Auckland Council
Te Kaunihera o Tāmaki Makaurau

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

Date:	**Monday 21, Tuesday 22, Wednesday 23 and Thursday 24 August 2023**
	Monday 28, Tuesday 29, Wednesday 30 and Thursday, 31 August 2023
	Monday 4, Tuesday 5, Wednesday 6 and Thursday, 7 September 2023
	Monday 11, Tuesday 12, Wednesday 13 and Thursday, 14 September 2023
Time:	**9.30am**
Venue:	**To be confirmed**

APPLICATION MATERIAL – VOLUME TWO

NOTICE OF REQUIREMENT

NOR 4(B) – ALTERATION TO DESTINATION 6717 STATE HIGHWAY 20B – STATE HIGHWAY 20 TO AUCKLAND INTERNATIONAL AIRPORT

SUPPORTING GROWTH ALLIANCE

WAKA KOTAHI NZ TRANSPORT AGENCY

Note: The reports contained within this document 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 hearings advisor.

COMMISSIONERS

Chairperson	**David Wren**
Commissioners	**Alan Pattle**
	Basil Morrison

Bevan Donovan
KAITOHUTOHU WHAKAWĀTANGA
HEARINGS ADVISOR

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A NOTIFIED NOTICE OF REQUIREMENT TO THE AUCKLAND COUNCIL UNITARY PLAN BY WAKA KOTAHI NZ TRANSPORT AGENCY

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TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

Airport to Botany Landscape Effects Assessment

December 2022

Version 1

Document Status

Responsibility	Name
Author	Tom Lines
Reviewer	Chris Bentley
Approver	Adam Jellie

Revision Status

Version	Date	Reason for Issue
1.0	9 December 2022	Final for lodgement

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Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
AUP:OP	Auckland Unitary Plan: Operative in Part
BRT	Bus Rapid Transit
CVA	Cultural Values Assessments
HANA	High Aircraft Noise Area
MANA	Moderate Aircraft Noise Area
N/A	Not Applicable
NIMT	North Island Main Trunk railway
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Airport to Botany Bus Rapid Transit (Botany Town Centre to Rongomai Park)
NoR 2	Notice of Requirement 2: Airport to Botany Bus Rapid Transit (Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue)
NoR 3	Notice of Requirement 3: Airport to Botany Bus Rapid Transit (Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange)
NoR 4a	Notice of Requirement 4a: Airport to Botany Bus Rapid Transit (SH20/20B Interchange to Orrs Road)
NoR 4b	Notice of Requirement 4b: Alteration to NZ Transport Agency Designation 6717 – State Highway 20B
NPS:UD	National Policy Statement on Urban Development
NZCPS	New Zealand Coastal Policy Statement
Programme partners	Te Ākitai Waiohua, Auckland Airport, Auckland Transport and Waka Kotahi
RCA	Road Controlling Authority
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
SEA	Significant Ecological Area
SH1	State Highway 1
SH20	State Highway 20
SH20B	State Highway 20B
SWGP	Southwest Gateway Programme

Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
ULDMP	Urban and Landscape Design Management Plan
Waka Kotahi	Waka Kotahi NZ Transport Agency

Executive summary

The Project is proposed to be an 18 km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations, connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany and will be part of Auckland's wider Rapid Transit Network (**RTN**). The Project has been divided into five Notice of Requirements (NoR 1, NoR 2, NoR 3, NoR 4a and 4b).

This assessment considers the natural character, landscape and visual effects in relation to the Airport to Botany Project (the Project). The assessment has been undertaken in line with the Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines. Prior to undertaking the assessment, a desktop analysis was undertaken followed by multiple site visits along the route of the Project.

The assessment of effects for each NoR analyses the context and determines the landscape characteristics and values of each area and then assesses the construction and operational effects of the Project.

A summary table of effects is provided in each NoR section and overall project conclusions (Section 12). Section 10 include measures to avoid, remedy or mitigate construction effects and in Section 11 measures to avoid, remedy or mitigate operational effects are identified. Recommended mitigation measures for construction and operation are considered in a Project wide context, i.e. across all NoRs. The primary means of mitigating the effects is through design responses to be illustrated in an Urban Landscape and Design Management Plan (**ULDMP**).

The mitigation of operational effects includes (in addition to Project wide recommendations) specific recommendations relating to works associated with the Puhinui Road BRT Bridge and the SH20B to SH20 Ramp Structure.

In addition to the above construction and operational effects, the Project provides the following positive effects:

- The provision of a BRT corridor;
- The provision of high quality walking and cycling facilities to provide improved connectivity to points along the corridor in addition to areas of open space such as Rongomai Park;
- Opportunities to enhance the character and identity of neighbourhoods through partnership with Manawhenua in all future phases of the Project, including (but not limited to) the future naming of BRT stations and introduction of mahi toi elements to reinforce local identify; and
- A net increase in canopy cover adjacent to the Project corridor associated with planting in berms, green stormwater infrastructure such as vegetated swales and planted stormwater wetlands.

1 Introduction

1.1 Purpose and scope of this Report

This Assessment of Landscape, Visual and Natural Character Effects report (**this Report**) has been prepared to inform the Assessment of Effects on the Environment (**AEE**) for five Notices of Requirement (**NoRs**) being sought by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport for the Airport to Botany Bus Rapid Transit Project (**the Project**) under the Resource Management Act 1991 (**RMA**). Specifically, this Report considers the actual and potential effects associated with the construction and operation of the Project on the existing and likely future environment as it relates to, landscape, visual and natural character effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

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 within each NoR, 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, visual and natural character effects. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this Report for clarity.

1.2 Report structure

In order to provide a clear assessment of each NoR, this Report follows the structure set out in the AEE. That is, each notice has been separated out into its own section, and each section contains an assessment of the actual and potential effects for the specific NoR. Where appropriate, measures to avoid, remedy or mitigate effects are recommended.

Each section is arranged in geographical order, starting from the westernmost point of the proposed NoR, to the easternmost point. Table 1 below describes the extent of each section, and where the description of effects can be found in this Report.

Table 1 Report structure

Sections	Section number
Description of the Project	2
Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines	3
Identification and description of the landscape character of the existing and likely receiving environment	5.2, 6.2, 7.2, 8.2
Assessment of general landscape, visual and natural character matters for all Airport to Botany Bus Rapid Transit NoRs	5.2.2, 6.2.2, 7.2.2, 8.2.2
Assessment of specific landscape, visual and natural character matters for Airport to Botany Bus Rapid Transit NoR 1	5.3, 5.4
Assessment of specific landscape, visual and natural character matters for Airport to Botany Bus Rapid Transit NoR 2	6.3, 6.4

Assessment of specific landscape, visual and natural character matters for Airport to Botany Bus Rapid Transit NoR 3	7.3, 7.4
Assessment of specific landscape, visual and natural character matters for Airport to Botany Bus Rapid Transit NoRs 4a and 4b	8.3, 8.4
Overall conclusion of the level of potential adverse landscape, visual and natural character effects of the Project	11

2 Project description

The overall Project is proposed to be an 18 km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations. It is part of Auckland's wider Rapid Transit Network (**RTN**) connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany.

As set out in the AEE, this Report specifically relates to a portion of the overall Project (approximately 14.9 km) which extends from Botany Town Centre in the vicinity of Leixlep Lane to Orrs Road in the Puhinui peninsula, off SH20B. The Project primarily involves the upgrade and widening of existing transport corridors to provide for a dedicated BRT corridor and high-quality walking and cycling facilities.

Nine BRT stations are proposed as part of the Project. These stations are generally located at signalised intersections and will be staggered on either side of the intersection.

These stations are situated in the following locations:

- Smales Road;
- Accent Drive;
- Ormiston Road – Botany Junction Shopping Centre;
- Dawson Road;
- Diorella Drive;
- Ronwood Avenue (Manukau Central);
- Manukau Station;
- Puhinui Road/Lambie Drive; and
- Puhinui Station.

As part of the Project, two new structures are proposed:

- A BRT bridge crossing the North Island Main Trunk (**NIMT**) and connecting to the concourse level of the Puhinui Station; and
- A southbound ramp from SH20B to SH20.

Upgrades to existing structures are proposed at the:

- Bridge over Ōtara Creek (NoR 1);
- Bridge over SH1 (NoR 2);
- Bridge over NIMT (NoR 3); and
- Bridge over Waokauri Creek (NoR 4a).

Figure 1: Overview of the Project and NoR extents

Table 2: Overview of NoRs

Notice	Description	Requiring Authority
NoR 1	Bus Rapid Transit corridor and high quality walking and cycling facilities from Botany Town Centre to Rongomai Park	Auckland Transport
NoR 2	Bus Rapid Transit corridor and high quality walking and cycling facilities from Rongomai Park to Puhinui Interchange, in the vicinity of Plunket Avenue	Auckland Transport
NoR 3	Bus Rapid Transit corridor and high quality walking and cycling facilities from Puhinui Interchange, in the vicinity of Plunket Avenue to SH20/SH20B Interchange	Auckland Transport
NoR 4a	Bus Rapid Transit corridor and high quality walking and cycling facilities from SH20B/20 Interchange to Orrs Road	Auckland Transport
NoR 4b	Alteration to designation 6717 to provide for the widening of SH20B, including a southbound on-ramp onto SH20, high quality walking and cycling facilities and enable a Bus Rapid Transit corridor	NZ Transport Agency

3 Assessment methodology

The sections to follow provide an overview of the assessment methodology that has been used to consider the landscape, character and visual effects for the NoRs that make up the Project.

3.1 Preparation for this Report

Work undertaken for this report commenced in January 2022. In summary, the preparation for this work has included:

- Review of the Airport to Botany specialist briefing package, the Single Stage Business Case (**SSBC**) and the Te Tupu Ngātahi GIS viewer;
- A review of the statutory setting of the Project and surrounding context;
- A review of the base map data such as contours and aerial photography;
- A preliminary site visit on 17 February 2022 with the Project Team;
- A specialists' workshop held on 8 March 2022 to discuss initial findings following the first site visit; and
- A more detailed site visit including taking representative photographs along the route was undertaken on 23 March 2022 by Chris Bentley and Tom Lines to understand the nature of the receiving environment and its physical and visual relationship to the surrounding environment, as well as the context, character and visual catchment and viewing audiences from the wider area.

3.2 Assumptions and limitations

In undertaking this assessment, the following limitations have been encountered and therefore the following assumptions have been made:

- This assessment is based on site visits to publicly accessible locations only. These areas include road corridors (including footpaths) and public parks / reserves. Large portions of the Project pass through properties currently held in private ownership. Therefore, the assessment of the impacts within or adjoining these private properties rely upon our site visits to publicly accessible locations, and information from our own desktop reviews (such as aerial photography). Only potential viewing audiences outside of the proposed designation boundary have been considered within this report. It is assumed that all private properties within the proposed designation boundary will be acquired;
- This assessment does not provide an assessment of the impacts on Mana Whenua cultural concepts or values. 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; and
- This Report relies on the collective inputs and expertise of a range of disciplines which have informed the considerations and conclusions of this assessment. This includes urban design, arboricultural and ecological expertise.

The proposed NoRs are located within a predominantly urban landscape which will evolve over time and are likely to experience change before the implementation of the Project. The National Policy Statement on Urban Development (**NPS:UD**) enables higher density dwellings within a walkable catchment of rapid transit stops. In the context of this Project, it is anticipated that:

- Zoning within a walkable catchment of proposed BRT stations along the Project corridor will enable, at minimum, apartment buildings of six storeys; and
- Beyond walkable catchments, residential zoning will provide for three dwellings up to three storeys in height (subject to meeting the relevant development standards).

3.3 Assessment framework

The same assessment methodology applies to the construction and operational stages of the works for all NoRs.

This assessment has been undertaken and peer reviewed by NZILA registered landscape architects with reference to the *Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines* (2021) and *Quality Planning Landscape Guidance Note*[1] and its signposts to examples of best practice.

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.

Landscape impacts 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 impacts are in relation to natural or induced change to any streams, wetlands and their margins as outlined in the New Zealand Coastal Policy Statement (NZCPS).[2] These are usually the result of landform, vegetation or hydrological modification or the introduction of structures into the landscape.

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.

The process of change itself, that is the construction process and/or activities associated with the development, also carry with them their own visual impacts however, these are distinct from those generated by a completed development.

The landscape and visual effects generated by any particular project 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 the Project depends on a number of factors, these include:

- The degree to which the Project contrasts, or is consistent, with the qualities of the surrounding landscape;

[1] https://www.qualityplanning.org.nz/node/802

[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)

- The proportion of the Project that is visible, determined by the observer's position relative to the objects viewed;
- The distance and foreground context within which the Project is viewed;
- The area or extent of visual catchment from which the Project 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 Project is viewed;
- The predictable and likely known future character of the locality; and
- 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 the Project 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. The aim is to provide a high amenity environment through appropriate design outcomes that can provide an adequate substitution for the currently experienced amenity.

3.3.1 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' and are described in the table below.

Table 3: 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. Concise Oxford English Dictionary Definition 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. Concise Oxford English Dictionary Definition Moderate: adjective- average in amount, intensity, quality or degree
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. Concise Oxford English Dictionary Definition 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.

3.3.1.1 Mitigation

For effects that are very low or low, mitigation is generally not required. Mitigation may be required for landscape effects of a low-moderate to moderate rating and area likely to be required for effects of a moderate-high 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.

3.3.2 Landscape effects

Landscape effects are derived 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 values ascribed to the landscape.

Potential landscape effects in this assessment relate to the following landscape attributes:

- Landform and Hydrology;
- Vegetation Patterns and Open Space;
- Urban Development and Land Use; and
- Aesthetic Qualities including Views and Visual Coherence.

3.3.3 Visual effects

Visual effects are effects on landscape values as experienced in views. They are a technique to help understand landscape effects and are a subset of landscape effects. Visual effects are considered for both temporary (construction effects) and permanent (operational effects) of the Project.

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); and
- Views (viewing audience and views afforded to, from and within the Project area).

Based on the above, the visual assessment for the Project focuses on the potential visual effects arising (through the construction and operation of the Project) within the proposed NoR extents and localised landscape. The focus of the assessment is on the nature and level of effects within the NoR extents and how this translates to effects for immediately adjacent land uses (existing and future but acknowledging that the existing land uses will change in the future).

3.3.4 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[3] and their margins, and the protection of them from inappropriate subdivision, use and development.

[3] A 'river' is defined in the RMA as a continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse.

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 Pakuranga Creek, Ōtara Creek, Waokauri Creek, Otaimako Creek, Pūkaki Creek and Puhinui Stream

3.3.5 Consideration of effects

Effects are assessed in two parts as outlined below; firstly, through the construction period of the Project where the natural character and landscape values within the Project 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 variable in nature and may temporarily be heightened by the intervention of heavy machinery and activities. In the second part (the operational phase of the Project), 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 natural character and landscape characteristics and values resulting from the construction of the Project. It also includes visual amenity effects for both public and private viewing audiences from construction works.
- **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 Project on landscape character, natural character and visual amenity for both public and private viewing audiences.

Finishing works are expected to include lighting, signage, road, footpath / cycleway details and line markings, streetscape elements and landscaping (including trees, mitigation planting and riparian / stormwater device / wetland planting). These are to be determined at the future detailed design stage of the Project.

3.3.6 Positive effects

This section identifies the positive effects resulting from the Project. These include:

- The provision of a BRT corridor;
- The provision of high quality walking and cycling facilities to provide improved connectivity to points along the corridor in addition to areas of open space such as Rongomai Park;
- Opportunities to enhance the character and identity of neighbourhoods through partnership with Manawhenua in all future phases of the Project, including (but not limited to) the future naming of BRT stations and introduction of mahi toi elements to reinforce local identify; and
- A net increase in canopy cover adjacent to the Project corridor associated with planting in berms, green stormwater infrastructure such as vegetated swales, planted stormwater wetlands and residual land.

4 Consideration of cultural landscape values

4.1 Overview

It is recognised in Section 4.43 of the *Te Tangi a te Manu, Aotearoa New Zealand Landscape Assessment Guidelines* that *cultural landscapes important to tangata whenua warrant recognition both for landscape assessment in general and specifically as a matter of national importance under s6(e) of the RMA*:

"*the relationship of Māori and their culture and traditions with their ancestral landscape, water, sites, waahi tapu, and other taonga*."

