and shelterbelts of trees are intermittent features along the roadway and form private property boundaries (Figure 11-3 below).

A group of scheduled notable trees (2598, Redwood) is located to the east of the road corridor within the private property boundary of 1135 Coatesville-Riverhead Highway.

**Figure 10-3: Existing shelterbelt and boundary vegetation along Coatesville-Riverhead Highway**

The existing Coatesville Riverhead Highway corridor is zoned as ‘Road’ under the AUP:OP and is approximately 20-25m wide, the carriageway is approximately 10-12m wide.

Land use either side of the existing road corridor is characterised by predominantly rural production and rural residential residences. Commercial, rural production and light industrial development is distributed intermittently along the length of the corridor. The single house zoned land to the north east of the corridor is a visible change in land use from the surrounding rural uses. To the south of the single house zone residential area is a Special Purpose – School Zone which contains the Hare Krishna Centre and School (Figure 11-4 below).

Figure 10-4: Hare Krishna Centre and Special Purpose – School Zone

### Scheduled Landscape and Ecological Features

A scheduled notable group of trees (2598, Redwood, refer Figure 11-5 below) is located outside of the project footprint but within the proposed designation.

Figure 10-5: Scheduled notable tree group 2598 viewed from Riverhead Road.

**Historical and Cultural Associations**

There are no scheduled historical features within or proximate to the Project area.

#### 10.2.2.2 Likely Future Environment

**Overview**

The land surrounding the majority of the Project area is expected to retain its existing rural aesthetic, land use and character. The existing single house zoned land to the south of the project is also expected to retain its current urban character. However, to the west of the north section of the project area a localised change is expected within the FUZ from a rural to urban land use. This land is expected to be urbanised for residential purposes over the next 10-20 years. It is anticipated that the abiotic features of the landform will be altered over time as the landscape is urbanised.

It is anticipated that the limited biotic (land cover) features within the landscape will be generally retained within the wider landscape. However, within the FUZ where land is going to be developed substantial change in the landscape from rural to urban will take place. Biotic features including existing vegetation are expected to be largely removed to accommodate urban development.

## 10.3 Extent of Visibility and Viewing Audience

The visual catchment is the area of land from which part or all of the Project area is visible. This is largely determined by landform, land cover and built elements, which in combination may obscure or filter views. The extent of visibility of the proposed road corridor is contained by the existing surrounding built form, in addition to some changes in topography. Some vantage points within proximity to the Project area are likely to witness heightened adverse visual effects. In summary the viewing audience for the Project includes:

- *Public Views:* Transient public audience (vehicle users). Key roads where views can be obtained from include the Coatesville Riverhead Highway, Old Railway Road, Riverland Road, Riverhead Road, Kaipara Road. Views include:
  - Travellers (cars, pedestrians and cyclists) along Old Railway Road, Riverland Road, Riverhead Road, Kaipara Portage Road, Moontide Road which bisect the Project corridor (Refer Appendix 2 Site Photo 13, Site Photo 14, Site Photo 15);
  - Travellers (cars, pedestrians, and cyclists) along Coatesville Riverhead Highway (Refer Appendix 2 Site Photo 16, Site Photo 17, Site Photo 18,); and
- *Private Views:* The viewing context also includes an urban residential viewing audience that borders the north east of the Project corridor. The majority of the corridor is bordered by rural residential and agricultural production lots. Specifically:
  - Views from rural residential properties with short driveways that immediately front on to Coatesville Riverhead Highway (1093,1095 and 1187) (Appendix 2 Site Photo 19);
  - Views from urban residential properties within proximity to the Project corridor on Grove Way (5, 7, 9, 11, 15, 17, 19 and 21) (Appendix 2 Site Photo 21, Site Photo 21);
  - Occupants of nearby commercial buildings along Coatesville Riverhead Highway adjacent to the proposed corridor (Appendix 2 Site Photo 22).

Views are well contained within the immediate area surrounding the road corridor due to density of development that borders the existing road corridor.

## 10.4 Landscape Values

There are no regionally or nationally significant landscapes (ONLs, ONFs or ONCs) within or proximate to the proposed designation boundary.

The gently sloping topography and the mature boundary vegetation contributes to the visual amenity of the landscape. The enduring natural features within the modified rural landscape include riparian vegetation and natural watercourses which link to the Brigham Creek Inlet.

## 10.5 Landscape Sensitivity

This corridor is situated within a broader landscape that will predominantly continue to function as a rural production and residential landscape. Retained rural residential properties will have a low moderate sensitivity to change as a result of the proposed widening of the road, due to the reduced distance from the road and the increased level of traffic. Rural agricultural production audiences have a low sensitivity to change, due to the audiences having less of a focus on the amenity aspects of the landscape.

FUZ land to the north west of the Project corridor has been assessed within the AUP:OP as being suitable for urbanisation. This area has a very low sensitivity to the changes proposed by the Project as they align with the anticipated future character. The existing single house zoned land residential audiences opposite the FUZ also have a low level of sensitivity, due to the existing urban context and the expected urban landscape to be developed to the west.

## 10.6 Assessment of Landscape Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

### 10.6.1 Positive Effects

Generalised positive effects related to the Project are covered in Section 5 of this report. Additional positive effects related specifically to this Project include:

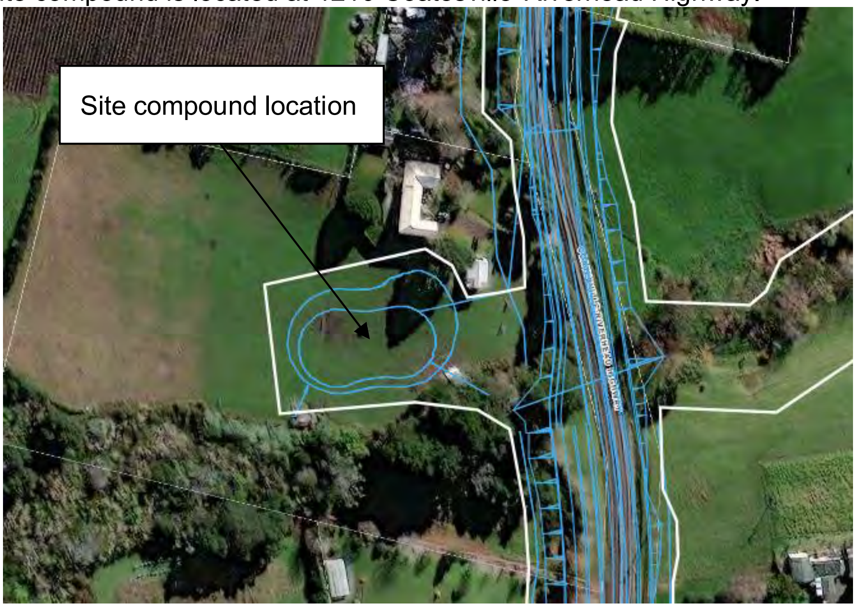
- New opportunities for active modes of transport along the Coatesville Riverhead Highway to create an integrated road environment.
- The opportunity to create a transportation corridor that will include space for trees and soft landscape that will seamlessly integrate with the FUZ.

### 10.6.2 Assessment of Construction Effects

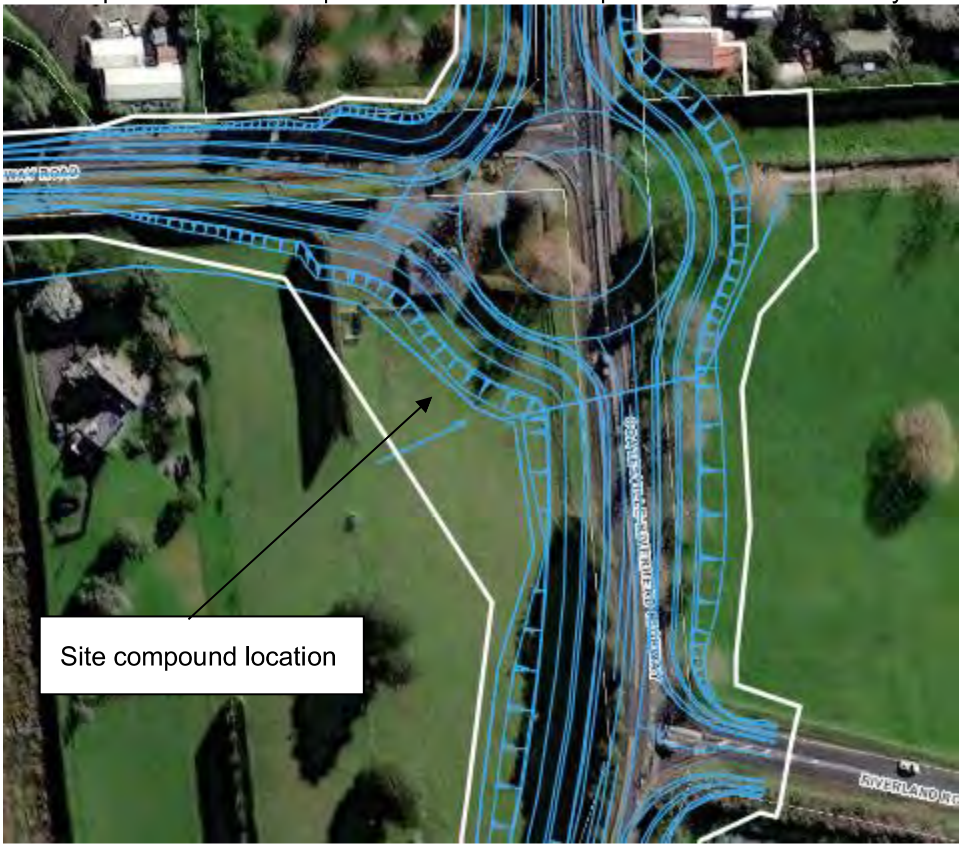
**Construction Areas**

Site compound and construction areas are to be established at two locations within the Project area. Construction traffic will be heightened at these locations through the construction period of the Project.

- A proposed site compound is located at 1210 Coatesville-Riverhead Highway.



- A site compound with a stockpile area and sediment ponds at 182 Old Railway Road.




The proposed site compounds are all located in pastoral fields within rural zoned land. We recommended that all site compounds are grassed after works have completed.

Without the implementation of recommended mitigation measures it is anticipated that physical landscape effects will be **low** adverse. The physical landscape effects resulting from establishment and use of the construction work areas, provided that recommended mitigation measures are undertaken, are assessed to be **very low** once they have been re-grassed.

**Vegetation Clearance**

The majority of existing road side vegetation is proposed to be removed to accommodate the wider proposed Project corridor including adjacent batter slopes. This consists primarily of pastoral grassland, non-native shelterbelt trees and shrubs located within the road-side boundaries and private properties, within the Project area. Some additional riparian vegetation is expected to be removed within proximity to the Project's watercourse crossings. It is anticipated that the scheduled notable group of trees located within proximity to the Project will be retained.

Although it is recognised that the effects related to the removal of riparian vegetation will be higher than non-native vegetation, overall, the adverse physical landscape effects likely to arise from vegetation clearance within the Project area are assessed as **low** adverse with or without mitigation**.**

**Structures and Earthworks**

There cut and fill balance of earthworks is anticipated to result in cut material being in surplus across the project. Although, the level of cut required is greater than the required fill, imported brown rock may be required to construct the road. Some of these earthworks will occur on land within proximity of watercourses, which have a higher sensitivity to change.

The impacts and potential landscape effects of the proposed earthworks include the modification of and permanent changes to the underlying landform, surface level changes in close proximity to retained private properties in rural and urban contexts. The proposed cut and fill slopes range in scale from 1m to 14m wide and will alter the form and width of the existing road corridor and surrounding predominantly rural landscape.

Retaining walls are included in the design within proximity to a retained residential property on the corner of Coatesville-Riverhead Highway and Moontide Road. The length of this wall is approximately 34m and sits entirely within the road boundary, the height of the wall will be approximately 1.5m.

Overall, the earthworks and retaining walls are considered to be of a scale and quantity that is reasonably anticipated with a project of this scope and size and all cut and fill slopes are expected to be integrated within the existing modified environment. Without the implementation of mitigation measures it is anticipated that physical landscape effects will be **low-moderate** adverse. Provided that recommended mitigation measures are implemented, it is anticipated that a **low** adverse level of effects will be experienced as a result of the incursion into rural land and sensitive water courses.

**Dry Ponds and features**

One wetland is proposed as part of the proposed road upgrade, this will be located within proximity to an existing tributary of the Brigham Creek Inlet. The wetland will be constructed within an existing pastoral field, where a site compound is located, to the south of the FUZ. The proposed wetland will require earthworks to re-shape the land and achieve optimal depths and edge profiles, which will be determined as part of the resource consent phase.


It is anticipated that without the implementation of mitigation measures, physical landscape effects will be **low-moderate** adverse. We consider that with the implementation of mitigation measures effects on the physical landscape to implement the proposed wetland to be **low** adverse, as a result of there being no direct impacts on sensitive landscape features.

**Private Properties**

Residential properties within and adjacent to the Project area (including those which are partially designated) will be impacted by the Project in the following ways:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;
- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences;
- Potential construction of noise mitigation measures and retaining walls; and;
- Demolition of existing dwellings and ancillary buildings (required properties).

Approximately 30 existing retained dwellings are expected to be directly impacted by the proposed project works. Landscape mitigation measures are proposed under 9.6.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects below.

As a result of the proximity of the above construction works to audiences and the proposed changes. It is anticipated that without any mitigation adverse effects on properties during construction be **moderate** adverse and **moderate high** adverse for 13 properties that front on to the Coatesville-Riverhead Highway. it is assessed that the visual effects on the physical landscape on retained private properties is **low-moderate** adverse and **moderate** adverse for 13 properties that front onto Coatesville-Riverhead Highway.

#### 1.1.1.1 Site Finishing Works

Finishing works are expected to include grassing of exposed earth, lighting, signage, line markings, footpath/cycleway details and reinstatement of private property fences and gardens. Streetscape elements and landscaping, including those required as mitigation will also be implemented. These activities are to be determined by detailed design and will occur within the already modified areas of the Project. Without the proposed mitigation measures it is anticipated landscape effects will be **low** adverse. With the inclusion mitigation measures landscape effects are anticipated to be **very low** adverse through this final phase of the construction process.

#### 1.1.1.2 Temporary Visual Effects

The construction of the Project is anticipated to be in four stages along the proposed corridor over a period of 2-3 years, this time frame will be refined further . Visual effects are anticipated to occur progressively through the Project area and transient viewing audiences may concurrently experience adverse visual effects from both stages through the construction period. The consideration of visual effects through the construction phase acknowledges the full range of activities (and their resultant visual impact), required to implement the upgraded road corridor.

It is anticipated that construction activities required to implement the Project will introduce a noticeable change to the landscape adjacent to the existing arterial road. Once the widening has been completed and the existing road is merged with the additional lane, the effects on the transient audience will be heightened. Another important consideration is that landscape change by way of vegetation removal and construction will be in the context of an emerging urban landscape at the north of the project corridor.

Notwithstanding the above, some vantage points within the Project area are likely to witness heightened adverse visual effects through the construction phase due to the magnitude of vegetation removal and/or earthworks proposed. These areas are outlined below:

- Private properties where physical landscape effects will occur within private gardens at these locations:
    - Coatesville-Riverhead Highway property numbers 1093, 1095, 1135, 1140, 1156, 1158, 1169, 1170, 1173, 1175, 1177, 1179, 1181, 1186, 1187, 1194, 1197, 1200, 1210, 1229, 1230, 1288, 1293, 1295, 1296, 1302, 1308, 1312, 1320, 1335, 1351, 1352, 1356, 1363, 1367, 1368, 1385, 1387, 1397 and 1409;
    - Riverhead Point Drive property number 1;
    - Old Railway Road property numbers 179, 181, 182 and 184; and;
    - Riverland Road property numbers 8 and 9;
- Private properties in proximity to the site compound at 182 Old Railway Road.
- Private properties in proximity to the site compound and Wetland 1 at 1210 Coatesville-Riverhead Highway.

The nature and significance of the potential adverse visual effects are considered to be moderated through the Project area by the following aspects:

- Road works and construction activities can generally be expected to occur within arterial roads;
- The Coatesville-Riverhead Highway is already a central element within the visual composition of the Project area;
- The construction phase is expected to be implemented in four main works phases which are expected to allow efficient access to the construction zones while maintaining continued access for the intersecting roads and existing private and commercial driveways.

Without the implementation of mitigation measures it is anticipated that temporary visual effects will be **low-moderate** adverse for transient audiences. With the inclusion of mitigation measures visual effects for the transient public viewing audience are anticipated to be **low** adverse through the construction phase, taking into account those vantage points listed above where adverse effects are likely to be heightened during the temporary construction period.

Adverse visual effects during the construction phase are likely to be heightened for private viewing audiences directly adjacent to the Project area on the basis of more direct and prolonged engagement and proximity to the construction activities of the Project. This will include the presence of heavy machinery and the visible disturbance of both the road corridor and also individual private interfaces with the road.

Therefore, without proposed mitigation measures it is considered that audiences will experience **moderate** adverse to **moderate high** adverse effects for retained properties in proximity to the expanded transportation corridor. With the inclusion of proposed mitigation measures adverse visual effects are anticipated to range between **moderate** adverse and **low-moderate** adverse during the construction phase for private viewing audiences, depending on their location, proximity to the works and outlook.

### 10.6.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

Recommendations are in line with the general recommendations in Section 6.1.2.

In addition to these measures the following project specific interventions are suggested:

- Coordinate with developers with lots in the FUZ that borders the Project corridor to ensure that the proposed developments integrate with the road corridor;
- A tree protection plan is produced for the group of scheduled notable trees (2598, Redwood) located to the east of the project corridor to ensure that the root protection area is not infringed upon and damage to these trees is avoided; and;

- The production of a riparian vegetation protection plan is suggested to be provided within the ULDMP, to indicate protection measures and locations to be protected during construction.

### 10.6.4 Assessment of Operational Effects

#### 10.6.4.1 Natural Character Effects

Within the footprint of the road corridor and the proximate surrounding landscape, there are four existing watercourses. All of the watercourses that will be impacted by the proposed upgrade are crossed by the existing road. All existing watercourse crossings are culverted and no bridges are proposed within the proposed upgrade. The proposed widening will require earthworks within proximity of the natural watercourses and the removal of riparian vegetation and will alter the form and function of the existing watercourses.

We recommended that riparian vegetation is reinstated and / or improved after the completion of the construction period. Without the inclusion of mitigation measures, and in particular the replacement landscape riparian planting, it is anticipated that effects on natural character will be **low-moderat**e adverse. With the inclusion of mitigation measures a result of the above it is determined that **low** adverse effects on natural character forming elements, features and processes that will be experienced in the operational phase of the project.

#### 10.6.4.2 Visual Amenity Effects

Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to their proximity to the corridor. Audiences that are set back further than 80m from the project corridor are anticipated to experience some level of material change to the visual composition and residential amenity of the road corridor as perceived from their private property. It is anticipated that adverse effects experienced will be no greater than **very low** with or without the inclusion of mitigation measures.

Urban properties set back from the Project area on Grove Way are expected to experience a reduction in landscape amenity. This will be as a result of the removal of tree and understorey vegetation which separates Grove Way and the Coatesville-Riverhead Highway. During the operational phase of the project streetscape vegetation will be provided within the upgraded road. It is suggested that within this section of the route a detailed design exercise is undertaken to ensure that Grove Way landscape amenity at this section of the route is optimised.

Without the implementation of mitigation measures, it is anticipated that the visual effects on urban properties will be **low-moderate** adverse, within the context of anticipated urbanisation. With the provision of mitigation measures it is anticipated that the amenity provided within the upgraded project corridor will be comparable to the existing amenity. As a result, we consider that adverse visual amenity effects will be **very low** during the operational phase of the project.

Over time as the surrounding FUZ land is live zoned at the northern and southern extents of the project corridor visual effects are anticipated to be reduced for the private viewing audiences within the emerging urban area. This is as a result of the increased density surrounding the project corridor and the change to an urban amenity including streetscape improvements, maturing street trees, berm planting and active modes of transport.

For rural properties directly adjacent to the Project area (from which land is required), visual amenity and residential character effects will be heightened as a result of the construction impacts including driveway regrading, potential loss of yard space, removal of existing screening vegetation and by grater proximity of the carriageway and footpaths/cycleways to private dwellings. We recommended that boundary fences and garden plantings (removed through the Project works) are reinstated on completion of the works affecting the property. We recommend that mitigation measures for each property are considered on an individual basis with consultation with the landowner.

Without the inclusion of mitigation measures it is anticipated that visual effects on rural properties will range from **low-moderate** adverse for some further back from the transport corridor. Rural properties which have lost screening vegetation and front yard area as a result of the road widening, without mitigation it is anticipated that these will experience **moderate-high** adverse to **moderate** adverse visual effects.

It is anticipated that during the operational phase of works, provided that the mitigation measures are implemented, rural residential properties that front directly on to the project will experience **low** adverse to **low-moderate** adverse visual effects once reinstatement works and proposed mitigation planting has established. It is anticipated that visual effects will reduce over an extended period of time as mitigation landscape planting matures, typically between 3-5 years.

Public viewing audiences will engage with an expanded road corridor, particularly within the proposed urban section of the project corridor. Within the rural sections of the road corridor the road will be similar to the existing road. Visual effects for this audience are expected to be **very low** adverse in the context of the urbanisation of the surrounding landscape to the north. Over time, visual effects are anticipated to be neutral for the public viewing audience, based on visual amenity for users associated with the streetscape being replaced with a similar landscape and increased accessibility to active modes of transport. Visual effects within the context of the rural landscape will be **low** adverse as a result of the road corridor expanding into the surrounding landscape.

Overall, visual effects are anticipated to be partially or fully mitigated by measures implemented during the finishing phase of the construction period (within the road corridor and private property boundaries), that will mature through the operational phase of the Project to adequately reduce any potential long-term residual visual effects of the Project.

#### 10.6.4.3 Landscape Character Effects

The principal elements of the Project will generally be in accordance with the existing arterial road. At the completion of the Project, the urban sections of the upgraded corridor will resemble that of an urban arterial road with active modes of transport, structured street tree planting, integrated stormwater management and engineered roading elements. The rural sections of the upgraded route will retain a rural character and aesthetic with surrounding vegetation provided to settle the road into the landscape.

A planting plan is recommended to be included in the ULDMP which will be developed as part of the detailed design of the Project. We recommended that any planting proposed as mitigation through the regional consents process is integrated with the planting plan as recommended through this assessment under the ULDMP. This will ensure that natural and landscape character values are preserved as an outcome of the Project.

Although clearance of vegetation is expected as part of the required works, a structured landscape planting design will improve the landscape character along the project corridor, once implemented. This will alter the character of the surroundings immediately after construction as mature trees and shrubs will have been replaced with smaller less developed vegetation.

Figure 10-6: Coatesville-Riverhead Highway SH16 to Short Road (rural), Indicative 33m cross section

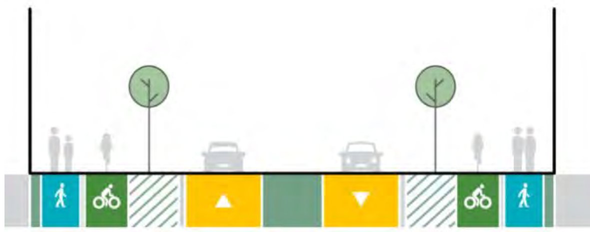


Figure 10-7: Coatesville-Riverhead Highway Short Road to Riverhead Highway (urban), Indicative 24m cross section

The cross sections above (Figure 11-6 and 11-7) illustrates the proposed upgrade to the road and the expected future use. Although indicative, there is available space within the road corridor for green infrastructure elements such as street trees and berms where stormwater devices with a small footprint and associated planting can be accommodated within the urban section. It is anticipated that these will be in keeping with the expected vernacular of the future urban landscape in the urban section of the route. There will also be space within embankments either side of the rural section of the route and to provide landscape amenity. These features are expected to match the existing rural amenity within the corridor.

The proposed vegetation (in the form of street tree planting, riparian vegetation, berm planting, screening vegetation and rural amenity planting) in conjunction with stormwater management, will provide landscape amenity of the Project area within the context of the urban and rural environments.

Within the rural environment it is anticipated that without the implementation of mitigation measures landscape effects will be **low-moderate** adverse to **low** adverse. With the provision of mitigation measures to integrate the expanded road corridor with the rural environment it is anticipated that landscape effects will be **low** adverse, reducing to neutral over time as vegetation matures.

Without mitigation it is anticipated that **low-moderate** adverse effects will be experienced may not reduce to neutral over time within the urban environment. It is anticipated that effects on the urban landscape will be **low** adverse reducing to neutral as vegetation matures.

### 10.6.5 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

Recommendations are in line with the general recommendations in Section 6.1.3.

## 10.7 Conclusions

Overall, landscape and visual effects without mitigation are expected to range from **moderate-high** adverse to **low** adverse for the construction phase of works and **moderate-high** adverse to **very low** adverse for the operational phase. Landscape and visual effects assuming that mitigation measures are implemented are anticipated to range from **moderate** adverse to **very low** adverse for the construction phase and **low moderate** adverse to **very low** adverse for the operational phase.

Without the implementation of mitigation proposals it is anticipated that natural character effects will be **low-moderate** adverse. Provided that mitigation riparian planting are implemented, it is anticipated that the natural character effects are anticipated to be **low** adverse.

Overall, the adverse effects can be mitigated and reduced over time in relation to the urbanisation of the surrounding landscape in the northern future urban areas and the implementation of mitigation planting in the rural areas to the south.

# 11 Conclusion

**NoR RE1 Don Buck Road FTN Upgrade**

Overall, landscape and visual effects without mitigation are expected to range from **moderate** adverse to **very-low** adverse. Landscape and visual effects assuming that mitigation measures are implemented will range from **low-moderate** to **very low** for the construction phase and **low** to **very low** for the operational phase. Natural Character effects are expected to be **moderate** adverse without mitigation and **low** adverse with the implementation of mitigation measures. Overall, the adverse effects can be mitigated and there are a number of positive landscape and visual effects that can ensue.

**NoR RE2 Fred Taylor Drive (alteration to existing designation 1433)**

Overall, landscape and visual effects without mitigation are expected to range from **moderate** adverse to **very-low** adverse for the construction phase of works and **low-moderate** adverse to **very low** adverse for the operational phase. Landscape and visual effects assuming that mitigation measures are implemented are anticipated to range from **low-moderate** adverse to **very low** adverse for the construction phase and **low** adverse to **very low** adverse for the operational phase.

Without the implementation of mitigation proposals it is anticipated that natural character effects will be **low-moderate** adverse. Provided that mitigation riparian planting are implemented, it is anticipated that the natural character effects are anticipated to be **very low** adverse.

Overall, the adverse effects can be mitigated and reduced over time in relation to the urbanisation of the surrounding landscape. The surrounding landscape context has a lower level of sensitivity to change due to the existing context of the arterial road and the projected urbanisation and development of time. There are a number of positive landscape and visual effects that will result from the project including the opportunity to formalise the streetscape and amenity provide consistent amenity along the Project corridor.

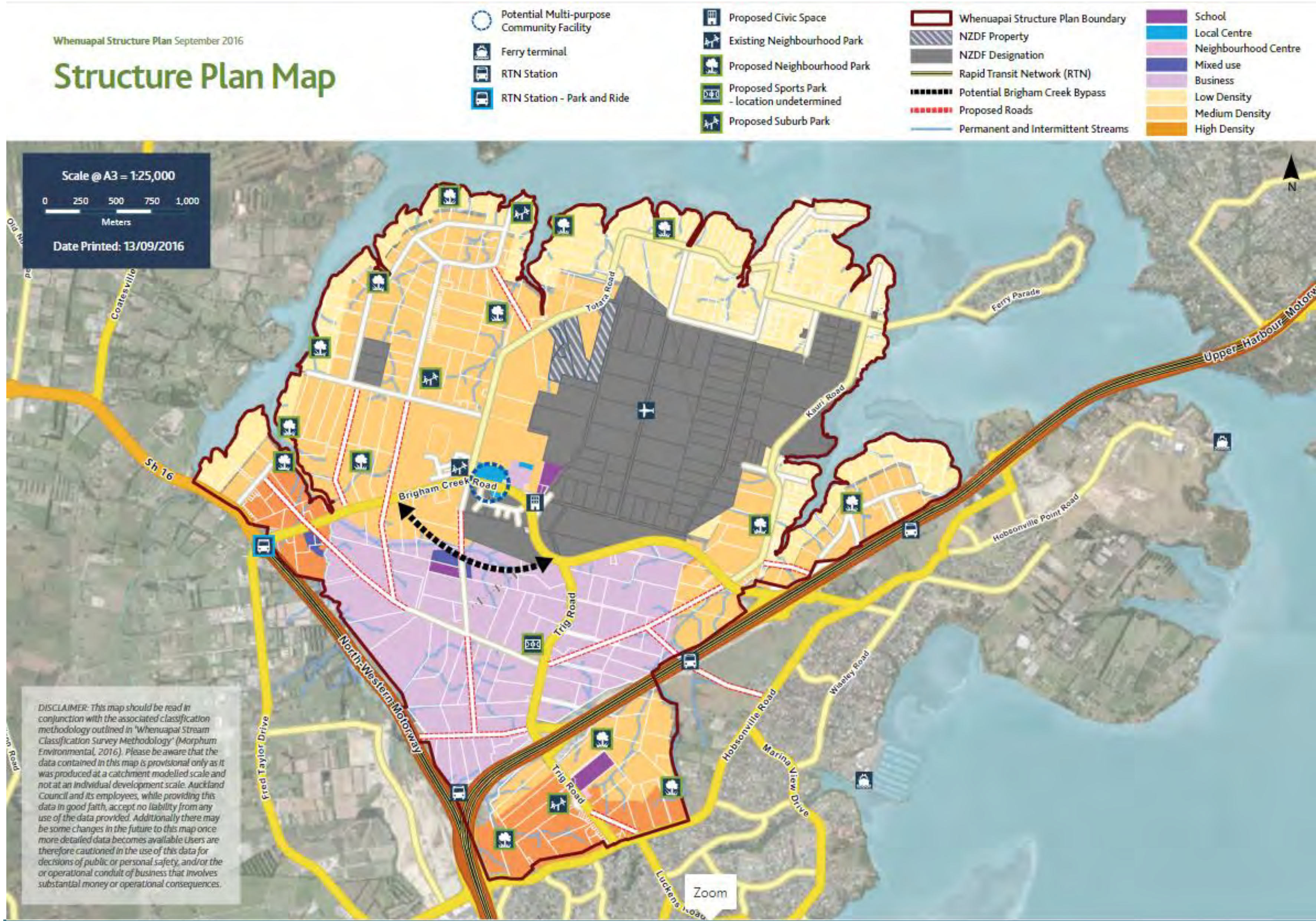
**NoR R1 Coatesville-Riverhead Highway Upgrade**

Overall, landscape and visual effects without mitigation are expected to range from **moderate-high** adverse to **low** adverse for the construction phase of works and **moderate-high** adverse to **very low** adverse for the operational phase. Landscape and visual effects assuming that mitigation measures are implemented are anticipated to range from **moderate** adverse to **very low** adverse for the construction phase and **moderate** adverse to **very low** adverse for the operational phase.

Without the implementation of mitigation proposals it is anticipated that natural character effects will be **low-moderate** adverse. Provided that mitigation riparian planting are implemented, it is anticipated that the natural character effects are anticipated to be **low** adverse.

Overall, the adverse effects can be mitigated and reduced over time in relation to the urbanisation of the surrounding landscape in the northern future urban areas and the implementation of mitigation planting in the rural areas to the south.

# 2 Appendix 1: Whenuapai Structure Plan


Whenuapai Structure Plan September 2016
Structure Plan Map
Potential Multi-purpose Community Facility
Ferry terminal
RTN Station
RTN Station - Park and Ride
Proposed Civic Space
Existing Neighbourhood Park
Proposed Neighbourhood Park
Proposed Sports Park - location undetermined
Proposed Suburb Park
Whenuapai Structure Plan Boundary
NZDF Property
NZDF Designation
Rapid Transit Network (RTN)
Potential Brigham Creek Bypass
Proposed Roads
Permanent and Intermittent Streams
School
Local Centre
Neighbourhood Centre
Mixed use
Business
Low Density
Medium Density
High Density
Scale @ A3 = 1:25,000
0 250 500 750 1,000
Meters
Date Printed: 13/09/2016
N
Coatesville
Sh 16
Totara Road
Ferry Parade
Upper Harbour Motorway
Kauri Road
Brigham Creek Road
Hobsonville Point Road
Trig Road
North-Western Motorway
Fred Taylor Drive
Hobsonville Road
Whitaker Road
Marina View Drive
Luckens Road
Zoom
DISCLAIMER: This map should be read in conjunction with the associated classification methodology outlined in 'Whenuapai Stream Classification Survey Methodology' (Morphum Environmental, 2016). Please be aware that the data contained in this map is provisional only as it was produced at a catchment modelled scale and not at an individual development scale. Auckland Council and its employees, while providing this data in good faith, accept no liability from any use of the data provided. Additionally there may be some changes in the future to this map once more detailed data becomes available Users are therefore cautioned in the use of this data for decisions of public or personal safety, and/or the or operational conduct of business that involves substantial money or operational consequences.

# 3 Appendix 2: Graphic Supplement

Boffa Miskell

# SUPPORTING GROWTH ALLIANCE

## REDHILLS AND RIVERHEAD - NOTICE OF REQUIREMENTS

## LANDSCAPE AND VISUAL EFFECTS ASSESSMENT APPENDIX 2 GRAPHIC SUPPLEMENT

AUGUST 2022

# Redhills and Riverhead - Notice of Requirements

Contents


*Existing View*

Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 10:19 AM NZST

| | |
|---|---|
| Horizontal Field of View | : 74° |
| Vertical Field of View | : 46° |
| Projection | : NA |
| Image Reading Distance @ A3 is 50 cm | |

*Data Sources: Photography - BML*



**NOR R1 DON BUCK ROAD FTN UPGRADE**

View west from Fred Taylor Drive towards Don Buck Road

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 1


Existing View

Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 10:26 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*

**NOR R1 DON BUCK ROAD FTN UPGRADE**

View west from Westgate Drive towards Don Buck Road

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 2


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 10:49 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R1 DON BUCK ROAD FTN UPGRADE**

View west from Rush Creek Drive towards Don Buck Road

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 3


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 10:48 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R1 DON BUCK ROAD FTN UPGRADE**

View north along Don Buck Road

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 4


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 10:48 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R1 DON BUCK ROAD FTN UPGRADE**

View south along Don Buck Road

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 5


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 10:42 AM NZST

| | |
|---|---|
| Horizontal Field of View | : 74° |
| Vertical Field of View | : 46° |
| Projection | : NA |
| Image Reading Distance @ A3 is 50 cm | |

*Data Sources: Photography - BML*



**NOR R1 DON BUCK ROAD FTN UPGRADE**

View of properties 459 - 463 Don Buck Road

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 6


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 11:11 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R2 FRED TAYLOR DRIVE (ALTERATION TO EXISTING DESIGNATION (1433))**

View west towards Fred Taylor Drive along Kakano Road.

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 7


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 11:20 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R2 FRED TAYLOR DRIVE (ALTERATION TO EXISTING DESIGNATION (1433)**

View west towards Fred Taylor Drive along Pua Street.

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 8


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 10:58 AM NZST

| | |
|---|---|
| Horizontal Field of View | : 74° |
| Vertical Field of View | : 46° |
| Projection | : NA |
| Image Reading Distance @ A3 is 50 cm | |

*Data Sources: Photography - BML*



**NOR R2 FRED TAYLOR DRIVE (ALTERATION TO EXISTING DESIGNATION (1433)**

View west towards Fred Taylor Drive along Kakano Road.

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 9


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 11:08 AM NZST

| | |
|---|---|
| Horizontal Field of View | : 74° |
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| Projection | : NA |
| Image Reading Distance @ A3 is 50 cm | |

Data Sources: Photography - BML



**NOR R2 FRED TAYLOR DRIVE (ALTERATION TO EXISTING DESIGNATION (1433))**

View north along Fred Taylor Drive from outside 94 Fred Taylor Drive

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 10


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 11:15 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R2 FRED TAYLOR DRIVE (ALTERATION TO EXISTING DESIGNATION (1433)**

View south along Fred Taylor Drive from outside 75B Fred Taylor Drive

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 11


Boffa Miskell

www



Viewpoint Details

Date of Photography: 2 August 2022 11:04 AM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

Data Sources: Photography - BML



**NOR R2 FRED TAYLOR DRIVE (ALTERATION TO EXISTING DESIGNATION (1433)**

View south along Fred Taylor Drive from properties accessed form Matakohe Road.

Date: 2 August 2022 Revision: 0

Plan prepared for Supporting Growth

SP 12


Existing View

Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 12:20 PM NZST

| | |
|---|---|
| Horizontal Field of View | : 74° |
| Vertical Field of View | : 46° |
| Projection | : NA |
| Image Reading Distance @ A3 is 50 cm | |

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View west towards Coatesville-Riverhead Highway from Kaipara Portage Road

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 13


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 1:57 PM NZST

| | |
|---|---|
| Horizontal Field of View | : 74° |
| Vertical Field of View | : 46° |
| Projection | : NA |
| Image Reading Distance @ A3 is 50 cm | |

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View east towards Coatesville-Riverhead Highway from Riverhead Road

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 14


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 1:06 PM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View north along Coatesville-Riverhead Highway from the corner of Moontide Road

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 15


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 12:38 PM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View south along Coatesville-Riverhead Highway from outside Hallertau Brewery

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 16


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 12:57 PM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View south along Coatesville-Riverhead Highway opposite Old Railway Road

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 17


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 1:10 PM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View south along Coatesville-Riverhead Highway south of Moontide Road

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 18


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 12:45 PM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

Data Sources: Photography - BML



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View south along Coatesville-Riverhead Highway from the edge of the FUZ

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 19


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 12:29 PM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View south west across Coatesville-Riverhead Highway from outside 5 Grove Way

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 20


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 12:33 PM NZST

| | |
|---|---|
| Horizontal Field of View | : 74° |
| Vertical Field of View | : 46° |
| Projection | : NA |
| Image Reading Distance @ A3 is 50 cm | |

*Data Sources: Photography - BML*

**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View south west across Coatesville-Riverhead Highway from outside 15 Grove Way

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 21


Boffa Miskell

www



Viewpoint Details

Date of Photography: 27 May 2022 12:52 PM NZST

Horizontal Field of View : 74°
Vertical Field of View : 46°
Projection : NA
Image Reading Distance @ A3 is 50 cm

*Data Sources: Photography - BML*



**NOR R3 COATESVILLE-RIVERHEAD HIGHWAY UPGRADE**

View north along Coatesville-Riverhead Highway from outside the Huapai Golf Club

Date: 27 May 2022 Revision: 0

Plan prepared for Supporting Growth

SP 22

# 4 Appendix 3: Landscape Effects Methodology

## 4.1 Overview

This Landscape Effects Assessment (LEA) has been undertaken with reference to Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines[11]. The same methodology applies to the construction and operational stages of the works and for NoRs (R1, R2, and R3). These guidelines have been developed to relate to the Aotearoa New Zealand environmental planning context and align with te ao Māori and te ao Pākehā concepts of landscape.

While natural character, landscape and visual amenity effects assessments are closely related, they form separate procedures. An assessment of the effects on natural character of an activity involves consideration of the proposed changes to the current condition compared to the existing. The assessment of the potential effects on landscape considers effects on physical attributes, landscape character and values. The assessment of visual effects considers how changes to the physical landscape affect the viewing audience.

Visual effects relate to the amenity values of a landscape including the natural and physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.

Landscape effects result from natural or induced change in the components, character or quality of the landscape. Usually these are the result of landform or vegetation modification or the introduction of new structures, facilities or activities into the landscape.

Natural character effects are in relation to natural or induced change to any streams, wetlands and their margins as outlined in the NZCPS guidance note[12]. These are usually the result of landform, vegetation or hydrological modification or the introduction of structures into the waterbody or its margin.

The process of change itself, that is the construction process and/or activities associated with the development, also carry with them their own visual effects, however, these are distinct from those generated by a completed development.

The landscape and visual effects generated by any particular proposal can, therefore, be perceived as:

- positive (beneficial), contributing to the visual character and quality of the environment.
- negative (adverse), detracting from existing character and quality of environment; or
- neutral (benign), with essentially no effect on existing character or quality of environment.

The degree to which landscape and visual effects are generated by a development depends on a number of factors, these include:

- The degree to which the proposal contrasts, or is consistent, with the qualities of the surrounding landscape.
- The proportion of the proposal that is visible, determined by the observer's position relative to the objects viewed.

[11] 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines', [Final Draft subject to final editing, graphic design, illustrations, approved by Tuia Pito Ora/NZILA 5 May 2021]

[12] 'New Zealand Coastal Policy Statement' [issued 4 November 2010]. Accessed online 24.11.2021 *NZCPS 2010 Guidance note Policy 13: Preservation of natural character* (DOC, September 2013). (https://www.doc.govt.nz/globalassets/documents/conservation/marine-and-coastal/coastal-management/nz-coastal-policy-statement-2010.pdf)

- The distance and foreground context within which the proposal is viewed.
- The area or extent of visual catchment from which the proposal is visible.
- The number of viewers, their location and situation (static, or moving) in relation to the view.
- The backdrop and context within which the proposal is viewed.
- The predictable and likely known future character of the locality.
- The quality of the resultant landscape, its aesthetic values and contribution to the wider landscape character to the area.

Change in a landscape and 'visibility' of a proposal does not of itself, constitute an adverse landscape or visual effect. It is the effect on the values of the landscape, positive, adverse or benign that need to be understood and evaluated.

## 4.2 Scale of Effects

In determining the magnitude of potential and actual landscape and visual effects of the Project, a consistent 7-point rating scale has been used that is based on the recommendations in the Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines. The effects ratings referred to in this assessment are based upon a seven-point scale which ranges from 'very low' to 'very high' and are described in the table below.

***7-point rating scale***

| *Effect Rating* | *Use and Definition* |
| --- | --- |
| **Very High:** | Total loss of key elements / features / characteristics, i.e. amounts to a complete change of landscape character and in views. |
| **High:** | Major modification or loss of most key elements / features / characteristics, i.e. little of the pre-development landscape character remains and a major change in views.<br><br><u>Concise Oxford English Dictionary Definition</u><br><br>High: adjective- Great in amount, value, size, or intensity. |
| **Moderate-High:** | Modifications of several key elements / features / characteristics of the baseline, i.e. the pre-development landscape character remains evident but materially changed and prominent in views. |
| **Moderate:** | Partial loss of or modification to key elements / features / characteristics of the baseline, i.e. new elements may be prominent in views but not necessarily uncharacteristic within the receiving landscape.<br><br><u>Concise Oxford English Dictionary Definition</u><br><br>Moderate: adjective- average in amount, intensity, quality or degree |

| *Effect Rating* | *Use and Definition* |
|---|---|
| **Low-Moderate:** | Minor loss of or modification to one or more key elements / features / characteristics, i.e. new elements are not prominent within views or uncharacteristic within the receiving landscape. |
| **Low:** | Little material loss of or modification to key elements / features / characteristics. i.e. modification or change is not uncharacteristic or prominent in views and absorbed within the receiving landscape.<br><br>Concise Oxford English Dictionary Definition<br><br>Low: adjective- 1. Below average in amount, extent, or intensity. |
| **Very Low:** | Negligible loss of or modification to key elements/ features/ characteristics of the baseline, i.e. approximating a 'no change' situation and a negligible change in views. |

***Mitigation***

For effects that are very low or low, mitigation is generally not required.  Additional landscape mitigation may be required for landscape effects of a low-moderate to high rating to reduce effects to a lower degree.  For effects that are very high, mitigation is unlikely to reduce the level of effect to any discernible degree. Operational effects are assessed after mitigation planting has been established, typically this is between 3-5 years after implementation. While planting establishes it is anticipated that adverse effects will reduce over time.

## 4.3 Methodology Breakdown

The methodology that forms the basis for the assessment is set out below:

- Identification of relevant statutory provisions and non-statutory guidance relating to landscape;
- Analysis and description of existing landscape elements, features and character of the existing 'Baseline Landscape' within the NoRs and surrounding areas;
- Analysis and description of landscape elements, features and character of the likely future environment within the NoRs and surrounding areas;
- Analysis and description of perceptual, sensory and associative qualities within the Project areas, and the identification of the viewing audience and visual catchment;
- Summary of landscape values within the Project areas, including inputs from other specialists such as ecology, stormwater and historic heritage;
- Evaluation of the sensitivity of the landscape within the Project areas to landscape change arising from transport infrastructure upgrades;
- Analysis and description of the development proposal including construction methodology, timeline and discussion of avoidance and mitigation measures already integrated through the design;
- Identification of the principal elements of the Project (effects generators) likely to result in landscape, natural character and visual effects;
- Identification of temporary (construction) vs permanent (operational) effects of the Projects;
- Identification of general and targeted mitigation measures to reduce the magnitude of likely effects;

- Assessment of effects (adverse, neutral and/or positive) on the bio-physical aspects of the landscape resource, landscape character, natural character and visual amenity, taking account of the proposed mitigation measures; and
- Summary of the overall landscape and visual effects of the Projects and an overall determination of the significance of landscape and visual effects.

## 4.4 Landscape Values

Considering the absence of any scheduled high value landscape areas (ONLs, ONFs. HNCs or ONCs) at a national, regional or district level within or directly adjacent to the Project areas, a summary is provided of local landscape values within each Project Group. Local values generally considered three broad categories including: biophysical, perceptual and associative values.[13]

## 4.5 Landscape Sensitivity

The level of sensitivity of the sites and wider rural areas to land use change is influenced by the latest planning direction (AUP:OP and also the Whenuapai Structure Plan) that has placed the sites, local landscape and NoRs into the Future Urban Zone (FUZ) and some live mixed housing urban zoning around Whenuapai City Centre.

Notwithstanding the above, the interface between the land and water (riparian margins) is particularly sensitive to landscape change and under Part 2 of the RMA (section 6(a)) and relevant policies of the National Policy Statement for Freshwater 2020 (NPS-FM), the values within these areas of the landscape should generally be protected from inappropriate subdivision, use and development.

Other landscape attributes may also be sensitive to the effects of landscape change such as topographical and landform features, vegetation (scheduled notable trees or patterns of contiguous land cover), existing sensitivity associated with the built environment and views afforded to large mature trees, landmarks and/or landscape features within the contextual landscape. A scheduled notable tree is a tree or group of trees that a community or nation regards as being of special importance. These are listed in the Schedule 10: notable trees schedule in the AUPOIP[14].

## 4.6 Landscape Effects

Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced over time. This may in turn affect the perceived value ascribed to the landscape.

Potential landscape effects in this assessment relate to the following landscape attributes:

- Biophysical - Abiotic: Geophysical processes (landform) and drainage patterns.
- Biophysical – Biotic: Vegetation cover, quality and pattern (native and exotic).
- Human attributes: Land uses, active and passive recreation, amenity and built form.

Landscape and visual effects are assessed in two parts as outlined below; firstly, through the construction period of the Projects where the bio-physical and human attributes within the Project

[13] Landscape Guideline: Appendix 1: NZTA Landscape and Visual Assessment Guidelines

[14] AUPOIP Schedule 10: Notable Trees, https://unitaryplan.aucklandcouncil.govt.nz/Images/Auckland%20Unitary%20Plan%20Operative/Chapter%20L%20Schedules/Schedule%201 0%20Notable%20Trees%20Schedule.pdf [accessed 5 July 2022]

area are required to be modified to implement the Project. Landscape and visual effects during the construction phase are generally considered to be temporary and dynamic in nature and may temporarily be heightened by the intervention of heavy machinery, areas of exposed ground and the use of construction service areas. In the second part (the operational phase of the Projects), the overall significance and value of landscape and visual change is explored and ultimately the Project's impact on landscape character, natural character and visual amenity is assessed.

The two categories of effects are outlined as follows:

- **Temporary Effects** (Construction Effects): Describes the anticipated effects on the bio-physical elements and features of the landscape resource (landform, vegetation and hydrology) resulting from the construction of the Project. It also includes visual amenity effects for both public and private viewing audiences from construction works. The construction activities required to implement the Project are categorised under the following broad headings:
    - **Site enabling works** - site establishment, demolition and vegetation clearance;
    - **Project formation works** - bulk earthworks, retaining walls, park and ride formation, platform and overhead structures, culvert upgrades, stormwater wetlands construction.

- **Permanent Effects** (Operational Effects): Describes the effects on the landscape of completed works (including integrated landscape mitigation measures), the significance of physical landscape change and ultimately the resulting effects of the Projects on landscape character, natural character and visual amenity for both public and private viewing audiences.
    - **Finishing works** - lighting, signage, road, footpath/cycleway details and line markings, streetscape elements and landscaping (including trees, mitigation planting and riparian/stormwater device/wetland planting).

## 4.7 Natural Character Effects

Section 6(a) of the RMA identifies as a matter of national importance to recognise / provide for the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers[15] and their margins, and the protection of them from inappropriate subdivision, use, and development.

Assessing existing natural character is primarily concerned with the degree to which natural processes, natural patterns and natural elements have undergone human modification. Hydrological and ecological survey and assessment for the Project area generally underpin the landscape evaluation of existing natural character values.

The natural character assessment for this Project applies to the existing water bodies and wetlands associated with the tributaries of the Brigham Creek Inlet, the Kumeū River and its branches.

## 4.8 Visual Effects

Visual effects relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people’s responses to the changes, and to the overall effects with

[15] A ‘river’ is defined in the RMA as a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse.

respect to visual amenity. Visual effects are considered for both temporary (construction effects) and permanent (operational effects) of the Projects.

Potential effects considered in this assessment relate to the following visual amenity attributes:

- Visual quality and composition (legibility, coherence, setting, scenic quality)
- Visibility (extent of visibility to the Project area)
- Views (viewing audience and views afforded to, from and within the Project area).

The nature and magnitude of the visual effect can be influenced by a number of factors such as:

- The extent to which the Project areas are visible;
- Legibility and whether there are intervening elements in the landscape that restrict views towards the Project area;
- Whether or not aspects of the Project appear 'at odds or integrated' with existing (or anticipated future) landscape character and composition;
- Distance between the viewer and the Project area;
- The nature of the viewing audience, numbers and extent of the visual catchment.

The proposed road corridor NoRs are located within an evolving future urban landscape, which in itself will bring about substantial landscape and visual change. Therefore, the visual composition that exists today is likely to change considerably over the course of the next decade.

Based on the above, the visual assessment for the Projects focuses on the potential visual effects arising (through the construction and operation of the Projects) within the proposed NoR areas, and localised landscape. The focus of the assessment is on the nature and significance of effects within the Project areas and how that translates to effects for immediately adjacent land uses (existing and future, but acknowledging that the existing land uses will change in the future).

Assessment photography was obtained during the project site visit in March 2022. The outlook from viewpoints that were captured onsite were photographed and assessed in variable weather conditions and at standing eye level. The photographs were taken with a digital SLR camera.

## 4.9 Limitations

This landscape assessment does not specifically address and respond to Mana whenua values from a design planning perspective. However, Mana whenua knowledge and associative values of the project landscape has been shared through the separate and parallel engagement between the Project team and Mana whenua who have expressed interest in the Projects. There are several crossovers with related specialties including urban design, hydrology, ecology, arboriculture and historic heritage. This report references the latest data available in respect of these matters at the time of issue.

All site assessments have been undertaken from public land and supported through detailed desktop GIS mapping and aerial photograph information.

## 4.10 Project Assumptions

The findings of this landscape effects assessment are underpinned by the following assumptions:

- For the FUZ areas, it is likely that construction of the road corridors will occur ahead of, or in parallel to, the urbanisation of these areas. Therefore, the starting assumption is that the roads will be constructed in the existing village and semi-rural environment and operate in an urban environment.
- Enabling work is expected to begin on stage 1 of the roads in 2023. The overall duration for the works is estimated to be approximately two years i.e. completed by 2028. Construction timings are indicative and further details will be confirmed closer to the time of construction and at the OPW stage.
- Areas that are already urbanised, or are planned to be (as per precinct plans in the AUP:OP), construction and operation of the transport corridors will be within an urban environment.
- The proposed designation footprint has sufficient space to enable design changes to occur through the detailed design phase of the Project, in order to integrate the road corridor from a visual and urban design perspective with adjoining land uses.

## 4.11 Statutory Guidance

### 4.11.1 Notice of Requirement

This assessment has been prepared to support the NoRs for the projects. The process for consideration of a NOR is set out in section 168 of the RMA. This includes consideration of the actual or potential effects (including positive effects) on the environment of allowing the requirement under the Resource Management Act (RMA).

Part 2, Schedule 6, Clause 33(7)(b) in Part 8 of the RMA, in particular ss 168, 171 and 176 of the RMA. The designation once confirmed authorises the activities relating to the Project or work enabled by the designation that would otherwise require a resource consent for land use activities pursuant to section 9(3) of the RMA. This assessment therefore focuses on the landscape and visual effects of the land use activities that will be authorised by the proposed designations for the Project. Landscape and visual effects arising from activities that require future regional consents will be assessed as part of a future consent process.

## 4.12 Non-Statutory Guidance

The Kumeū-Huapai / Riverhead area has not been structure planned. Land release for the Kumeū-Huapai/Riverhead area is identified in the FULSS to occur between 2028 and 2032. Council's current view is that structure planning must occur prior to the release of land currently zoned FUZ. This is indicatively programmed for Kumeū-Huapai / Riverhead in 2025.

The project team is working closely with Auckland Council to support desired outcomes for the Kumeū-Huapai / Riverhead area.

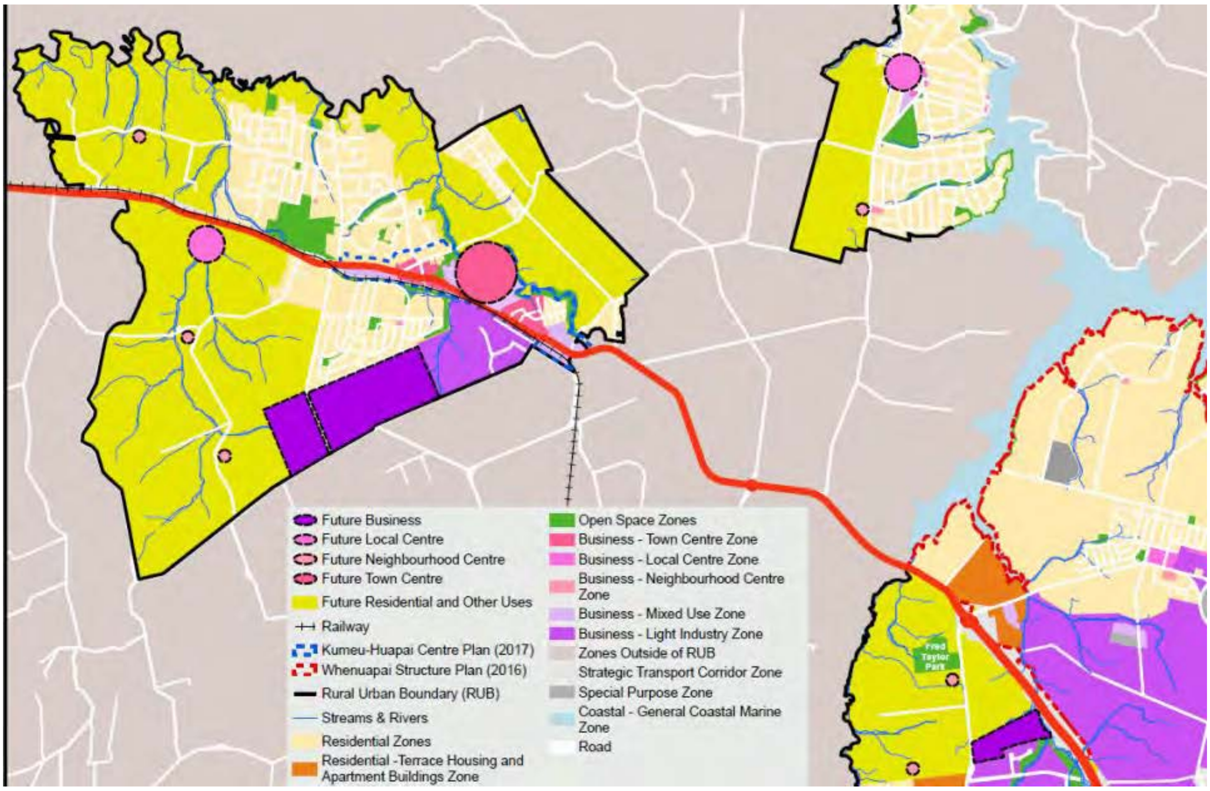


**Figure 11-1: Spatial Land Use Strategy - Kumeū-Huapai, Riverhead, and Redhills North.**

**Note: The Spatial Land Use Strategy is not a detailed structure plan and is only intended to be a high-level outline of the future land uses in the Future Urban zone.**

### 4.12.1 National Policy Statement on Urban Development – NPS UD

The National Policy Statement-Urban Development (NPS-UD) came into effect on 20 August 2020 and sets out a list of things that local authorities must do to give effect to the objectives and policies defined within the policy statement. The NPS-UD does not explicitly address or refer to urban design but sets out the characteristics and rationale for "*well-functioning urban environments*" that enable all communities to provide for their social, economic, and cultural well-being and for their health and safety, now and into the future. This includes, amongst other requirements, the enabling of density and development capacity through "up-zoning" and more enabling planning provisions:

- around centre zones
- in areas with employment opportunities
- in areas that are well serviced by existing or planned public transport or where there is high demand for housing or business
- along rapid transit stops

In the context of this Project, the NPS-UD Policy 1 defines what constitutes a well-functioning urban environment as one that provides "good accessibility for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport". The implications of NPS-UD Policy 3 are that development of six storeys or more building heights are more likely within the context of an expanded road corridor.

# ATTACHMENT 64

## NORTH-WEST REDHILLS AND RIVERHEAD
## ASSESSMENT OF EFFECTS
## ON HERITAGE / ARCHAEOLOGY

TE TUPU NGĀTAHI
SUPPORTING GROWTH

# North West Redhills Riverhead

# Assessment of Effects on Heritage / Archaeology

December 2022

Version 1

## Document Status

| Responsibility | Name |
|---|---|
| Author | Dr. Hans-Dieter Bader |
| Reviewer | Dr. Janice Adamson |
| Approver | John Daly |

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| Version | Date | Reason for Issue |
|---|---|---|
| 0.1 | 16/12/22 | Notice of Requirement Lodgement |

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# Abbreviations

| Acronym/Term | Description |
|---|---|
| **AEE** | Assessment of Effects on the Environment |
| **AT** | Auckland Transport |
| **AUP:OP** | Auckland Unitary Plan Operative in Part |
| **CHI** | Cultural Heritage Inventory |
| **FTN** | Frequent Transit Network |
| **FUZ** | Future Urban Zone |
| **HNZPT** | Heritage New Zealand Pouhere Taonga |
| **HNZPTA** | Heritage New Zealand Pouhere Taonga Act 2014 |
| **RMA** | Resource Management Act 1991 |
| **NoR** | Notice of Requirement (under the Resource Management Act 1991) |
| **NZAA** | NZ Archaeological Association |
| **SH16** | State Highway 16 |
| **Te Tupu Ngātahi** | Te Tupu Ngātahi Supporting Growth |
| **Waka Kotahi** | Waka Kotahi NZ Transport Agency |

# Glossary of Acronyms / Terms

| Acronym/Term | Description |
|---|---|
| **Auckland Council** | Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010. |
| **Redhills Riverhead Assessment Package** | Two Notices of Requirement (for Don Buck Road and Coatesville-Riverhead Road) and one alteration to an existing designation (Fred Taylor Drive) for the Redhills Riverhead Package of Projects for Auckland Transport. |

# 1 Executive Summary

***Assessment undertaken***

1. The assessment is based on:

- a review of the heritage databases at Auckland Council, New Zealand Archaeological Association Site Recording Scheme and Heritage New Zealand Pouhere Taonga (**HNZPT**)
- a review of historic maps
- published and unpublished publications on the history of the study area
- previously undertaken archaeological investigations and research
- landscape and environment
- oral traditions where available

2. Assessment criteria used are from:

- Heritage New Zealand Pouhere Taonga Act 2014 (**HNZPTA**)
- Resource Management Act 1991 (**RMA**)
- Auckland Unitary Plan (**AUP:OP**)

3. All cultural heritage sites, archaeological sites, and risk areas where unrecorded, sub surface archaeological features could be encountered within 200 metres of the extent of each notice of requirement (NoR) are considered as part of this assessment.

4. This assessment does not evaluate impact on Māori cultural values. Te Tupu Ngātahi have engaged with mana whenua, and Te Kawerau ā Maki has provided a Cultural Impact Assessment (CIA) which assesses the potential effects on cultural values and the landscape of Te Kawerau a Maki.

**<u>NoR RE1 Don Buck Road FTN Upgrade</u>**

**Results of assessment and recommended measures**

5. There are no recorded archaeological sites or heritage areas, structures or buildings within the extent of NoR RE1. There is a small stream area which has been modified recently and the risk of encountering undisturbed archaeological features is small. There are minor potential adverse effects on this archaeological resource from NoR RE1.

6. The potential for unrecorded archaeological deposits and features to be encountered needs to be taken into account for all earthworks that include topsoil stripping, not just within the extent of NoR RE1 but also other areas such as haul roads and laydown areas. Once the earthworks are finished there will be no effects on archaeological or heritage sites during operation of NoR RE1.

7. There is a very small risk of potential adverse effects due to encountering unrecorded archaeological sites, as the area was used by Māori for food gathering and transit. An Accidental Discovery Protocol with relevant conditions would mitigate this small risk.

8. Any processes regarding tikanga, especially around koiwi, should be discussed with Mana whenua before the start of the project.

**Conclusion**

9. In conclusion, with the proposed mitigation in place there will be no adverse effects on historic heritage and archaeology from NoR RE1.

## NoR RE2 Fred Taylor Drive FTN Upgrade

### Results of assessment and recommended measures

10. There is one recorded archaeological site within the extent of NoR RE2 but no historic areas, structures or buildings. The archaeological site R11/3097 is the crash site of a B17E bomber from 1942. The main impact area has been recently earthworked. There is a small risk that the debris field of the crash extends across Fred Taylor Drive. The area has been utilised in the pre-Contact and early Contact period and therefore there is a very small risk of unrecorded archaeological features being encountered. There is therefore the potential for small adverse effects on historic heritage and the archaeological resources by the proposed upgrade of Fred Taylor Drive as part of NoR RE2.

11. The potential for unrecorded archaeological deposits and features to be encountered needs to be taken into account for all earthworks that include topsoil stripping, not just within the extent of NoR RE2, but also other areas such as haul roads and laydown areas. Once the earthworks are finished there will be no effects on archaeological or heritage sites during operation of NoR RE2.

12. There is a small risk of potential adverse effects due to unrecorded archaeological sites being encountered. An archaeological authority would mitigate the risk of remnants of the B17E crash site including fragmented human remains (the site has been cleared at the time but due to the nature of the crash there is still a small risk of discoveries) and also any additional unrecorded archaeological sites being encountered.

13. Any processes regarding tikanga, especially around koiwi, should be discussed with Mana whenua before the start of the project.

### Conclusion

14. In conclusion, with the proposed mitigation in place, there will be no adverse effects on historic heritage and archaeology from NoR RE2.

## NoR R1 Coatesville-Riverhead Highway Upgrade

### Results of assessment and recommended measures

15. There are no recorded archaeological sites or historic areas, structures or buildings within the extent of NoR R1. The area has been utilised in the pre-Contact and early Contact period and therefore there is a very small risk of unrecorded archaeological features being encountered.

16. The potential for unrecorded archaeological deposits and features to be encountered needs to be taken into account for all earthworks that include topsoil stripping, not just within the extent of NoR R1, but also other areas such as haul roads and laydown areas. Once the earthworks are finished there will be no effects on archaeological or heritage sites during operation of NoR R1.

17. There is a very small risk of potential adverse effects due to unrecorded archaeological sites being encountered. An Accidental Discovery Protocol with relevant conditions would mitigate this small risk.

18. Any processes regarding tikanga, especially around koiwi, should be discussed with Mana whenua before the start of the project.

**Conclusion**

19. In conclusion, with the proposed mitigation in place there will be no adverse effects on historic heritage and archaeology from NoR R1.

# 2 Introduction

This heritage and archaeology assessment has been prepared for the North West Redhills and Riverhead Local Arterials Notices of Requirement (**NoRs**) for Auckland Transport (**AT**) (the "**Redhills Riverhead Assessment Package**"). The NoRs are to designate land for future strategic and local arterial transport corridors as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**) to enable the construction, operation and maintenance of transport infrastructure in the North West area of Auckland.

This report assesses the effects on cultural heritage and archaeology of the North West Redhills Riverhead Assessment Package identified in Table 2-1 below.

**Table 2-1: North West Redhills Riverhead Assessment Package – Notices of Requirement and Projects**

| Notice | Project |
|---|---|
| **NoR RE1** | Don Buck Road FTN Upgrade |
| **NoR RE2** | Fred Taylor Drive FTN Upgrade (alteration to existing designation 1433) |
| **NoR R1** | Coatesville-Riverhead Highway Upgrade |

## 2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the assessment of effects within the Redhills Riverhead Assessment Package. Its purpose is to inform the Assessment of Effects on the Environment (**AEE**) that accompanies the Redhills Riverhead Assessment Package sought by Waka Kotahi and AT.