Through regular hui, site visits and Cultural Values Assessments (**CVA**) prepared for the previous phases of the Project, Manawhenua have shared that the Project traverses a significant cultural landscape.

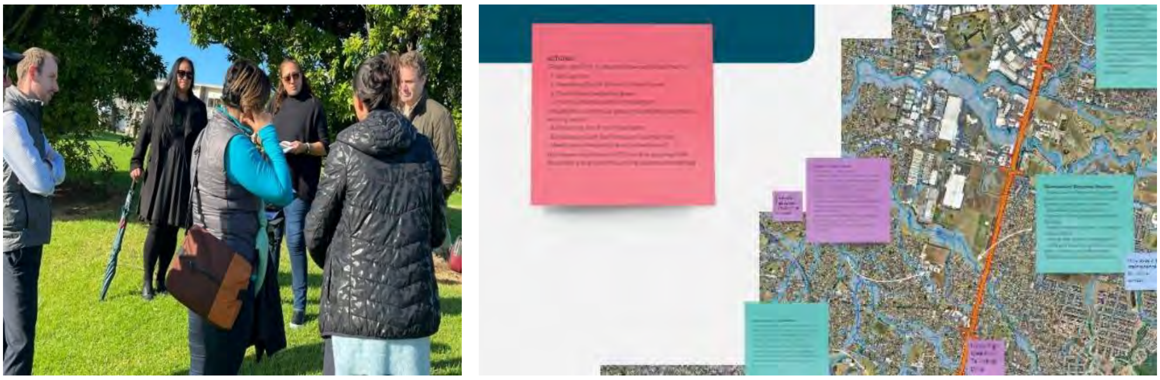


Figure 2: Example record of site visit and online hui

4.2 Cultural landscape

Manawhenua identified that maunga, moana, awa, marae and papakāinga are key features of their identity and form part of the wider cultural context, beyond the Project area. The figure below acknowledges the key features that Manawhenua have shared. These constitute part of the wider cultural context with respect to the Project.

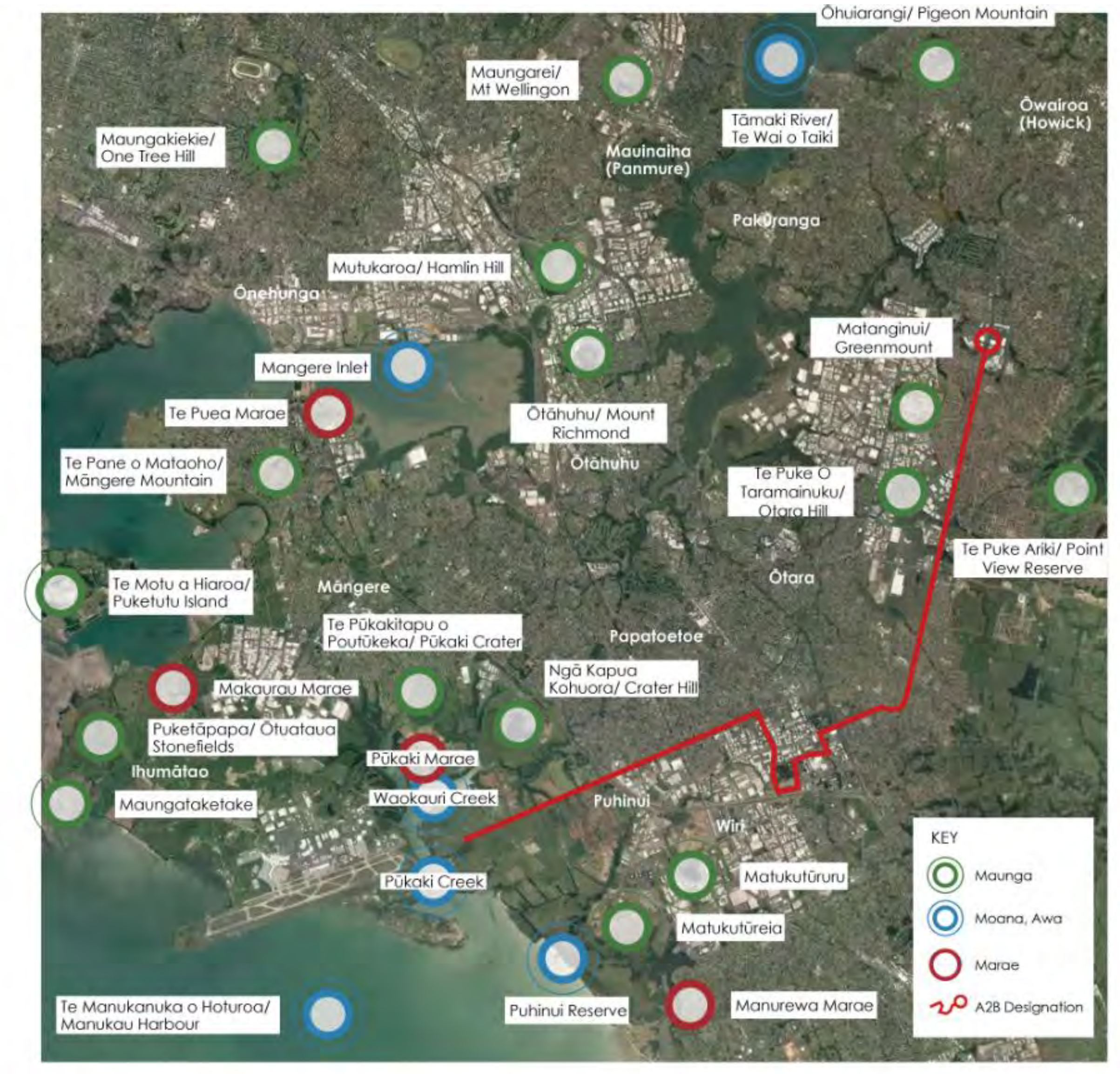


Figure 3: Cultural landscape features, identified with Manawhenua

The Cultural Landscape Values section under each of the NoR specific sections set out some opportunities to recognise the cultural landscape through the future design of the Project.

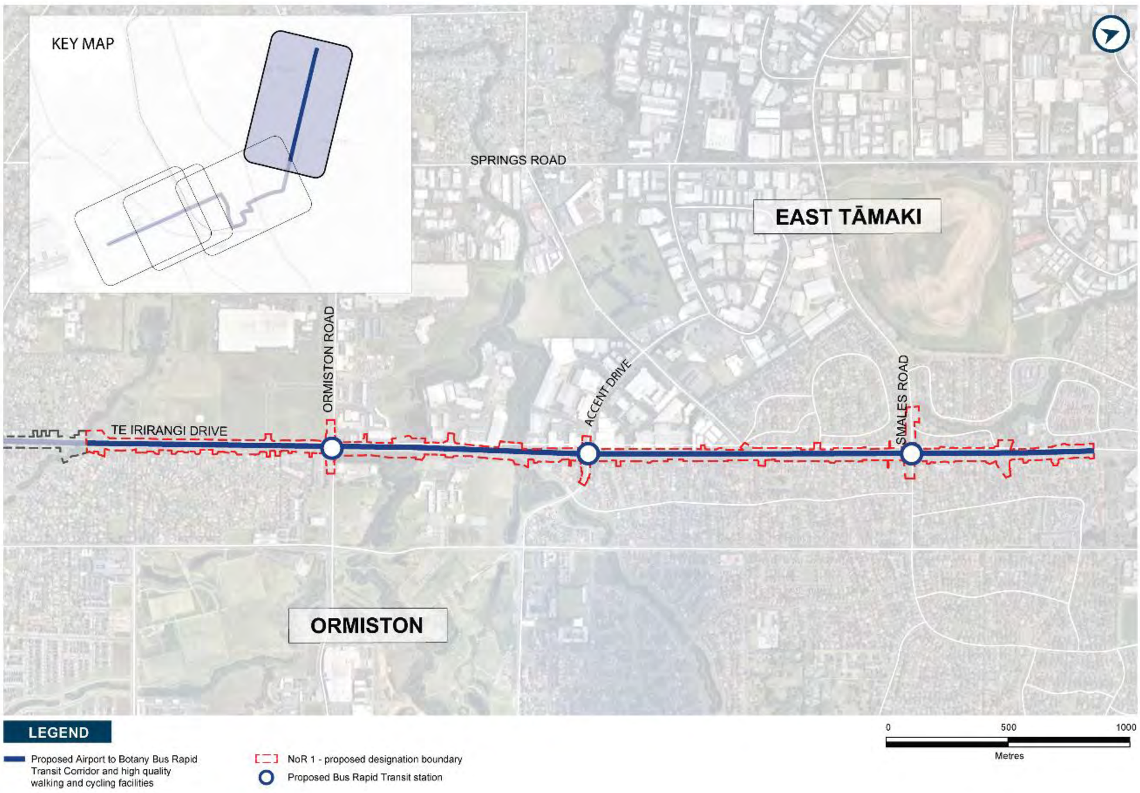
5 Airport to Botany Bus Rapid Transit NoR 1

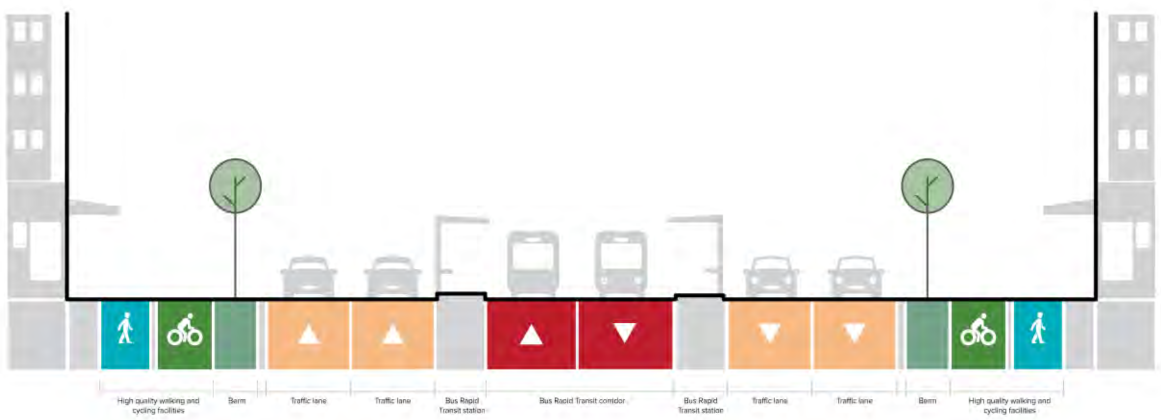
This section assesses landscape and visual matters relating to NoR 1 – the Project corridor between Botany Town Centre and Rongomai Park.

5.1 Overview and description of works

As set out in Table 4 below, the proposed works in NoR 1 include the widening of existing Te Irirangi Drive to accommodate a centre-running BRT corridor, two vehicle lanes in each direction and high quality walking and cycling facilities.

Table 4: Overview of NoR 1

NoR 1 – Botany Town Centre to Rongomai Park	
	
Key features	
BRT Corridor	Centre-running along Te Irirangi Drive
BRT Stations	• Smales Road Station; • Accent Drive Station; and • Ormiston Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	Two lanes in each direction (existing)

Access	There is an existing central median along the majority of Te Irirangi Drive which restricts right-turn access
Speed environment	50km/h
Signalised intersections	• Te Irirangi Drive and Smales Road; • Te Irirangi Drive and Accent Drive; • Te Irirangi Drive and Bishop Dunn Avenue; and • Te Irirangi Drive and Ormiston Road.
Stormwater infrastructure	• Swales; and • Wetlands.
NoR 1 typical cross section	
	

5.2 Existing environment

Refer to **Appendix B** for the suite of Figures.

5.2.1 Location description

NoR 1 follows the alignment of Te Irirangi Drive, extending from Botany Town Centre, being the northern most point of the wider Project and the termination of the Airport to Botany corridor, before passing Botany Junction to Rongomai Park. The environment is characterised by open space, residential housing, schools and commercial land.

5.2.2 Landscape characteristics and values

The following sections provide a further description of the receiving environment in addition to a selection of site appraisal photographs.

5.2.2.1 Landform and hydrology

The landform characteristics of NoR 1 generally sit at around the 20 mRL contour along the existing road corridor. The topography does however dip in localised areas where it negotiates across an overland flow path that connects into a tributary of Pakuranga Creek near Kellaway Drive Reserve and across tributaries of Ōtara Creek to the immediate north and south of Sancta Maria School. In an approximate mid-point of NoR 1 the topography steadily climbs in elevation to around 30 mRL in the context of commercial businesses near Accent Drive to the immediate west.

The topographical characteristics in the context of the site broadly reflect that observed along the existing road corridor. Surrounding development and historic earthworks means that the landform features easy grades. The minor incisions which define the tributaries of the Ōtara and Pakuranga creek bisect the Te Irirangi Drive road corridor in a broadly east to west orientation and break up the largely topographical characteristics of the developed local area.

To the west of NoR 1, two elevated landforms rise above the surrounding commercial and industrial industries, these are Hampton Park (located off East Tāmaki Road), and the now closed Greenmount Landfill, hinged off Harris Road and Smales Road. It should be noted that Hampton Park and the imaged area that surrounds it includes an Outstanding Natural feature (ID 39, Hampton Park scoria cone). This is a small but complete volcanic centre and includes a small scoria cone and tuff ring within the outer flank of the Ōtara Hill tuff ring. East of NoR 1 are the sequence of ridges including Redoubt Road and Point View Drive.

In relation to hydrology, the developed nature of the receiving environment has dictated a broadly modified and managed catchment, observed through the use of culverts and other such engineered stormwater infrastructure. Despite this, the tributaries of Ōtara and Pakuranga Creek remain as legible watercourses with often naturalised through daylighted streams with planted margins. The catchment of NoR 1 collects runoff in these key tributaries which flow west, eventually discharging into the Tāmaki River.

5.2.2.2 Vegetation patterns and open space

In relation to vegetation, an established theme of Washingtonia Palms in the central median and Pōhutukawa along the road berms features for much of the length of the existing Te Irirangi Drive corridor. The Washingtonia Palms and their locations form a clearly recognisable and deliberate planting regime. Slip lanes lining Te Irirangi Drive also provide for a more intensified focus of vegetation which assists in providing a visual buffer between the arterial road corridor and neighbouring residential land uses. Occasional shrub and tree planting also occurs along the interfaces of the residential developments including hedges to supplement the fence conditions along the road corridor.

Kellaway Drive Reserve is located to the west of Te Irirangi Drive and occupies and area of land positioned between residential properties and Kelvin Hart Drive. A watercourse occupies much of the reserve and feeds into the Greenmount Drainage Reserve to the north. This watercourse is a tributary of Pakuranga Creek and is characterized by mown edges and riparian planting. Te Irirangi Drive borders a section of the reserves eastern boundary although open space continues on the eastern side of Te Irirangi Drive and is accessed by the existing underpass.

Within the open space areas of Rongomai Park, at the southern end of NoR1, landscaping has been provided including a native planting palette of flaxes, Nikau and Pōhutukawa to name a few. Stream corridors that bisect Te Irirangi Drive provide a mix of native riparian planting and occasional weed species. An approximately 35 m wide band of indigenous vegetation occurs along the eastern side of Te Irirangi Drive to the north of Ormiston Road and extends northwards towards Sancta Maria School for an approximate 325 m forming a notable green feature along the largely developed context of the road corridor, this area is zoned open space in the Auckland Unitary Plan (Operative in Part) (**AUP:OP**).

5.2.2.3 Urban development and land use

Urban development along NoR 1 features a broad mix of land uses including open space, special purpose (school), residential, local centre, neighborhood centre, mixed use and light industry zones. This results in diverse urban characteristics and interface conditions.

The northern portion of NoR 1 includes, commercial business which form the defining land use characteristic along the western side of the existing road corridor. This includes car yards, big box retail and various warehouses. This characteristic broadly terminates at the intersection with East Tāmaki Road where residential development populates the interface leading to the Botany Town Centre where greater intensity retirement living is present (Dannemora Gardens, Metlifecare). The Sancta Maria College School and the surrounding open grounds features along the western portion of the road corridor opposite the node of big box retail. Residential development then occupies the eastern side of the road corridor where slip lanes and minor road intersections meet Te Irirangi Drive.