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Redhills Riverhead Assessment Package on the existing and likely future environment as it relates to effects on heritage and archaeology 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:

a) Identify and describe the heritage and archaeological context of the Redhills Riverhead Assessment Package area;
b) Identify and describe the actual and potential effects onto heritage and archaeology of each project corridor within the Redhills Riverhead Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential effects onto heritage and archaeology (including any conditions/management plan required) for each project corridor within the Redhills Riverhead Assessment Package; and
d) Present an overall conclusion of the level of actual and potential effects onto heritage and archaeology for each project corridor within the Redhills Riverhead Assessment Package after recommended measures are implemented.

## 2.2 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each project corridor and project features within the Redhills Riverhead Assessment Package as it relates to historic heritage and archaeology.
c) Identification and description of the existing and likely future heritage landscape, separated into physical environment, Māori settlement history, European settlement history and previous archaeological projects as far as it is relevant to describe positive and adverse effects;
d) Description of the actual and potential adverse effects on heritage and archaeology of construction of each project corridor;
e) Description of the actual and potential adverse effects on heritage and archaeology of operation of each project corridor;
f) Recommended measures to avoid or mitigate potential adverse effects on heritage and archaeology; and
g) Overall conclusion of the level of potential adverse effects on heritage and archaeology of each project corridor after recommended measures are implemented.

This report should be read alongside the AEE, which contains further details on the history and context of the project. The AEE also contains a detailed description of works to be authorised for the project, 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 effects on historic heritage and archaeology. 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.

## 2.3 Preparation for this Report

Preparation for this report included desktop investigations and drive by visits. The drive by visits used only public roads and public land to get close to areas of interest pinpointed by the desktop research. Drive by visits were found sufficient for the purpose of the report and much less disruptive to landowners than site visits under Covid19 restrictions.

Sources for desktop research include:

- NZ Archaeological Association (NZAA) online site recording database Archsite
- LINZ database of historic maps and survey plans via Quickmaps
- Heritage New Zealand Heritage List/ Rārangi Kōrero
- Heritage New Zealand online reports database
- Auckland Council Geomaps GIS viewer
- Auckland Council Cultural Heritage Inventory (CHI)
- Auckland Council Archives (online resources)
- Archives New Zealand (online resources)
- Local histories – published and unpublished
- Archaeological reports
- Aerial photographs
- National Library cartographic collection
- Alexander Turnbull Tiaki online collection
- Auckland Museum pictorial collections

# 3 Assessment Methodology

## 3.1 Statutory Requirements

There are two main pieces of legislation in New Zealand that control work affecting archaeological sites. These are the HNZPTA and the RMA.

This assessment considers heritage places and archaeological sites as defined in the HNZPTA, scheduled sites in the AUP:OP, and also heritage sites that are recognised in the Auckland Council's CHI.

### 3.1.1 Heritage New Zealand Pouhere Taonga Act 2014

HNZPT administers the HNZPTA. The HNZPTA contains a consent (authority) process for any work affecting archaeological sites, where an archaeological site is defined as:

> *"6(a) any place in New Zealand, including any building or structure (or part of a building or structure), that—*
>
> *(i) was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where the wreck occurred before 1900; and*
>
> *(ii) provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand; and*
>
> *6(b) includes a site for which a declaration is made under section 43(1)"*

Any person, who intends carrying out work that may damage, modify or destroy an archaeological site, or to investigate a site using invasive archaeological techniques, must first obtain an authority from HNZPT. The process applies to sites on land of all tenure including public, private and designated land. The HNZPTA contains penalties for unauthorized site damage or destruction

The archaeological authority process applies to all sites that fit the HNZPTA definition, regardless of whether:

- The site is recorded in the NZAA Site Recording Scheme or registered by HNZPT;
- The site only becomes known about as a result of ground disturbance; and/ or
- The activity is permitted under a district or regional plan, or a resource or building consent has been granted.

HNZPT also maintains The New Zealand Heritage List Rārangi Kōrero of Historic Places, Historic Areas, Wāhi Tupuna/Tipuna, Wāhi Tapu and Wāhi Tapu Areas. The New Zealand Heritage List Rārangi Kōrero includes some significant archaeological sites. The purpose of The New Zealand Heritage List Rārangi Kōrero is to inform members of the public about such places and to assist with their protection under the RMA.

### 3.1.2 Resource Management Act 1991

The RMA promotes the sustainable management of natural and physical resources (RMA Section 2, 5(1)).

RMA Section 2, 5(2) states that:

*In this Act, **sustainable management** means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—*

*(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations*

The protection of historic heritage from inappropriate subdivision, use, and development is identified as a matter of national importance (section 6(f)).

Historic heritage is defined in section 2 of the RMA:

*(a) means those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, deriving from any of the following qualities:*

- *(i) archaeological:*
- *(ii) architectural:*
- *(iii) cultural:*
- *(iv) historic:*
- *(v) scientific:*
- *(vi) technological; and*

*(b) includes—*

- *(i) historic sites, structures, places, and areas; and*
- *(ii) archaeological sites; and*
- *(iii) sites of significance to Māori, including wāhi tapu; and*
- *(iv) surroundings associated with the natural and physical resources*

These categories are not mutually exclusive, and some archaeological sites may include above ground structures or may also be places that are of significance to Māori.

In Auckland the AUP:OP has specific provisions for historic heritage and places of significance to mana whenua. Those places of significance to mana whenua also have the potential to contain archaeological value. It is noted that scheduled historic heritage places have a stronger protection than archaeological sites that are not scheduled in the AUP:OP.

### 3.1.3 Assessment Criteria

The background for the assessment criteria used in this report has been outlined as follows:

> *"Archaeological values relate to the potential of a place to provide evidence of the history of New Zealand. This potential is framed within the existing body of archaeological knowledge, and current research questions and hypotheses about New Zealand's past. An understanding of the overall archaeological resource is therefore required" (Heritage New Zealand Pouhere Taonga 2019:9).*

The assessment criteria are split into two sections: Main Archaeological values and Additional values:

The first archaeological values look at an ***intra** (within the)* ***site*** *context.*

- **Condition**:
  How complete is the site? Are parts of it already damaged or destroyed?
  Condition varies from undisturbed to destroyed and every variation in between. It is also possible that the condition of various parts of the site varies.

- **Rarity/Uniqueness:**
  Rarity can be described in a local, regional and national context. Rarity can be rare as a site, or rarely examined or today a rare occurrence in the records.

- **Information Potential:**
  How diverse are the features to be expected during an archaeological excavation on the site?
  How complete is the set of features for the type of site?
  Can the site inform about a specific period or specific function?

The second set of archaeological values are ***inter site*** *(between sites) context* criteria:

- **Archaeological landscape / contextual value:**
  What is the context of the site within the surrounding archaeological sites?
  The question here is the part the site plays within the surrounding known archaeological sites. A site might sit amongst similar surrounding sites without any specific features. Or a site might occupy a central position within the surrounding sites. Though a site can be part of a complete or near complete landscape, whereby the value of each individual site is governed by the value of the completeness of the archaeological landscape.

- **Amenity value:**
  What is the context of the site within the physical landscape?
  This question is linked to the one above but focuses onto the position of the site in the landscape. Is it a dominant site with many features still visible or is the position in the landscape ephemeral with little or no features visible? This question is also concerned with the amenity value of a site today and its potential for onsite education.

- **Cultural Association:**
  What is the context of the site within known historic events or to people?
  This is the question of known cultural association either by tangata whenua or other descendant groups. This question is also concerned with possible commemorative values of the site.

Other values could include (Heritage New Zealand Pouhere Taonga 2019:9):

- Architectural
- Historic
- Scientific
- Technological
- Cultural

The last value, cultural, acknowledges if there is an impact on Māori cultural values. This assessment will not evaluate these, but rather state their relevance in relation to the other values. The HNZPTA requires an assessment of Maori values as part of archaeological authority applications. Generally, HNZPT prefers that such an assessment be provided by tangata whenua (Heritage New Zealand Pouhere Taonga 2019:10).

In addition, the AUP:OP (Part 1, Chapter B: 5.2.2) outlines a place as having historic heritage value if it has one or more of the following values:

Identify and evaluate a place with historic heritage value considering the following factors:

(a) historical: the place reflects important or representative aspects of national, regional or local history, or is associated with an important event, person, group of people, or with an idea or early period of settlement within New Zealand, the region or locality;

(b) social: the place has a strong or special association with, or is held in high esteem by, a particular community or cultural group for its symbolic, spiritual, commemorative, traditional or other cultural value;

(c) Mana Whenua: the place has a strong or special association with, or is held in high esteem by, Mana Whenua for its symbolic, spiritual, commemorative, traditional or other cultural value;

(d) knowledge: the place has potential to provide knowledge through archaeological or other scientific or scholarly study, or to contribute to an understanding of the cultural or natural history of New Zealand, the region, or locality;

(e) technology: the place demonstrates technical accomplishment, innovation or achievement in its structure, construction, components or use of materials;

(f) physical attributes: the place is a notable or representative example of:

(i) a type, design or style;

(ii) a method of construction, craftsmanship or use of materials; or

(iii) the work of a notable architect, designer, engineer or builder;

(g) aesthetic: the place is notable or distinctive for its aesthetic, visual, or landmark qualities;

(h) context: the place contributes to or is associated with a wider historical or cultural context, streetscape, townscape, landscape or setting.

The methodology applies to all NoRs (NoRs RE1, RE2, R1) and to both construction and operation stages.

# 4 Redhills Riverhead Assessment Package Overview

A brief summary of the Redhills Riverhead Assessment Package projects provided in Table 4-1 below.

**Table 4-1: Redhills Riverhead Assessment Package Project Summary**

| Corridor | NOR | Description | Requiring Authority |
|---|---|---|---|
| Don Buck Road FTN Upgrade | RE1 | Upgrade of Don Buck Road corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| Fred Taylor Drive FTN Upgrade | RE2 | Upgrade of Fred Taylor Drive corridor to a 30m wide four-lane cross-section providing bus priority lanes and separated active mode facilities on both sides of the corridor. | Auckland Transport |
| Coatesville-Riverhead Highway Upgrade | R1 | Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial cross-section with active mode facilities on the western side; and<br>Upgrading the northern section of the corridor to a 24m two-lane urban arterial cross-section with active mode facilities on both sides of the corridor. | Auckland Transport |

## 4.1 Physical Environment

The physical environment is low lying undulating. The study area (for all NoRs) is framed by the Ngongetepara Stream (off Brigham Creek) with the Totara Creek as a side stream and the Waiarohia Creek and Stream. The latter forms a natural boundary to the Hobsonville peninsula, called Onekiritea in pre-Contact times.

Brigham Creek and the Kumeū Stream that runs to the north of the study area forming a pathway between the Waitemata and the Kaipara harbours. The upper reaches of the Kumeū stream turn south and the study area is between these alluvium plains and the reaches of the Upper Waitemata Harbour.

The soils of the area are allophanic soils impeded (LI) (https://soils-maps.landcareresearch.co.nz/). These soils are made from volcanic materials and this is reflected by the area made from East Coast Bays formation (Mwe: sand and mudstone with mixed volcanic content), Puketoka formation (Pup: pumiceous mud, sand and gravel including alluvial deposits) and Taupo Pumice alluvium (Q1a: estuarine and swamp deposits) (Figure 4-1).

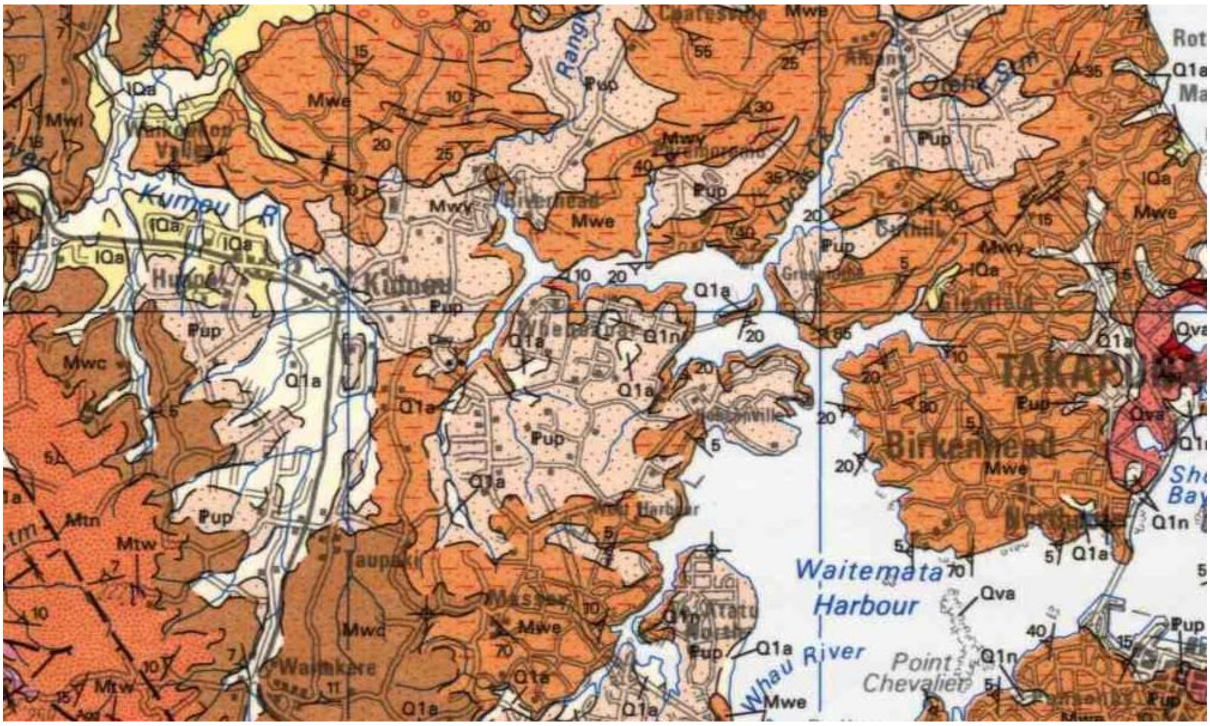



**Figure 4-1: Detail of geological map, Auckland (Copyright Crown).**

Historically the area was covered in Kauri forest like the rest of West Auckland, but with contact since European settlement this forest has given way to ‘undulating fern lands’ (Figure 4-2).

The modern use for farming and grazing shows that the volcanic content of the soils adds fertility to the general silty clay soils. The question is therefore how the area was used in pre-Contact times. The fertility of the soil would have supported growing of taro and other crops and swamps were seen as ‘food baskets’ for the availability of birds, eels and other resources like raupo. Is the observed deforestation during pre-Contact times simply a matter of burning the forest or is it a sign of horticulture that left little archaeological signatures?

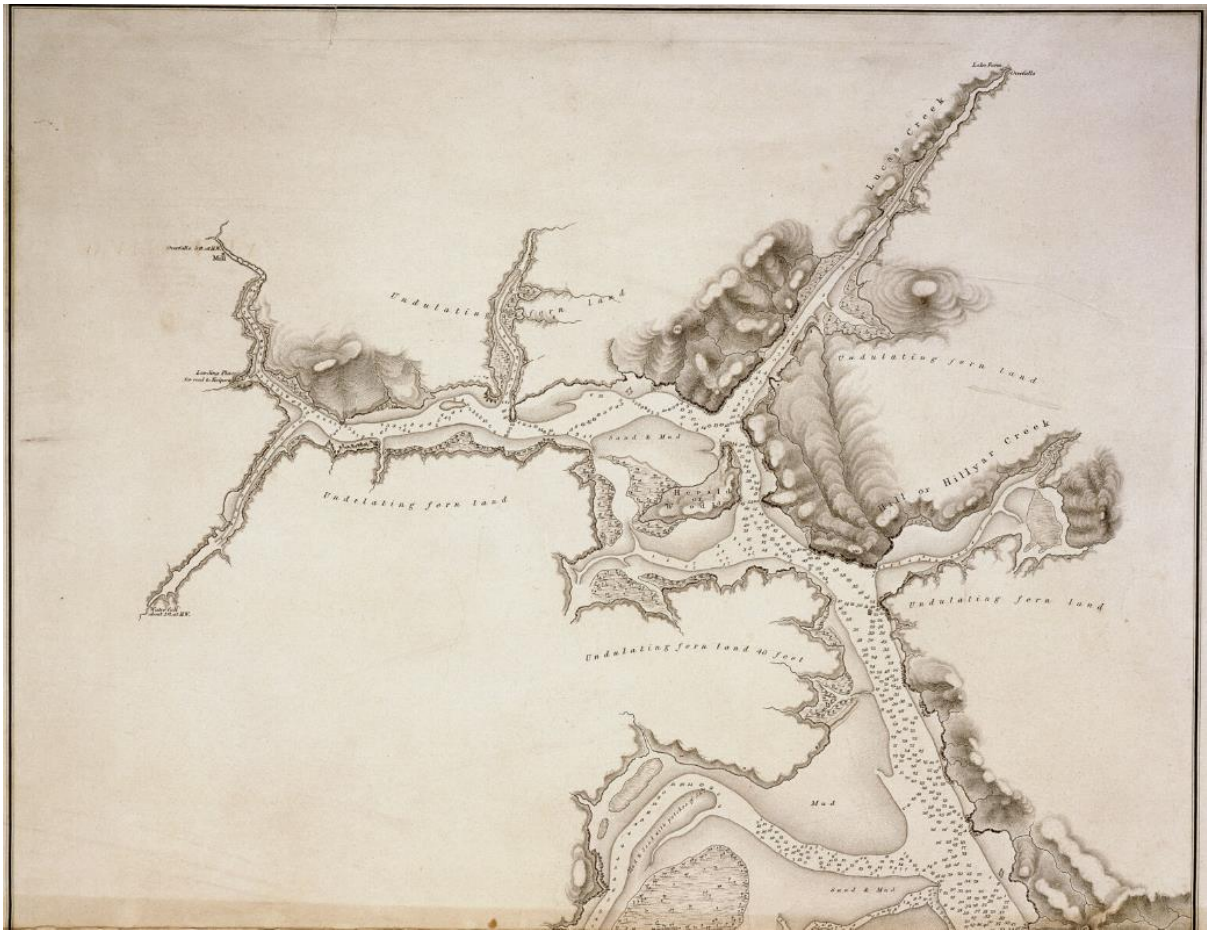



**Figure 4-2: Detail of: 'Waitemata River from Kauri Point Auckland Harbour to its sources, surveyed by Comr. B. Drury and the officers of H.M.S. Pandora 1854'-(Auckland Libraries Heritage Collections Map 3909).**

## 4.2 Pre-Contact Settlement

Whenuapai is on the cross roads for several portages between Kaipara and Waitemata Harbour and close to one of the portages between Waitemata and Manukau harbours, Ngongitepata and Te Whau (Hooker 1997). A canoe landing place on the Waitemata Harbour close to the study area is indicative of one of these pathways leading inland towards the Kaipara Harbour (Figure 4-2). The meaning of the 'Whenua pai' might be 'fertile' or 'good' land (Simmons 1980) which contradicts the view of the early European settlers of the land being of poor quality as it is low lying, often flooded and clay soils (Rutherford 1940). An alternative, possibly older Māori name of the area is Waimarie which could be translated as 'calm water' (Simmons 1980). Most recorded archaeological sites are along the harbour or creek edges indicating that exploitation of kai moana was an important food source.

Like most places in Tāmaki Makaurau many different iwi have a relationship with the place. Te Kawerau, Wai o Hua and Ngāti Whātua and their many hāpu had a particular influence in the study area. The most recent of these inter tribals conflicts was attacks by Ngāpuhi under Hongi Heke. Armed with muskets they inflicted a defeat on Ngāti Whātua as utu for being defeated in the previous century. For some years few people lived in the district as Ngāpuhi did not establish settlements[1].

[1] https://www.kaiparamoana.com/k-rero-o-mua-our-history

One of the first visits by a European to the area was by Samuel Marsden in 1820 who reported that plenty of food was around the Kaipara. Ngāti Whātua settlements near Kumeū are reported for this period (Dunsford 2002; Stone 2001). A land claim map from 1867 might indicate one of the areas of settlement (see figure below).


**Figure 4-3: Detail of ML533, 1867, shows an area of a Maori claim along the stream called Turakiawatea. The red line indicates the area taken for the railway. This includes the area of Kumeū. It seems possible that one of the pre-Contact settlements was located within the area.**

## 4.3 Post Contact Settlement

For a short moment in time Governor Hobson considered Hobsonville as an area to start the Auckland settlement (Foster and Felgate 2011).

Between 1844 and 1865 pre-emptive waiver transactions, Crown purchases and Native Land Court sales reduced Māori customary land occupation in the Kaipara area to about a third[2].

The Waiparera Block is close to the study area. It was sold to the Crown in 1853 (Turton 1877). It is one example how the land changed hands. Brigham's land claim and later Crown Grant in 1857 is another example. Brigham's Creek is named after this land speculator.

Dense Kauri forest within the Kumeū area and throughout the Waitakere Ranges drew European commerce into the area. Within a few decades all timber able to be milled was cut down (Morris 1996). Gum diggers followed the timber mills, but little is known of this activity through historic sources.

Towards the end of the 19th century the clay on the Hobsonville peninsula and surrounding areas was used for brick and pipe works which supplied the growing Auckland with this valuable building resource.

## 4.4 Archaeological Background

The NZAA Site Record Scheme has several site records close to the study area. It is mainly coastal shell midden and a few early historic structures. Historic structures including historic houses are recorded in the CHI. Several sites from both these databases are scheduled in the AUP:OP.

Each NoR has been buffered by 200 metres and all recorded historic sites as well as archaeological site potential are discussed individually in relation to these individual buffer zones. The following figures show the previously recorded archaeological sites on ArchSite (the NZAA Site Recording Scheme online), on CHI (Cultural Heritage Inventory of the Auckland Council online) and the relevant sites only in relationship to the 200m buffers of all NoRs discussed in this report (the study area).

2 https://www.kaiparamoana.com/wai312-claim-to-settlement

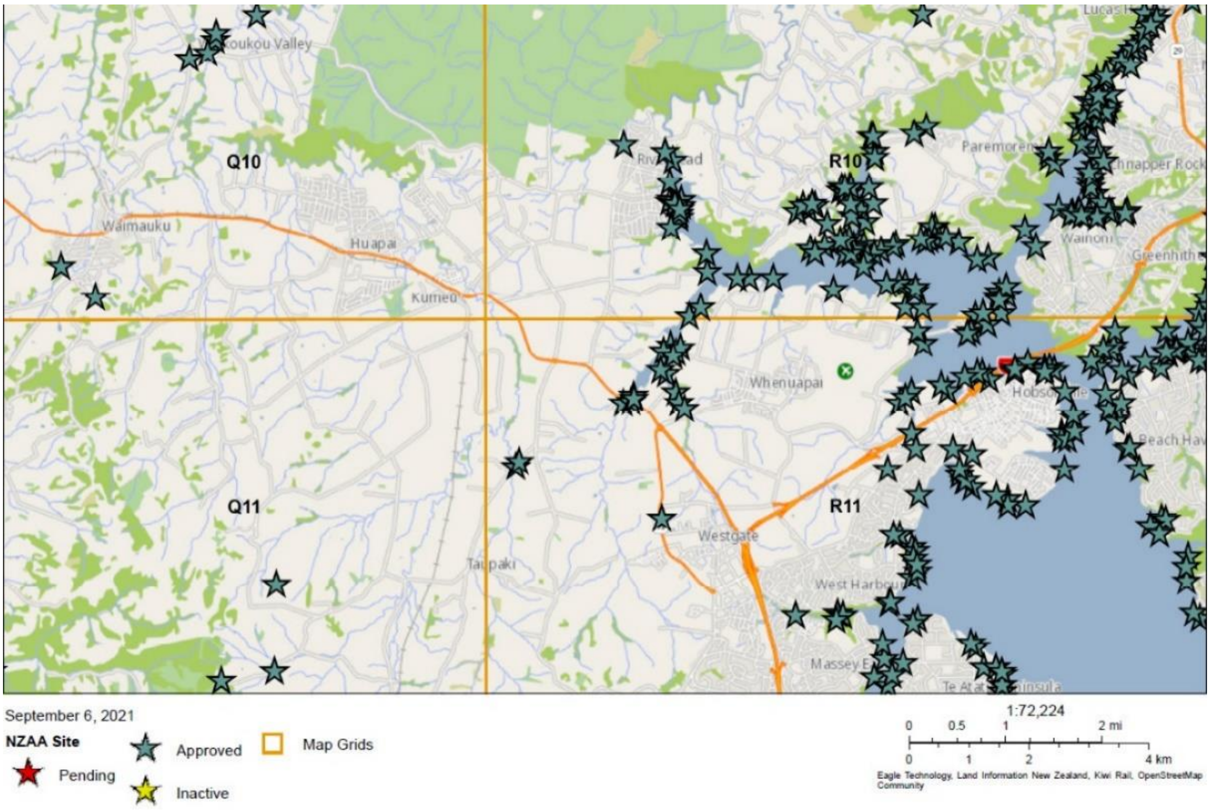



Figure 4-4: Archsite site distribution in the vicinity of the study area.

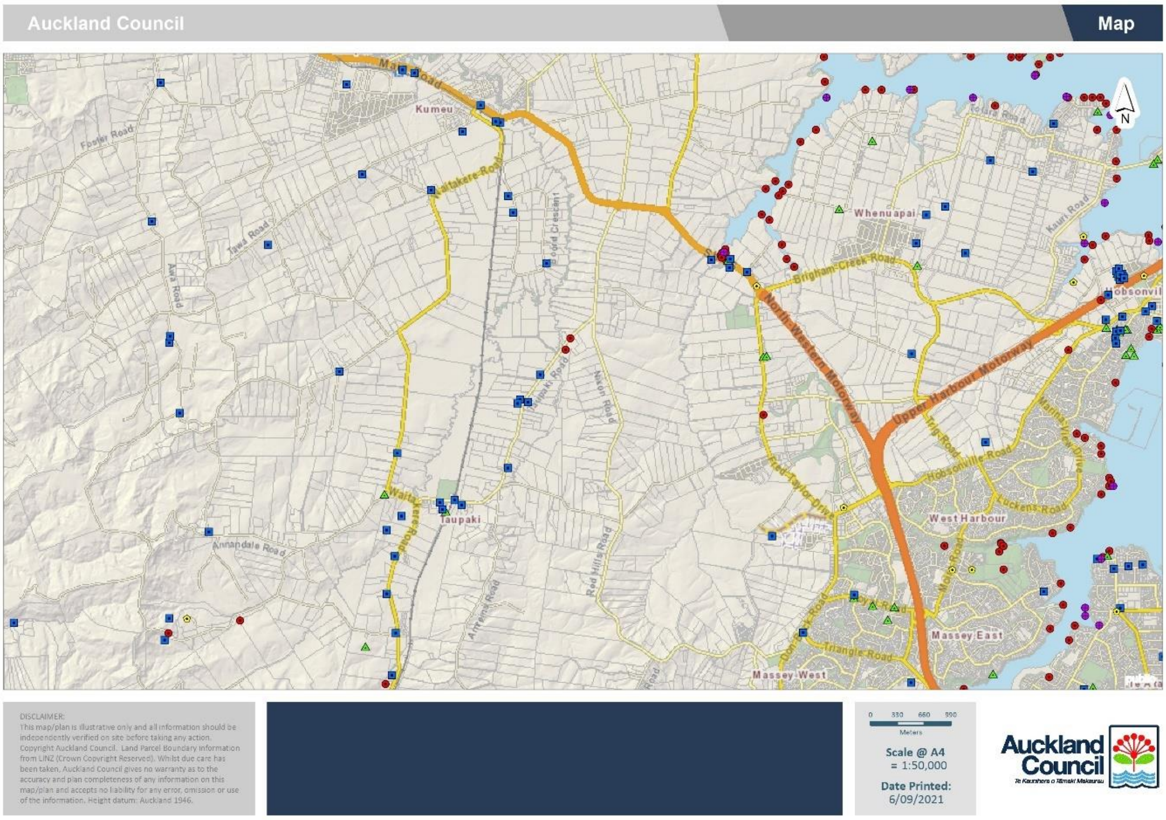



Figure 4-5: CHI sites in the vicinity of the study area.

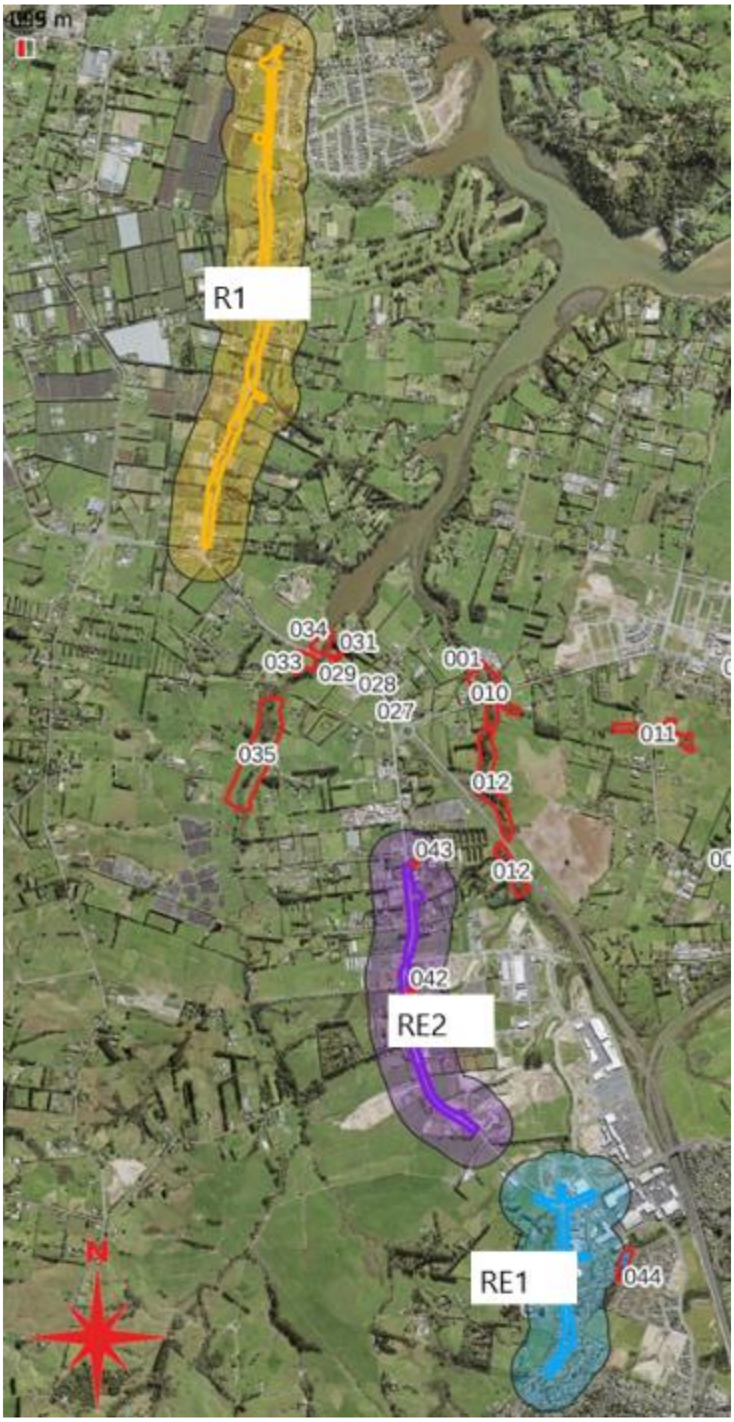



**Figure 4-6: NoRs corridors (RE1, RE2, RE3 in various colours) with 200m buffer zones (hatched areas surrounding NoR corridors), all heritage sites (numbered 042 and 043) and high risk area (numbered 044) within these buffer zones.**

Details of the sites and the risk areas are discussed within each NoR (see below).

## 4.5 Previous Archaeological Investigations

A number of assessments and monitoring exercises have taken place in the area between Hobsonville and Kumeū (see bibliography (Macready 2019)). Only a handful of these projects added anything significant to our knowledge of the study area (Foster and Felgate 2011; Hawkins and Campbell 2020; Shackles 2019).

Investigations of site damages to a few shell midden along the northern coastline along Hobsonville showed a long occupation history using continuous kai moana exploitation (Shackles 2019).

Another investigation focused on the homestead and its development of one of the early settlers in the area, the Ocklestones (Foster and Felgate 2011). It paints a vivid picture of the changes and continuations of the rural life on the edge of Auckland, which is today replaced by suburbia. The 1940 aerial shows the study area dominated by orchards and grazing (Figure 4-7).

A similar case study was undertaken during moving a heritage house from its original position (Hawkins and Campbell 2020).

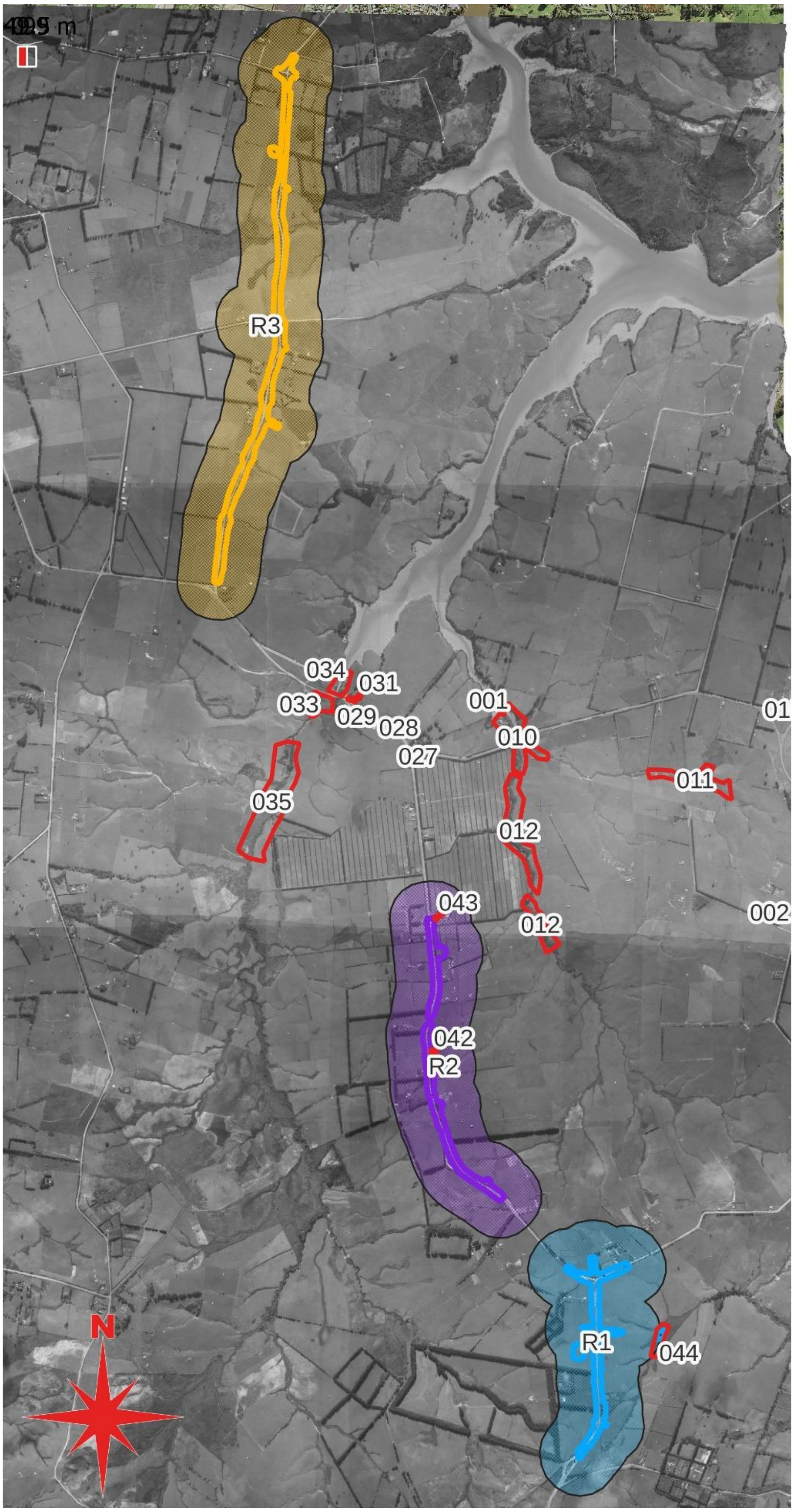



**Figure 4-7: Rural character of the study area in 1940. Many shelterbelts of orchards can be seen as well as large areas of grazing.**

# 5 Positive Effects

The nature of historic heritage, especially archaeological features, recorded and unrecorded, is that all disturbances including construction has a negative effect that cannot be remediated only mitigated.

Nonetheless construction around wetlands and streams will allow environmental archaeological research to be undertaken that could clarify the dates, sequence and details of the anthropogenic vegetation change from forest to open fern lands.

Any pre-Contact horticulture like frequent harvesting of fern root rhizomes or taro fields has not been observed in the study area. Large linear developments like the proposed transport corridors are a rare opportunity to close this gap in our knowledge.

# 6 NoR RE1: Don Buck Road FTN Upgrade

It is proposed to submit a NoR (NoR RE1) to designate the land required to implement the upgrade of Don Buck Road to a four-lane local arterial with bus priority lanes and separated cycle lanes and footpaths on both sides of the corridor.


Figure 6-1: Overview of the Don Buck Road FTN Upgrade

## 6.1 Project Corridor Features

Don Buck Road is an existing two-lane arterial extending from Fred Taylor Drive in the north to Swanson Road and Universal Drive in the south. The extent of the proposed upgrade included is from Fred Taylor Drive in the north and Royal Road to the south. The corridor currently functions as a north-south arterial road running parallel to SH16 and is anticipated to facilitate future growth in Redhills, whilst also connecting people to rapid transit stations, regional active mode corridors and the SH16 motorway interchanges. The corridor is also intended to support active modes, freight, and public transport priority for the future FTN network.

This section of Don Buck Road is proposed to be upgraded from a corridor width of 27-35m to a 30m wide four-lane local arterial with buses priority lanes and separated cycle lanes and footpaths on both sides of the corridor. Intersections located along the corridor are proposed to be signalised.

An overview of the proposed design is provided in Figure 6-1 below. Furthermore, an overview of the proposed form and function is set out in Table 6-1 below.

## 6.2 Existing and Likely Future Environment

### 6.2.1 Planning context

The land adjacent to Don Buck Road is comprised of various business, residential and open space zoning. The following outlines the key elements of the planning context for the Don Buck Road FTN Upgrade:

- The eastern side of Don Buck Road above Westgate Drive is zoned under the AUP:OP as Business – Light Industry. To the south of Westgate Drive, the eastern side of Don Buck Road contains an Open Space – Community Zone (occupied by Massey Leisure Centre), with the remaining land zoned as Residential – Mixed Housing Zone.
- The western side of Don Buck Road is within the I610 Redhills Precinct and is predominantly zoned Residential – Mixed Housing Urban, with a portion of land in the northern section of the corridor zoned Residential – Terraced Housing and Apartment Buildings Zone (**THAB**). Land further to the west of Don Buck Road forms part of the Redhills Precinct.

Table 6-1 below provides a summary of the existing and likely future environment as it relates to the Don Buck Road FTN Upgrade.

**Table 6-1: Don Buck Road FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[3] | Likely Future Environment[4] |
|---|---|---|---|
| Urban (Business) | Business (Industrial) | Low | Urban (Business) |
| Urban (Residential) | Residential – Mixed Housing Urban Zone<br>Residential – Terraced Housing and Apartment Zone | Low | Urban (Residential) |
| Open Space | Open Space – Community Zone | Low | Open Space |

### 6.2.2 Heritage Environment

This section describes in detail the heritage features within a 200 m buffer of NoR RE1.

[3] Based on AUP:OP zoning/policy direction
[4] Based on AUP:OP zoning/policy direction

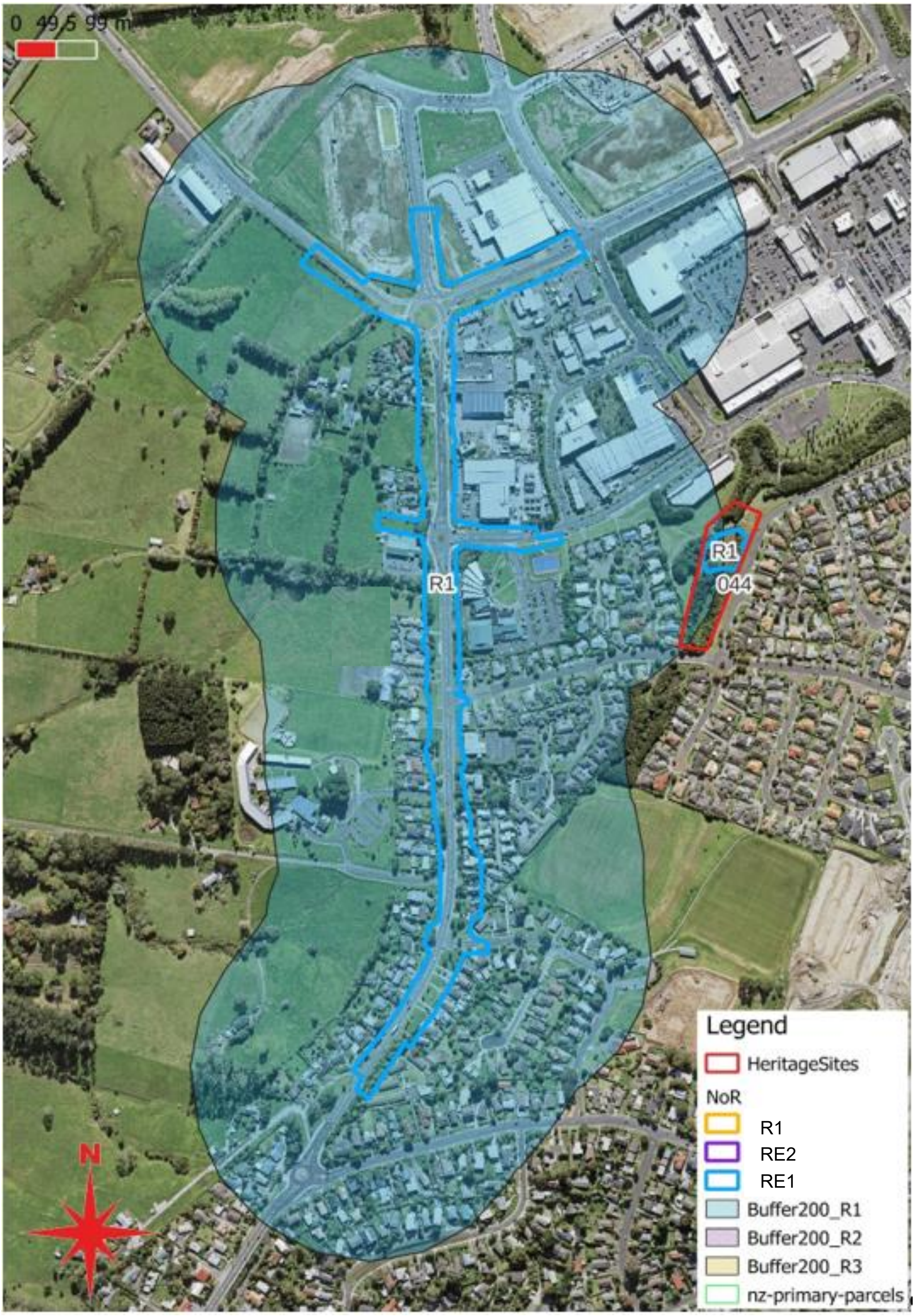



**Figure 6-2: NoR RE1. The risk area around the stream is shown as 044. The picture also shows the 200 m buffer zone around the NoR of the road.**

Within NoR RE1 and the 200 m buffer zone no archaeological sites are recorded. No notable trees are recorded in this part of the study area, nor are any historic overlays, structures or buildings recorded in the AUP:OP or the CHI.

The only heritage item within the study area of NoR RE1 is a possible risk zone whereas yet unrecorded archaeological features may be encountered around a small stream / wetland identified above. However, the site visit and the comparison of the modern aerial to the 1940 aerial shows that major modifications of the stream and surrounding the stream have taken place. It is therefore less likely that any intact archaeology would have survived those modifications.

Overall, there is little risk that any cultural heritage or archaeology will be encountered within or close to NoR RE1.


**Figure 6-3: Risk area 044 overlaid onto a modern aerial.**

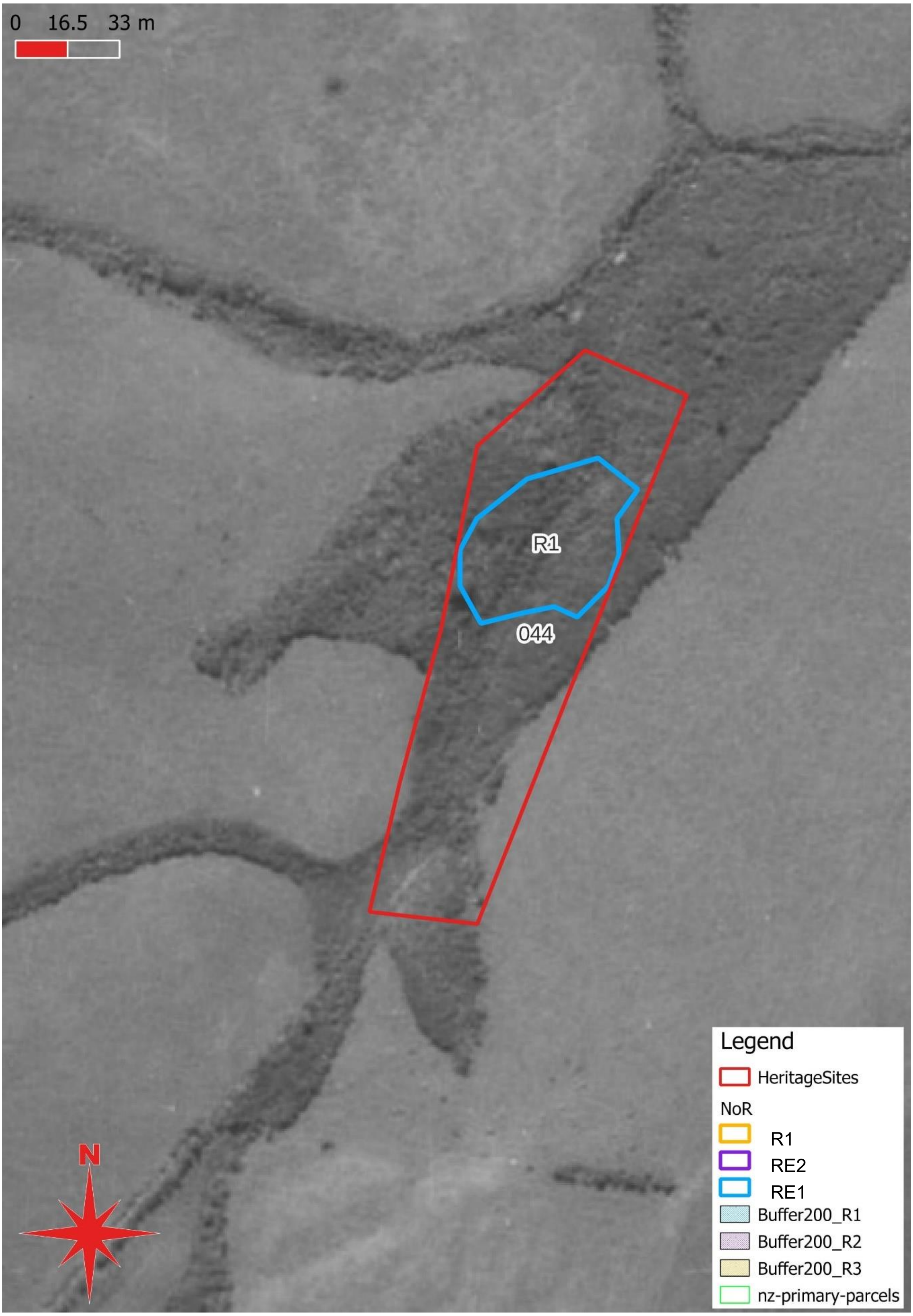



**Figure 6-4: Risk area 044 overlaid onto the 1940 aerial. It shows a largely unmodified wetland and small stream surrounded by grazing fields.**

Figure 6-5: View onto largely modified park area looking towards risk area 044. It shows the highly modified nature of the modern environment.

## 6.3 Assessment of Effects on Historic Heritage and Archaeology and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

### 6.3.1 Assessment of Construction Effects and Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

There are no actual adverse effects on historic heritage or archaeology as there are no archaeological sites recorded within NoR RE1 or within the 200 m buffer zone.

However, there is always a small risk that archaeological features may be encountered in an area that we know has been utilised by Māori in the past, especially so close to the upper Waitemata Harbour, particularly around the small stream/wetland mentioned above.

An induction of all earthwork contractors to the signs of archaeological features and preparation and implementation of an Accidental Discovery Protocol with input by mana whenua would mitigate any potential adverse effects.

It is recommended that all areas of earthworks or topsoil stripping undertaken during construction are included in the Accidental Discovery Protocol.

### 6.3.2 Assessment of Operational Effects and Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

There are no adverse effects which will arise as a result of operation of NoR RE1.

No measures are recommended to avoid operational effects as there are no adverse effects.

## 6.4 Conclusions

In conclusion there are no actual adverse effects on historic heritage or archaeology from NoR RE1.

The small risk of potential adverse effects as a result of unrecorded archaeological features being discovered during construction can be mitigated by an induction of all earthwork contractors to the signs of archaeological features and the preparation and implementation of an Accidental Discovery Protocol.

Any processes regarding tikanga, especially around koiwi, should be discussed with Mana whenua before the start of the project.

# 7 NoR RE2: Fred Taylor Drive FTN Upgrade

It is proposed to submit a NoR (NoR RE2) to designate the land required to implement the upgrade of Fred Taylor Drive to a four-lane corridor with separated walking and cycling facilities.

## 7.1 Project Corridor Features

Fred Taylor Drive is an existing two-lane arterial corridor which extends from the existing Brigham Creek Interchange in the north to SH16 in the south (via an intersection with Don Buck Road). This corridor runs through a mix of residential and industrial land uses and forms an important connection as the spine of the Redhills network.

It is proposed to upgrade the corridor between Hailes Road and Dunlop Road to accommodate a 30m wide four-lane FTN arterial with separated walking and cycling facilities[5]. The existing corridor designation is approximately 30m wide on average, with the proposed upgrade expected to remain within the existing designation 1433 to the extent possible with localised widening occurring at intersections. The Fred Taylor Drive FTN Upgrade also includes the upgrade of the intersections with Kakano Road and Northside Drive to signals.

The upgraded Fred Taylor Drive corridor will have multiple purposes. These are to provide access from Redhills to both a future rapid transit station and the strategic highway network; and the FTN facilities will provide a multimodal corridor into Westgate metropolitan centre. The proposed corridor will also support an active mode shift with separated cycle lanes and footpath on both side and public transport priority lanes. An overview of the proposed design is provided in Figure 7-1 below.

Figure 7-1: Overview of Fred Taylor Drive FTN Upgrade

[5] The Fred Taylor Drive FTN Upgrade has an interdependency with the North West Strategic Transport Network, therefore the portion of Fred Taylor Drive north of Hailes Road forms part of the upgrade to Brigham Creek Interchange.

## 7.2 Existing and Likely Future Environment

### 7.2.1 Planning context

The northern section of Fred Taylor Drive is within the Redhills North FUZ, with an area of land zoned under the AUP:OP as Open Space – Sport and Active Recreation Zone (Fred Taylor Park) adjacent the road corridor. The southern section of Fred Taylor Drive is zoned under the AUP:OP as THAB zone on the western side, and forms part of the I610 Redhills Precinct. The eastern side is zoned Business – Light Industry Zone and Business – Mixed Use Zone and forms part of the I615 Westgate Precinct.

Table 7-1 below provides a summary of the existing and likely future environment as it relates to the Fred Taylor Drive FTN Upgrade.

**Table 7-1: Fred Taylor Drive FTN Upgrade Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[6] | Likely Future Environment[7] |
|---|---|---|---|
| Business | Business (Light Industrial) | Low | Urban (Business) |
| | Business (Mixed Use) | Low | |
| Residential | Residential – Terraced Housing and Apartment Zone | Low | Urban (Residential) |
| Open Space | Open Space – Sport and Active Recreation | Low | Open Space |
| Undeveloped greenfield areas | Future Urban | High | Urban |

### 7.2.2 Heritage Environment

This section describes in detail the heritage features within a 200 m buffer of NoR RE2.

[6] Based on AUP:OP zoning/policy direction
[7] Based on AUP:OP zoning/policy direction

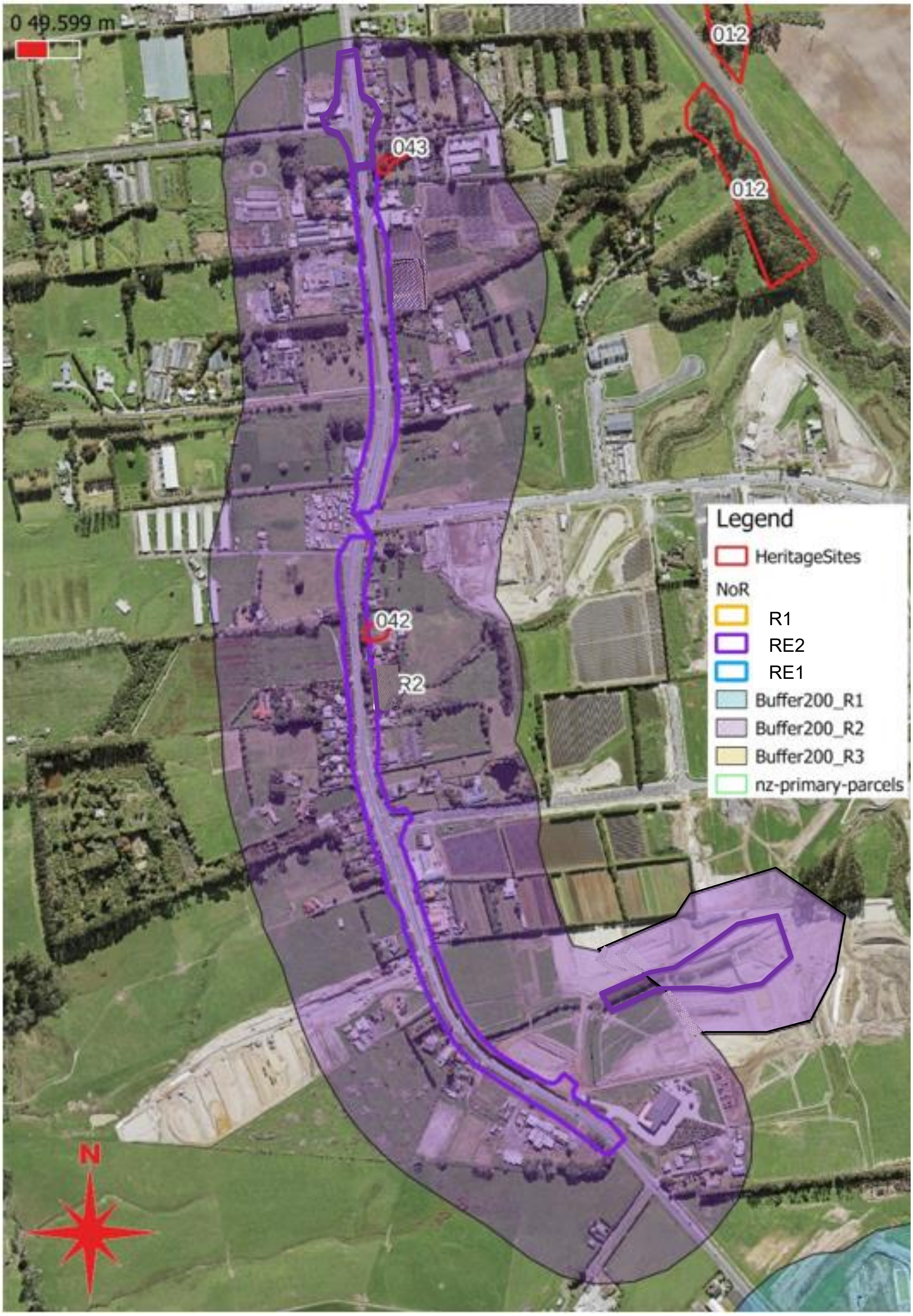



**Figure 7-2: NoR RE2 and 200 m buffer zone. The figure also shows two trees (043) recorded in the CHI and one archaeological site (042).**

Within NoR RE2 and the 200 m buffer zone one archaeological site (042) is recorded (R11/3097; CHI#20445). No notable trees are recorded in this part of the study area, nor are there any historic overlays, structure or buildings recorded in the AUP:OP. Two trees (043) are recorded in the CHI (#2164 and 2165).

The archaeological site is a post 1900 site and refers to the crash site of a B17 bomber during WWII (Figure 17 to 22). The main area of the crash site has been subject to large scale earthworks. Nothing is visible on the surface anymore from the remaining debris field.

The possible extent of the site R11/3097 is explained in the CHI 20445 record:

*"Site of crash of USAAF Boeing B-17 Flying Fortress reg. no. 41-2667 on June 9, 1942. As the aircraft bellied before eventually coming to rest the crash site extended over a considerable distance over 81-85 and 89 Fred Taylor Drive and the Kopupaka reserve. The force of the impact and subsequent explosion reportedly blew large pieces of debris, including one of the bombs, around a quarter of a mile away from where the aircraft came to rest across what is now Fred Taylor Drive. The main debris field and bomb crater were located at 81 Fred Taylor drive."*

The important part of this description is that the debris field crossed Fred Taylor Drive and is therefore much larger than the recorded extent of the site R11/3097. Elements of this debris field could still be within the road or in close vicinity to the road and therefore within NoR RE2. Nonetheless the main debris field has recently been developed and there is no archaeology left in the ground.

Details of this development can be found here:

Bickler, S., 2019, 81 *Fred Taylor Drive, Archaeological Assessment of Effects*. Unpublished report for NZRPG Management Ltd, Auckland.

Fragmented human remains of the 11 crew and passengers could be possibly found along the entire debris field.

Overall there is little risk to encounter any cultural heritage or archaeology within or close to the NoR RE2, apart from the risk to encounter a small part of the debris field of the B17 crash site which could include fragmented human remains. Despite the clean-up efforts at the time, due to the nature of the crashit is possible not all human remains were found and collected.

Figure 7-3: Two trees recorded as CHI 2164 and 2165. They are not on the notable tree list of the AUP:OP.


**Figure 7-4: Recorded crash site of a B17 bomber (042).**


Figure 7-5: Crash site overlaid onto 1940 aerial, two years before the crash occurred.


Figure 7-6: Photo from the inquiry into the crash showing the extent of the debris field (CHI archives).


Figure 7-7: View onto the crash site from the ground (CHI archives).


**Figure 7-8: Marked up view over the debris field used for the official inquiry into the crash (CHI archives). It clearly shows that the debris field extends across Fred Taylor Drive.**

**Figure 7-9: Large scale earthworks over the archaeological site to the east of Fred Taylor Drive. There is nothing left of the archaeological site on the eastern side of the road.**

## 7.3 Assessment of Effects on Historic Heritage and Archaeology and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

### 7.3.1 Assessment of Construction Effects and Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

There are no actual adverse effects on historic heritage or archaeology.

However, there is a potential risk that elements of the debris field of a B17E bomber crash site from 1942, including fragmented human remains, could be encountered.

There is also always a small risk that additional archaeological features could be encountered in an area that we know has been utilised by Māori in the past, especially so close to the upper Waitemata Harbour.

Induction of all earthwork contractors to the signs of archaeological features, especially relating to the B17 crash site, preparation and implementation of an Accidental Discovery Protocol with input by mana whenua, and a precautionary archaeological authority would mitigate the potential adverse effects.

It is recommended that all areas of earthworks or topsoil stripping during construction are included in the Accidental Discovery Protocol.

The archaeological authority under the HNZPTA would mitigate the potential loss of heritage value of the remaining debris field of the crash site of a B17 bomber which is of local significance and linked to important worldwide events (WWII).

### 7.3.2 Assessment of Operational Effects and Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

There are no adverse effects which will arise as a result of operation of NoR RE2.

No measures are recommended to avoid operational effects as there are no adverse effects.

## 7.4 Conclusions

In conclusion there are no actual adverse effects on historic heritage or archaeology from NoR RE2.

The small risk of potential adverse effects can be mitigated by induction of all earthwork contractors to the signs of archaeological features, an Archaeological Authority relating to site R11/3097 and as yet unknown archaeological features, and the preparation and implementation of an Accidental Discovery Protocol.

Any processes regarding tikanga, especially around koiwi, should be discussed with Mana whenua before the start of the project.

# 8 NoR R1: Coatesville-Riverhead Highway Upgrade

It is proposed to submit a NoR (NoR R1) to designate the land required to implement the upgrade of Coatesville-Riverhead Highway to a two-lane rural arterial corridor in the southern section and an urban arterial corridor in the northern section, with separated walking and cycling facilities along the entire corridor length.

## 8.1 Project Corridor Features

Coatesville-Riverhead Highway is an existing arterial extending from SH16 in the south to its intersection with Dairy Flat Highway in the north east, with the extents of the proposed upgrade from SH16 in the south to its intersection with Riverhead Road in the north. The southern section of the alignment from SH16 to Short Road runs through rural land uses which are expected to remain. The northern section (close to and within the Riverhead township) runs through low-medium density residential land uses on the east and future urban zoned land on the west.

The Coatesville-Riverhead Highway Upgrade Project involves:

- Upgrading the southern section of the corridor to a 33m two-lane low speed rural arterial with active mode space on the western side; and
- Upgrading the northern section of the corridor to a 24m two-lane urban arterial with walking and cycling facilities on both sides of the corridor.

It includes upgrades to the intersections with Old Railway Road and Riverhead Road and is expected to tie in with a future roundabout at SH16 as part of the Waka Kotahi NZTA SH16 Safety Improvements Project.

The proposed upgrade will provide a key north-south connection from Riverhead to the strategic road network and proposed Rapid Transit Corridor[8] and City Centre to Westgate rapid transit services[9] at Westgate. Furthermore, the upgrades will support active mode use and reduce safety risks on the corridor.

An overview of the proposed design is provided in Figure 8-1 below.

[8] A North West Strategic Package Project

[9] Other proposed transport project not being delivered by Te Tupu Ngātahi

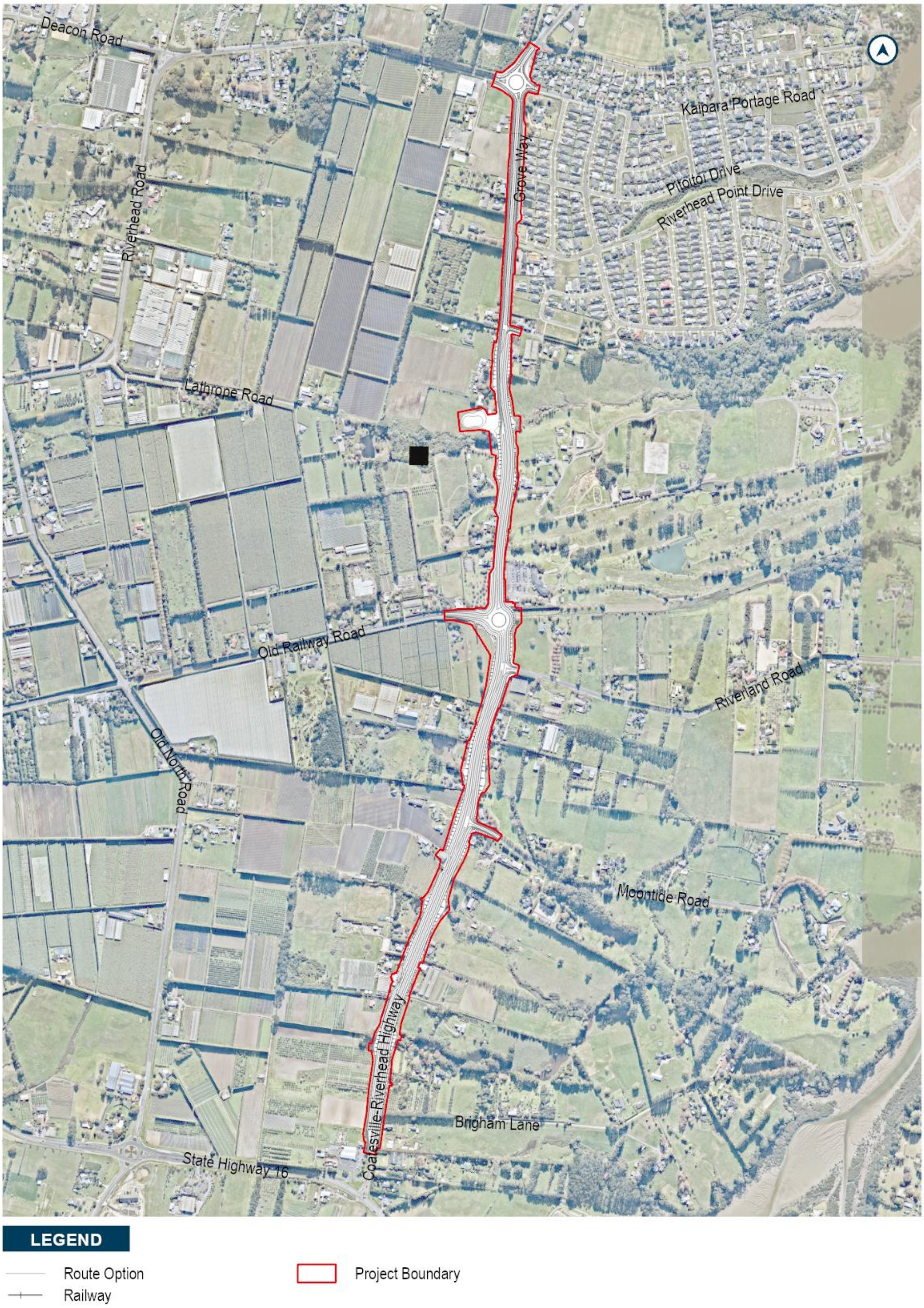



**Figure 8-1: Overview of the Coatesville-Riverhead Highway Upgrade**

## 8.2 Existing and Likely Future Environment

### 8.2.1 Planning context

The southern section of Coatesville-Riverhead Highway from SH16 to Short Road runs through rural land uses predominantly zoned under the AUP:OP as Rural – Mixed Rural Zone on both sides of the existing corridor. The northern section (close to and within the Riverhead township) runs through land zoned as Residential – Single House Zone and to the east and future urban zoned land on the west.