South of this area at the intersection of Preston Road and Te Irirangi Drive is a local centre node providing restaurants, convenience stores, commercial businesses and a petrol station. A currently undeveloped piece of land[4] at the south western corner of the intersection is proposed to provide mixed use development with an increased height limit of up to 28m, indicating a proposed future higher density development outcome than typically anticipated in this zone.

The southern portion of NoR 1 features the locally distinguishable Rongomai Park on the western side of the road. This open space characteristic, together with the adjoining Preston Road Reserve, creates a sequence of public reserves that provide an open and spacious characteristic along this portion. The eastern side of the road corridor contains a mix of primarily single storey residential

[4] Florence Carter Avenue Precinct of the Auckland Unitary Plan

development established in the late 1990's and early 2000's as part of the coordinated evolution of this area. Occasional slip roads and more often cul de sacs provide access to these residents.

As set out in detail in the AEE, it is anticipated that additional intensification is likely to occur at all residential zoned land[5], existing centres and around the proposed BRT stations as envisioned by the NPS:UD.

5.2.2.4 Aesthetic qualities including views and visual coherence

The aesthetic qualities of NoR 1 are also considered to be closely related to vegetation and open space in addition to the visibility of distant landforms. The boulevard characteristic of the road corridor is considered to have aesthetic qualities through the established visual coherence of the tree planting along its length. Vegetated sections in relation to the tributaries of Pakuranga Creek, together with the indigenous planting north of Ormiston Road forms a notable area of visual relief along the road corridor. The open space land use of Rongomai Park, Sancta Maria School and to a lesser extent Kellaway Drive reserve are also considered to have aesthetic value.

Beyond the extents of the existing road corridor, visual connections to distant landscape features are considered to hold aesthetic qualities and landmark qualities to the area. These include the Greenmount Drive landfill (earmarked to become public open space)[6] and Hampton Park (which is an ONF (ID39) and includes a Historic Heritage Overlay Extent of Place[7]), in addition to the distant ridges of Redoubt Road and Point View Drive to the east of the road corridor. Glimpse views of these features are attainable where there are visual breaks along the road corridor. A brief vista along Ormiston Road, capturing the Ormiston Bridge is also considered an important view. The architecturally designed Ormiston Bridge is a local landmark and signalizes the gateway to the Flat Bush Development to the east of the NoR.

5.2.2.5 Natural character

Natural character is the result of the combined levels of indigenous nature (i.e. biophysical values) and perceived nature (i.e. sensory values), which are typically defined by the extent to which natural elements, patterns and processes occur and are legible; and the nature and extent of existing human modifications. As such the highest degrees of natural character occur where there is the least modification within an area and its context.

The key abiotic attributes of NoR 1 include the geology, water catchments and landform, formed predominantly by geological and coastal processes. The geology of NoR 1, specifically the margins of the identified streams are influenced by the volcanic history of the area, including Green Mount/ Matanginui and Ōtara Hill / Te Puke o Taramainuku. Both of these manuga and the surrounding area are both affected by human influence including urban development. Scoriaceous deposits and tuff deposits form the geology of the northern portion of NoR 1[8], however as acknowledged, human influence has significantly limited these underlying geological attributes.

In relation the hydrological processes, the Project sits in a water catchment which is within a well-established developed suburb of southeast Auckland. This means that aspects of the catchment within the coastal environment are modified through roads, stormwater piping and culverts. Despite

[5] Except where qualifying matters apply as per clause 3.32 of the NPS:UD and subject to meeting the relevant development standards

[6] https://www.aucklandcouncil.govt.nz/about-auckland-council/how-auckland-council-works/local-boards/all-local-boards/howick-local-board/Documents/greenmount-landfill-park.pdf

[7] 1343 St John Church and Hampton Park

[8] https://www.researchgate.net/figure/Geology-of-the-Auckland-Isthmus-after-Hayward-et-al-2011-The-whole-area-shown-in_fig1_257876143

this, the tributaries of Ōtara and Pakuranga Creek remain as legible watercourses with often naturalised through daylighted streams with planted margins. Overall, it is considered the abiotic attributes of the coastal environment are low-moderate.

The biotic attributes of the receiving environment are the living organisms which shape an ecosystem. This aspect in part relies on the surveys undertaken by the Project Ecologist and Arboriculturist, with their findings outlined in their respective assessments. The margins of the streams within the NoR environment feature a mix of native and exotic vegetation species. In relation to fauna, whist the riparian areas have little natural vegetation remaining, the habitat is suitable for the “at risk – Declining” copper skink. Indigenous fauna such as short fin eels and long fin eels are understood to reside or pass through the various streams/ tributaries. Overall, despite the presence of exotic species, including weed species being present, the biotic attributes include a range of indigenous flora and fauna, some considered at risk. Taking the above into account, it is considered that the abiotic attributes are moderate-high.

Experiential attributes comprise the interpretation of human experience of the waterbodies that occur within the NoR 1 area. Whilst the natural watercourses pass through the urban environment, bisecting the NoR 1 project, the presence of the urban environment on these areas does impact the experiential attributes. The presence of weed species, often mown grass margins also reduces the sense of naturalness in these areas. Overall, it is considered the experiential natural character attributes are considered low-moderate.

5.2.2.6 Viewing audiences

In terms of the viewing audiences for NoR 1, the designation boundary remains broadly aligned to the existing road corridor. Due to the historic provision for rapid transit along Te Irirangi Drive[9], a good portion of NoR 1 falls within the existing road corridor. The Project will however impact a number of property frontages that meet Te Irirangi Drive including residential properties, commercial premises, school and recreational facilities. Due to the low elevational nature of the Project, the current viewing audiences of the Te Irirangi Drive road corridor are likely to be consistent to that requiring assessment, apart from where entire properties are removed, revealing a new ‘leading edge’ to the road. For example, in the instance that a residential property adjoining Te Irirangi Drive is to be removed, the property behind will then obtain clearer views toward the Project, A furthermore detailed description of specific viewing audiences will be discussed in the assessment section of the report however in essence a wide range of viewing audiences will have the potential to be affected. This includes those residential properties that line the road corridor, park users, visitors to the Sancta Maria School, visitors to local commercial premises and those residing at the Dannemora Gardens in the northern portion of the NoR. Road users along Te Irirangi Drive in addition to those approaching the intersections with the road, are also going to be affected by the Project.

[9] Manukau District Plan, Chapter 8 – Pg.17, 6.1.6/Pg.86, A1.3.2.10

Figure 4: Metlifecare Dannemora, Retirement Village on the western side of Te Irirangi Drive

Figure 5: Close up view of buffer vegetation between residential properties and Te Irirangi Drive

Figure 6: Shingleton Lane, slip lane separated by a grass berm and Pohutukawa Trees. Residential - Single House zone

Figure 7: Aaronville Way slip lane separating residential properties from Te Irirangi Drive

Figure 8: Te Irirangi Drive with commercial development to the west

Figure 9: Vegetated stream corridor beside Mitre 10 store

Figure 10: View of Te Irirangi Drive with Santa Maria school fence bounding the road reserve

Figure 11: Botany Junction Shopping Centre

Figure 12: View from the Botany Junction carpark across Te Irirangi Drive towards the intersection with Ormiston Road

Figure 13: Parking area within Rongomai Park, facing Te Irirangi Drive (looking North)

5.3 Assessment of construction effects

The following sections provide an assessment of construction effects on landscape characteristics and values for NoR 1.

5.3.1 Summary of construction activities within existing environment

Construction Areas

Construction compounds, laydowns, construction machinery, earthworks and material storage will be present across the NoR, typically in existing road corridor areas such as Brinlack Drive, or within private properties (currently with residential dwellings), that adjoin the corridor such as 16 Tonu'U Court. Night works, where required, will in places introduce artificial light into an existing urban environment. Landscape effects related to construction activities across the NoR will be associated with the widening of Te Irirangi Drive for the construction of the BRT corridor, high quality walking and cycling facilities and associated; bridge construction e.g. over Kellaway Drive, stormwater infrastructure construction, and removal of existing buildings and urban elements.

Vegetation Clearance

Broad areas of vegetation are proposed to be removed to accommodate the widening of the Te Irirangi Drive road corridor. This consists of trees and shrubs (including some indigenous trees) both within the Te Irirangi Drive road corridor and within private properties. Grass berms and lawn areas along the corridor will also be removed.

5.3.2 Effects on landscape characteristics and values

The potential construction effects on the landscape arise from the physical changes to the receiving environment which may change its characteristics and values. When considering the physical change during construction of NoR 1, changes to the landform, hydrology, vegetation, open space, urban development, land use in addition to aesthetic qualities and natural character values are understood. The presence of elements and activities associated with construction (i.e. construction machinery, lay down areas, stockpiles etc.) can also temporarily change the values and characteristics of an area.

5.3.2.1 Landform and hydrology

The Project will occur within a modified environment that has been altered through the creation of residential and commercial development in addition to supporting infrastructure. The modified nature of the topography on balance means that there are limited areas of value. As described, a number of streams and tributaries flow beneath Te Irirangi Drive. These streams are piped/ culverted apart from one tributary to the south of Sancta Maria College that connects to Ōtara creek. Whilst the stream remains daylighted as it passes under Te Irirangi Drive, the stream embankments have been influenced by the bridge abutments where Te Irirangi Drive passes above the stream.

Changes to the landform will principally result from grading to accommodate changes to the proposed road levels and surfaces. It is not considered that there would be a loss of any landform features within the site or wider context, the landform values would remain broadly as they are at present. Given the proposed earthworks will occur within or alongside the existing road corridor, in a highly modified environment, effects with mitigation are considered to be very low. Earthworks in the vicinity of existing stream networks are anticipated to have slightly elevated effects although keeping in mind that the works involving stream crossings will occur adjacent to and alongside modified stream extents and therefore effects during construction are anticipated to be **low** adverse.

5.3.2.2 Vegetation patterns and open space

NoR 1 includes a variety of vegetation types which are typical of an established urban environment. The most predominant vegetation that will be impacted by the works are the Washingtonia Palms and Pōhutukawa which occupy the central median and berms. An area of native vegetation (of predominantly manuka and kanuka) within 303 Te Irirangi Drive will also be impacted by the works and the footprint of the widened corridor. A mix of other species within private properties that line Te Irirangi Drive will also undoubtably be affected by the works due to the removal of the dwellings. Additionally, riparian vegetation along the various streams and creeks in proximity to the works (i.e. within the designation), will be impacted. Retaining at stream crossings are proposed instead of earthwork embankments which will reduce the extent of vegetation removal. A total of 692 single trees and 33 groups of trees have been identified across NoR 1.

Exotic species make up a good portion of the trees to be removed however, it is noted that a number of Pōhutukawa and areas of native bush vegetation considered to have a higher landscape value, will be removed. During construction and prior to mitigation / replacement tree planting it is considered there will be **moderate-high** temporary adverse effects.

In relation to open space, some level of earthworks are anticipated in relation to where Te Irirangi Drive crosses Kellaway Drive Reserve however earthworks are anticipated to be limited and tightly aligned to the corridor footprint. It is not anticipated that there will be any earthworks within Rongomai Park as the designation effectively abuts the parks eastern boundary. With the above in mind, it is considered that **very low** adverse effects to open space during construction will be anticipated.

5.3.2.3 Urban development and landuse

The Project will be along established road corridors and supports a variety of land uses, including residential, commercial and recreational open space. Construction activities would impact on some of these established zones however it is considered that works within these areas can be readily absorbed and remain associated with the existing transport infrastructure upgrades.

This change would be limited to the existing edges of these land uses, and the removal of residential properties would reveal a new 'edge' of development during construction. These revealed properties are similar in their character, visual composition, bulk, scale and land use, as those that would be removed. With the above in mind, it is considered that the level of effect during construction would be **low** adverse.

5.3.2.4 Aesthetic qualities including views and visual coherence

In relation to the boulevard characteristic of the road corridor, during construction this characteristic will effectively be lost as a result of tree removal notably the Washingtonia Palms and a number of Pōhutukawa. The removal of this characteristic landscaped throughfare is a result of the BRT corridor proposed in the centre of the existing road corridor.

The mix of indigenous planting at 303 Te Irirangi Drive will also be impacted during construction as the road corridor will be widened to the east to accommodate the additional infrastructure. Notwithstanding this, it is anticipated that a remnant green backdrop will remain in this area given the extent of the designation will not include all of the planting within this property. Views of neighbouring open space in addition to vegetated sections of the neighbouring tributaries of Pakuranga Creek will be temporarily interrupted however it is considered that these views tend to be short lived and incidental to the overall urban characteristics of the corridor.

Vistas to distant landscape features such as Greenmount Drive Landfill and Hampton Park in addition to distant ridges to the east are likely to be partially interrupted however it is anticipated that this will be limited to particular construction phases of the Project where machinery might be located in the sightlines towards these features.

With the above in mind, it is considered that for the most part, the effects on the aesthetic qualities and visual coherence values will be temporary, i.e. limited to the construction period, apart from the removal of vegetation. The removal of the boulevard characteristic will result in temporary adverse effects however it is anticipated that future tree planting along road berms in addition to appropriate landscaping of residual land will reduce these levels of effect once the Project is completed and in operation. Overall, it is considered that adverse effects during construction will be **low**.

5.3.2.5 Natural character

In considering the abiotic effects on the natural character values during construction, the catchment is part of a modified and managed catchment system due to the urbanisation of the area. Construction effects on the abiotic natural character values will predominantly be in relation to the proposed rain gardens in 310 Te Irirangi Drive, to the north and south of the commercial complex of Bishop Dunn Place, this will involve construction near the stream margins. These changes will occur where localised modification has already taken place (i.e. the natural character values of these areas has already been reduced and/or impacted through the development of the area). It is considered this localised change during construction will result in **low** adverse effects on the abiotic natural character values.

In terms of effects to biotic attributes, the northern most rain garden, adjoining Mitre-10, has greater values than the one to the south due to the presence of indigenous vegetation. The vegetation in this area whilst featuring indigenous species are of common stock and not of a particularly great age i.e. they have been planted in the last 10 to 15 years. Prior to replacement planting, in relation with the rain gardens, it is considered the effects to the biotic attributes will be **low**.

In relation to experiential attributes, it is considered that as the experiential values are slightly reduced due to the presence of additional infrastructure and due to the compromised nature of these areas being within a developed, commercial environment, any effects on the experimental attributes during construction will be **low**.

5.3.2.6 Visual amenity effects

The temporary visual amenity effects associated with NoR1, would arise from the presence of construction activities, elements and structures during the course of the Project. These temporary effects would affect a range of viewing audiences which are located within, adjacent to, and in the wider vicinity of the site.

Residential Viewing Audiences (including Dannemora Gardens Aged Care Facility)

Residential viewing audiences are considered to have a higher sensitivity to change as these residents are at home, using rooms normally occupied in waking or daylight hours, and are likely to experience views for longer than those briefly passing through an area. These viewing audiences form a primary viewing audience along NoR 1 however due to the relatively low elevational characteristics of the Project, most visual effects will not extend much further beyond the properties that remain along the edge of the proposed designation boundary.

Works would typically be visible from one direction within the properties (e.g. from the west for those along the eastern side of Te Irirangi Drive). Proposed tree removal, particularly along the side berms will in places provide greater visibility toward the road and associated planned works. Future intensification of the corridor, realised through the application of the NPS:UD may provide greater numbers of viewing audiences and additionally the potential to view the Project at a more elevated position (i.e. 6 storeys).

Notwithstanding this, whilst the Project will require substantial works, these will remain within the road corridor and clearly related to road infrastructure activities. Therefore, regardless of the potential increased visibility, it is considered that construction works will remain broadly in keeping with major upgrade works occurring within an established major arterial road corridor. With the above in mind, it is considered the adverse effects on residential viewing audiences (existing and potential future), will be up to **low-moderate** during construction.

Travelling Viewing Audiences

These viewing audiences are located along the road corridors and footpaths of the receiving environment, and include those which are travelling in vehicles, on foot, or on alternative modes of transport such as bicycles. It is considered that due to the activities these viewing audiences are engaged within, their sensitivity to change would be lower.