Table 8-1 below provides a summary of the North West existing and likely future environment as it relates to the Coatesville-Riverhead Highway Upgrade.

**Table 8-1: Coatesville-Riverhead Highway  Existing and Likely Future Environment**

| Environment today | Zoning | Likelihood of Change for the environment[10] | Likely Future Environment[11] |
|---|---|---|---|
| Rural | Rural | Low | Rural |
| Residential | Residential | Low | Urban (Residential) |
| Future Urban Zone / Undeveloped greenfield areas | Future Urban | High | Urban |

### 8.2.2 Heritage Environment

This section describes in detail the heritage features within a 200 m buffer of the NoR area.

[10] Based on AUP:OP zoning/policy direction
[11] Based on AUP:OP zoning/policy direction

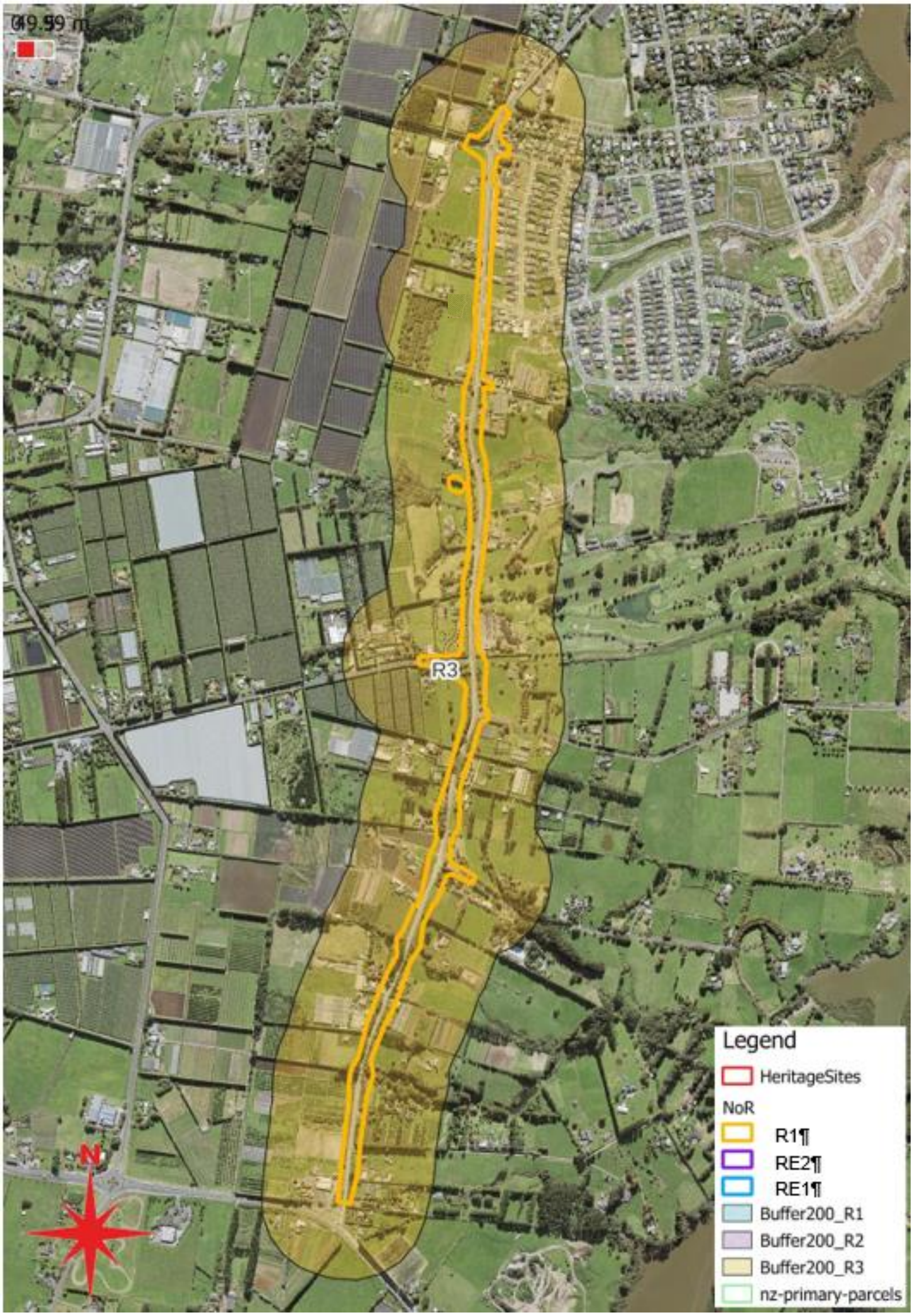



**Figure 8-2: Extent of NoR R1 and 200 m buffer zone. No heritage sites and no high risk areas are within the NoR or the buffer zone or in the vicinity.**

There are no recorded archaeological sites or historic overlays recorded in the AUP:OP. No CHI sites are shown either.

An early map of the harbour survey (Figure 4-2) shows a canoe landing area, presumably the start of an “ara” (pathway) from the upper harbour to the Kumeū River (Figure 8-3). This potential pathway would cross NoR R1. Nonetheless pathways are rarely recognised in the archaeological record.


**Figure 8-3: On the right-hand side of the picture a small creek of the upper harbour is shown. This is the location of a canoe landing. Any potential pathway would lead west towards the Kumeū River.**

## 8.3 Assessment of Effects on Historic Heritage and Archaeology and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

### 8.3.1 Assessment of Construction Effects and Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

There are no actual adverse effects on historic heritage or archaeology.

However, there is always a small risk that archaeological features may be encountered in an area that we know has been utilised by Māori in the past, especially so close to the upper Waitemata Harbour.

An induction of all earthwork contractors to the signs of archaeological features and the preparation and implementation of an Accidental Discovery Protocol with input by mana whenua would mitigate the potential adverse effects.

### 8.3.2 Assessment of Operational Effects and Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

There are no adverse effects which will arise as a result of operation of NoR R1.

No measures are recommended to avoid operational effects as there are no adverse effects.

## 8.4 Conclusions

In conclusion there are no actual adverse effects on historic heritage or archaeology from NoR R1.

The small risk of potential adverse effects from accidentally discovering archaeological features can be mitigated by an induction of all earthwork contractors to the signs of archaeological features and the preparation and implementation of an Accidental Discovery Protocol.

Any processes regarding tikanga, especially around koiwi, should be discussed with Mana whenua before the start of the project.

# 9 Conclusion

There are no actual adverse effects of NoR RE1, RE2 and R1 on historic heritage or recorded archaeological sites.

The footprint of the recorded archaeological site R11/3097 could possibly extend into NoR RE2. To mitigate this potential adverse effect, it is recommended that a precautionary archaeological authority is obtained to record any element of the crash site including potentially fragmented human remains that might be discovered in NoR RE2.

The areas surrounding both NoRs RE1 and R1 were utilised in pre-Contact and early Contact periods and there is always a slim probability that archaeological features might be discovered. An Accidental Discovery Protocol is recommended as mitigation. The induction of all earthwork contractors should be part of this Accidental Discovery Protocol.

There are no residual historic heritage or archaeological adverse effects with the recommended mitigation processes in place.

# 10 References


Druskovich, Brent. 2016. *Archaeological Monitoring and Analysis at the Former Sinton House, 238 SH 16 Kumeu - RII/2828*. Auckland.

Dunsford, D. 2002. *Doing It Themselves: The Story of Kumeu, Huapai and Taupaki*. Auckland: Publishing Press Ltd.

Foster, Russell, and Matthew Felgate. 2011. *Archaeological Investigation of Field Cottage and Ocklestone House*. Auckland.

Hawkins, Stuart, and Matthew Campbell. 2020. *120 Hobsonville Road, R11/2965 (HNZPTA Authority 2019/697): Final Report*. Auckland.

Heritage New Zealand Pouhere Taonga. 2019. *Archaeological Guidelines Series No.2: Guidelines for Writing Archaeological Assessments.* Wellington. http://www.heritage.org.nz/protecting-heritage/archaeology/archaeological-guidelines-and-templates.

Hooker, B. 1997. “Portages of Early Auckland.” *Auckland Waikato Historical Journal* 70: 26–31.

Macready, Sarah. 2019. *SH16 IMPROVEMENTS, BRIGHAM CREEK TO WAIMAUKU: PRELIMINARY ARCHAEOLOGICAL ASSESSMENT*. Auckland.

Morris, M. 1996. *Horses and Flying Fortresses*. Auckland: M.Morris.

Rutherford, J., ed. 1940. *The Founding of New Zealand: The Journals of Felton Mathew, First Surveyor-General of New Zealand, and His Wife, 1840-1847*. Dunedin: A.H. and A.W. Reed.

Shackles, Richard. 2019. *COASTAL WALKWAY SUNDERLAND-HUDSON PRECINCT, HOBSONVILLE POINT: ARCHAEOLOGICAL MONITORING AND INVESTIGATION REPORT*. Auckland.

Simmons, David R. 1980. “George Graham’s Maori Place Names of Auckland.” *Rec. Auckland Inst. Mus.* 16: 11–39.

Stone, Russell C J. 2001. *From Tamaki-Makau-Rau to Auckland*. Auckland: Auckland University Press.

Turton, H Hanson. 1877. *Maori Deeds of Land Purchases in the North Island of New Zealand.* Wellington: Government Printer.

# ATTACHMENT 65

## CULTURAL IMPACT ASSESSMENT

# CULTURAL IMPACT ASSESSMENT

**FOR**

# TE TUPU NGĀTAHI NORTH WEST PROJECT (LOCAL AND STRATEGIC TRANSPORT NETWORK)

**PREPARED FOR**

# TE TUPU NGĀTAHI

**DECEMBER 2022**



Ref. TKITT000054

**Te Kawerau Iwi Tiaki Trust**
PO Box 59-243 Mangere Bridge Auckland
www.tekawerau.iwi.nz

TE KAWERAU A MAKI

*"Kawerau Iwi, Kawerau Mana, Kawerau Tangata"*

| | | | |
|---|---|---|---|
| Report No. | TKITT000054 | | |
| Prepared by: | Edward Ashby | Mana Taiao Manager | |
| Date of issue: | 07 December 2022 | | |
| Revision: | Version 2 | | |

# EXECUTIVE SUMMARY

The North West Project proposes to upgrade and develop new sections of the local and strategic transport network extending from Whenuapai through Westgate and Brigham Creek to Waimauku. A significant element of the project is the Alternative State Highway (ASH) from Brigham Creek to western Huapai. The project sits within and across an important cultural landscape at the crossroads between the Hikurangi, Waitematā, and Kaipara Valley takiwa. It is the northern part of Te Kawerau ā Maki's heartland and contains a number of significant cultural sites and resources from our most ancient traditions through to our major Treaty settlement redress. A total of 51 cultural sites and resources were identified across the wider project area. The project was assessed against these sites and resources resulting in the documenting of eight significant adverse effects, 15 minor adverse effects, three negligible adverse effects, one potential significant beneficial effect*, one minor beneficial effect*, and 25 neutral effects. Where adverse effects were identified offsets (or further mitigation) were suggested. The significant adverse effects relate to the removal of productive topsoil, impacts to fresh water (including the taniwha), impacts to the Kumeū River (including the taniwha), impacts to fish species, setting impacts to Nga Rau Pou ā Maki, impacts to Pukewhakataratara, impacts to Wai paki i rape ō Ruarangi, and impacts to the cultural landscape. There is particular concern regarding a strategy of supporting urban growth in a flood prone catchment that holds the most regionally significant topsoil in northern Auckland. Due to these sensitivities the iwi cannot support the ASH component of the project. Advice is provided on suggested limits and offsets, and recommendations are provided for the project overall.

# PEPEHA

Ko Hikurangi te maunga

Ko ngā Rau Pou ā Maki ngā tohu whakahī

Ko te Wao Nui ā Tiriwa te ngahere

Ko te Manukanuka ā Hoturoa me te Waitematā ngā moana

Ko Waitākere te awa

Ko Tainui te waka

Ko Tawhiakiterangi te tupuna

Ko Te Kawerau ā Maki te iwi

Hikurangi is the mountain

The many posts of Maki (Waitākere Ranges peaks) are the markers

Te Wao nui ā Tiriwa is the forest

Manukau and Waitematā are the harbours

Waitākere is the river

Tainui is the canoe

Tawhiakiterangi is the person

Te Kawerau ā Maki is the tribe

# CONTENTS

# INTRODUCTION

### 1.0 Project Background

Te Kawerau Iwi Tiaki Trust ('the Trust') have been commissioned by Te Tupu Ngātahi (an alliance involving Waka Kotahi, Auckland Transport, BECA, AECOM, Bell Gully and Buddle Finlay) (hereafter the Client) to prepare a Cultural Impact Assessment (CIA) for proposed upgrades and new sections of the local and strategic transport network extending from Hobsonville/Whenuapai through Westgate and Brigham Creek to Kumeū, Taupaki and Waimauku. The proposed transport network project is known as the 'North West Project'.

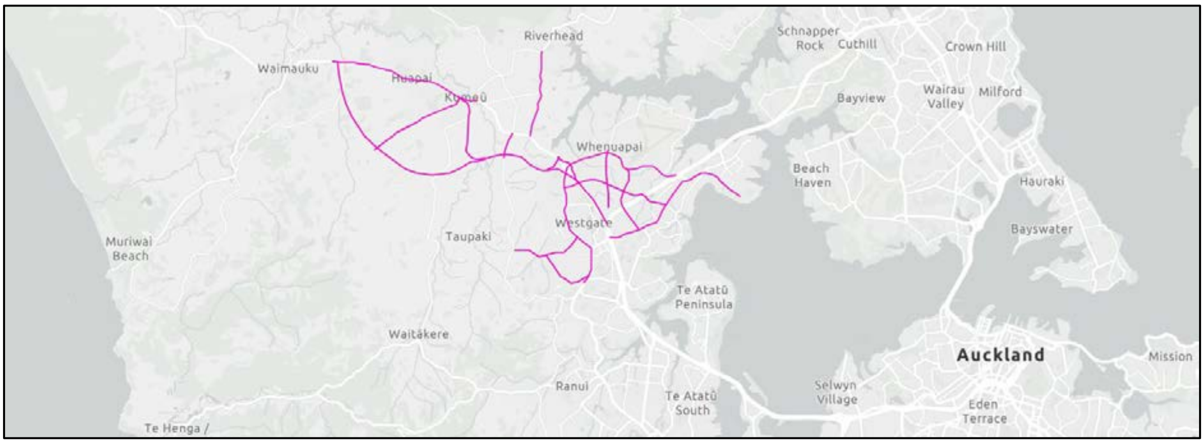



**Figure 1: Plan showing Site regional context**

The Client seeks to identify and protect the preferred transport network in Auckland's future growth areas. The wider strategy of Te Tupu Ngātahi is to support growth in housing and employment, to provide people with genuine travel choices, to address climate change by achieving transformative mode shift, and to address transport safety issues. For the North West Project the specific outcomes include an extensive walking and cycling network, 71km of bus lanes plus a rapid transit corridor to Kumeū-Huapai, safety upgrades, and state highway upgrades including an alternative route for State Highway 16. The network works will generally involve transport corridor widening/realignment, new corridors, bulk earthworks, bridge construction/stream crossings, stormwater management (e.g. ponds), vegetation removal/replanting, and installation of related infrastructure.

Specific to the 'strategic network' components of the North West Project are: the Alternative State Highway (ASH) route will include a new four-laned dual carriageway motorway and the upgrade of Brigham Creek Interchange; The SH16 main road (Main Rd) upgrade will include upgrading the existing corridor to a 24m wide urban corridor, including a 600m section of active mode only upgrade and realignment of Station Road to form a new signalised intersection with SH16; The development of a new rapid transit corridor (including the Regional Active Mode Corridor – RTC) and active mode corridor will be in one co-located corridor; The upgrade of Access Road (Access Rd) from a 20m width to a 30m four-lane cross-section with separated cycle lanes and footpaths on both sides of the corridor within the urban section and the north side within the rural section.

This CIA report has been prepared by the Trust as a legal entity of Te Kawerau ā Maki who are a mana whenua iwi of wider Tāmaki Makaurau (Auckland), but with particular lead interests in Hikurangi (West Auckland) and the Upper Waitematā Harbour. The purpose of this CIA report is to provide the Client and relevant statutory agencies with documentation of Te Kawerau ā Maki's cultural values, interests, and associations with the project area and its natural resources, and the potential impacts of the proposed project activities on these. This impact assessment also provides recommendations as to how to avoid, remedy or mitigate any potential cultural effects that arise from the project.

Te Kawerau ā Maki engagement in statutory processes including provision of technical advice for impact assessments is guided by our tikanga (customs and protocols) and mātauranga (tribal knowledge) and framed by Te Tiriti ō Waitangi, our Te Kawerau ā Maki Claims Settlement Act 2015, our Iwi Management Plan (IMP), and our organisational strategic values: Mana Motuhake (independence); Kaitiakitanga (guardianship and sustainable management); Whānaungatanga (people focused); Auahatanga (innovation); Mātauranga Māori (culture-driven).

## 2.0 Site Description

The project is situated in northern West Auckland/southwest Kaipara running from Hobsonville to Waimauku. It essentially runs along the low-lying alluvial plains between the Waitākere Ranges to the southwest, the Riverhead hill country to the north, and the Waitematā Harbour to the east. The project is situated primarily within the catchment of the Kumeū River. For the most part the project follows the alignment of SH16 and its various feeder roads, however the proposed Alternative State Highway crosses rural land to the west between the townships of Taupaki and Kumeū/Huapai.

The wider proposed project area (hereafter the Study Area) includes the entire alignment including the local and strategic network and a wider catchment of 4km radius from the project footprint. This wider area is appropriate for placing the project within its proper cultural landscape context and for capturing any potential setting impacts.

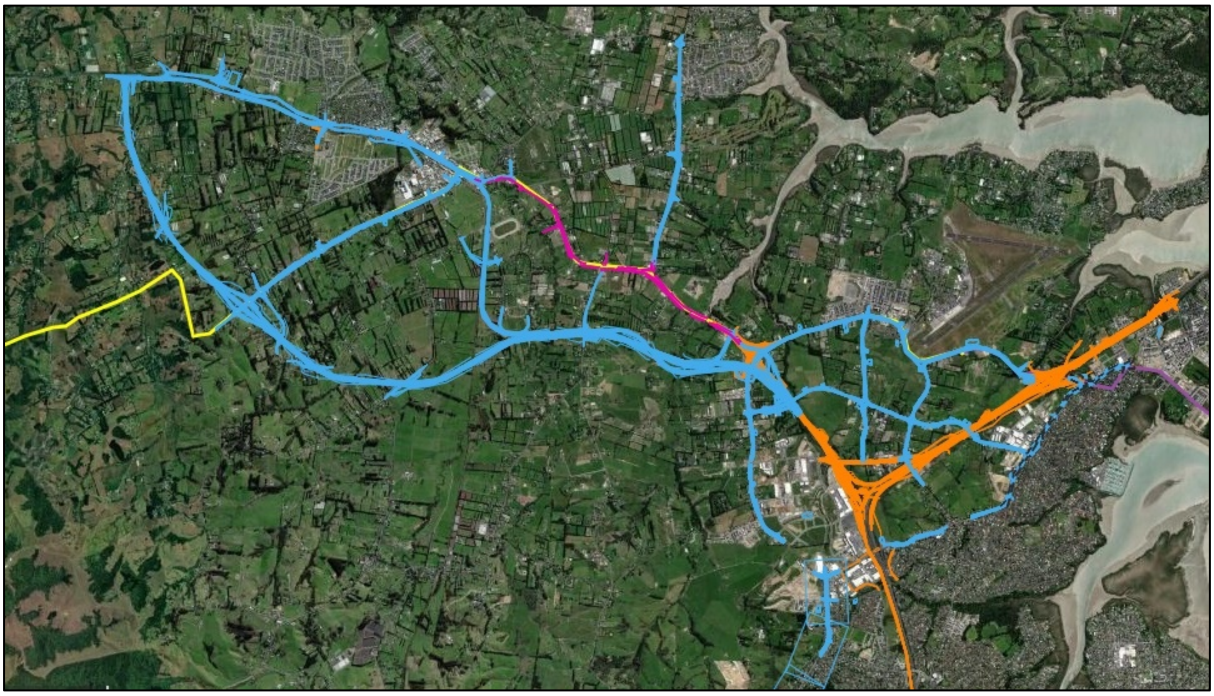


**Figure 2: Plan showing Site (supplied by Client)**

For the purposes of this report, the proposed project site (hereafter the Site) includes the local and strategic network footprint, including both its construction (including temporary compounds) and operational phases. Specifically this includes the Redhills, Riverhead, and Whenuapai 'arterials' as well as the strategic corridors known as ASH, Main Rd, RTC, and Access Rd.

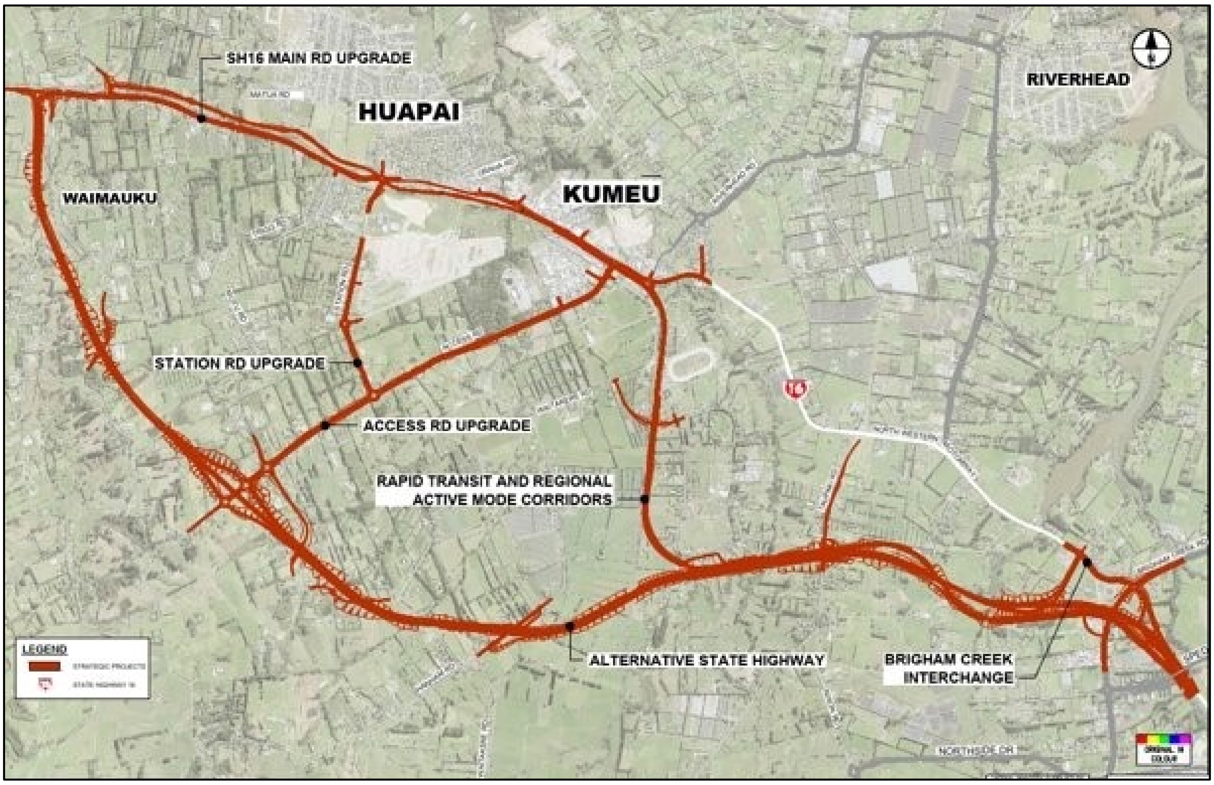


Figure 3: Plan showing Strategic Network (supplied by Client)

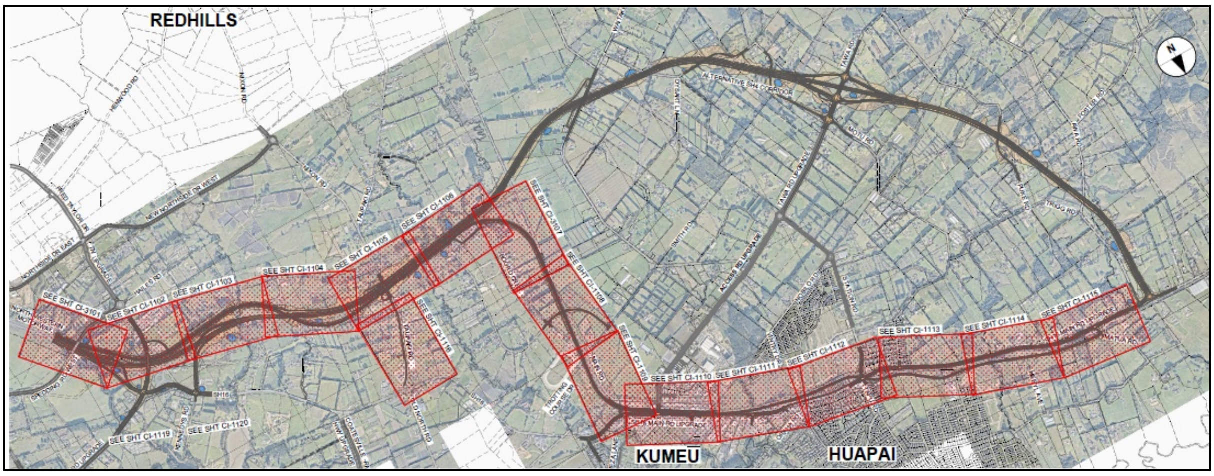


Figure 4: Plan of the Rapid Transit Corridor and Regional Active Mode (supplied by Client)

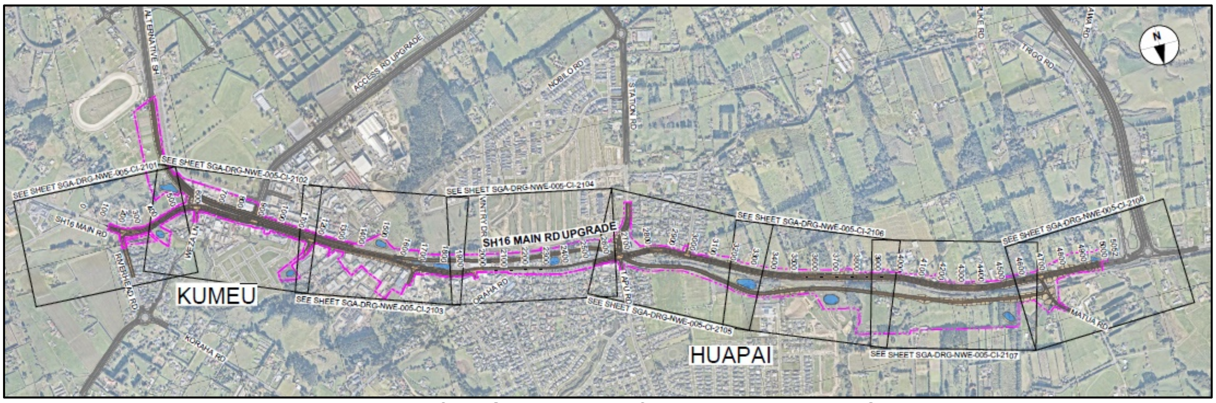


Figure 5: Plan of the SH16 Main Rd footprint (supplied by Client)

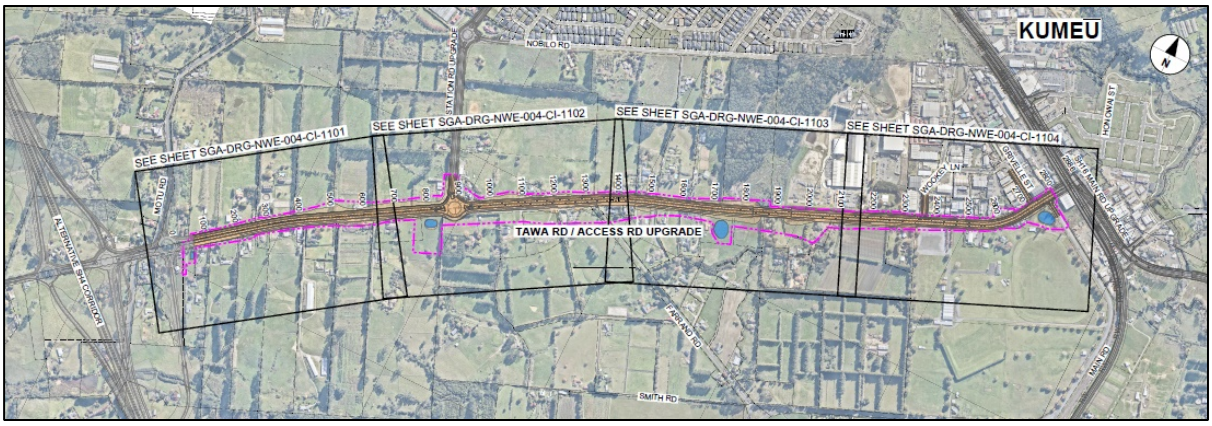


Figure 6: Plan of the Access Rd footprint (supplied by Client)

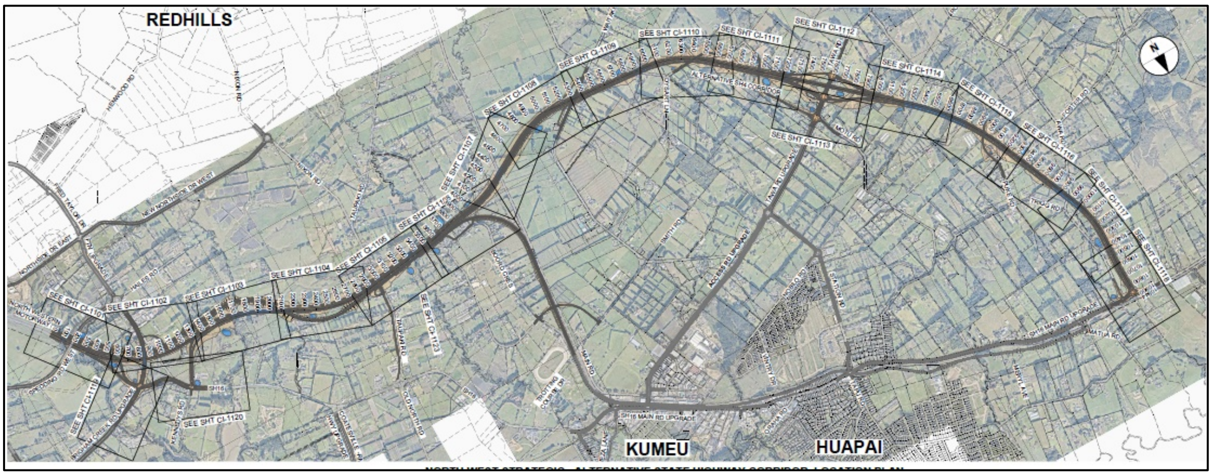


Figure 7: Plan of the Alternative State Highway footprint (supplied by Client)