Whilst construction activities will result in a degree of visual change, works will broadly remain within or in the immediate context of the existing road corridor environment. The presence of construction machinery within the established road corridor will also be a familiar site to that observed across Auckland where roading infrastructure upgrades are a common sight. Granted that the extent of works along the corridor may be of a greater scale or size to that typically observed, the works will be clearly associated with upgrading of a significant arterial road. Combined with the relatively short duration of the views experienced, it is determined that the adverse effects during construction would be no more than **low**.

Occupational Viewing Audiences and Visitors to Business Premises and Sancta Maria School

These viewing audiences are focussed within the areas where commercial activities are established within the receiving environment. For example, these include Dannemora Pharmacy and associated medical centre,[10] Gull Te Irirangi, Oracle Autos,[11] Storage King, Reward Hospitality, Botany Toyota, East Auckland BMW, Mitre 10 Mega Botany, Botany Junction Shops, Sancta Maria School and future development within the Florence Carter Avenue Precinct.

Visual change during the construction of NoR 1 for these viewing audiences would be varied, due to the differing locations, outlooks and activities which would occur within their views. However, for the majority of businesses and the school, the temporary construction effects bought about by the Project would be seen as a transport infrastructure project, largely taking place in the road corridor. In considering the lower sensitivity to visual change that these viewing audiences are considered to

[10] 1 Redcastle Drive

[11] 455E East Tamaki Road

hold, any construction activity relating to the Project is likely to result in adverse effects no more than **low**.

Recreational Viewing Audiences

These viewing audiences are located across a wide area and are considered to be those viewing audiences engaged within recreational activities in defined areas. It should be noted that effects for people walking or cycling within transport corridors are not considered under recreational viewing audiences and are instead considered in the travelling viewing audiences section. For this assessment, the recreational viewing audiences are considered to be those located in the areas zoned as “Open Space” under the AUP:OP. These include those viewing audiences which are engaged in informal and formal outdoor recreation.

These areas specifically include Kellaway Drive Reserve and Rongomai Park. The sensitivity to visual change differs across these recreational viewing audiences due to the activities they are engaged within. However, it is important to note that the sensitivity of the viewing audiences can be determined by a number of factors, including the context of the environment they are within and the level of awareness that the viewing audience is likely to hold. As such, it is considered that the following sensitivities to visual change apply to the recreational viewing audiences:

- Informal outdoor recreational viewing audiences are considered to have a <u>higher</u> sensitivity to change.
- Formal outdoor recreational viewing audiences are considered to have a <u>lower</u> sensitivity to change.

Kellaway Drive Reserve

Viewing audiences in Kellaway Drive Place Reserve would view some visual change in the eastern portion of the reserve where the Te Irirangi Drive road corridor abuts the edge of the reserve. This would include machinery relating to building over the localised landform depression in addition to associated earthworks and activities required to construct the widened road corridor. Whilst works would bring about adverse visual effects, these would be temporary due to the nature of the reserve servicing a network of walkways rather than rest stops or informal areas of open grass spaces. Moreover, the works will remain in proximity and related to the existing Te Irirangi Drive road corridor, where the level of amenity will already have been partially compromised, therefore it is considered viewing audiences would be partly ‘desensitised’ to change. Overall, it is considered these works will result in localised effects considered **low-moderate**, however noting that within the balance of the wider park, remaining accessible and part of the overall amenity experience, any effects are considered **low** adverse.

Rongomai Park

Viewing audiences within Rongomai Park would be engaged within formal recreational activities. Spectators would also be focused on such activities occurring within the park. It is considered that these viewing audiences would have a lower sensitivity to change.

Change to the receiving environment during construction would occur in the eastern boundary of the park and will not impact the playing spaces of the park or the supporting facilities. Works will remain clearly associated with the road environment and such change will be secondary to the activities within the park. Views of the works will also be limited to when people are visiting the park, often for sport activities are restricted to defined periods which are often seasonal. With the above considered it is determined that any effects on users of Rongomai Park as a result of the construction of the Project will be **low** adverse.

5.3.3 Summary of construction effects on landscape character and values

The table below provides a summary of the construction effects on landscape character and values for NoR 1.

Table 5: Summary of construction effects on landscape character and values for NoR 1

Effect		Assessment
Natural Character Effects		
Abiotic		Low
Biotic		Low
Experiential		Low
Landscape Effects		
Landform		Low
Hydrology		Low
Vegetation		Moderate-High
Open Space		Very Low
Urban Development and Landuse		Low
Aesthetic Qualities		Low
Visual Amenity Effects		
Residential		Low-Moderate
Travelling		Low
Occupational		Low
Recreational	Kellaway Drive Reserve	Low
	Rongomai Park	Low

5.4 Assessment of operational effects

5.4.1 Summary of operational activities within receiving environment

As set out in Section 6.1, the following points summarise the key changes to the receiving environment as a result of the Project:

- Realignment and widening of Te Irirangi Drive;
- Centre-running BRT corridor;
- High quality walking and cycling facilities;
- Two lane vehicular carriageway in each direction;
- Berms that can accommodate tree and shrub planting between the vehicular carriageway and walking and cycling facilities;
- A series of stormwater management devices alongside Te Irirangi Drive with appropriate planting (not in designation);

- Three BRT stations (near intersections of Smales Road, Accent Drive and Ormiston Road); and
- Other landscaping – to be confirmed – i.e. along road berms etc.

The following assessment also considers mitigation measures (as recommended in Section 11), as having been fully implemented. This includes careful consideration and design of structures such as BRT stations, outfalls, storm water ponds and the like, in addition to the appropriate level of planting to mitigate the removal of vegetation (including trees) and provision of a high-quality amenity environment. The following assessment considers the residual effects once vegetation has become fully established (i.e. 5 years growth), following planting and any plant and tree replacement (in the event of plant failure).

5.4.2 Effects on landscape characteristics and values

The potential effects on the landscape arise from the permanent physical changes to the receiving environment which may change its characteristics and values. When considering the permanent physical change, changes to the landform, hydrology, vegetation, open space, urban development, land uses in addition to aesthetic qualities and natural character are understood. The change in these attributes, in addition to the presence of permanent elements and structures will also alter the character of an area.

5.4.2.1 Landform and hydrology

Permanent changes to the landform will arise from the result of grading and other such earthworks to accommodate the new road levels and surfaces. It is considered that these effects are sufficiently covered in the construction effects section of this assessment (Section 6.3). It is considered that there would not be further change to the landform during operation of the Project. In determining the effect rating, it is considered that the effects would remain consistent with those anticipated under the construction phases. It is therefore determined that the effects on the landform during operation would be **low** adverse.

Permanent effects to the hydrological values will also have been undertaken in the construction phases of the Project and as established, works near streams (which remain limited) will have taken place alongside modified stream extents. Stormwater management devices located along the corridor will occur outside of the established stream corridors and will assist in managing stormwater run off before discharging into the waterways. Overall, it is considered that **very low** effects will occur on the hydrological values of the receiving environment.

5.4.2.2 Vegetation patterns and open space

Once NoR 1 is in operation, it is anticipated that a substantial number of trees would be established as part of the Project corridor. Although initially these trees would not be of a size and scale comparable to some of the trees removed as part of the Project. In time, the proposed indigenous trees would grow to become established specimens. It is considered that initially, following construction, the adverse effects on the vegetation values would be low adverse, as the trees would not be of a height and stature which was removed. Once established, these trees will provide a greater contribution to the area and provide greater presence through the establishment of placemaking identity. Therefore, it is considered that once fully mature these trees would contribute to the vegetated cover of NoR 1 resulting in **low** beneficial effects.

In considering effects on open space, due to the limited effects during construction and now completed works with remediated interfaces with these areas, any residual effects would be **very low** adverse, noting that the same landscape values that these currently provide will be retained following completion of the Project.

5.4.2.3 Urban development and landuse

The Project is along developed road corridors and supports a variety of land uses, including residential, commercial and recreational open space. These established land uses will remain along the interface of the Project and continue to represent the urban patterns of the area.

The proposed upgrade of Te Irirangi Drive as a result of the Project will signalise the importance of the arterial route and the deliberate move to invest into improving the connectivity of the area to the wider area. Future development realised through the NPS:UD notably occurring around the proposed BRT stations along Te Irirangi Drive will reinforce these objectives and contribute to urban intensification. With the above considered, it is determined that any residential effects will be **very low** adverse

5.4.2.4 Aesthetic qualities including views and visual coherence

The removal of the recognisable pattern of Washingtonia Palms will remain an adverse effect during the operation of the Project. Notwithstanding this, provision has been made within the proposed designation boundary to provide for replanting within and adjacent to the corridor. With a coordinated planting palette, a boulevard like characteristic will be reinstated. The provision of a native tree palette will move to better relate the characteristics of the road corridor to the unique identity of Tāmaki Makaurau.

With the above considered, it is determined that any residual effects on the aesthetic qualities and visual coherence will be **very low** adverse.

5.4.2.5 Visual amenity effects

The potential effects on the identified viewing audiences arise from the permanent physical changes to the receiving environment which may change the viewers visual appreciation of the area.

Residential Viewing Audiences (including Dannemora Gardens Aged Care Facility)

Residential viewing audiences adjacent to NoR 1 will experience the greatest degree of change due to their proximity to the Project, whereas those residents that are set back from the Project will decern little to no perceivable change. For those residents immediately adjacent to the Project, there view will continue to be of a major arterial road corridor, with vehicular traffic located a similar distance from the property boundaries as currently observed. The proposed pedestrian footpath and cycleway will form the immediate feature of their view towards Te Irirangi Drive. A substantial number of trees and supporting landscaping are provided for in the BRT corridor which, when established, will provide a similar level of amenity to that currently experienced. For this reason, it is considered the residential visual effects on existing and indeed future residential viewing audiences, will be **very low** adverse.

Travelling Viewing Audiences

Permanent change for these travelling viewing audiences will arise from the slight realignment and change in road width of Te Irirangi Drive, in addition to the presence of new BRT stations in the road corridor. These changes will however take place within the road corridor, and such change will be in keeping with that expected within a major arterial route as it evolves with the growth of the area it services. These viewing audiences will remain transient in nature, and therefore move along the road corridor, for a short period of time. When considered alongside an improved amenity experience as a result of streetscape enhancement works, it is determined that the permanent visual effects for these viewing audiences would be **very low** beneficial.

Occupational Viewing Audiences and Visitors to Business Premises and Sancta Maria School

Following completion of the Project, these viewing audiences will interact with the road corridor in much the same way as they do at present. The road corridor will continue to provide passive advertising to their businesses and feature as a prominent element in their view. For those working within or visiting these premises, it is considered the lower sensitivity these viewing audiences will have to change, combined with clear similarities the Project has with the receiving environment, any effects will be **very low** adverse.

Recreational Viewing Audiences

Due to the limited physical impact the Project will have on the open space and activities undertaken within them; it is considered that any residual effects will be particularly limited. The completed Project will interact with the areas of open space in much the same way as they do at present, and in doing so, effects on the users of these spaces will experience **very low** adverse visual effects.

5.4.2.6 Natural character

Once the Project has been completed, it is considered any residual abiotic, biotic and experiential effects will be **very low** adverse. There will be some level of change in the form of the rain gardens in the vicinity however such change will remain alongside a developed context. Cleared vegetation around the footprints will be established in appropriate vegetation.

5.4.3 Summary of operational effects on landscape character and values

The table below provides a summary of the operational effects on landscape character and values for NoR 1.

Table 6: Summary of operational effects on landscape character and values for NoR 1

Effect		Assessment
Natural Character Effects		
Abiotic		Very Low
Biotic		Very Low
Experiential		Very Low
Landscape Effects		
Landform		Low
Hydrology		Very Low
Vegetation		Low +
Open Space		Very Low
Urban Development and Landuse		Very Low

Aesthetic Qualities		Very Low
Visual Amenity Effects		
Residential		Very Low
Travelling		Very Low +
Occupational		Very Low
Recreational	Kellaway Drive Reserve	Very Low
	Rongomai Park	Very Low

5.5 Cultural landscape values

It is acknowledged that the Project traverses areas of cultural significance. As set out in the AEE, Manawhenua have been involved as partners through the NoR phase of the Project. To appropriately recognise the cultural landscape in the future phases of the Project, it is recommended that:

- Manawhenua are involved as partners in the future design of the Project;
- Appropriate wayfinding and signage along the NoR 1 is provided to improve awareness to local Maunga such as, Mātanginui, Te Puke ō Taramainuku and Te Puke Ariki;
- Opportunities are identified to enhance water quality and restore streams within the Project area;
- Provision is made for tree planting within and adjacent to the Project corridor to represent an urban ngahere; and
- Opportunities are identified to acknowledge cultural narratives in the design of Project elements.

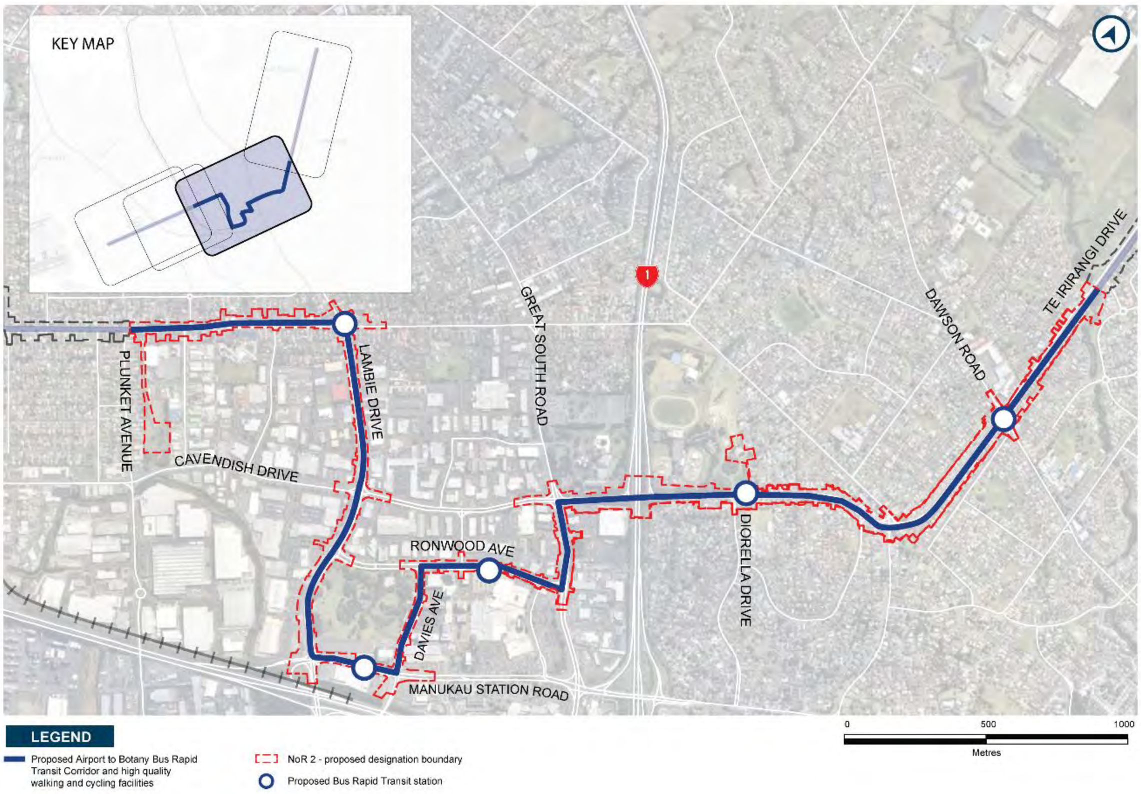
6 Airport to Botany Bus Rapid Transit – NoR 2

This section assesses landscape and visual matters relating to NoR 2 – the Project corridor between Rongomai Park and Puhinui Station, in the vicinity of Plunket Avenue.

6.1 Overview and description of works

As set out in Table 7 below, the proposed works in NoR 2 include the widening of several existing roads to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities.

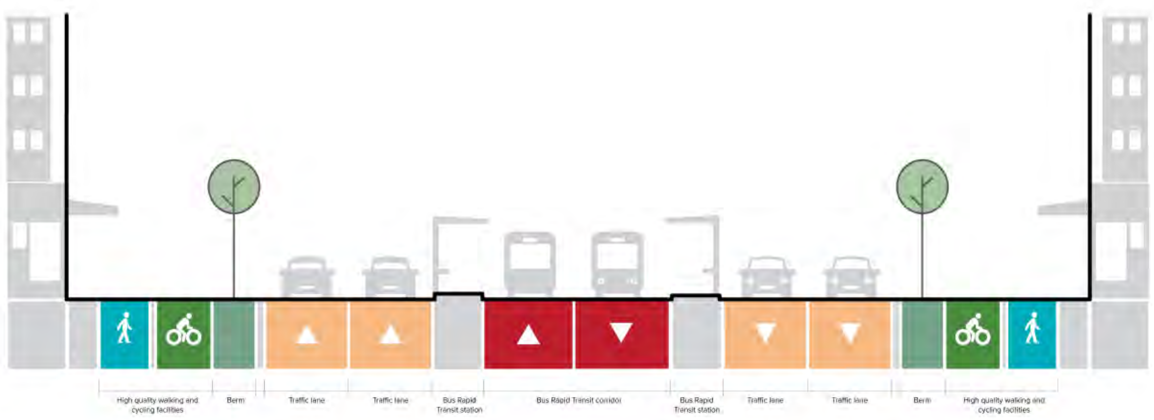
Table 7: Overview of NoR 2

<table>
<tr><td colspan="2">NoR 2 – Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue</td></tr>
<tr><td colspan="2">


</td></tr>
<tr><td colspan="2">Key features</td></tr>
<tr><td>BRT Corridor</td><td>Centre-running for the majority of the corridor along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, Lambie Drive, and Puhinui Road

West-running on Davies Avenue along the edge of Hayman Park</td></tr>
<tr><td>BRT stations</td><td>Dawson Road Station;
Diorella Drive Station;
Ronwood Avenue Station;
Manukau Station; and
Corner of Lambie Drive and Puhinui Road Station.</td></tr>
</table>

Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	• Two lanes in each direction along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, and Lambie Drive; • One-way single lane along Davies Avenue; and • One lane in each direction along Puhinui Road.
Access	Existing central medians limit right turn access on Te Irirangi Drive, Great South Road, Ronwood Avenue, and Lambie Drive. New signalised intersection at Mitre 10 and Bunnings Warehouse on Lambie Drive. Priority access for fire engine movements across the BRT corridor at Papatoetoe Fire Station.
Speed environment	• 30 km/h on Ronwood Avenue and Davies Avenue; and • 50 km/h on Te Irirangi Drive, Great South Road, Manukau Station Road, Lambie Drive and Puhinui Road.
Signalised intersections (**new intersections in bold**)	• Te Irirangi Drive and Dawson Road; • Te Irirangi Drive, Boundary Road and Hollyford Drive; • Te Irirangi Drive and Diorella Drive; • Te Irirangi Drive, Great South Road and Cavendish Drive; • Great South Road and Ronwood Avenue; • Ronwood Avenue and Davies Avenue; • Davies Avenue, Wiri Station Road and Manukau Station Road; • Manukau Station Road and Lambie Drive; • **Mitre 10 and Bunnings Warehouse;** • **Lambie Drive and Ronwood Avenue;** • Lambie Drive and Cavendish Drive; • Lambie Drive and Puhinui Road; and • **Puhinui Road and Plunket Avenue.**
Stormwater infrastructure	• Swales; and • Wetlands.
NoR 2 typical cross section	



For assessment purposes, NoR 2 has been split into three sections as shown in the figure below:

Figure 14: Sections of Airport to Botany Bus Rapid Transit NoR 2

6.2 Existing environment

Refer to **Appendix C** for the suite of Figures.

6.2.1 Location description

Section A of NoR 2 extends from Rongomai Park which adjoins the western end of Te Irirangi Drive to State Highway 1 (**SH1**). Key features of this section include a tributary of the Ōtara Creek, the open space nature of Rongomai Park, a tributary of the Ōtara Creek and the Manukau Sports Bowl which has a heavily vegetated / tree lined frontage. Section A contains a range of residential zones from Single House zone to Mixed Housing Urban and Terrace Housing and Apartment Buildings zones.

Section B of NoR 2 extends from the east of the SH1 to Ihaka Place on Lambie Drive, through the Manukau Central. The existing environment consists of a mix of commercial, high density residential and retail land uses.

Section C of NoR 2 is between Lambie Drive / Ihaka Place and Puhinui Station and consists of a variety of residential properties including single dwellings to more intensive mixed housing. Ihaka Place is the interface between residential and business zoning.

As set out in detail in Section 7.5 of the AEE, it is anticipated that additional intensification is likely to occur at all residential zoned land[12], existing centres and around the proposed BRT stations as envisioned by the NPS:UD.

6.2.2 Landscape characteristics and values

The following sections provide a further description of the receiving environment in addition to a selection of site appraisal photographs.

6.2.2.1 Landform and hydrology

Section A

The portion of Te Irirangi Drive within Section A includes a gentle gradient from around 25 mRL which decreases in elevation towards Whetstone Road and Belinda Avenue in response to a permanent stream south of Rongomai Park within Preston Road Reserve. The topography then steadily rises to approximately 39 mRL at the Te Irirangi Drive / Boundary Road intersection.

The urbanised receiving environment has resulted in the hydrology being informed by the various road corridors and subsequent overland flow paths. In principle, the catchment flows to the north toward Ōtara Creek eventually discharging into the Tāmaki River. A permanent stream intersects with Te Irirangi Drive in a low point near Belinda Avenue, south of Rongomai Park, which forms part of a sequence of linear esplanade reserves. The stream alignment appears broadly naturalised where it is daylighted however, it passes via a pipe beneath Te Irirangi Drive, discharging into Preston Road Reserve.

Section B

This section of NoR 2 follows an at grade gradient along the existing road corridors. Topographically there are no particular features of note along the route or in the local area. The most noticeable change to the landform characteristics is within Hayman Park where a shallow gully leading to centralised storm water ponds exists. This piece of land was purchased by Manukau City Council in 1966[13], ensuring the preservation of a large open space close to the newly formed city centre. When the park was established, the original landform was altered by the excavation of ponds along the course of a minor tributary of the Puhinui Stream and the creation of a small, elevated landform in the south western portion of the park.[14]

As a developed area, the hydrological features have been highly modified and often align to the existing roading infrastructure. West of Lambie Drive and positioned between commercial business is the Puhinui Stream which captures much of the stormwater runoff and flows west toward the Manukau Harbour.

Section C

The portion of Puhinui Road within Section C includes a gentle grade of around 20m RL and features a slight low point between York Road and Plunket Avenue before rising to 20m RL. The surrounding

[12] Except where qualifying matters apply as per clause 3.32 of the NPS:UD and subject to meeting the relevant development standards
[13] https://kura.aucklandlibraries.govt.nz/digital/collection/localhistory/id/4304/
[14] http://heritageetal.blogspot.com/2017/10/take-walk-along-puhinui-stream.html

context of the Puhinui Road corridor reflects these topographical conditions, sitting at around the 20 m RL to 22 m RL, with no notable or distinguishing features.

The urbanised environment has resulted in the hydrology being managed through stormwater infrastructure such as curb and channels. A tributary of the Puhinui Stream occurs just south of Puhinui Road within Grayson Avenue Reserve. Large portions of the stream remain day lighted with modified embankments. The stream flows into Puhinui Domain to the south of Brett Avenue and via a culvert into the Puhinui Creek on the southern side of Cavendish Drive.

6.2.2.2 Vegetation patterns and open space

Section A

In relation to vegetation, a large, vegetated buffer exists along the interface of the Manukau Sports Bowl and Te Irirangi Drive towards the southern end of this section of NoR 2. This vegetation contains a mix of native and exotic trees which form a dense green edge to this portion of the corridor. Street trees exist along the grassed roadside berms in addition to a planted central median which begins opposite Sandrine Avenue. Whilst the planting regime is sporadic in some places, in relation to tree placement and species, the Washingtonia Palms in the central median begin to form a vegetated vertical characteristic. In terms of street trees in the berms, these areas are primarily characterised by young Titoki and Pohutukawa species. The intersection of Boundary Road however supports some grouping of trees including a mix of native and exotic species up to approximately 6m in height. The open space at the termination of the Boundary Road cul-de-sac (Orlando Reserve), also supports some further tree and shrub planting including a Norfolk Pine, Nikau and Muehlenbekia in the form of dense clumps off-set in the wide road berm to the east.

The rhythm of Washingtonia Palms in the central berm and Pohutukawa in the side berms becomes more legible, north of Boundary Road, with many of the Palms being over 10m in height. This sequence of vegetation more or less continues along the remaining parts of NoR 2, with the occasional London Plane tree planted in the road berm instead of Pohutukawa. Whilst tree cover is sometimes patchy, the visibility of trees along the road corridor remains clearly apparent and results in a boulevard like characteristic.

Where this section of NoR 2 crosses the tributary of the Ōtara Creek (including land on Rongomai Park and Medvale Avenue Reserve), a mix of riparian planting exists forming a vegetated marker between the more recently established suburbs to the north of Clover Park. This linear belt of planting remains closely connected to the meandering stream, with open space pasture covered fields in areas beyond.

Section B

A vegetated buffer continues along Te Irirangi Drive to the west of SH1. This buffer contains a mix of native and exotic species with the most mature specimens along the northern side of the road corridor forming the interface between the road corridor and the AUT south Campus. Buffer planting continues to exist on the immediate eastern side of SH1 which are the planted embankments and abutments of the Te Irirangi Drive Bridge and offramp.

Ornamental planting exists at the front of numerous businesses along the western portion of Great South Road. Three Phoenix Palms also form part of the western berm in addition to Five Washingtonia Palms. A number of Pohutukawa have been established opposite the BNZ building forming the south eastern portion of 639 Great South Road. The eastern portion features a section of supporting amenity planting apart from a broadly mature vegetated buffer between Great South Road and the neighbouring electrical infrastructure at 656 Great South Road.

Ronwood Avenue which meets Great South Road at its eastern end, continues in a western direction toward Davies Avenue, and Hayman Park before terminating at Lambie Drive. A central planted median exists along the length of Ronwood Avenue which divides the bi-directional traffic. The central median primarily contains Puriri and Norfolk Island Pines, which transitions to Gum trees in the context of the Westfield Shopping Centre. These central medians are also supported by planted grassed berms containing Magnolia trees.

Hayman Park is the primary piece of open space along this section of NoR 2 and anchors the city centre to the landscape. The park has evolved from farmland and now features a variety of large trees which are both native and exotic. Many of these are Gum trees however, a number Pines exist along the interface with Lambie Drive signal the south western corner of the park. The park supports a playground, skate park, toilet facilities and large areas of open green space.

Recent streetscape upgrades through Davies Avenue has included a native tree and shrub planting palette. Nikau trees are a key theme in this area along with Pohutukawa. The maturity of the Pohutukawa increases where they sit opposite Hayman Park. This large scale vegetation, together with a wide planted median draws the park environment across the street and in to Manukau Central.

Manukau Station Road features recently established Pohutukawa which occupy the grassed medians on the approach to Davies Avenue. Supplementary ground cover and shrub planting also becomes more apparent on the approach to this intersection.

The central medians of Lambie Drive contain large tree planting which results in an avenue street characteristic. Puriri trees feature in the central median to the west of Hayman Park. A single row of Norfolk Island Pines often intermixed with Gum trees, also characterises the street. Grass berms form the street interface, with occasional tree planting often associated with the neighbouring commercial buildings.

Section C

In terms of vegetation, as described in earlier sections, Lambie Drive features a central median which supports a number of large Norfolk Pine trees. Grass berms with occasional street trees feature along the Puhinui Road portion of the NoR. The placement and location of these trees is sporadic although a number of semi mature Pohutukawa exist along the road corridor in addition to various exotics. Residential gardens about the Puhinui Road corridor are often characterized by lawn, with occasional trees.

In relation to open space, there are no defined reserves along this portion of the road corridor apart from a very small (approximately 2.8m wide) piece of land connected to Grayson Avenue Reserve however this strip of land is partly occupied by the neighbouring property at 153 Puhinui Road and forms the width of the drainage reserve forming the tributary of the Puhinui Stream which leads into the Puhinui Doman, south of the road corridor. An informal portion of open space with park like qualities exists on the northern side of Puhinui Road within the Tavistock Street road corridor. This area of land sits opposite the frontage of the tennis courts of Puhinui School.

6.2.2.3 Urban development and land use

Section A

The current land use of this section is predominantly characterised by the low intensity residential typologies which define the broader area to the east of SH1. The Preston Road Reserve open space to the north, and Manukau Sports Bowl to the south broadly bookend the northern portion of residential development which lines Te Irirangi Drive. In addition to these residential land uses, a node of local centre zoning exists at the Dawson Road / Te Irirangi Drive intersection and features a petrol station and other convenience businesses.

A number of overhead structures also characterise part of the existing road corridor, these include the overhead transmission lines that pass over the northern portion of NoR 2 in the context of Belinda Avenue and Whetstone Road and a pedestrian footbridge. Three rows of transmission lines pass through this area which originate from a substation off Highbrook Drive to the north west. A concrete pedestrian over bridge also features in the context of Belinda Avenue and Whetstone Road near the point that the tributary of the Ōtara Creek crosses beneath Te Irirangi Drive. The over bridge provides an important pedestrian connection between residential development either side of the corridor and for those visiting Preston Road Reserve and Rongomai Park to the west.

Section B

The short section of Te Irirangi Drive and Great South Road within this section of NoR 2 features general business zoning. Activities include various commercial business in addition to electricity infrastructure and an and AUT campus along the northern side of Te Irirangi Drive.

The metropolitan centre zoning of Manukau Central features within the NoR and is in the centre of this section. The Hayman Park open space zoning forms a sizable 10ha piece of land, mirroring the core of the centre. In line with the aspirations of the Manukau Framework Plan (2017). Eke Panuku is currently upgrading Hayman Park with the development of a regional playground on the corner of Ronwood Avenue and Davies Avenue as well as a major redevelopment including a stormwater wetland within the park. It is proposed that the stormwater requirements of the Project will be integrated with the proposed upgrade of the existing wetland by Heathy Waters and Eke Panuku.

North of the Manukau Central, general business zoning transitioning to light industrial zoning exists. Outdoor car parking and hardstands heavily feature across the developed areas and in some cases entirely surround commercial premises along Lambie Drive and the northern side of Ronwood Avenue.

Section C

Low intensity residential land uses feature along this section of Lambie Drive and Puhinui Road in the form of predominantly one and two storey dwellings. Industrial buildings are located in this immediate context to the south of Puhinui Road (east of Lambie Drive), set back from the residential buildings that form the main interface. A node of local shops including a hair salon, butcher, food outlet and medical centre, occur opposite the Ranfurly Road / Puhinui Road intersection, forming a community focal point. Puhinui School fronts the southern side of Puhinui Road between Norman Spencer Drive and Grayson Avenue.

6.2.2.4 Aesthetic qualities including views and visual coherence

Section A

The aesthetic qualities of this section of NoR 2 are considered to be closely related to vegetation and open space. The boulevard characteristic of the road corridor is also considered to have aesthetic qualities through the established visual coherence of the tree planting along its length. Additionally, the open space land use of Preston Road Reserve and Rongomai Park and the associated stream feeding Ōtara Creek hold aesthetic values which are to be considered. Lastly, the vegetated frontage of the Manukau Sports Bowl is considered to have aesthetic qualities in that it visually softens a portion of the road corridor and provides visual relief to the more sparsely vegetated urban environment which surrounds it.

Section B

The key aesthetic qualities of this section include the vegetated central medians and berms along Te Irirangi Drive, Ronwood Avenue, Davies Avenue and Lambie Drive. Mature native vegetation along Great South Road (in front of the electricity infrastructure), and along the approaches to the Te Irirangi Bridge provide areas of visual relief along the developed road corridors. Ronwood Avenue supports an established street tree regime which provides verticality and contributes to reducing the perceived scale of the taller buildings such as the Renaissance Centre[15] on the corner of Sharkey Street and Ronwood Avenue. Davies Avenue also features various layers of vegetation along the road corridor forming a park like streetscape, particularly in the context of Hayman Park. The Lambie Drive corridor is partly characterised by the large Norfolk pines and Gum trees which provide a vertical element along much of the length of the street.