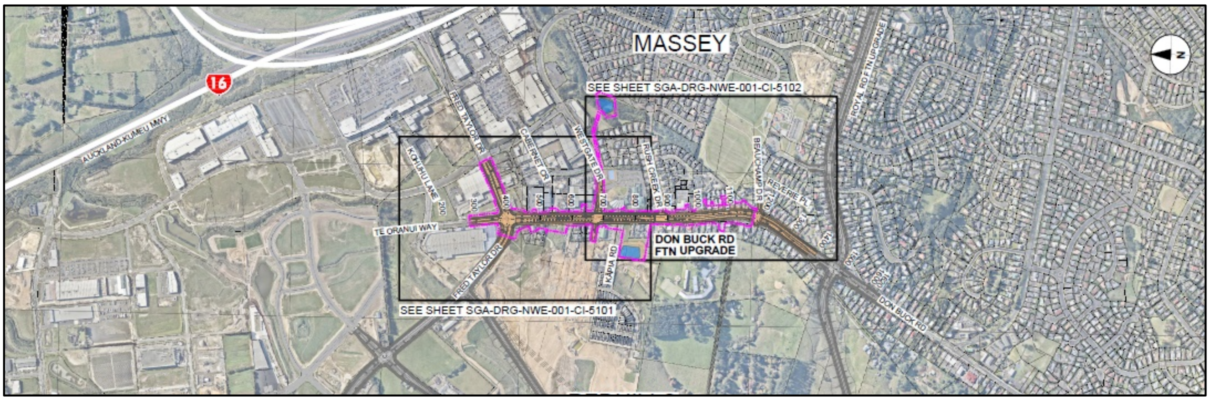


Figure 8: Plan of Don Buck Rd Local Network footprint (Supplied by Client)

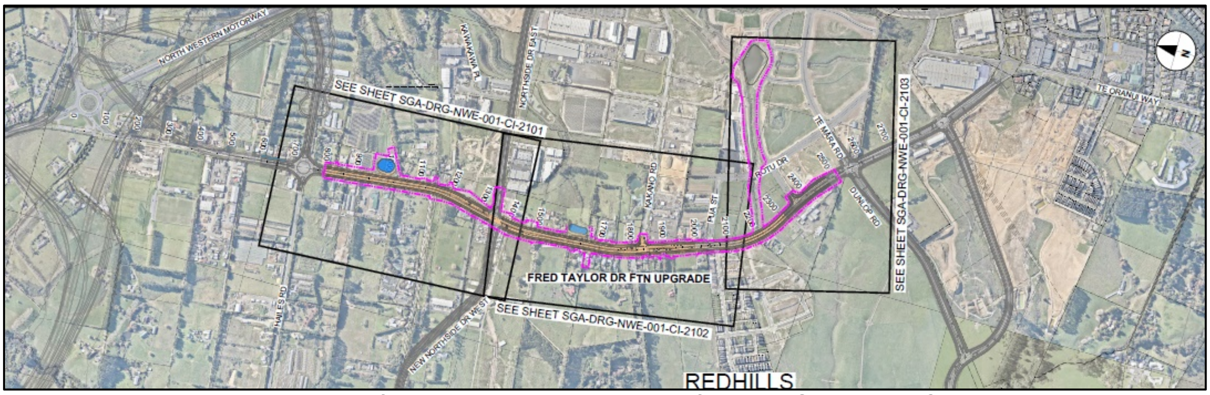


Figure 9: Plan of Fred Taylor Dr Local Network footprint (Supplied by Client)

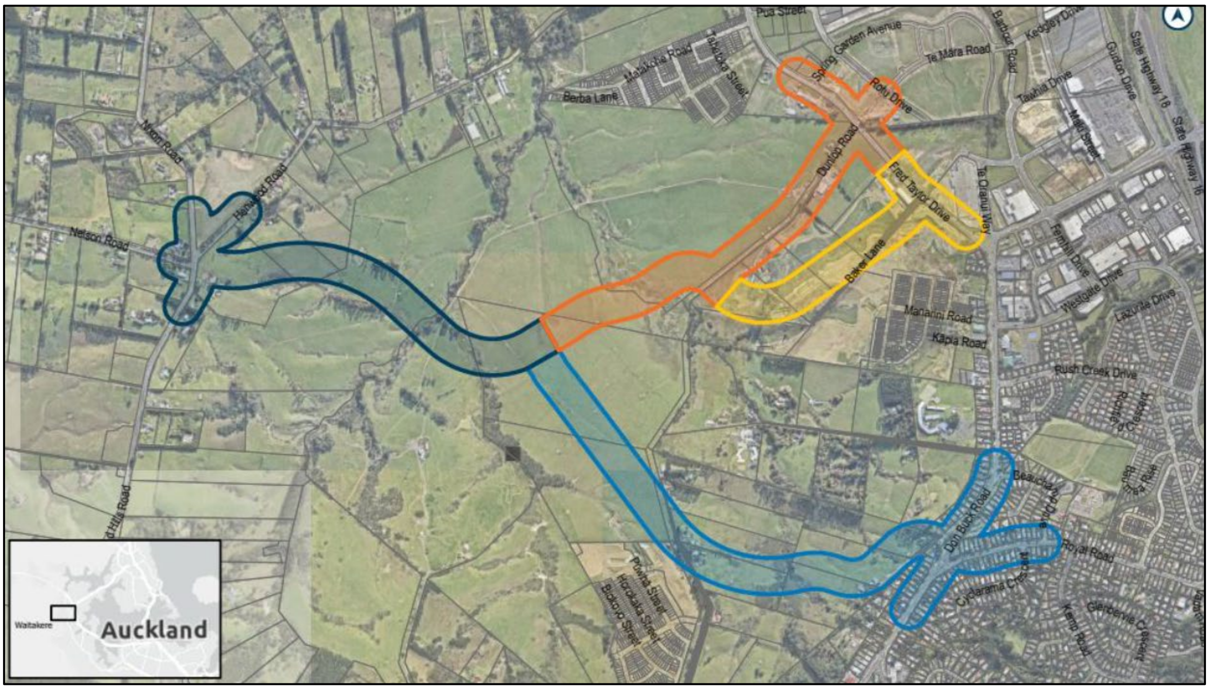


Figure 10: Plan of Red Hills Arterial footprint (Supplied by Client)

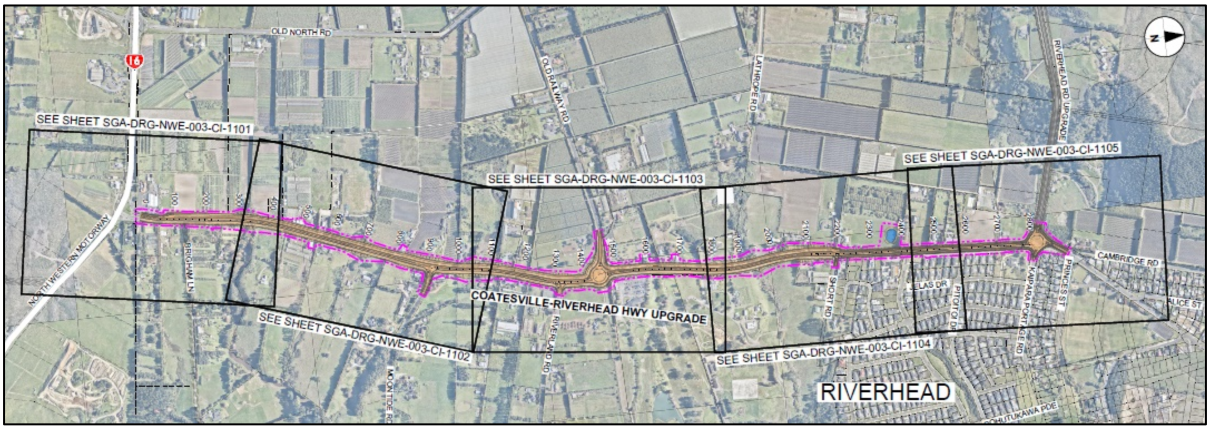



Figure 11: Plan of Coatesville-Riverhead HWY Local Network footprint (Supplied by Client)

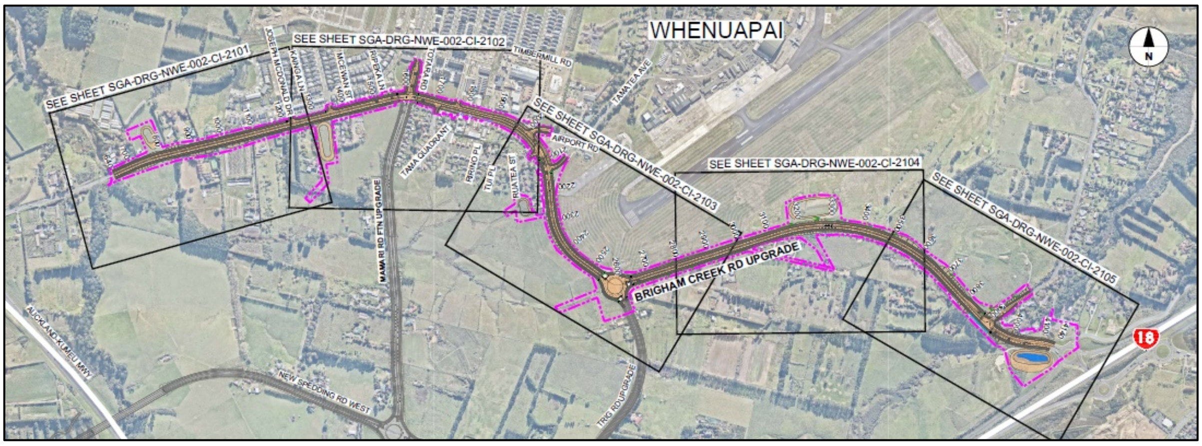



Figure 12: Plan of Brigham Creek Rd Local Network footprint (Supplied by Client)

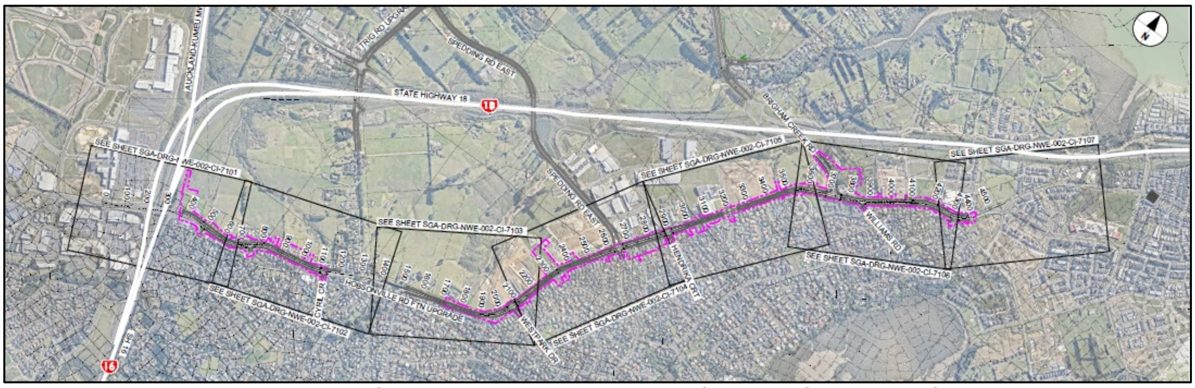



Figure 13: Plan of Hobsonville Rd Local Network footprint (Supplied by Client)

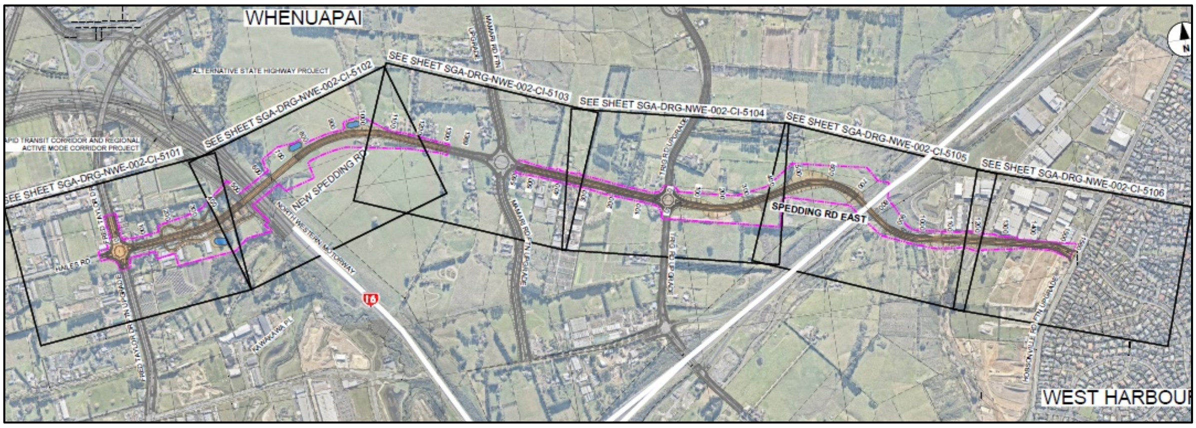



Figure 14: Plan of New Spedding Rd Local Network footprint (Supplied by Client)

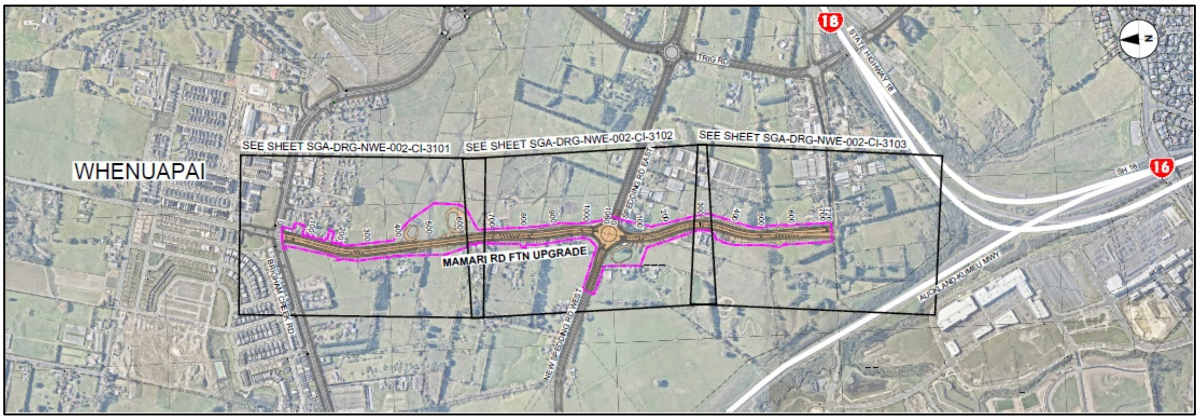



Figure 15: Plan of Mamari Rd Local Network footprint (Supplied by Client)

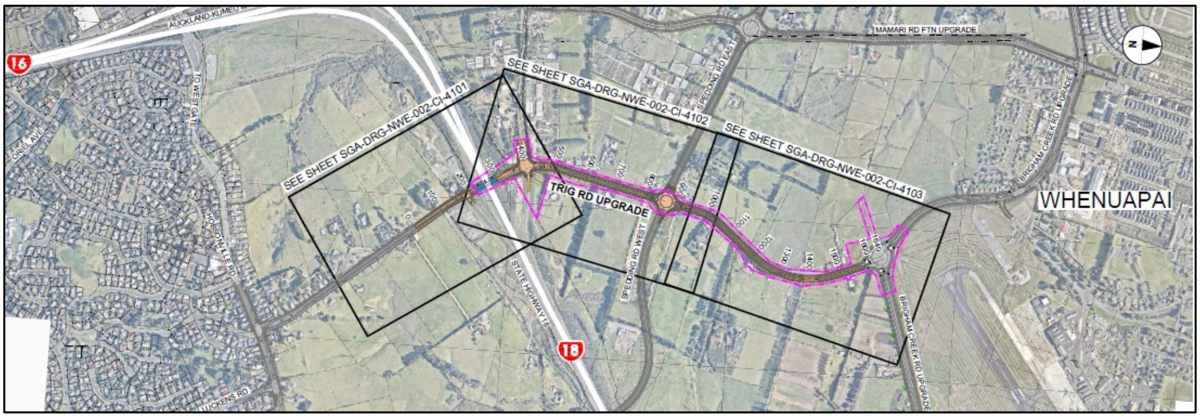



Figure 16: Plan of Trig Rd Local Network footprint (Supplied by Client)


**Figure 17: Plan of Trig Rd Corridor footprint (Supplied by Client)**

## 3.0 Aims and Objectives

The aim of this CIA report is to document Te Kawerau ā Maki's cultural values, interests, and associations with the Site; identify specific cultural sites and resources; assess the values of these sites and resources; identify the potential impacts that arise from project activities and assess the significance of effect; and provide recommendations as to how to avoid, remedy or mitigate the potential effects to Te Kawerau ā Maki.

This impact assessment will:

- provide a baseline of known environmental or natural features and resources that may hold cultural values;
- provide a statement of cultural association Te Kawerau ā Maki has with the Site and Study Area;
- identify any known cultural sites and resources within the Site or Study Area;
- describe the value or significance of such sites and resources;
- identify the potential for unrecorded cultural sites (i.e. buried Māori archaeology);
- identify the cultural constraints and risks associated with the Site and the potential significance of effects; and
- provide recommendations for further assessment where necessary and/or measures to avoid, remedy or mitigate adverse effects upon Te Kawerau ā Maki.

### 4.0 Statutory Context

*Te Tiriti o Waitangi*

The key guiding document in any consideration of planning or practice that may impact upon the cultural values or wellbeing of Mana Whenua is Te Tiriti o Waitangi. The principles of the Treaty are recognised and provided for in the sustainable management of ancestral lands, water, air, coastal sites, wāhi tapu and other taonga, and natural and physical resources. The Treaty is articulated in law through an evolving set of principles. These include:

a. reciprocity
b. rangatiratanga
c. partnership
d. shared decision-making
e. active protection
f. mutual benefit
g. right of development
h. redress.

While Article 1 of the Treaty enables the Crown to govern and make laws, Article 2 guarantees Māori rangatiratanga over their people, lands and taonga (things of value). Māori values, associations and interests with their taonga applies regardless of property titles or other constructs, and the Treaty requires that the Crown actively protect these associations and interests (including through but not limited to statutes). Article 3 provides for equality and equity of citizenship and outcome.

*Te Kawerau ā Maki Claims Settlement Act 2015*

Te Kawerau ā Maki Claims Settlement Act (TKaMCSA) records the acknowledgements and apology given by the Crown to Te Kawerau ā Maki for historic grievances and breaches of Te Tiriti ō Waitangi and gives effect to provisions of the Deed of Settlement that settles the historical claims of Te Kawerau ā Maki. The Act binds the Crown to Te Kawerau ā Maki to work together in accordance with Te Tiriti. The Settlement as delivered through the Act provided both cultural and commercial redress to Te Kawerau ā Maki. This includes binding protocols between Government Ministries and Te Kawerau ā Maki (Part 2, s21 to s26), a recognised and agreed area of interest (Part 1, s12(2b), Part 1 of attachments to Act), and statutory acknowledgements and deeds of recognition (Part 2, s27 to s40, and Schedule 1).

Statutory acknowledgements require relevant consent authorities, the Environment Court, and Heritage New Zealand Pouhere Taonga to: (a) have regard to the statutory acknowledgement; (b) require relevant consent authorities to record the statutory acknowledgement on statutory plans and to provide summaries of resource consent applications or copies of notices of applications to the trustees; and (c) enable the trustees and any member of Te Kawerau ā Maki to cite the statutory acknowledgement as evidence of the association of Te Kawerau ā Maki with a statutory area. The statutory acknowledgement supports Te Kawerau ā Maki trustees being considered as affected persons in relation to an activity within the area under s95E and s274 of the Resource Management Act (1991), and s59(1) and 64(1) of the Heritage New Zealand Pouhere Taonga Act (2014).

Te Kawerau ā Maki Statutory Acknowledgement Areas are:

- Taumaihi (part of Te Henga Recreation Reserve)
- Motutara Settlement Scenic Reserve and Goldie Bush Scenic Reserve
- Swanson Conservation Area
- Henderson Valley Scenic Reserve

- Coastal statutory acknowledgement
- Waitākere River and tributaries
- Kumeū River and tributaries
- Rangitōpuni Stream and tributaries
- Te Wai-ō-Pareira / Henderson Creek and tributaries
- Motutara Domain (part of Muriwai Beach Domain Recreation Reserve)
- Whatipū Scientific Reserve

*Heritage New Zealand Pouhere Taonga Act 2014*

Statutory protection of Māori archaeology and wāhi tapu is provided for under the Heritage New Zealand Pouhere Taonga Act 2014 (HNZPTA), which is administered by Heritage New Zealand Pouhere Taonga (HNZPT), an autonomous Crown Entity. Under the Act all *in situ* materials, sites, and features older than 1900AD are considered archaeological sites whether previously recorded or not and are afforded automatic protection from damage, modification, or destruction without first obtaining an Archaeological Authority from HNZPT. Moveable objects and artefacts that are not *in situ* but that are from an archaeological context, or are of Māori origin, are controlled under the Protected Objects Act (1975). The HNZ Act S45(2)b stipulates that works on sites of interest to Māori can only occur if (a) the practitioners can demonstrate they have the requisite competencies for recognising and respecting Māori values, and (b) the practitioners undertaking the works have access to appropriate cultural support. Under the Act Mana Whenua are enabled to provide advice or assessment regarding the management or decision taking arising from impacts to their cultural sites, provided these meet the Act's criteria. It is noted that Te Kawerau ā Maki never ceded our sovereignty to govern our taonga to HNZPT and view the HNZPTA as overstepping its authority or role as the decision-maker over the taonga of Te Kawerau ā Maki, thus being in direct breach of Article II of Te Tiriti ō Waitangi.

*Resource Management Act 1991*

The Resource Management Act (RMA) 1991 provides statutory recognition of the Treaty of Waitangi and the principles derived from the Treaty. It introduces the Māori resource management system via the recognition of kaitiakitanga and tino rangatiratanga and accords Territorial Local Authorities with the power to delegate authority to iwi over relevant resource management decisions. The Act contains over 30 sections, which require Councils to consider matters of importance to tangata whenua. Some of the most important of these are:

- Take into account principles of the Treaty of Waitangi and their application to the management of resources (Section 8).
- Recognition and provision for, as a matter of national importance, the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu and other taonga (Section 6(e)).
- Having particular regard to the exercise of kaitiakitanga or the iwi's exercise of guardianship over resources (Section 7(a)).
- Requiring the Minister for the Environment to consider input from an iwi/hapū authority when preparing a national policy statement (Section 46).
- The ability for local authorities to transfer their functions, powers or duties under the Act to iwi authorities (Section 33).
- Development of joint management agreements between councils and iwi/hapū authorities (Section 36B to 36E).
- Having regard to any relevant planning document recognised by an iwi/hapū authority (sections 35A(b), 61.2A(a), 66.2A(a), 74.2A).
- The obligation to consult with iwi/hapū over consents, policies and plans. (Combination of all the sections above and Clause 3(1)(d) of Part 1 of the first schedule of the Resource Management Act).

An assessment of impacts on cultural values and interests (CIA) can assist both applicants and the council in meeting statutory obligations in a number of ways, including:

- preparation of an Assessment of Environmental Effects (AEE) in accordance with s88(2)(b) and Schedule 4 of the Resource Management Act 1991 (RMA)
- requests for further information under s92 of the RMA in order to assess the application
- providing information to assist the council in determining notification status under ss95 to 95F of the RMA
- providing information to enable appropriate consideration of the relevant Part II matters when making a decision on an application for resource consent under s104 of the RMA, or when undertaking a plan change
- consideration of appropriate conditions of resource consent under s108 of the RMA.

It is noted that Te Kawerau ā Maki never ceded our sovereignty to govern our taonga to local authorities and view the RMA as enabling councils to overstep their authority or role as the decision-maker over the taonga of Te Kawerau ā Maki, thus being in direct breach of Article II of Te Tiriti ō Waitangi.

*Reserves Act 1977 and Conservation Act 1987*

Section 4 of the Conservation Act, which is invoked by the Reserves Act, states that the Act must be interpreted and administered as to give effect to the principles of the Treaty of Waitangi.

*Public Works Act 1981*

The PWA and its predecessor legislation have had a considerable negative impact upon Māori amounting to a breach of Te Tiriti Article II and international conventions. Te Kawerau ā Maki's last kāinga at Kōpironui was stolen by the Crown under the PWA in the 1950s leaving our people landless. While tacit protections for Māori land have been inserted into the PWA it remains a deeply problematic piece of legislation, both in terms of acquisition of land but also disposal of 'formerly' Māori land, that is not compliant with Te Tiriti o Waitangi or tikanga Māori.

## 5.0 Planning Policy Context

*UN Declaration on the Rights of Indigenous Peoples*

New Zealand supported the UN Declaration on the Rights of Indigenous Peoples (2007) in 2010. This support was an affirmation of fundamental rights and the aspirations of the Declaration. Article 11 states that indigenous peoples have the right to practise and revitalise their cultural traditions and customs, including the right to maintain, protect and develop the past, present and future manifestations of their cultures, such as archaeological and historical sites, artefacts, designs, ceremonies, technologies and visual and performing arts and literature (clause 1). States shall provide redress through effective instruments, which may include restitution, developed in conjunction with indigenous peoples, with respect to their cultural, intellectual, religious and spiritual property taken without their free, prior and informed consent or in violation of their laws, traditions and customs. (clause 2). Article 18 and 31 note that indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decision-making institutions. Further that Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.

*ICOMOS New Zealand Charter 2010*

The International Council on Monuments and Sites (ICOMOS) is UNESCOs principal advisor in matters concerning the conservation and protection of historic monuments and sites and advises the World Heritage Committee on the administration of the World Heritage Convention (which includes provision of nationally significant heritage). The New Zealand National Committee (ICOMOS NZ) produced a New Zealand Charter in 2010 which has been adopted as a standard reference document by councils. The Charter sets out conservation purposes, principles, processes and practice. The scope covers tangible and intangible heritage, the settings of heritage, and cultural landscapes. Of particular relevance the Charter states that tangata whenua kaitiakitanga over their taonga extends beyond current legal ownership wherever such cultural heritage exists. The Charter also states that the conservation of Māori heritage requires incorporation of mātauranga and therefore is conditional on decisions made in association with tangata whenua and should procced only in this context.

*National Policy Statement for Freshwater Management 2020*

The NPS for freshwater management provides national policy settings that relevant statutory agencies including local authorities must comply with. Central to the NPS is the concept of Te Mana ō Te Wai set out in s1.3. This is an aspirational concept that means that the integrity (physical and spiritual) of all water is upheld to its highest possible quality or state. The Crown's interpretation of the concept is that the fundamental importance of water is recognised and that by protecting the health of freshwater we protect the health and well-being of the wider environment, including by protecting wai mauri, and the restoration of the balance between water, the environment, and communities. It provides six principles for the management of water (s1.3(4)). Relevant to tangata whenua are: (a) Mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater; (b) Kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations; (c) Manākitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others. Policy 2.2(2) states that tangata whenua are actively involved in freshwater management (including decision-making processes), and Māori freshwater values are identified and provided for. Policy 2.2(3) requires that freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments. Section 3.4 sets out how councils must actively involve tangata whenua in the management of fresh water.

*Auckland Unitary Plan*

At a Local Government level, the Auckland Unitary Plan (AUP) provides for the protection and management of matters of importance to Mana Whenua including the environment and cultural heritage. These matters are set out in the Regional Policy Statement Chapter B6, but are also embedded in the lower-order policies and rules throughout the Plan.

Policy B6.2.2 provides for the recognition of Treaty of Waitangi/Te Tiriti ō Waitangi partnerships and participation. This includes Policy B6.2.2(1) that provides for Mana Whenua to actively participate in the sustainable management of natural and physical resources including ancestral lands, water, sites, wāhi tapu and other taonga.

Policy B6.3.2 deals with recognising Mana Whenua values and includes clause (1) that enables Mana Whenua to identify their values associated with ancestral lands, freshwater, biodiversity, and cultural heritage places and areas, and clause (2) that requires the integration of Mana Whenua values, mātauranga and tikanga in the management of natural and physical resources within the ancestral rohe. Clause (3) ensures that any assessment of environmental effects for an activity that may affect Mana Whenua values includes an appropriate assessment of adverse effects on those values. Clause (6) of the policy requires resource management decisions to have particular regard to potential impacts on: the holistic nature of the Mana Whenua world view; the exercise of kaitiakitanga; mauri; customary activities; sites and areas with significance spiritual or cultural heritage value; and any protected customary right under the Takutai Moana Act (2011).

Policy B6.5.2 provides for the active protection of Mana Whenua cultural heritage. Clause (2) sets out a framework for identifying and evaluating Mana Whenua cultural heritage using the assessment factors of: mauri; wāhi tapu; kōrero tūturu; rawa tūturu; hiahiatanga tūturu; and whakaaronui o te wā. Clause (4) requires the protection of places and areas listed in Schedule 12 Sites and Places of Signifiance to Mana Whenua from adverse effects. Clause (7) provides for the inclusion of a Māori cultural assessment in structure planning and plan change processes, and clause (9) encourages appropriate design, materials and techniques for infrastructure in areas of known historic settlement and occupation.

*Iwi Management Plan*

Te Kawerau ā Maki Resource Management Statement (1995) was lodged with Council explicitly as an iwi authority planning document under sections 66(c) and 74(b) of the RMA 1991 (since repealed). The IMP describes the continuing role of Te Kawerau ā Maki as kaitiaki (guardians) and provides policies to guide statutory authorities and applicants. Policy 2.2(2) promotes the integration of Te Kawerau ā Maki tikanga in resource management, while clause (3) requires engagement by all agencies within the rohe to help give effect to the kaitiaki role of the iwi. Policy 4.1.2(3) requires that cumulative effects upon Te Kawerau ā Maki are fully recognised and provided for. Policy 4.2.2 concerns Te Kawerau ā Maki cultural heritage and requires the protection of all heritage sites including access requirements (s4.2.2(1)); the involvement of Te Kawerau ā Maki in all instances where potential effects may arise (s4.2.2(2)); and the recognition of Te Kawerau ā Maki cultural and spiritual values (s4.2.2(3 and 4)). Policy 4.3.2 concerns the management of kōiwi, while s4.4.2 regards the management of water. Activities in the Coastal Marine Area are covered by s4.5.2. Waste management policies are described in s4.6.2 and land and landscape policies are set out in s4.7.2. Indigenous flora and fauna policy settings are described in s.4.8.2 including opposition to all destruction of native flora and fauna without Te Kawerau ā Maki written consent. Policy 4.9.2 concerns Te Kawerau ā Maki participation in design of the built environment and interpretation of heritage. The IMP also details formal support and adoption of the 1993 Matātua Declaration on cultural and intellectual property rights of indigenous peoples.

## 6.0 Te Ao Māori

Our worldview is the framework by which we understand and navigate our physical and metaphysical environment. A full account of the cosmological underpinnings of Te Ao Māori is not offered here but in brief it recognises both the spiritual and the physical, is guided by different domains governed by atua or distinct spiritual entities, and involves several core concepts including whakapapa, mana, wairua, mauri, tapu, and noa. Te Ao Māori places emphasis on the holistic link between people and the environment. Mātauranga is the knowledge or wisdom about the world developed over generations and passed down from tūpuna, while tikanga is the evolving set of principles and customary practices by which Māori give effect to this knowledge to navigate the world safely.

*Papatūānuku*

The primordial goddess embodying the whenua or land. She is the earthmother to all living things. This whakapapa is one of the reasons why whenua is the name for placenta as well as land, and why in Te Ao Māori tangata whenua belong to the whenua and not the other way around. Papatūānuku is a source of rejuvenation and life.

*Ranginui*

The primordial god embodying the sky or heavens. He is the skyfather to all living things. When he was separated from his wife Papatūānuku by their children, his tears became the rain which is considered tapu until it reaches the ground (wai Māori).

*Tūmatauenga*

The god of war and human activities and a progenitor of humanity.

*Tāwhirimātea*

The god of weather including thunder, lightning, wind, clouds and storms. He was opposed to the forced separation of his parents Papatūānuku and Ranginui and therefore he wars with his brothers and their descendants to this day.

*Tāne*

The god of forests and animals and an originator and protector of humans. Responsible for separating the embrace of his parents and ushering in Te Ao Marama (the age of light).

*Tangaroa*

The god of the sea, lakes, rivers and animals that live in them. There is a close and sometimes contentious relationship between Tangaroa and Tāne reflected in creatures such as reptiles and whales and in the dynamic between the sea and the coastline.

*Rongo*

The god of cultivated plants and agriculture also associated with peace.

*Haumia-tiketike*

The god of uncultivated plants and wild foraging.