In addition to the planted street environment, Hayman Park also provides for a key aesthetic quality in this section of NoR 2. The connection of the park to the built components of Manukau Central is observed through the tree planting along Davies Avenue in addition to the visual presence of the mature trees that populate it. The park is a key visual element within views along the southern portion of Lambie Drive, the western end of Ronwood Avenue and along Davies Avenue. The park provides an important informal recreational focal point to the developing city centre of Manukau.

Recent work in relation to the Manukau Station, combined with the Manukau Institute of Technology building, hinged off Hayman Park, forms a legible arrival point signalising the revitalisation of this portion of Manukau Central.

Section C

Similar to NoR 1, due to the low elevation of the road corridor in relation to the surrounding environment, views to distant landmarks are not attainable. Views beyond the road corridor are very limited and are restricted to vistas along Lambie Drive (toward the north and south), Puhinui Road and local streets at intersections with these roads. The characteristics of the road corridor of Lambie Drive and Puhinui Road are of an established residential community hinged off a key arterial route connecting to SH20B and the Manukau Central. Tree planting, notably the Norfolk Island Pines and loose rhythm of Pohutukawa trees along the road berms provide this section's key aesthetic qualities. Puhinui Domain is an old drainage reserve, located to the south of industrial buildings. It has poor connectivity to Puhinui Road and has degraded aesthetic qualities.

6.2.2.5 Natural character

Section A

[15] 18 Ronwood Drive

The area considered relevant to Policy 15 of the NZCPS is the tributary of Ōtara Creek, to the south of Rongomai Park. The natural character condition of this area is described below.

The key abiotic attributes of NoR 2, Section 1 include the geology, water catchments and landform, formed predominantly by geological and coastal processes. The geology of the Ōtara Stream is considered to be in the region mesozoic and tertiary non-volcanic rocks. Hydrologically, the catchment is part of a managed stormwater catchment heavily influenced by the surrounding urban development. The stream follows a broadly natural watercourse either side of Te Irirangi Road, although it passes through a pipe beneath the road. With the above in mind, it is considered the abiotic attributes in the vicinity of the project are low-moderate.

A mix of native species exists alongside the margins of the stream however weeds and pest plants also exist along the stream banks as well as within the watercourse such as the pest plant Egeria (Egeria densa), which was observed during the ecological survey. Shortfin eels were also observed. Poor habitat quality for the Kākahi (freshwater mussel) was considered. Longfin eel and īnanga have been recorded in the area although not observed during the survey. Taking the above into account, it is considered that the abiotic attributes are low-moderate.

In relation to experiential attributes, structures such as the Te Irirangi Drive bridge, associated piping, and other structures such as the pedestrian bridge and nearby residential properties reduce the feeling of wilderness. The stream experiential attributes of the stream, whilst demonstrating some natural qualities, remains clearly influenced by associated human habitation. With the above in mind, the experiential attributes of the stream are considered to be low-moderate.

Section B

The area of NoR 2 Section B considered is restricted to the Puhinui Creek, engineered stormwater pond located within Hayman Park. The geology includes Mesozoic and tertiary non-volcanic rocks. Lava Rocks are located in the wider area, toward the Ash Hill and Wiri Mountain (south west). Hydrologically, the current condition of the stormwater pond is a result of human modification, with the pond originating from a culvert in the south eastern corner of Hayman Park. With the above considered, the biotic attributes are considered low.

Limited riparian cover exists in relation to the stormwater pond feature, furthermore the ecological survey considers that any fish species would be limited to common, non-threatened species in addition to the habitat not being suitable for long-fin eel. Taking the above into account, it is considered that the abiotic attributes are low.

In relation to experiential attributes the absence of indigenous species or natural hydrological process, in combination with the presence of mown grass areas and developed context results in low experiential natural character attributes.

Section C

This section considers the stormwater infrastructure within Puhinui Domain, south of Puhinui Road. The geology of the area remains consistent with NoR 2 Section 3, being mesozoic and tertiary non-volcanic rocks. Hydrologically the tributary and stormwater pond are part of the urban network stormwater management. The stream has a naturally straight and uniform channel with areas being concrete lined. Riparian cover and vegetation are not present apart from mown grass. Although Shortfin eels were observed within the stream, the habitat of the stream is considered to be poor. In relation to experiential values, the presence of the stream and stormwater pond within an urbanised environment reduces the experiential attributes. Furthermore, the absence of indigenous vegetation, and poor habitat quality also impact on the experiential attributes and with the above in mind, it is considered the natural characteristics of the stream, that is the biotic, abiotic and experiential attributes are considered low.

6.2.2.6 Viewing audiences

Section A

The proposed designation boundary remains clearly associated with the existing Te Irirangi Drive corridor. The widening of this corridor will however necessitate the removal of some properties within this extent of NoR 2 that primarily form the road interface. The removal of buildings will form a newly developed edge that fronts on to the upgraded road corridor. The resulting viewing audiences will be the road users of Te Irirangi Drive and those approaching the road from the local streets that intersect it. Viewing audiences will also include the residents, visitors to the local shops, in addition to visitors to the Manukau Sports Bowl, Rongomai Park and Orlando Reserve.

Figure 15: View from Whetstone Road footbridge towards the east showing the typical single house residential environment that adjoins the eastern side of Te Irirangi Drive at this location

Figure 16: View from Whetstone Road footbridge towards Rongomai Park

Figure 17: Te Irirangi Drive looking north towards Rongomai Park. The alignment will cut into the vegetation on the right that currently provides a buffer between the residents and Te Irirangi Drive

Figure 18: corner of Te Irirangi Drive and Hollyford Drive (Orlando Reserve)

Figure 19: Te Irirangi Drive frontage to the Manukau Sports Bowl densely vegetated with a mixture of exotic and native trees

Figure 20: Manukau Sports Bowl

Figure 21: Te Irirangi Drive frontage to the Manukau Sports Bowl densely vegetated with a mixture of exotic and native trees

Section B

The viewing audiences of this section of NoR 2 vary along its length and are closely related to the associated land uses it passes through, e.g. visitors to commercial premises/ shops within Manukau Central. Road users include pedestrians and cyclists who form the transitory viewing audiences along the corridor.

Within Manukau Central, visitors to key social infrastructure including the Manukau Station and Hayman Park will have the opportunity to view sections of the Project. Commercial businesses along Ronwood Avenue would obtain direct views of the Project along the Ronwood Avenue section. Visitors to the commercial business along Lambie Drive will also obtain short term views as they enter and exit the buildings.

Figure 22: Ronwood Avenue adjacent to Westfield's Cinema carparking building

Figure 23: Western end of Ronwood Avenue with high rise apartments on the corner of Osterley Way and Hayman Park in the distance

Figure 24: Corner of Ronwood Avenue and Davies Avenue. Manukau City Centre on the left and Hayman Park on the right

Figure 25: Davies Avenue with Manukau Institute of Technology (MIT) in the distance and Hayman Park on the right

Figure 26: Lambie Drive north bound, north of Cavendish Drive

Section C

The proposed designation boundary remains broadly associated to the existing Puhinui Road Corridor, although widening of this corridor will necessitate the removal of some properties that primarily form the interface. The removal of buildings will form a new developed edge that fronts on to the upgraded road corridor. The resulting viewing audiences will be the road users of Puhinui Road and those approaching the road from the local streets that intersect. Viewing audiences will also include the residents, visitors to the local shops and visitors to Puhinui School which line the road corridor.

Figure 27: Puhinui Road East of Ranfurly Road

Figure 28: Ranfurly Road- Puhinui Road intersection, local shops

6.3 Assessment of construction effects

The following sections provide an assessment of construction effects on landscape characteristics and values for NoR 2.

Construction Areas

The following construction activities apply to all sections of NoR 2 areas and include:

- Construction compounds, laydowns;
- Construction machinery; and
- Earthworks and material storage.

Construction of the BRT corridor and high quality walking and cycling facilities, stormwater treatment and removal of existing buildings and development.

Specific landscape effects related to activities in Section A involve the removal of the pedestrian footbridges across Te Irirangi Drive.

Specific landscape effects related to activities in Section B includes the construction of the stormwater pond / wetland in Hayman Park.

Specific landscape effects related to activities in Section C includes the construction of stormwater treatment devices within Puhinui Domain and east of Plunket Ave and the construction of a BRT bridge structure along Puhinui Road, directly connecting the BRT corridor to the Puhinui Train Station.

Night works, where required, will in places introduce artificial light into an existing urban environment. Landscape effects related to construction activities across the NoR will be associated with the widening of the following existing roads:

- Te Irirangi Drive;
- Great South Road;
- Ronwood Ave;
- Davies Ave;
- Manukau Station Road; and
- Lambie Drive.

Vegetation Clearance

Vegetation clearance for the construction of the Project across all sections of NoR 2 include trees and shrubs (including some indigenous trees) within the road corridors, private properties (e.g. the road frontage of the Manukau Sports Bowl) and public open spaces. Grass berms and lawn areas along the corridor will also be removed.

6.3.1 Effects on landscape characteristics and values

The potential construction effects on the landscape arise from the physical changes to the receiving environment which may change its characteristics and values. When considering the physical change during construction of NoR 2, changes to the landform, hydrology, vegetation, open space, urban development, land use in addition to aesthetic qualities and natural character values are understood. The presence of elements and activities associated with construction (i.e. construction machinery, lay down areas, stockpiles etc.) can also temporarily change the values and characteristics of an area.

6.3.1.1 Landform and hydrology

Section A

As an urbanised landscape, the topographical and hydrological patterns are either modified or influenced by established human activity. The modified receiving environment does not feature any notable topographical features however it is acknowledged that a tributary of Ōtara Creek exists within the NoR, crossing beneath Te Irirangi Drive via a pipe.

Change to the landform will remain related to grading and associated earthworks which will assist in preparing the widened road corridor. This will undoubtably result in localised earthworks in the vicinity of the tributary of Ōtara Creek, although works will be limited to discreet sections in the proximity of existing modified embankments relating to the historical formation of Te Irirangi Drive. With the above considered, it is determined that due to the relatively low level of the affected landscape values, the effects during construction are considered to be **low** adverse.

Section B

Topographically, there are no landform features of note. The most notable differentiation from the easy contour of the urban landform is Hayman Park, although noting that the original landform as altered when the park was established. The urban environment also does not include notable hydrological features although it is noted that the Puhinui Stream is located to the west of the designation boundary.

Change to the landform will largely be restricted to the road corridors and within interfaces with neighbouring, primarily commercial, properties and With the above considered, it is determined that the effects during construction across NoR 2 Section B are **very low** adverse.

Section C

There are no landform features of note within this section of NoR 2 and it is acknowledged that the modified nature of the gentle 20mRL gradient along the length of the corridor and immediate vicinity will undergo grading to established levels for the widened road.

Hydrologically, the corridor is also considered to be of low value, it is noted however that works will be required within the tributary of the Puhinui Stream in addition to a stormwater pond within Puhinui Domain. It is considered these areas are modified environments such as the alignment of the stream and embankments in addition to the pond, considered to be constructed[16] With the above considered, it is determined that the effects during construction across NoR 2 Section C are **very low** adverse.

6.3.1.2 Vegetation patterns and open space

Section A

A total 160 protected trees have been identified across NoR 2 Section A. The removal of large areas of vegetation along the Te Irirangi Drive frontage of the Manukau Sports Bowl will result in adverse effects in relation to these specific landscape values. Whilst no scheduled trees are located within this area, collectively the grouping of trees is considered locally noteworthy and contribute to a distinctive vegetated green buffer which is uncharacteristic (and consequentially unique) in the context of the road corridor. With this in consideration, the removal of this vegetation, prior to appropriate mitigation planting (considered in the operation effects section), will result in **moderate** adverse effects.

The removal of the increasingly recognisable boulevard of Washingtonia Palms will result in effects considered **low-moderate**, noting that this vegetation collectively contributes to an established pattern of vegetation along the central median of the Te Irirangi Drive road corridor.

Some vegetation is likely to be removed in relation to the stream crossing of a tributary of Ōtara Creek (within Rongomai Park and Medvale Avenue Reserve). This vegetation includes typical native riparian vegetation (e.g. Kanuka and māhoe however, this is not identified as a Significant Ecological Area (‘**SEA**’) in the AUP:OP. Limited removal of vegetation within this area is considered to have **low-moderate** adverse effects. Although this includes native riparian planting, the extent of removal is well contained, includes vegetation less than 20 years old.

Vegetation is also proposed to be removed within Orlando reserve which includes a mix of native amenity planting. Effects in relation to this vegetation removal and effects on the Open Space is considered to be **low** adverse.

Section B

The Project will require the removal of 209 protected trees across this section of NoR 2. Notably the Project will require the removal of a number of mature / semi-mature trees through the corridor route. Indigenous vegetation likely established as part of the Te Irirangi Drive bridge embankments will be removed along the eastern portion of the NoR section. Some Washingtonia Palms and Pohutukawa’s will also be removed near the BNZ Building on Great South Road, noting that the Pohutukawa may be

[16] A study of aerial photography undertaken in 1939 and 1958 does not illustrate a pond in this location

able to be transplanted (pending agreement with the Project arborist). Street tree planting along Ronwood Ave will also be impacted and this includes some locally distinctive gum trees in addition to Puriri, Magnolia and Norfolk Island Pines and will result in the removal of the avenue characteristics of this road corridor. Some semi-mature vegetation along Davies Road will also be removed (and potentially relocated). Recently established Pohutukawa along Manukau Station Road will require relocation or removal. Street tree planting along Lambie Drive consisting of the established street tree species of the area being Norfolk Island Pines, Puriri and gums.

The removal of these trees, although not considered notable in the AUP:OP, will result in **moderate** adverse effects particularly when considering that at the time of removal, a number of these trees may be mature native specimens, (noting that by the time they are to be removed in the future they may be semi-mature).

Section C

The Project will require the removal of 64 protected trees across NoR 2 Section C. Notably the Project will require the removal of a number of mature/ semi-mature trees through the corridor route including Pohutukawa which often feature along the berms of the road corridor. Norfolk Island Pines which feature along the northern portion of Lambie Drive (and beyond, in NoR 2 Section B), will also be impacted by the Project.

The removal of these trees during the construction stages of the Project, although not considered notable in the AUP:OP, will result in **moderate** adverse effects particularly when considering that at the time of removal, a number of these trees may be mature native specimens in addition to the indigenous nature of much of these trees.

In terms of open space, that is effects on Puhinui Domain, it is considered effects will be **very low** as the value of the space at present is considered limited due to access and amenity.

6.3.1.3 Urban development and land use

Section A

The urban development and land use patterns for which the Project will be introduced is a developed, primarily residential environment. Construction activities would impact this established land use, albeit temporarily, however it is considered that works within these areas can be readily absorbed and remain associated with transport infrastructure upgrades, particularly given works remains primarily within the road corridor.

This change would be limited to the existing edges of these land uses, and the removal of residential properties would reveal a new 'edge' of development during construction. These revealed properties are similar in their character, visual composition, bulk, scale and land use, as those that would be removed. With the above in mind, it is considered that the level of effect during construction would be **low** adverse.

Section B

The urban development and land use patterns in which the Project will be developed are primarily a commercial urban environment, focused around the business district of Manukau Central. It is considered that works in the area remain associated with the transport infrastructure upgrades and signalise the modernisation and connectivity of the Manukau Central with the surrounding context. In this respect, it is considered the urbanised land use will readily absorb the proposed upgrade works and as such any level of effect during construction would be **very low** adverse.

Section C

The Project will be constructed within a predominantly residential environment, although it is noted local shops exist along the northern side of Puhinui Road near Ranfurly Road. As a road corridor, both Puhinui Road and Lambie drive are well recognised as important connector roads to the Airport, Manukau Central and east/ west connections across south Auckland. The importance of this route is somewhat 'down tuned' due to the low rise residential development along the road corridor, however recent upgrades to facilitate a priority lane for buses signalises the importance of this corridor. Moreover, Puhinui Road is positioned in the identified walkable catchment and NPS-UD zoning in Auckland Council's Plan Change 78 map viewer, 18 August 2022 as illustrated below.