*Matā-oho*

The local god of volcanic activity and earthquakes that formed the Tāmaki volcanic field.

*Whakapapa*

The sacred genealogy linking all things. Humans whakapapa not only to human tūpuna (ancestors), but also to the whenua, atua and their respective lineages. All indigenous animals and plants have an interconnected whakapapa. Whakapapa is a prerequisite of mana whenua, whānaungatanga, and kaitiakitanga.

*Mana*

A core metaphysical concept regarding the inherent authority or power of people, places or objects. Mana is derived or delegated from atua and, in the case of humans, is both inherited and earned through actions. Everything including people has an element or degree of mana. A person or tribe's mana can increase or decrease depending on the success, failure or nature of actions (or inactions) and is directly tied to their wellbeing. Undertaking the responsibilities of manakitanga and kaitiakitanga successfully are examples of maintaining or enhancing mana and contribute to cementing mana whenua.

*Tapu*

A core metaphysical concept regarding a state or degree of sacredness, prohibition, being set apart or forbidden. Tapu is a state where a person, place or thing is under the protection of or dedicated to an atua and is thus removed from profane or normal or common things and uses. Tapu is closely linked to mana and governs the behaviour of individuals and the wider society. Everything including people has an element or degree of tapu that must be preserved and respected. It is a priority of rangatira, tohunga and kaitiaki to maintain tapu and to ensure it is not diluted by common things. As with mana, the maintenance of tapu is directly linked to the wellbeing of both individuals and the tribe.

*Noa*

A core metaphysical concept regarding a normal or common (and sometimes profane) state that is in essence the opposite of tapu. Noa actions and things (whakanoa) can dilute tapu.

*Wairua*

A core metaphysical concept regarding the immortal spiritual or non-physical element of people, places or things.

*Mauri*

A core metaphysical concept regarding the essence that binds the physical and the spiritual together to enable life to exist and to thrive. Mauri is a sacred element and can be weakened or enhanced. When damaged or diluted the binding between the physical and the spiritual realms is weakened and life begins to falter and fail. It is the sacred obligation of mana whenua, through the act of kaitiakitanga, to maintain the balance of mauri within people, places, objects, ecosystems, and the hapū or iwi.

*Mātauranga*

The body of knowledge or customary wisdom and skill embedded within the tohunga, whānau, hapū and iwi. Mātauranga is passed down the generations from tūpuna but is also added onto through successive generations of uri, and culturally encodes hundreds of years of observations, measurements, theory, and custom regarding Te Ao Māori and the environment.

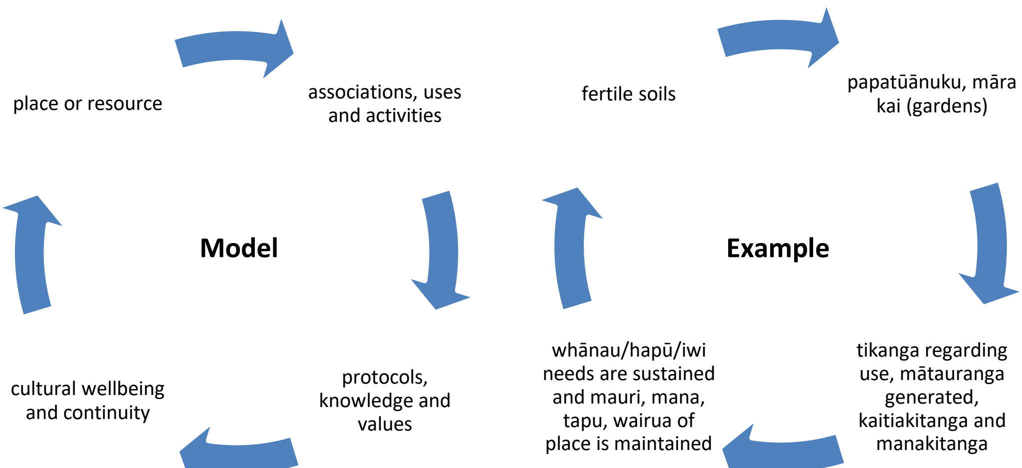
*Tikanga*

The lore, customs, practices, protocols, rules and methods that give effect to the application of mātauranga in navigating the natural and social world. There are different tikanga for different contexts and in different domains.

*Cultural Values*

Cultural values are the shared norms that govern the continuation of culture and provide the framework for social and individual actions. Key values include: rangatiratanga (chiefly authority or self-governorship), whānaungatanga (kinship and reciprocal connection through shared whakapapa), wairuatanga (spirituality), manakitanga (hospitality and showing care), and kaitiakitangata (guardianship or stewardship).

A model of how cultural values function is provided below.



## 7.0 Scoping and Consultation

The Study Area comprises a 4000m radius from the Site (from any point along its corridor). This radius is considered appropriate given the large scale of the Site and the presence of heritage sites within the catchment that could have setting or indirect impacts. Within this area all appropriate and known cultural sites, areas, landscapes and resources have been identified. Te Kawerau ā Maki however reserve the right to withhold certain information regarding wāhi tapu or sites that are culturally and spiritually sensitive to the iwi.

This report includes all known or appropriate-to-report elements of the natural and cultural environment within the Site and Study Area considered to hold cultural value for Te Kawerau ā Maki. This information forms the baseline of the assessment. This includes native biodiversity and ecology, geological and topographic features, natural resources including water bodies, built heritage such as marae, socio-cultural features such as papakāinga, cultural landscapes, historic or cultural sites, Māori archaeological sites, pou whenua and significant cultural public art.

Mātauranga/cultural knowledge of the Site and Study Area has been obtained, where appropriate, from Te Kawerau ā Maki kaumatua, kuia and other holders of knowledge within the iwi. Readily available published and unpublished written records, illustrations, maps, archaeological and geological records were reviewed during preparation of this cultural assessment. Spatially referenced heritage asset data was reviewed from the Auckland Council Cultural Heritage Inventory (CHI) and the New Zealand Archaeological Association (NZAA) recording scheme database (ArchSite). Other information, reports, and impact assessments available for the Site that have been provided by the Client have been reviewed including: engineering and design drawings of the route and a summary analysis of impacts identified from other disciplines. The opinions contained within this document may change and/or develop as new information is released.

This Cultural Impact Assessment involved a desktop study based on review of technical information, cultural knowledge of the area, and research, as well as site visits along the corridor to assess and confirm site conditions.

## 8.0 Assessment Approach

Following standard Environmental Impact Assessment (EIA) methodologies and planning terminology, but adapted for CIA purposes, this report will:

a. **Identify** the cultural sites, areas and resources (defined as both tangible and intangible cultural heritage, natural resources of cultural interest, and socio-cultural features) within a Study Area encompassing the proposed Site and a wider area that may be directly or indirectly impacted. The Study Area is defined as approximately 4000m radius of the Site to correspond with a likely area of setting impacts (e.g. noise, visual), indirect impacts, and a logical catchment of the cultural landscape.

b. Provide comment on the cultural **value** of the identified cultural sites, areas and resources. Māori cultural value is not derived from national or local policy but is defined and determined by tangata whenua and their particular world view and culture. Māori values are distinct from historic, archaeological or other value-systems, and are recognised by the courts and statute as their own legitimate knowledge-system with tangata whenua being the experts. Māori values are informed by whakapapa and guided by tikanga and kawa, with emphasis placed on the associative and living connection to places and resources which sustain cultural knowledge (mātauranga), practices, and spiritual and physical wellbeing. All cultural sites, areas and resources are of value to Te Kawerau ā Maki, who hold a holistic view of the environment and the unique relationship of the iwi to the whenua. It is difficult to apply a Western paradigm of value hierarchy or significance ranking (i.e. 'low, medium, high') when using a Te Ao Māori lens. Nevertheless, the methodology here attempts to distinguish the relative importance of matters as determined by a number of criteria, including the degree of mana, tapu or mauri, the degree to which a resource has specific kōrero or mātauranga, its sensitivity to changes (ability to absorb impacts), and its relative scarcity. This approach recognises that a matters' value is intrinsic but relative to context. This approach is supported by RMA Part II matters noting the relationship of tangata whenua with their lands, waters, and taonga as nationally significant. The approach is set out below:

- high: cultural sites/areas/resources that retain their integrity overall, are either rare or are common but hold specific customary uses or mātauranga, are considered a wāhi tohu or landscape indicator, or have a high sensitivity to change.
- medium: cultural sites/areas/resources that retain the key elements of their integrity, are either uncommon or are common but hold specific customary uses or mātauranga, or have a moderate sensitivity to change.
- low: cultural sites/areas/resources that have been significantly degraded or damaged, are common and do not hold specific current customary uses or mātauranga, or have a low sensitivity to change.

Value is also assigned against the cultural values identified in the AUP Policy B6.5.2(2):

i. Mauri: the mauri (life force and life-supporting capacity) and mana (integrity) of the place or resource holds special significance to Mana Whenua;
ii. Wāhi Tapu: the place or resource is a wāhi tapu of special, cultural, historic, metaphysical and or spiritual importance to Mana Whenua;
iii. Kōrero Tūturu: The place has special historical and cultural significance to Mana Whenua;
iv. Rawa Tūturu: the place provides important customary resources for Mana Whenua
v. Hiahiatanga Tūturu: the place or resource is a repository for Mana Whenua cultural and spiritual values; and
vi. Whakaaronui o te Wa: the place has special amenity, architectural or educational significance to Mana Whenua.

c. Identify the potential **impacts** to cultural resources and elements. Only Mana Whenua can define the impact to their cultural values, but guidance is noted below. Cultural impacts can be:

- no change
- negligible: changes result in small impacts on integrity of the site/area/resource such that their function is reduced but not notably diminished, ability to understand/appreciate/use/access is impacted to a inconsequential degree, the ability to interpret the cultural landscape or setting is impacted but the change can easily be absorbed.
- minor: changes result in small impacts on integrity of the site/area/resource such that their function is reduced but not significantly diminished, ability to understand/appreciate/use/access is impacted to a small degree, the ability to interpret the cultural landscape or setting is impacted to a small degree or change can otherwise be largely absorbed.
- moderate: changes result in appreciable/significant impacts on the integrity of the site/area/resource such that their function is impeded, ability to understand/appreciate/use/access is impacted to a notable degree, the ability to interpret the cultural landscape or setting is impacted to a notable degree or change can otherwise not be absorbed.
- major: changes result in large scale/total impacts on the integrity of the site/area/resource such that their function is effectively destroyed, ability to understand/appreciate/use/access is impacted to a significant degree/is no longer possible, the ability to interpret the cultural landscape or setting is impacted to a significant degree or change can otherwise not be absorbed and the landscape or setting is no longer recognisable/able to function.

Impacts can be either adverse or beneficial. Impacts can also be temporary or permanent. They can occur during the construction or the operational phase of a development. Impacts can be:

i. direct (i.e. physical impacts resulting from a development, impacts to the settings of cultural sites or the character of cultural landscapes, visual, noise, odour, or culturally inappropriate land use activities).
ii. indirect (i.e. traffic congestion, erosion due to vegetation loss, or other secondary impacts that occur over time or in a secondary location to the original activity).
iii. cumulative (i.e. impacts which are caused by the combined result of past, current and future activities, or in-combination impacts).

d. Define the **significance of effect** resulting from combining the value of a cultural site, area or resource and the level of potential impact to that site, area or resource. Significance of effect is assessed pre-mitigation but can also be assessed again post-mitigation to ascertain the *residual effect* and effectiveness of any proposed mitigation. Significant effects (within a planning framework) are those with moderate or large effects (either adverse or beneficial). This method is outlined below in Table 1. Note that positive effects will be coloured green.

**Table 1: Significance of effect**

| | | LEVEL OF IMPACT | | | | |
|---|---|---|---|---|---|---|
| | | No Change | Negligible | Minor | Moderate | Major |
| CULTURAL VALUE | High | Neutral | Minor | Moderate | Large | Large |
| | Medium | Neutral | Negligible | Minor | Moderate | Large |
| | Low | Neutral | Negligible | Negligible | Minor | Moderate |

## 9.0 Assumptions and Limitations

Te Kawerau ā Maki are the experts of our own culture and tikanga. This expertise and the equal weighting of mātauranga Māori evidence is accepted in the courts and by statute. Through a necessity to work within a Western planning framework we utilise planning language where possible to aid in mutual understanding, however there is difficulty in the translation and application of some core cultural concepts to such a framework. This is particularly an issue when segmenting or demarcating value spatially, when ascribing a type of significance hierarchy, and when limiting value to tangible elements, whereas Māori hold a holistic perspective that operates differently to typical Western paradigms. This means that where there is doubt or confusion over a term or point of discussion, readers should contact Te Kawerau ā Maki directly for clarification.

Due to the sensitive nature of certain cultural knowledge, areas and sites (e.g. burial grounds), Te Kawerau ā Maki reserves the right not to identify the exact spatial extents or provide full information of such areas to retain and protect this knowledge within the iwi. In other situations, while a general area may be known to be of cultural significance the exact spatial extent or location of the site may have been lost over successive generations. Where possible and appropriate, sites are described and defined to enable discussion of the impacts while acknowledging these limitations.

The environmental and archaeological data relied upon for elements of this report are derived from secondary sources and it is assumed the data and opinions within these and other secondary sources is reasonably accurate.

The CHI and ArchSite databases are a record of known archaeological and historic sites. They are not an exhaustive record of all surviving historic or cultural sites and resources and do not preclude the existence of further sites which are unknown at present. The databases also utilise a site location point co-ordinate system rather than detailing site extents or cultural landscapes.

# ENVIRONMENTAL BASELINE

## 10.0 Topography and Geology

The Site is situated across the alluvial plains of the Kumeū River and Upper Waitematā Harbour, which crosses a number of underlying geological substrata. Near the mid-point of the network near Westgate this includes Waitematā Group East Coast Bays Formation being of "*Alternating sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grits.*" Near Whenuapai and Riverhead the underlying geology is of Late Pliocene to Middle Pleistocene pumiceous river deposits being of "*Pumiceous mud, sand and gravel with muddy peat and lignite: rhyolite pumice, including non-welded ignimbrite, tephra and alluvia*." Within the Kumeū basin the underlying geology is Holocene river deposits consisting of "*Sand, silt mud and clay with local gravel and peat beds.*" Near Waimauku and Huapai the underlying geology is Tauranga Group Middle Pleistocene - Late Pleistocene river and hill slope deposits being "*Predominantly pumiceous sand, silt, mud and clay, with interbedded gravel and peat.*"

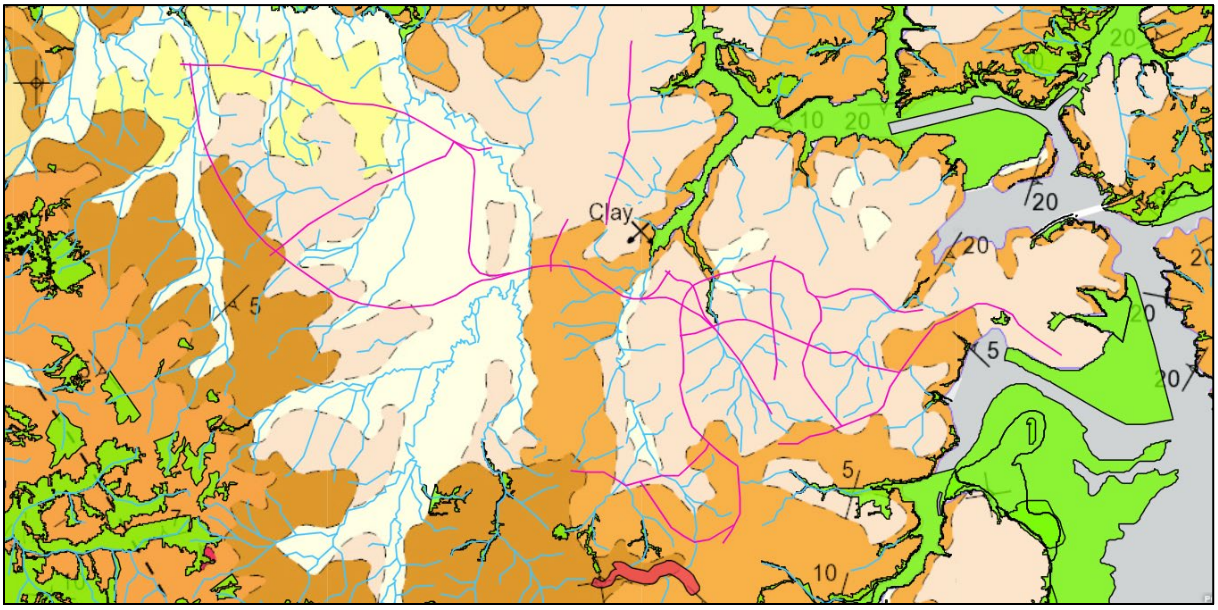



**Figure 18: Map showing the underlying geology of the Study Area (adapted from GNS Science)**

While all whenua is associated with Papatūānuku, alluvial soils are particularly valued due to their unique composition and higher organic content making them highly productive for horticulture, and thus containing a strong sense of mauri. The Land-Use Capability of these alluvial soils ranges from 1 (negligible limitations to horticulture) to 3 (moderate limitations to horticulture) meaning they are of very high productive quality, and in fact the largest area of high quality horticultural soils in northern Auckland.

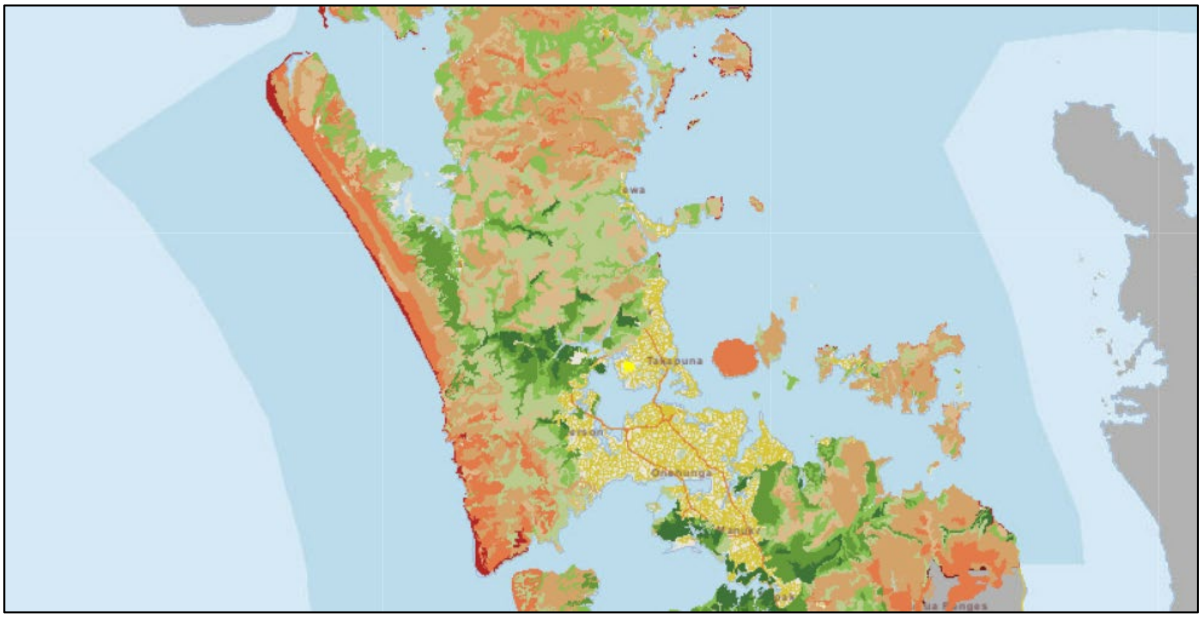


**Figure 19: Land-use capability map showing high productivity within the Study Area (from Auckland Council)**

The topography of the Site is low-lying alluvial plains for the most part, with steeper terrain to the south along the Waitakēre Ranges and to the north along the Riverhead hillcountry. The major drainage catchment is the Kumeū River but the Site also drains to Te Wai Roa ō Kahu (Upper Waitematā Harbour) and to Te Wai ō Pareira (Henderson Creek) via Manutewhau awa. The landscape is predominantly of an open rural (pasture) character but with areas of urban character at Whenuapai, Westgate, Kumeū and Huapai. There are no Outstanding Natural Features (ONFs) or Outstanding Natural Landscapes (ONLs) within or immediately adjoining the Site footprint, although ONLs are within the western part of the Study Area.

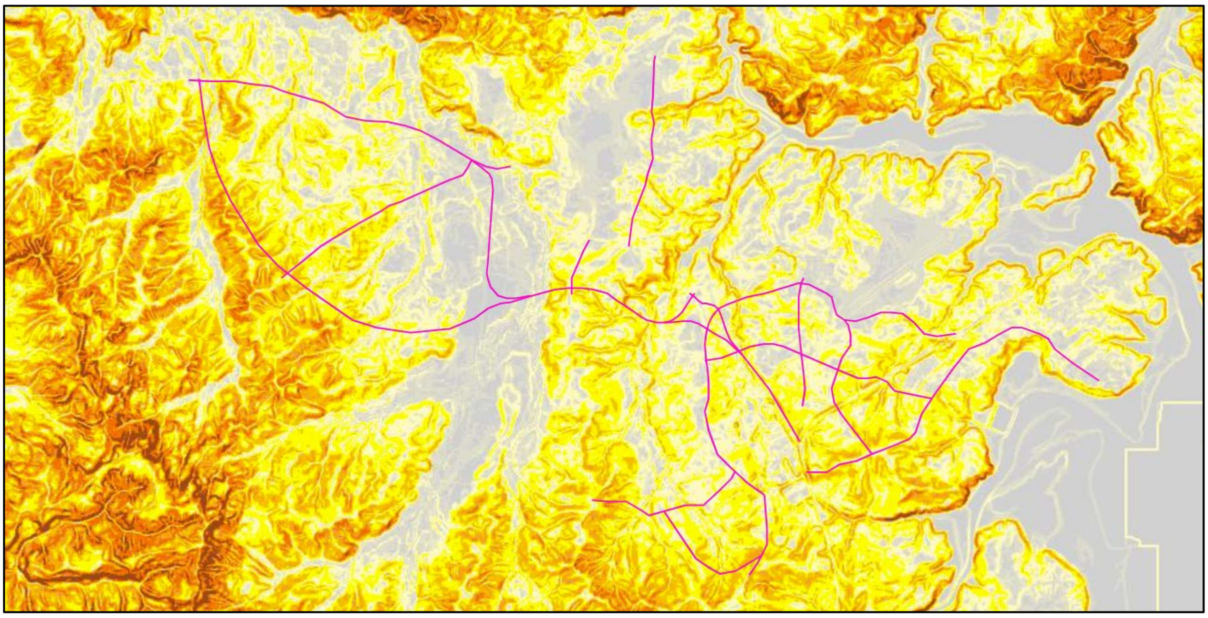


**Figure 20: Map showing slope within the Study Area**

## 11.0 Natural Resources and Ecology

*Freshwater*

The natural resources and ecology of the wider Study Area include significant freshwater ecosystems and habitat. This includes Te Waitematā, Te Wai ō Pareira (Henderson Creek), Wai Whauwhaupaku (Swanson Stream), Manutewhau awa (Massey-West Harbour), Wai huruhuru manawa (Massey), Wai Totora (Westgate), Wai Whakataratara (Westgate), Ngongetepara awa (Westgate-Whenuapai), Waiteputa (Westgate-Massey West), Taketakemanu awa (Westgate-Taupaki), Rawawaru (Whenuapai), Te Waiarohia ō Ngariki (Whenuapai), Pītoitoi awa (Brigham Creek), Te Wai Roa ō Kahu (Upper Waitematā Harbour), Rangitōpuni awa (Riverhead), Pakinui awa (Taupaki), Te Awa Kumeū, Ahukāramuramu awa (Waimauku), Waikoukou Awa (Waimauku), and the Te Awa Kaipara. In addition there are likely to be numerous wetland areas across the Study Area and Site. Freshwater and marine SEAs in the Study Area include SEA-M2-57b, SEA-M2-55a, and SEA-M2-56a.

The Site directly crosses a large number of (around 26 notable) rivers, streams or major tributaries most notably Te Waiarohia ō Ngariki, Wai Totora, Ngongetepara awa, Kumuū awa, and Ahukāramuramu awa.

The freshwater ecosystems within these waterways and waterbodies is not yet assessed (at the time of writing an ecological assessment was not available) but it is possible to include:

- indigenous fishes including tuna (eel), toitoi (bully), Īnanga, and kokopu
- indigenous freshwater invertebrates including mayflies, mud snails, dragonflies, freshwater mussels (kākahi), kōura (freshwater crayfish), and many others

*Terrestrial*

The natural resources and ecology of the wider Study Area include significant terrestrial ecosystems and habitat. This includes the Waitākere Ranges indigenous forest (Te Wao Nui ā Tiriwa) to the south and smaller pockets of vegetation Significant Ecological Area to the west and northwest. The Waitākere SEAs include old growth broadleaf and conifer forest of high biodiversity and habitat value across many endemic plant, fungi, invertebrate and vertebrate species. SEAs include: SEA_T_7036, SEA_T_2650, SEA_T_6381, SEA_T_6674, SEA_T_6743, SEA_T_2648, SEA_T_4866, and SEA_T_6540. There are also a number of scheduled trees within the Study Area and along the Site corridors including pohutakawa, kauri, rimu, tōtora, and karaka.

Generally, however the area is typified by exotic vegetation including large areas of ryegrass, kikuyu grass, and other pasture grasslands, as well as exotic trees including poplars, willow and other species but particularly pine at Riverhead.

The terrestrial ecosystems across the area are not yet assessed (at the time of writing an ecological assessment was not available) but it is possible to include:

- indigenous plants including tī kōuka, harakeke (flax), kauri, mānuka, kānuka, kahikatea, rārahu (braken fern), ponga, tōtora, rimu, pohutakawa, karaka, miro, tawa, mosses, liverworts and hornworts
- indigenous fungi including wood ear, sooty black mould, blue mushroom, and puffball
- indigenous herpetofauna including green gecko, forest gecko, copper skink, ornate skink, and although unlikely the Hochstetter's frog is found in the adjacent Waitākere Ranges

- indigenous invertebrates including earthworms (including giant North Auckland variety), wētā, grasshopper and many others

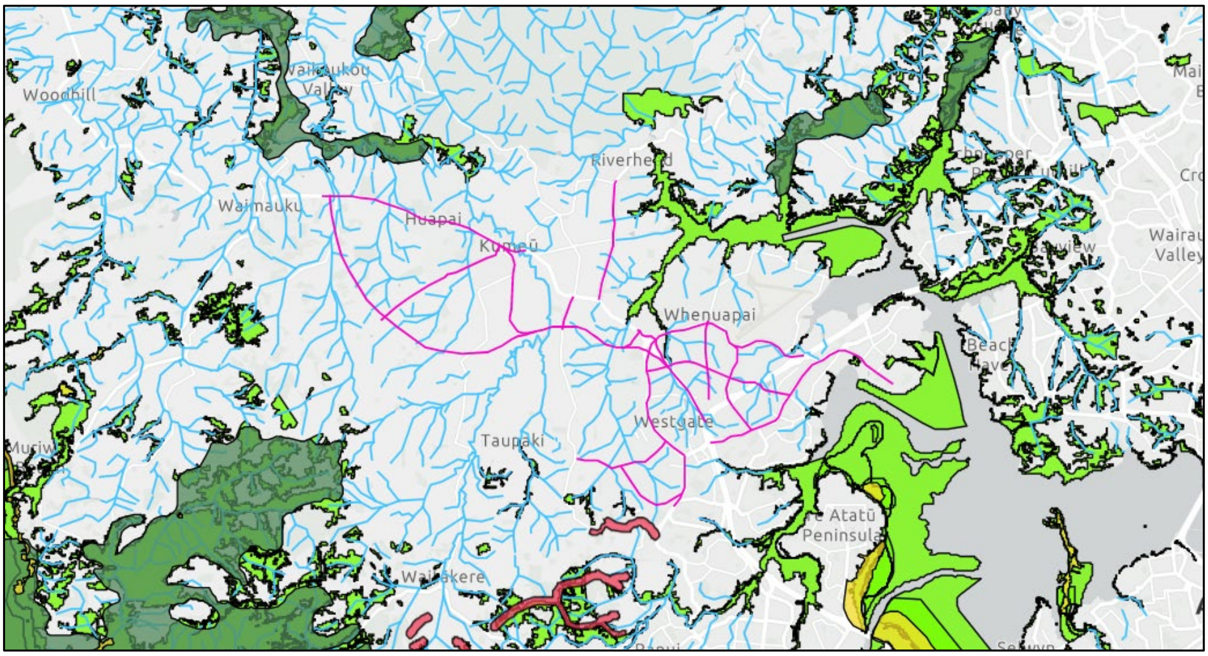


**Figure 21: Map showing streams, significant ecological areas, and other natural features**

*Avifauna*

As the Study Area covers marine, freshwater, forest, low-land plains, and hillcountry there are a wide variety of bird species as well as the native long-tailed bat (pekapeka) that interact with the area. The forested slopes of the Waitākere Ranges and Riverhead provide important roosting opportunity for bats as noted in the preliminary bat assessment carried out by the Client within a 10km radius of the Site. There are even several recordings of bats within the area we know as Ahipekapeka (west of Brigham Creek). The indigenous forest and SEAs to the south and west provide habitat for native birds such as tui, pīwakawaka, kereu, and ruru. The hillcountry and open plains provide habitat for kahu. The streams and coastal areas provide habitat for species such as tarāpuka (gull), takapu (gannet), kōtare (kingfisher), tōrea-pango (oystercatcher), poaka (stilts), pūtangitangi (paradise duck) and pūkeko. Importantly, several kawau (black shag or cormorant) have been spotted around Waimauku, Westgate, and the Upper Waitematā Harbour. The kawau is considered the kaitiaki of Te Kawerau's rohe.

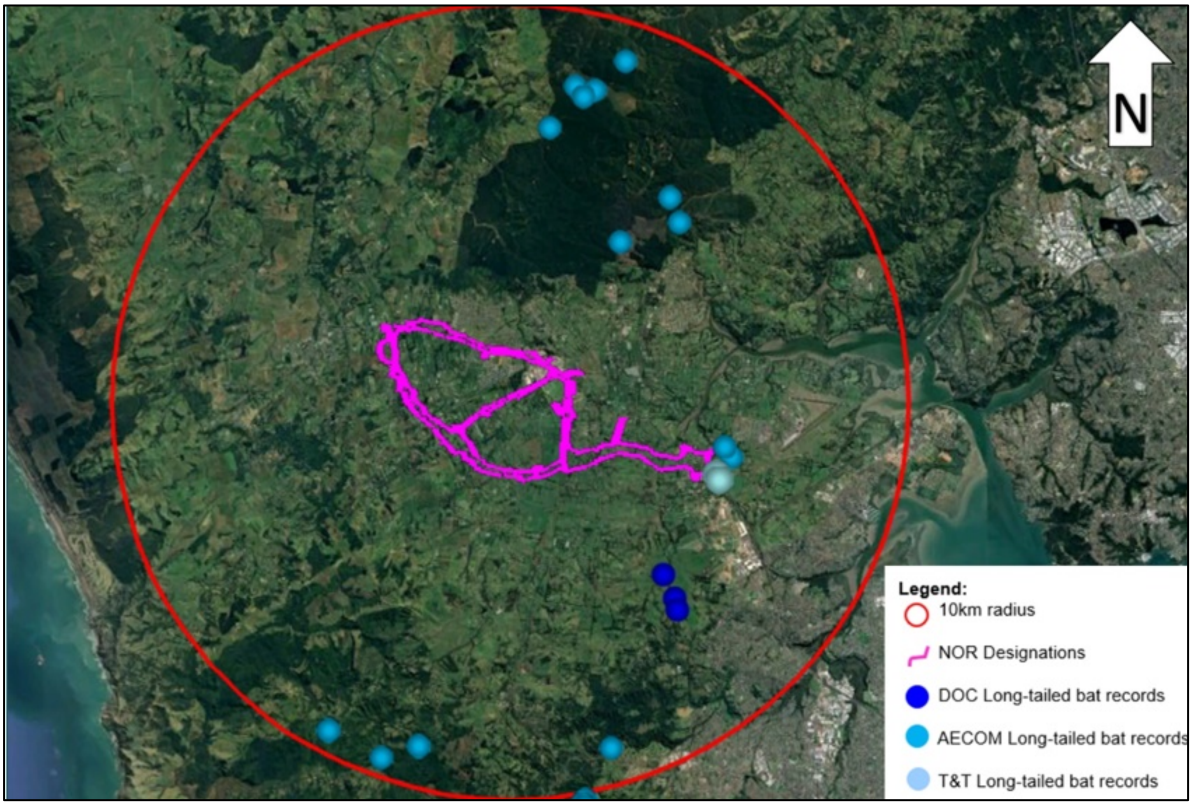


**Figure 22: Map showing bat sightings within 10km of the Site (supplied by Client)**


**Figure 23: Image of a kawau (from NZ Birds Online)**

### 15.0 Potential Direct Impacts

Direct impacts are likely to occur from bulk earthworks (permanent adverse), stream realignment (permanent adverse), works within a waterway (temporary and permanent adverse), construction and operational discharges to waterways (temporary and permanent adverse and beneficial), vegetation clearance (temporary and permanent adverse), noise pollution during construction of the Site network and operation of the ASH (temporary and permanent adverse), light pollution (permanent adverse), and changes to the setting of cultural sites (permanent adverse and beneficial),

### 16.0 Potential Indirect Impacts

Indirect impacts are likely to occur from vegetation clearance causing erosion (temporary adverse), severing habitat for terrestrial species during operation of ASH (permanent adverse), and subsequent large-scale urban intensification of the catchment enabled by the ASH (permanent adverse).

### 17.0 Potential Cumulative Impacts

Cumulative impacts are likely to occur from hydrological changes to the catchment (permanent adverse), net changes in stormwater contaminant discharges or quality (permanent adverse and beneficial), changes to the setting of and between wāhi tohu (permanent adverse), subsequent large-scale urban intensification of the catchment enabled by the ASH (permanent adverse), light pollution (permanent adverse), changes to the cultural landscape (permanent adverse and beneficial), and increased walking and cycling opportunities linked to human access and health and emissions (permanent beneficial).

### 18.0 Summary of Effects

Specific potential impacts identified as relating to the proposed project are included in Table 3 below:

**Table 3: Summary of potential cultural impacts**

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| Waimauku-Whenuapai Cultural Landscape | Direct, indirect and cumulative permanent adverse construction and operation impacts arising from ASH including:<br><br>Built form of ASH within rural setting<br><br>Changes to the setting of and between wāhi tohu (visual, artificial lighting at night, audial, aural, spiritual) | Major Adverse | Large Adverse | Urban and Landscape Design Management Plan<br><br>Cut and fill batters shaped to a natural profile.<br><br>Boundary fences and planting to be reinstated for partially affected properties.<br><br>A planting plan, including limiting removal of noteworthy trees | Moderate Adverse direct effects but Large Adverse indirect and cumulative effects | Cultural Design Plan including funding for implementation.<br><br>Scheduling (schedule 12 AUP) all identified Māori Sites of Significance within Study Area through a Private |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | Changes to the rural character necessitated through subsequent large-scale urban intensification of the catchment enabled by the ASH<br>……………………<br>Potential direct permanent beneficial operation impacts arising from Local Network (Don Buck Rd, Fred Taylor Dr, Coatesville-Riverhead HWY, Brigham Creek Rd, Hobsonville Rd, New Spedding Rd, Mamari Rd, Trig Rd) and existing corridor Strategic Network (Main Rd, RTC, Access Rd) upgrades that can contribute cultural design, place naming, and walking and cycling access opportunities | <br>…………..<br>Potential Negligible Beneficial (Non-ASH) | <br>………………..<br>Potential Minor Beneficial (Non-ASH) | and vegetation where practicable.<br><br>Where practicable retaining stockpiles and reusing soil on site.<br><br>Construction Noise and Vibration Management Plan.<br><br>Site Specific Construction Management Schedule<br><br>Pre and Post Building Condition Survey where vibration may exceed certain criteria.<br><br>Road surface material, option that reduces noise at the source<br><br>Best practise rail design and installation<br><br>Installation of noise barriers<br><br>Building modification mitigation should above mitigation not achieve desired outcome<br><br>Ecological and landscape planting will help integrate the corridors with rural areas. Alongside the limited access points, the ecological and landscaping will | | Plan Plan Change.<br><br>Establishment of a Cultural Heritage and Offset fund and trust be established for the benefit of TKāM and NWōK with regard to the conservation, interpretation, and education regarding taonga within the Study Area.<br><br>Permanent exclusion of urban intensification (Rural Zone) west of ASH and low density east of ASH (CSL Zone)<br><br>RFR in favour of TKaM placed on any land within the Designation that may eventually be disposed of by NZTA |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | | | | create a green buffer which will reinforce rural areas and will help avoid future development in rural areas. | | |
| Whenua (productive soils) | Direct, indirect and cumulative permanent adverse construction impacts arising from:<br><br>Bulk earthworks primarily from ASH but also from the wider Strategic and Local Network<br><br>Removal of regionally significant high productivity soils (mauri) necessitated through subsequent large-scale urban intensification of the catchment enabled by the ASH | Major Adverse | Large Adverse | Where practicable retaining stockpiles and reusing soil on site.<br><br>Cut and fill batters shaped to a natural profile. | Large Adverse | Topsoil Conservation Plan<br><br>Permanent exclusion of urban intensification (Rural Zone) west of ASH and low density east of ASH (CSL Zone) |
| Wai Māori (fresh water) | Direct, indirect and cumulative temporary and permanent adverse construction and operation impacts arising from:<br><br>Earthworks within proximity to watercourses (particularly ASH)<br><br>Vegetation clearance along watercourse embankments<br><br>Significantly increased impervious area within sensitive receiving water | Moderate Adverse | Large Adverse | Construction Environmental Management Plans.<br><br>Operational impacts worked through and resolved during detailed design by optimising the design of culverts and bridges and new channels to minimise flood effects upstream and downstream of crossings.<br><br>Vegetated swales<br><br>Stormwater wetlands | Moderate Adverse | Permanent exclusion of urban intensification (Rural Zone) west of ASH and low density east of ASH (CSL Zone) |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | environment (primarily ASH)<br><br>Changes to hydrology of the catchment resulting from new roads and culverts (primarily ASH)<br><br>Increased risk of operational discharges of heavy metals and other contaminants from traffic enabled by the ASH<br><br>Changes to the landuse and discharge type necessitated through subsequent large-scale urban intensification (and net impervious area) of the catchment enabled by the ASH<br><br>……………………..<br><br>Potential direct and cumulative permanent beneficial impacts relating to the Local Network (Don Buck Rd, Fred Taylor Dr, Coatesville-Riverhead HWY, Brigham Creek Rd, Hobsonville Rd, New Spedding Rd, Mamari Rd, Trig Rd) and existing corridor Strategic Network (Main Rd, RTC, Access Rd) upgrades arising from:<br><br>Improved stormwater management upgrades including swales, wetlands, | …………..<br><br>Minor Beneficial (Non-ASH) | ………………..<br><br>Moderate Beneficial (Non-ASH) | Stormwater ponds<br><br>Tree pits/rain gardens on routes with walking/cycling<br><br>Use of bridges where possible (instead of culvert-reclamation systems) | | |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | ponds, and tree pits/rain gardens | | | | | |
| Waitematā ō Kahumatamomoe | No change to low potential negligible net or cumulative adverse impact resulting from works within catchment. On balance likely neutral once up-stream mitigations in place. | Neutral | Neutral | Nil | Neutral | Nil |
| Te Wai Roa ō Kahu | No change to low potential negligible net or cumulative adverse impact resulting from works within catchment. On balance likely neutral once up-stream mitigations in place. | Neutral | Neutral | Nil | Neutral | Nil |
| Wai ō Pareira | No change to low potential negligible net or cumulative adverse impact resulting from works within catchment. On balance likely neutral once up-stream mitigations in place. | Neutral | Neutral | Nil | Neutral | Nil |
| Te Awa Mānutewhau | Direct temporary and permanent construction and operation adverse impact from:<br><br>Upgrades to Don Buck Rd Wetland 2 occurring directly within awa<br><br>Slight increase in net impervious surface | Minor Adverse | Moderate Adverse | Refer to 'Wai Māori' mitigations above | Minor Adverse | Riparian planting for 200m in both directions from impact<br><br>Mauri health monitoring for 5 years |
| Te Waiarohia ō Ngariki | Direct and cumulative permanent construction and | Minor Adverse | Moderate Adverse | Refer to 'Wai Māori' mitigations above | Minor Adverse | Riparian planting for 200m in both |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | operation adverse impacts resulting from upgrades to southeast end of Brigham Creek Road and Trig Road upgrades from:<br><br>Construction earthworks in proximity to the awa<br><br>Works within the awa to install new culverts<br><br>Permanent fill batter slopes adjacent to the awa<br><br>Increase in impervious surface<br><br>Construction of Hobsonville Rd Wetland 4 | | | | | directions from impact<br><br>Mauri health monitoring for 5 years |
| Wai Rawawaru | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Wai Totara | Direct and cumulative permanent construction and operation adverse impacts resulting from upgrades to southeast end of Brigham Creek Road and RTC/RAMC from:<br><br>Construction earthworks in proximity to the awa<br><br>Permanent fill batter slopes adjacent to the awa<br><br>New section of road (New Spedding Rd and RTC ) and net | Minor Adverse | Moderate Adverse | Refer to 'Wai Māori' mitigations above<br><br>New bridges over the span of the awa thus avoiding direct works in stream bed/banks | Minor Adverse | Cultural Design<br><br>Riparian planting for 200m in both directions from impact<br><br>Mauri health monitoring for 5 years |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | increase in impervious surface | | | | | |
| Te Awa Ngongetepara | Direct and cumulative temporary and permanent construction and operation adverse impacts resulting from upgrades to northwest end of Brigham Creek Road and from new RTC alignment from:<br><br>Construction earthworks in proximity to the awa<br><br>Site compound, stockpile, sediment pond, and lay-down area adjacent to awa<br><br>Permanent fill batter slopes adjacent to the awa<br><br>Increase in impervious surface from RTC | Minor Adverse | Moderate Adverse | Refer to 'Wai Māori' mitigations above<br><br>Proposed new RTC overbridge to avoid works within stream | Minor Adverse | Cultural design<br><br>Riparian planting for 200m in both directions from impact<br><br>Mauri health monitoring for 5 years |
| Waiteputa | Direct permanent construction and operation adverse impacts resulting from the new Redhills Arterial from:<br><br>Construction earthworks in proximity to the awa<br><br>Permanent fill batter slopes adjacent to the awa<br><br>New section of road and net increase in impervious surface | Minor Adverse | Moderate Adverse | Refer to 'Wai Māori' mitigations above<br><br>Lighting design to reduce light spill, buffer planting, | Minor Adverse | Cultural Design<br><br>Riparian planting for 200m in both directions from impact<br><br>Mauri health monitoring for 5 years |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| Te Awa Pītoitoi | Direct and cumulative temporary and permanent construction and operation adverse impacts resulting from upgrades to northwest end of Brigham Creek Road from:<br><br>Construction earthworks in proximity to the awa<br><br>Site compound, stockpile, sediment pond, and lay-down area adjacent to awa<br><br>Increase in impervious surface | Negligible Adverse | Minor Adverse | Refer to 'Wai Māori' mitigations above | Negligible Adverse | Riparian planting for 200m in both directions from impact<br><br>Mauri health monitoring for 5 years |
| Te Awa Rangitōpuni | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Awa Pakinui | Direct permanent operation adverse impact to the setting of the awa and its context which will be changed with the introduction of the new RTC and bridge about 250m to the north. | Negligible Adverse | Minor Adverse | Urban and Landscape Design Management Plan | Minor Adverse | Cultural design |
| Te Awa Kumeū | Direct and cumulative construction and operation adverse impacts from:<br><br>Works within the awa and its tributaries may impact the taniwha<br><br>RTC and ASH new alignment significant earthworks in proximity to the | Major Adverse | Large Adverse | Refer to 'Wai Māori' mitigations above<br><br>Proposed new RTC/ASH overbridge to avoid works within stream | Large Adverse | Avoid realignment of river<br><br>Minimise earthworks in proximity<br><br>Constructio n compounds set back 500m from river<br><br>Cultural design |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | awa, particularly cut on east side<br><br>RTC and ASH permanent fill batter slopes adjacent to the awa<br><br>ASH stormwater wetland 4, 5 and 6, and Main Rd/RTC Wetland 2 in close proximity to awa<br><br>RTC and ASH construction compounds in proximity to the awa<br><br>Main Rd construction compound near east side of existing SH16 bridge<br><br>RTC and ASH setting impacts from new bridge structures over the awa<br><br>Works in awa for SH16 temporary road realignment, deconstruction of existing bridge, and construction of new bridge<br><br>RTC and ASH new alignment net increase in impervious surface | | | | | Riparian planting for 500m in both directions from impact<br><br>Mauri health monitoring for 5 years<br><br>Establishment of a Cultural Heritage and Offset fund and trust be established for the benefit of TKāM and NWōK with regard to the conservation, interpretation, and education regarding taonga within the Study Area. |
| Te Awa Ahukāramuramu | Direct and cumulative permanent construction and operation adverse impacts resulting from upgrades to ASH/RTC/Main Rd from: | Minor Adverse | Moderate Adverse | Refer to 'Wai Māori' mitigations above<br><br>Proposed new RTC/Main Rd bridge to avoid works within stream | Minor Adverse | Cultural Design<br><br>Riparian planting for 200m in both directions from impact |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | Construction earthworks in proximity to the awa<br><br>Permanent fill batter slopes adjacent to the awa<br><br>Increase in impervious surface<br><br>Construction of RTC/SH Wetland 10 and ASH Wetland 15 | | | | | Mauri health monitoring for 5 years |
| Waikoukou | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Awa Kaipara | Indirect and cumulative permanent adverse impacts from up-stream discharges and unlocking further urban intensification | Minor Adverse | Moderate Adverse | Refer to 'Wai Māori' mitigations above | Minor Adverse | Mauri health monitoring for 5 years |
| Native Ngahere and Rākau | No change | Neutral | Neutral | Nil | Neutral | Nil |
| SEA and Rakau within or adjacent to Site Footprint | Direct permanent construction adverse impacts relating to works near Brigham Creek SEA and other native vegetation along stream corridors | Minor Adverse | Minor Adverse | A planting plan, including limiting removal of noteworthy trees and vegetation where practicable. | Neutral | Nil |
| Native Fungi within or adjacent to Site Footprint | Direct permanent construction adverse impacts relating to earthworks, although scale of impact unknown as no assessments | Negligible Adverse | Negligible Adverse | Nil | Negligible Adverse | Include fungi identificatio n in ecological assessmen ts |
| Native Fishes within or adjacent to Site Footprint | Direct and cumulative temporary and permanent construction and operation adverse impacts from: | Moderate Adverse | Moderate Adverse | Nil | Moderate Adverse | Fresh water ecological manageme nt plan<br><br>Use of fish passage design |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | Works within waterways that could cause injury, death or displacement<br><br>Realignment of Kumeū river could cause injury, death or displacement<br><br>Installation of culverts<br><br>Sediment and other construction discharges<br><br>Increase in impervious surface and related discharges | | | | | Mauri health monitoring for 5 years |
| Native Invertebrates within or adjacent to Site Footprint | Direct permanent construction and operation adverse impacts relating to:<br><br>Earthworks<br><br>Light pollution<br><br>although scale of impact unknown as no assessments | Negligible Adverse | Negligible Adverse | Nil | Negligible Adverse | Include terrestrial invertebrate identificatio n in ecological assessmen ts |
| Native herpetofauna within or adjacent to Site Footprint | Direct permanent construction and operation adverse impacts relating to:<br><br>Earthworks that could cause injury, death or displacement,<br><br>Removal of vegetation including rank grasses that could cause displacement<br><br>Segmentation of the landscape/habitats | Moderate Adverse | Minor Adverse | Nil | Minor Adverse | Lizard manageme nt plan |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | by the ASH, although scale of impact unknown as no assessments | | | | | |
| Native Avifauna within or adjacent to Site Footprint | Direct, indirect and cumulative temporary and permanent construction and operation adverse impacts from:<br><br>Removal of trees and vegetation along Site corridor leading to displacement<br><br>Bird strike from ASH in proximity to Waitākere Ranges<br><br>Light pollution from ASH and subsequent urban intensification<br><br>Loss of open habitat for Kahu (Hawks) | Minor Adverse | Minor Adverse | Impact management for TAR birds incl. North Island fernbird, banded rail and spotless crake to be incorporated into detailed design. | Minor Adverse | Bird Manageme nt Plan<br><br>Permanent exclusion of urban intensificati on (Rural Zone) west of ASH and low density east of ASH (CSL Zone) |
| Native Bats | Direct, indirect and cumulative temporary and permanent construction and operation adverse impacts from:<br><br>Removal of trees and vegetation along Site corridor leading to displacement<br><br>Light pollution from ASH and subsequent urban intensification | Minor Adverse | Minor Adverse | Bat management plan to be developed and incorporated into detailed design.<br><br>Significant ecological planting to mitigate impacts on bats has been incorporated into the designation footprint. This will lead to the enhancement of riparian areas and will green much of the corridor. | Minor Adverse | Bat manageme nt plan |
| Nga Rau Pou ā Maki (northern ridgeline) | Direct and cumulative permanent operation adverse impacts to the setting of the | Moderate Adverse | Large Adverse | Urban and Landscape Design Management Plan | Large Adverse | Establishm ent of a Cultural Heritage fund and trust be |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | northern ranges from ASH and the subsequent urban intensification of the lands below | | | | | established for the benefit of TKāM and NWōK with regard to the conservation, interpretation, and education regarding taonga within the Study Area.<br><br>Permanent exclusion of urban intensification (Rural Zone) west of ASH and low density east of ASH (CSL Zone) |
| Te Ara Pukewhakataratara | Direct and cumulative permanent construction adverse impacts arising from Don Buck Rd further earthworks and modification of Pukewhakataratara Ridgeline | Negligible Adverse | Minor Adverse | Nil | Minor Adverse | Cultural design plan to recognise the site |
| Pukewhakataratara | Direct and cumulative permanent construction adverse impacts arising from Don Buck Rd further earthworks and modification of Pukewhakataratara | Minor Adverse | Moderate Adverse | Nil | Moderate Adverse | Minimise earthworks<br><br>Cultural design plan to recognise the site<br><br>Enter the site in Schedule 12 as a Māori Site of Significance |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| Wai ō Pareira Kāinga | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Mānutewhau Kāīnga | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Rawawaru Kāīnga | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Ngongetepara Kāīnga | No change to negligible adverse direct and cumulative effects from earthworks and unlocking further urban intensification | Negligible Adverse | Minor Adverse | Nil | Minor Adverse | Cultural design |
| Te Ahipekapeka | Direct and cumulative permanent construction and operation adverse impacts arising from Coatesville-Riverhead HWY further earthworks and impervious surface | Negligible Adverse | Minor Adverse | Nil | Minor Adverse | Cultural design plan to recognise the site |
| Turanga ō Kawau | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Maraeroa | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Pītoitoi Kāīnga | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Taurangatira | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Tōangaroa | No change | Neutral | Neutral | Nil | Neutral | Cultural design |
| Wai paki i rape ō Ruarangi | Direct temporary construction adverse impacts from:<br><br>Main Rd construction compound near east side of existing SH16 bridge | Major Adverse | Large Adverse | Nil | Large Adverse | Cultural design |

| Name | Summary of impact | Level of Impact | Significance of effect | Proposed mitigation | Residual effect | Offsetting |
|---|---|---|---|---|---|---|
| | Main Rd/RTC Wetland 2 in close proximity to awa<br><br>Works in awa for SH16 temporary road realignment, deconstruction of existing bridge, and construction of new bridge | | | | | |
| Tuuraki awatea | No change to negligible adverse setting and temporary down-stream impacts. | Negligible Adverse | Minor Adverse | Refer to 'Wai Māori' mitigations above | Neutral | Nil |
| Pukeharakeke | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Ihumatāo | No change to negligible adverse cumulative effects from unlocking further urban intensification | Neutral | Neutral | Nil | Neutral | Nil |
| Te Patumāhoe Kāīnga | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Kahutōpuni | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Te Ara Rimu | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Waimauku | No change to negligible adverse cumulative effects from unlocking further urban intensification within a flood-prone area | Negligible Adverse | Minor Adverse | Nil | Minor Adverse | Permanent exclusion of urban intensification (Rural Zone) west of ASH and low density east of ASH (CSL Zone) |
| Taumata | No change to negligible adverse setting impacts. | Neutral | Neutral | Nil | Neutral | Nil |
| Kāhukurī | No change | Neutral | Neutral | Nil | Neutral | Nil |
| Treaty Settlement Land | No change | Neutral | Neutral | Nil | Neutral | Nil |

**Table 4: Summary of Cultural Effects**

| Measures | Count |
|---|---|
| **Significance of Effect ::** | |
| Neutral | 25 |
| Negligible Beneficial | 0 |
| Minor Beneficial | 1* |
| Moderate Beneficial | 1* |
| Large Beneficial | 0 |
| Negligible Adverse | 3 |
| Minor Adverse | 15 |
| Moderate Adverse | 3 |
| Large Adverse | 5 |

*Beneficial impacts were noted for the non-ASH elements in terms of landscape and water assuming all mitigations and offsets implemented, but overall (with ASH) the impact was adverse.

# CONCLUSION

The North West Project proposes to upgrade and develop new sections of the local and strategic transport network extending from Hobsonville/Whenuapai through Westgate and Brigham Creek to Kumeū, Taupaki and Waimauku. A significant element of the project is the Alternative State Highway (ASH) from Brigham Creek to western Huapai. The project aims to support urban growth in the area and to provide people with genuine travel choices, to address climate change by achieving transformative mode shift, and to address transport safety issues. The project sits within and across an important cultural landscape at the crossroads between the Hikurangi, Waitematā, and Kaipara Valley takiwa. It is the northern part of Te Kawerau ā Maki's heartland and contains a number of significant cultural sites and resources from our most ancient traditions through to our major Treaty settlement redress. Sited between Nga Rau Pou ā Maki (the Waitākere Ranges) and Rangitōpuni (Riverhead Forest) on the alluvial plains of the Kumeū and Kaipara valleys, the project covers an area of numerous streams and the most productive soils in the northern half of the Auckland region. The valley is also protected by the taniwha Tangihua.

This CIA identified a total of 51 cultural sites and resources, ranging in relative value from low to predominantly high, and encompassing productive soil, rivers, landmarks, sacred sites, historical sites, traditional walking routes, and flora and fauna. The project was assessed against these sites and resources resulting in the documenting of eight significant adverse effects, 15 minor adverse effects, three negligible adverse effects, one potential significant beneficial effect*, one minor beneficial effect*, and 25 neutral effects. Where adverse effects were identified offsets (or further mitigation) were suggested. The significant adverse effects relate to the removal of productive topsoil, impacts to fresh water (including the taniwha), impacts to the Kumeū River (including the taniwha), impacts to fish species, setting impacts to Nga Rau Pou ā Maki, impacts to Pukewhakataratara, impacts to Wai paki i rape ō Ruarangi, and impacts to the cultural landscape.

While some of the cumulative impacts identified and measured, in particular future urban intensification, cannot be tied singularly to the project, it is reasonable to include them in this CIA given the strategic scope of the project and its aspirations to unlock urban development and support urban growth. Many harms can be mitigated to some degree or offset or compensated. However, at a strategic level, it is reasonable to question the wisdom of supporting urban growth in a flood prone catchment that holds the most regionally significant topsoils in northern Auckland, and that (through the ASH) places high risk of urbanising the fringes of the northern Waitākere Ranges. The destruction of a food bowl for the benefit of more concrete warehouses seems to be the opposite of sustainability or forward planning. The removal of highly organic topsoils at such a scale certainly is at odds with the project aim of addressing climate change. It is the role of iwi to be kaitiaki of the mauri of the resources in their rohe for the inter-generational benefit of all. The sensitivity of the receiving environment here is witnessed by the fact we hold there to be a taniwha protecting it. Te Kawerau ā Maki has maintained for half a decade now that the Crown (in all its varying forms including Council and NZTA) would be better off working with us to plan for growth at Riverhead where the soils are far less productive and flood prone and we have the scale of land to strategically plan for inter-generational wellbeing. It is frustrating to watch more of our taonga risk disappearing due to the acts of the Crown.

Due to the sensitivities of the landscape, we are not supportive of the ASH component of the project. We would prefer that the existing SH16 corridor be widened. This is a choice between existing homes and the environment. We choose to support te taiao. Should it (the ASH) proceed against our opposition and advice we have suggested limits and offsets to what that might look like. Our preference is for the Crown to work with Te Kawerau ā Maki on strategic and inter-generational growth in ways where we both benefit and where the environmental impacts are lower.

# RECOMMENDATIONS

**Table 5: Recommendations and outcome alignment**

| No. | Recommendation | TKaM Strategic Value alignment | IMP policy alignment | Legislative alignment | AUP policy alignment | Other policy alignment |
|---|---|---|---|---|---|---|
| 1 | Te Kawerau ā Maki do not oppose the proposal, with the exception of the ASH component which we do oppose (and prefer SH16 be widened instead), otherwise provided that the mitigations and offsets discussed are incorporated – we desire notice of the outcome of the application and the final designation conditions | Mana Motuhake | | | | |
| 2 | Undertake further discussions and work to enable TKaM participation in design, construction and operation phases of the project e.g. through project board position and/or MOU and including procurement or training opportunities | Mana Motuhake, Kaitiakitanga, Whanaungatanga, Auaha | 2.2 (integration of tikanga) | RMA 6(e), 7(a), 8 | B6.2.2(1) (participation), B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga), B6.3.2(3) (AEE to include CIA), B6.3.2(6) (decisions to reflect cultural impacts), B6.5.2(7) (cultural landscapes in structure plans), B6.5.2(9) (cultural design of infrastructure) | UNDRIP, NPSFW, NZCPS, ICOMOS |
| 3 | Avoid realignment of the Kumeū River as a matter of spiritual integrity | Kaitiakitanga | 2.2 (integration of tikanga), 4.2.2 (cultural heritage) | RMA 6(e), 7(a) | B6.3.2(2) (integrate tikanga), B6.3.2(6) (decisions to reflect cultural impacts) | UNDRIP, ICOMOS, NPSFW |
| 4 | Should the ASH proceed against our advice, permanent exclusion of urban intensification (Rural Zone to remain) west of ASH and low density east of ASH (CSL Zone) should be provided | Kaitiakitanga | 2.2 (integration of tikanga), 4.1.2 (cumulative effects), | RMA 6(e), 7(a), 8 | B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga), | UNDRIP |

| No. | Recommendation | TKaM Strategic Value alignment | IMP policy alignment | Legislative alignment | AUP policy alignment | Other policy alignment |
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| | | | 4.2.2 (cultural heritage), 4.7.2 (landscape) | | B6.3.2(6) (decisions to reflect cultural impacts), B6.5.2(7) (cultural landscapes in structure plans) | |
| 5 | Avoid where possible significant earthworks on the areas of cultural value (sites) identified in this report, and where not possible, work with TKaM on design and construction monitoring that incorporates our tikanga | Kaitiakitanga | 2.2 (integration of tikanga), 4.2.2 (cultural heritage), 4.3.2 (koiwi), 4.9.2 (cultural design) | RMA 6(e), 7(a), 8; HNZPTA s45 | B6.2.2(1) (participation), B6.3.2(2) (integrate tikanga), B6.5.2(9) (cultural design of infrastructure), E11 and E12 rules (ADP) | UNDRIP, ICOMOS |
| 6 | Cultural Heritage and Offset fund and trust be established for the benefit of TKāM and NWōK with regard to the conservation, interpretation, and education regarding taonga within the Study Area. The budget for this fund will need to be negotiated but must be meaningful | Kaitiakitanga | 2.2 (integration of tikanga), 4.2.2 (cultural heritage), 4.9.2 (cultural design) | RMA 6(e) | B6.2.2(1) (participation), B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga), B6.5.2(7) (cultural landscapes in structure plans), B6.5.2(9) (cultural design of infrastructure) | UNDRIP, ICOMOS |
| 7 | Work with TKaM on water sensitive design that incorporates our tikanga, noting the importance of not mixing waters and soil and plant filtration, and giving effect to Mana ō te Wai, and including elements such as riparian planning buffers and long-term mauri monitoring | Kaitiakitanga, Mātauranga | 2.2 (integration of tikanga), 4.4.2 (management of water), 4.5.2 (coastal) | RMA 6(e), 7(a), 8 | B6.2.2(1) (participation), B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga), B6.5.2(9) (cultural design of infrastructure) | UNDRIP, NPSFW, NZCPS |

| No. | Recommendation | TKaM Strategic Value alignment | IMP policy alignment | Legislative alignment | AUP policy alignment | Other policy alignment |
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| 8 | Work with TKaM on ecologically sensitive design that incorporates our tikanga, including eco-sourced vegetation, a 100% native plant commitment, habitat enhancement, fish passages, and green corridors, and ensure and ecological offsetting framework is designed in partnership with TKaM | Kaitiakitanga, Mātauranga | 2.2 (integration of tikanga), 4.7.2 (landscape), 4.8.2 (flora and fauna), 4.9.2 (cultural design) | RMA 6(e), 7(a), 8 | B6.2.2(1) (participation), B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga) | UNDRIP |
| 9 | Develop in conjunction with TKaM an ecological restoration and management plan for the wetlands and streams that removes pests, monitors water, biodiversity and mauri quality including with cultural indicators, and includes enhancements such as native riparian planting | Kaitiakitanga | 2.2 (integration of tikanga), 4.4.2 (management of water), 4.7.2 (landscape), 4.8.2 (flora and fauna), 4.9.2 (cultural design) | RMA 6(e), 7(a), 8 | B6.2.2(1) (participation), B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga) | UNDRIP, NPSFW, NZCPS |
| 10 | Work with TKaM on a darkness sensitive design that incorporates our tikanga, and limits the degree of light pollution generated | Kaitiakitanga | 2.2 (integration of tikanga), 4.1.2 (cumulative effects), 4.7.2 (landscape) | RMA 6(e), 7(a) | B6.2.2(1) (participation), B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga) | UNDRIP, NZCPS |
| 11 | Work with TKaM on cultural design incorporation and interventions, such as ensuring inter- and intra- cultural site visibility and settings is maintained, undertaking place naming and educational and physical (artistic) interpretation of cultural sites and history, and opportunity to input to the built form of elements of the project (e.g. bridges) | Kaitiakitanga, Auaha, Mātauranga | 2.2 (integration of tikanga), 4.1.2 (cumulative effects), 4.2.2 (cultural heritage), 4.7.2 (landscape), 4.9.2 (cultural design) | RMA 6(e) | B6.2.2(1) (participation), B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga), B6.5.2(9) (cultural design of infrastructure) | ICOMOS |
| 12 | Actively support aspirations of TKaM to enter cultural sites within the Study Area onto the Auckland Council schedule of Sites of Significance to Mana Whenua, potentially through a private plan change | Kaitiakitanga | 4.2.2 (cultural heritage), 4.7.2 (landscape) | RMA 6(e), 7(a), 8 | B6.3.2(1) (identify values), B6.5.2(7) (cultural landscapes in structure plans/plan changes) | ICOMOS |

| No. | Recommendation | TKaM Strategic Value alignment | IMP policy alignment | Legislative alignment | AUP policy alignment | Other policy alignment |
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| 13 | Develop and implement a Topsoil Conservation Plan | Kaitiakitanga | 2.2 (integration of tikanga), 4.1.2 (cumulative effects) | RMA 6(e), 7(a), 8 | B6.3.2(1) (identify values) B6.3.2(2) (integrate tikanga), B6.3.2(6) (decisions to reflect cultural impacts), B6.5.2(7) (cultural landscapes in structure plans), B6.5.2(9) (cultural design of infrastructure) | UNDRIP |
| 14 | In addition to the ecological management plan and topsoil management plan, TKāM should co-develop an urban/landscape design management plan and heritage management plan | Kaitiakitanga | 4.2.2 (cultural heritage), 4.7.2 (landscape) | RMA 6(e), 7(a), 8 | B6.2.2(1) (participation), B6.3.2(2) (integrate tikanga), B6.3.2(6) (decisions to reflect cultural impacts), B6.5.2(7) (cultural landscapes in structure plans) | UNDRIP, ICOMOS |
| 15 | Cultural monitoring, including pre-works cultural inductions, and the monitoring of cultural sites and resources for the construction period of the project, should be resourced at the cost of the Client | Kaitiakitanga, Whanau Mātauranga Māori | 2.2 (integration of tikanga) | RMA 6(e), 7(a) | B6.2.2(1) (participation), B6.3.2(2) (integrate tikanga) | UNDRIP |
| 16 | Any lands within the designation that NZTA may wish to dispose of in the future should first be offered to TKaM to provide opportunity to re-acquire whenua alienated from TKaM | Mana Motuhake | | | | |

# REFERENCES


Murdoch, G. (2011). *Te Kawerau ā Maki Claim Overview Report*. Unpublished Report.

Taua, T.W. (2009). *He kohikohinga korero mo Hikurangi.* In F. Macdonald and R. Kerr (ed). West – The History Of Waitakere. Random House.