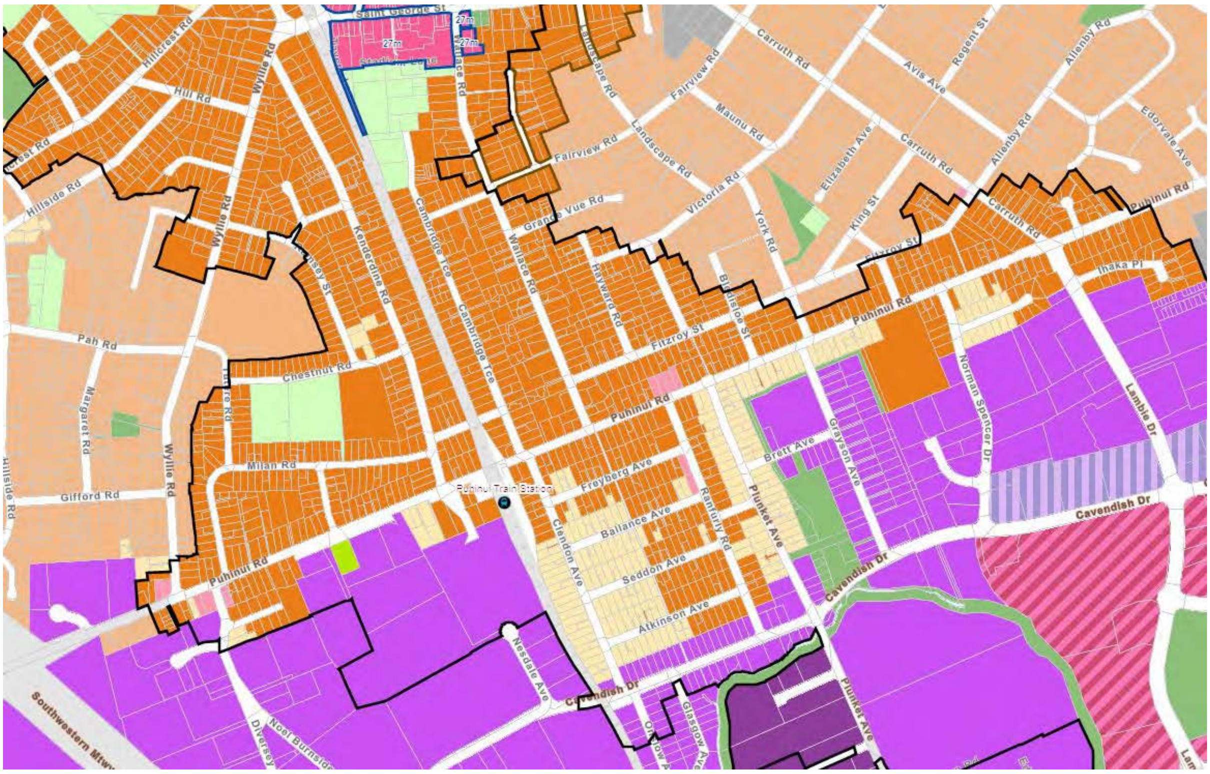


Figure 29: Black line indicating identified Walkable Catchment. Light orange area represents medium density residential areas, dark orange represents terraced housing and apartment areas Source, Auckland Council, Plan Change 78 map viewer, 18 August 2022

Aircraft noise overlays follow Puhinui Road with the Moderate Aircraft Noise Area (**MANA**) overlaying land on the northern side of Puhinui Road and the High Aircraft Noise Area (**HANA**) on the southern side of Puhinui Road. As set out in the AUP:OP, the HANA overlay prohibits new residential development.

With the above in mind, it is considered that the construction of the Project is an appropriate modification to land use and demonstrates the modernisation and connectivity of the urbanised areas with the surrounding context. In this respect, it is considered the urbanised land use will readily absorb the proposed upgrade works and as such any level of effect during construction would be **low** adverse.

6.3.1.4 Aesthetic qualities including views and visual coherence

Section A

The affected aesthetic qualities of this section during construction particularly relate to vegetation and open space. The removal of / impact of the vegetated block associated with the Manukau Sport Bowl, will result in an adverse effect considered to be moderate-high. It is considered that this grouping of vegetation contains aesthetic qualities that will be noteworthy to both residents and those passing through the area. This established vegetation provides a clear landmark attribute and therefore effects in relation to removal of this vegetation are considered to **moderate-high** adverse.

The removal of the Washingtonia Palms, representative of the boulevard characteristic of Te Irirangi Drive will also result in adverse effects considered **low-moderate**, although noting that these trees are positioned directly within the footprint of the proposed BRT corridor. Removal of vegetation within the tributary of the Ōtara Creek will result in adverse effects and further erode the visual coherence of this waterway. Notwithstanding this, the steam does not contain significant areas of vegetation. The removal of a limited area of vegetation during construction will result in adverse effects considered **low**, however such effects will be mitigated through revegetation planting which will establish to a comparable level of aesthetic qualities.

Section B

The affected aesthetic qualities of this section during construction particularly relate to vegetation patterns along the road corridor. The impact on vegetation along the road corridor will remove this aesthetic quality which will be particularly noticeable alongside the built up urban environment particularly alongside large buildings. With the above in mind, it is considered the effects on the aesthetic qualities will be **moderate** adverse during construction.

Section C

The affected aesthetic qualities of this section during construction are limited to the removal of vegetation along the road corridor. Whilst the tree planting appears at times sporadic and secondary to the built environment, during construction, semimature Pohutukawa for example will be larger in scale and further contribute to breaking down the built form of the area. With the above in mind, it is considered that the adverse effects on the aesthetic qualities during construction will be **moderate**.

6.3.1.5 Natural character

Section A

During construction, earthworks and vegetation removal will facilitate some adverse effects to the biotic, abiotic and experiential attributes. This change will however occur within a discreet area of the tributary and any effects will be broadly counted by the modified and managed nature of the environment. Overall, effects during construction are anticipated to be **low** adverse.

Section B

There will be no works within areas considered to relate to natural character within Section B.

Section C

Effects during construction will result in change to the tributary and stormwater pond, south of Puhinui Road. The stream alignment appears to be modified through its unnatural alignment and concrete edges and combined with the low degree of natural qualities present in relation to the stormwater pond, any effects to these qualities during construction are considered to be **low** adverse.

6.3.1.6 Visual amenity effects – Section A

The temporary visual amenity effects associated with NoR 2 Section A, would arise from the presence of construction activities, elements and structures during the course of the Project. These temporary effects would affect a range of viewing audiences which are located within, adjacent to, and in the wider vicinity of the site.

Residential Viewing Audiences

In relation to residential viewing audiences, those that adjoin the Te Irirangi Drive road corridor will experience the greatest visual effects. In this respect, the change will occur in the road corridor which directly abuts their properties, or properties that are within the proposed designation boundary. For residents that already meet the road corridor, the change during construction, whilst of relatively low amenity value (due to the presence of construction machinery), will be a more expected activity due to their established outlook. Future intensification of the corridor, realised through the application of the NPS:UD may provide greater numbers of viewing audiences and additionally the potential to view the Project at a more elevated position (i.e. 6 storeys).

For those residents that now create the new edge of development, construction activities within an area previously occupied by housing will have greater effects. Notwithstanding this however, works will occur within the visible context of the established road corridor, and for this reason it is considered the temporary effects on residents will be no more than **low-moderate** adverse.

Travelling Viewing Audiences

Viewing audiences located along the road corridors and footpaths of the receiving environment will observe construction activities within or in the immediate context of the existing road corridor environment. The presence of construction machinery within the established road corridor will also be a familiar sight to that observed across Auckland where transport infrastructure upgrades are a common sight. Granted that the extent of works along the corridor may be of a greater scale or size to that typically observed, the works will be clearly associated with upgrading of a significant arterial road. Combined with the relatively short duration of the views experienced, it is determined that the adverse effects during construction would be no more than **low** adverse.

Occupational Viewing Audiences and Visitors to Business Premises and Redoubt North School.

These viewing audiences include those at local shops at the intersection of Te Irirangi Drive and Dawson Road, such as the Z Service Station and Liquor Legends[17]. Views are also considered for those visiting the Manukau Sorts Bowl and Redoubt North School. Visual change during the construction of NoR 2 Section A would differ for each of these viewing audiences, due to the location and nature of their business and school premises. For example, activities may often occur on the

[17] 1/186 Te Irirangi Drive

forecourt of the Z Service Station and on the school field or Redoubt North School and activities occur beyond the interface with the road at Manukau Sports Bowl and Liquor Legends.

Notwithstanding this, for the majority of businesses and the school, the temporary construction effects associated with the Project would be observed and acknowledged as an infrastructure project, primarily located within the existing the road corridor. Works outside the road corridor will remain clearly attributed to the works within Te Irirangi Drive. Due to the lower sensitivity to change that these audiences hold (i.e. it is considered the activities these viewing audiences are engaged within (e.g. filling up a car), do not result in viewing audiences being highly sensitive), together with the works clearly relating to upgrades in the road corridor, any construction activity relating to the Project is likely to result in adverse effects no more than **low**.

Recreational Viewing Audiences

These viewing audiences are limited to the south eastern portion of Rongomai Park and Orlando Reserve (located near the Boundary Road intersection). Recreational viewing audiences in the south eastern portion of Rongomai Park would observe the change consisting of the widening of the road corridor, the proposed wrapping of the cycleway and pedestrian footpath into the park (to navigate around an existing transmission tower), and the removal of the pedestrian overbridge which bridges Te Irirangi Drive.

Visitors to the Orlando Reserve would typically be associated with those viewing audiences travelling along the footpath. The space between the road corridor and neighbouring residential development provides for very limited recreational opportunities. For both sets of viewing audiences, it is considered works will remain clearly associated with the upgrading of the road corridor. Viewing audiences within Orlando Reserve will effectively be amalgamated with those viewing audiences now obtaining access along the realigned footpath on the eastern side of Te Irirangi Dive. With the above considered, in that viewing audiences are within the immediate context of a road corridor (in which they are influenced by), and that works would be associated with transport infrastructure upgrades, it is considered any adverse effects during construction would be **low** adverse.

6.3.1.7 Visual amenity effects – Section B

The temporary visual amenity effects associated with NoR 2 Section B, would arise from the presence of construction activities, elements and structures during the course of the Project. These temporary effects would affect a range of viewing audiences which are located within, adjacent to, and in the wider vicinity of the site.

Residential Viewing Audiences

Due to the location of this section, there are currently limited residential viewing audiences although this does not discount further residential development within the city centre. At present, the Renaissance Centre forms the main residential viewing audiences of this section, apart from those who obtain glimpsed, partial views from along the eastern side of SH1 (e.g. Jontue Place). For those viewing audiences at the Renaissance Centre, the lower level apartments will attain the greatest views of the street (notably Ronwood Avenue), and subsequently observe the greatest degree of change. Those in mid to upper levels may have the opportunity to view the street however views are more focused beyond the immediate street environment that features below.

For both groups of residential viewing audiences, it is considered that any views of the works from these locations would be of construction machinery within the busy road environment. For those along the eastern side of SH1, views would form a small portion of their overall view. As such any effects would be **very low** adverse. Residents in the lower levels of the Renaissance Centre would obtain temporary adverse effects considered **low-moderate**.

Travelling Viewing Audiences

Viewing audiences located along the road corridors and footpaths of this section will observe construction activities within or in the immediate context of the existing road corridor environment. In all cases, the presence of construction machinery within the established road corridor will also be a familiar activity, expected from time to time along road corridors. It is recognised that the nature of works along the corridor may be of a larger extent to that typically observed however the works will be clearly associated with upgrading significant infrastructure in the vicinity of the Manukau Central. With the above in mind, combined with the relatively short duration of the views experienced, it is determined that the adverse effects during construction would be no more than **low**.

Occupational Viewing Audiences and Visitors to Business Premises

These viewing audiences include a wide range of business along the corridor route. Most of these businesses are internalised, i.e. apart from car parking, activities take place indoors, with little visual connection to the outdoor environment. Food and beverage facilities are also limited although it is noted that these facilities such as MELBA Manukau, provide views outside and other such activities could conceivably be established at the point of this Project's construction. In this respect, visual change during the construction of NoR 2 Section B would differ for each of these viewing audiences, due to the location and nature of their business.

Notwithstanding this, for the temporary construction effects bought about by the Project would be observed and acknowledged as an infrastructure Project, primarily located within the existing the road corridor. Combined with these viewing audiences' lower sensitivity to the proposed change, it is considered any adverse effects would be no more than **low**.

Recreational Viewing Audiences

These viewing audiences are limited to Hayman Park, however this park is the key area of open space within the city centre (not to discount the civic space located at the intersection of Osterley Way and Putney Way in the core of the City Centre[18]). Works will be focused along the existing road corridors of Ronwood Avenue and Davies Drive. Works will also be visible within NoR 2 Section C. However as consideration will be located within the road corridors and that these viewing audiences would experience views for a relatively short duration, any effects during construction will be **low**.

6.3.1.8 Visual amenity effects – Section C

The temporary visual amenity effects associated with NoR 2 Section C, would arise from the presence of construction activities, elements and structures, particularly the Puhinui Bridge), during the course of the Project. These temporary effects would affect a range of viewing audiences which are located within, adjacent to, and in the wider vicinity of the site.

Residential Viewing Audiences

In relation to residential viewing audiences, those that adjoin the Lambie Drive and Puhinui Road corridor will experience the greatest visual effects. In particular those residential viewing audiences in

[18] Views of the project from within this civic space are not anticipated to be obtained.

the vicinity of the proposed Puhinui Road Bridge. For residents that already meet the road corridor east of the Puhinui Bridge abutments, the change during construction will be a more expected activity due to their established outlook of a road environment. Any effects on these viewing audiences during construction are anticipated to be **low-moderate** adverse.

For those that are located opposite the proposed Puhinui Bridge, the change, although largely permitted in the zone, will be of a size and scale that may not be fully anticipated. Residential viewing audiences near to these areas would experience views of the overhead structure being built, including any abutment walls, columns, and the underside of the bridge. Whilst the bridge will appear clearly associated with the road corridor environment, the height and scale of construction activities along with the size of the bridge will not directly relate to the established scale of the road environment. For these reasons and noting that residential viewing audiences would have fixed views towards the Project, it is considered that adverse effects during construction would be **high** for residents that adjoin this portion of the road corridor, in particular the viewing audience on the northern side of Puhinui Road that are located directly adjacent to the bridge. Properties to the south are within the designation.

Viewing audiences further afield (i.e. at least one property back from the main interface,) would be more visually removed from the works, however, due to the height and scale of the activities, adverse effects will occur, particularly due to the receiving viewing audiences being residential nature. During construction, partial views of the Project may be visible either beyond the roof forms of established neighbouring properties, or across vacated properties that have been removed as part of the Projects land take strategy. With this considered, it is anticipated that residential viewing audiences set back from the road corridor will obtain **moderate** adverse effects during construction.

Travelling Viewing Audiences

Viewing audiences located along the road corridors and footpaths of this section will observe construction activities within or in the immediate context of the existing road corridor environment. Moreover, the broader context, beyond the confines of the road corridor, the fundamental characteristics of this environment would remain intact. Additionally, these viewing audiences would be transient in nature and experience this change for a short duration of time. With the above in mind, it is considered that the temporary adverse visual effects on these viewing audiences would be **low-moderate**.

Occupational Viewing Audiences and Visitors to Business Premises including Puhinui School

Occupational viewing audiences are limited to those associated with Puhinui School and the local shops positioned on the northern side of the road near the Ranfurly Road intersection. Shops here include a pawnbroker, butcher, convenience store, barber, bakery, two takeaway shops and a doctors surgery. Viewing audiences at Puhinui School will views the road corridor and associated works from the school play court. For both sets of viewing audiences, direct views to the road corridor will not include the proposed bridge abutments. It is anticipated that the Project would be observed and acknowledged as an infrastructure Project, primarily located within the existing the road corridor. Combined with these viewing audiences' lower sensitivity to the proposed change, it is considered any adverse effects would be no more than **low**.

Recreational Viewing Audiences

During construction, there will be works alongside the tributary to Puhinui Stream and in relation to the stormwater reserve. Viewing audiences are considered to be very limited (constrained due to access), and the park does not contain any key facilities or amenity features. With the above in mind, it is considered that during construction effects on viewing audiences will be **very low**.

6.3.2 Summary of construction effects on landscape character and values

The table below provides a summary of the construction effects on landscape character and values for Section A, Section B and Section C of NoR 2.

Table 8: Summary of construction effects on landscape character and values for NoR 2

Effect		**Assessment – construction**		
		Section A	**Section B**	**Section C**
Natural Character Effects				
Abiotic		Low		Low
Biotic		Low		Low
Experiential		Low		Low
Landscape Effects				
Landform		Low	Very Low	Very Low
Hydrology		Low	Very Low	Very Low
Vegetation	-	-	Moderate	Moderate
	Manukau Sports Bowl	Moderate		
	Washingtonia Palms	Low-Moderate		
	Ōtara Creek	Low-Moderate		
	Orlando Reserve	Low		
Open Space		Low	N/A	Very Low
Urban Development and Landuse		Low	Very Low	Low
Aesthetic Qualities	-	-	Moderate	Moderate
	Manukau Sports Bowl Vegetation	Moderate-High		
	Washingtonia Palms	Low-Moderate		
	Ōtara Creek	Low		
Visual Amenity Effects				
Residential	-	Low-Moderate	Low-Moderate	-
	East of proposed BRT bridge			Low-Moderate
	Opposite BRT bridge			High
	Setback BRT bridge			Moderate
Travelling		Low	Low	Low-Moderate
Occupational		Low	Low	Low
Recreational		Low	Low	Very Low

6.4 Assessment of operational effects

6.4.1 Summary of operational activities within the receiving environment

As set out in Section 7.1, the following points summarise the key changes to the receiving environment as a result of the Project:

- Realignment and widening of existing road corridors including Te Irirangi Drive, Great South Road, Ronwood Avenue, Davies Avenue, Manukau Station Road, Lambie Drive and Puhinui Road;
- Centre-running BRT corridor along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, Lambie Drive, and Puhinui Road;
- West-running BRT corridor along Davies Avenue, edge of Hayman Park;
- High quality walking and cycling facilities;
- Two lane vehicular carriageway in each direction with the exception of Davies Avenue (one way single lane) and Puhinui Road (one lane in each direction);
- Berms that can accommodate tree and shrub planting between the carriageway and walking and cycling facilities;
- Five BRT stations (Dawson Road Station, Diorella Drive Station, Ronwood Avenue Station, Manukau Station, Lambie Drive Station); and
- Other landscaping – to be confirmed – i.e. along road berms.

The following assessment also considers mitigation measures (as recommended in Section 11), as having been fully implemented. This includes careful consideration and design of structures such as BRT stations, outfalls, stormwater treatment, in addition to the appropriate level of planting to mitigate the removal of vegetation (including trees) and provision of a high-quality amenity environment. The following assessment considers the residual effects once vegetation has become fully established (i.e. 5 years growth), following planting and any plant and tree replacement (in the event of plant failure).

6.4.2 Effects on landscape characteristics and values

The potential effects on the landscape arise from the permanent physical changes to the receiving environment which may change its characteristics and values. When considering the permanent physical change, changes to the landform, hydrology, vegetation, open space, urban development, land uses in addition to aesthetic qualities and natural character are understood. The change in these attributes, in addition to the presence of permanent elements and structures will also alter the character of an area.

6.4.2.1 Landform and hydrology

Section A

Grading and other such earthworks to accommodate the new road levels and surfaces will result in permanent changes to the landform characteristics of this section of NoR 2. It is considered that these effects are sufficiently covered in the construction effects section of this assessment (Section 7.3). There would not be further change to the landform during operation of the Project. In determining the effect rating, it is considered that the effects would remain consistent with those anticipated under the construction phases. It is therefore determined that the effects on the landform during operation would be **low** adverse.

Permanent effects to the hydrological values will also have been undertaken in the construction phase, impacting the tributary of Ōtara Creek near Rongomai Park. Stormwater ponds located along the corridor will occur outside of the established stream corridors (one is proposed alongside the corridor near Belinda Avenue and will assist in managing stormwater run-off before discharging into the waterways. Overall, it is considered that **very low** effects will occur on the hydrological values of the receiving environment.

Section B

The permanent landform effects will be in relation to grading and other such earthworks to accommodate the new road levels and surfaces will result in permanent changes to the landform characteristics of this section of NoR 2. It is considered that these effects are sufficiently covered in the construction effects section of this assessment (Section 7.3). There would not be further change to the landform during operation of the Project. In determining the effect rating, it is considered that the effects would remain consistent with those anticipated under the construction phases. It is therefore determined that the effects on the landform during operation would be **low** adverse.

Permeant effects to the hydrological values will also have been undertaken in the construction phase Overall, it is considered any permanent effects to the hydrological values will be **very low** adverse.

Section C

As established in the baseline study, the topographical characteristics of this section of the NoR do not contain any notable features. The permanent effects will as a result of grading to accommodate the new road levels and surfaces in addition to excavations to enable the proposed Puhinui Bridge. In determining the effect rating, it is considered that the effects would remain consistent with those anticipated under the construction phases. It is therefore determined that the effects on the landform during operation would be **very low** adverse.

Permeant effects to the hydrological values will also have been undertaken in the construction phase, impacting the hydrological values of a modified tributary of Puhinui Stream and a man-made stormwater pond. As the hydrological values are already modified though historical earthworks. Overall, it is considered any permanent effects to the hydrological values will be **low** beneficial.

6.4.2.2 Vegetation patterns and open space

Section A

Once this portion of NoR 2 is operational, it is anticipated that a substantial number of trees would have been established as part of NoR 2 works to mitigate proposed tree and vegetation removal. These trees would notably be native species and will in time grow to become well suited to and established within the existing urban environment. It is proposed that this will include a combination of street trees set out in a formalised pattern within the road corridor, in addition to tree groups within the proposed designation boundary. It is considered that initially, following construction, the adverse effects on the vegetation values would be low, as the trees would not be of a height and stature which was removed. Once established, these trees will provide a greater contribution to the area and provide greater presence through urban ngahere and the establishment of placemaking identity. Therefore, it is considered that once fully mature these trees would contribute to the vegetated cover of NoR 2 resulting in **very low** adverse effects.

In considering effects on open space, any residual effects would be **very low** adverse, noting that Orlando Reserve, whilst already small in size, will have been further reduced due to the widening of the road corridor.

Section B

Following tree and vegetation removal, mitigation planting will have been established as part of the NoR 2 works. A focus on native tree species would result in a predominantly native tree palette across the NoR 2 section and result in a shift in the overall vegetation value identity, more suited to the natural values of Tāmaki Makaurau. Trees would be established within the street corridor and it is considered that initially, following construction, the adverse effects on the vegetation values would be **low**, as the trees would not be of a height and stature which was removed. Once established, these trees will provide a greater contribution to the area and provide greater presence through the establishment of placemaking identity. Therefore, it is considered that once fully mature these trees would contribute to the vegetated cover of NoR 2 resulting in **very low** beneficial effects.

Section C

Tree and shrub planting would have been established as part of the construction of the Project and will include a predominantly native planting palette of large scale trees. For much of the Puhinui Road corridor, the replacement planting will remain in keeping with the look and feel of indigenous specimen trees (i.e. Pohutukawa). Vegetation and trees along the northern portion of Lambie Drive would be replaced with specimens better suited to the urbanised environment of Tāmaki Makaurau, i.e. in that they will reflect the indigenous vegetation values of the region. This would result in a shift of the vegetation patterns and characteristics in relation to this portion of the NoR in particular. Notwithstanding this, it is considered the amenity and biodiversity and cultural values, together with the recast identity of the road corridor will result in **very low** beneficial effects once the trees have become fully established (i.e. within 5 years).

In considering effects on open space, the opportunity to improve connectivity with Puhinui Road and upgrade stormwater facilities and enhance the park, any residual effects would be **low** beneficial due to the change to Puhinui Domain.

6.4.2.3 Urban development and land use

Section A

The Project is focused along the developed road corridors of the area and supports a variety of land uses, including residential, commercial and recreational open space. These established land uses will remain along the interface of the Project and continue to represent the urban patterns of the area, although noting that Orlando Reserve will effectively be removed due to the extent of the required road widening.

The increased prominence of Te Irirangi Drive will signalise the importance of the arterial route and the deliberate move to invest into improving the connectivity to the wider area. Future development realised through the NPS:UD, notably occurring around the proposed BRT stations along Te Irirangi Drive will reinforce these objectives and contribute to urban intensification. Overall, it is considered that any residual effects will be **very low** adverse.

Section B

These established commercial and open space land uses will remain along the interface of the Project and continue to represent the urban patterns of the area. Future development, particularly residential development within Manukau Central will support the newly established stations and will reinforce these objectives and contribute to and reflect a compact urban form.

The provision of the busway along Davies Road will in some way adversely impacted the connectivity of Hayman Park open space to the city centre core however it is considered that appropriate landscaping and urban design techniques including traffic calming will ensure these effects are appropriately managed. Overall, it is considered the effects on the urban development and land use characteristics and values will be **very low** adverse.

Section C

These established predominantly land uses will remain along the interface of the Project and continue to represent the urban patterns of the area. It is considered the Project which involves the modernisation of public transport along the existing road corridor will be an appropriate modification to land use. It is therefore considered the urbanised land use will readily absorb the Project and as such any level of effect following completion would be **very low** adverse.

6.4.2.4 Aesthetic qualities including views and visual coherence

Section A

The removal of the recognisable pattern of Washingtonia Palms will remain an adverse effect during operation of the Project. Notwithstanding, this provision has been made in the design of the Project in which a 2 m (minimum) landscaped berm is provided for either side of the bus way, which will mean that at a minimum, two rows of trees will occur along the Te Irirangi Drive corridor. Landscape planting (including trees is also proposed on residual land, that is not suitable for urban reintegration, along the road corridor) and together, with a coordinated planting palette, a boulevard like characteristic will be reinstated. As previously considered, the provision of a native tree palette will move to better relate the characteristics of the road corridor to Tāmaki Makaurau's unique identity.

New areas of indigenous planting will be established along the corridor, in locations where redevelopment of vacated sites are not feasible or practicable, this will go some way of mitigating the removal of vegetation in the road frontage of the Manukau Sports Bowl land. Further opportunities around stream margins will also be established in which indigenous riparian planting will be considered.

Views of neighbouring open spaces and to vegetated sections of the neighbouring tributary of Ōtara Creek will be reinstated following the removal of construction machinery in addition to any interruptions to views to more distant landscape features.

With the above considered, it is determined that any residual effects on the aesthetic qualities and visual coherence will be **low** adverse.

Section B

Following construction and once the Project is in operation, vegetation patterns along the road corridors will have been established, and although the characteristics and aesthetic values may have been affected this does not necessarily mean that effects are considered adverse. As expressed, the move to introducing a predominantly native planting palette will better relate to the local area and foster a more meaningful identity. The widening of road corridors to provide for the busway will have the potential to reduce the aesthetic values of the streetscape however in time, with the provision of tree and landscape planting it is considered an updated transport network will signalise the modernisation of the city centre and immediate environs. The widening of the Davies Road corridor may reduce the legibility of the Hayman Park open space from the City Centre. Street tree planting along Davies Road and techniques to effectively draw the open space landscape across the road corridor will assist in reducing these effects and retain important aesthetic qualities associated with public open space.

Therefore, and with the above in mind it is considered that any residual effects in relation to the streetscape environment will be **very low** beneficial.

Section C

The key aesthetic qualities of this section of NoR 2 will be the deliberate decision to establish predominantly native planting. It is considered that this will better relate to the local area and foster a more meaningful identity. The widening of road corridors to provide for the busway will have the potential to reduce the aesthetic values of the streetscape however in time, with the provision of tree and landscape planting it is considered an updated transport network, building on the Puhinui Train Station will signalise the modernisation of the immediate environs. With the above considered, any residual effects in relation to the streetscape environment will be **very low** beneficial.

6.4.2.5 Natural character

Section A

Once the Project has been completed, it is considered any residual abiotic, biotic and experiential effects will be **very low** adverse. The proposed rain garden will result in some level of change however such change will remain alongside a developed context, in an area that has limited natural attributes.

Section B

There are no Natural Character attributes within this section of the NoR.

Section C

On completion of the Project, opportunities to enhance the park and associated tributary and stormwater pond will have been undertaken. Whist these aspects will not create a 'natural environment', new planting in the form of indigenous species will provide some greater natural character attributes to the area, and indirectly may encourage indigenous fauna to the area. With the above considered, any natural character effects are considered **very low** beneficial.

6.4.2.6 Visual amenity effects – Section A

The potential effects on the identified viewing audiences arise from the permanent physical changes to the receiving environment which may change the viewers visual appreciation of the area.

Residential Viewing Audiences

Residential viewing audiences adjacent to NoR 2 Section A will experience the greatest degree of change due to their proximity to the Project and availability of views towards the road corridor. Once the Project is complete, their view will continue to be of a major arterial road corridor (albeit upgraded), with vehicular traffic located a comparable distance from these property boundaries.

The proposed pedestrian footpath and cycleway will form the immediate element of their view towards Te Irirangi Drive. The road will be visual softened by appropriate landscaping including trees and supporting shrub planting. These areas of landscaping are proposed along the berms of the corridor which, when established, will provide a similar level of amenity to that currently experienced. For this reason, it is considered the residential visual effects on existing and indeed future residential viewing audiences, will be **very low** adverse.

Travelling Viewing Audiences

Permanent change for travelling viewing audiences will arise from the slight realignment and change in road width of Te Irirangi Drive, in addition to the presence of new bus stations in the road corridor (Dawson Road Station and Sports Bowl Station). These changes will however take place within the road corridor, and such change will be in keeping with that expected within a major arterial route as it evolves with the growth of the area it services. These viewing audiences will remain transient and when considered alongside an improved amenity experience as a result of streetscape enhancement works, it is determined that the permanent visual effects for these viewing audiences would be **very low** beneficial.

Occupational Viewing Audiences and Visitors to Business Premises and Redoubt North School

Following completion of the Project, these viewing audiences will interact with the road corridor in much the same way as they do at present. For those working within or visiting local business or the Redoubt North School, it is considered the lower sensitivity these viewing audiences will have to change, combined with clear similarities the Project has with the receiving environment, any residual effects will be **very low** adverse.

Recreational Viewing Audiences

It is considered that any residual effects will be limited, although it is noted that areas of Orlando Reserve will be impacted as a result of the Project (and consequentially the viewing audiences that currently access it). The completed Project will interact with the areas of open space in much the same way as they do at present, and in doing so, effects on the users of these spaces will experience **low** adverse visual effects.

The potential effects on the identified viewing audiences arise from the permanent physical changes to the receiving environment which may change the viewers visual appreciation of the area.

6.4.2.7 Visual amenity effects – Section B

Residential Viewing Audiences

Residual effects on residential viewing audiences are on balance anticipated to be **very low** beneficial due to the modernisation of the road corridor and provision for landscape planting which would have been established (for at least 5 years). Potential views will be limited to lower levels of the

Renaissance Centre and indeed further residential apartments that may be established before the Project is undertaken. For these to the east of SH1, it is not considered there will be an appreciable change to the Te Irirangi Drive road environment.

Travelling Viewing Audiences

Permanent change for travelling viewing audiences will arise from the alteration of the road corridors in addition to the presence of new bus stations in the road corridors. Any permanent effects are considered to be **very low** beneficial. This will be due to the modernisation and proposed streetscape enhancements as a result of the Project.

Occupational Viewing Audiences and Visitors to Business Premises

Following completion of the Project, these viewing audiences will interact with the road corridor in much the same way as they do at present. For those working within or visiting commercial business, it is considered the lower sensitivity these viewing audiences will have to change, combined with clear similarities the Project has with the receiving environment, any residual effects will be **very low** adverse.

Recreational Viewing Audiences

Residual effects on recreational viewing audiences within Hayman Park are considered to be **very low** adverse due to the marginal reduction of visual connectivity between Manukau Central and Hayman Park across Davies Avenue.

6.4.2.8 Visual amenity effects – Section C

The potential effects on the identified viewing audiences arise from the permanent physical changes to the receiving environment which may change the viewers visual appreciation of the area.

Residential Viewing Audiences

Residual effects on residential viewing audiences east of the Puhinui Bridge will experience some level of change in their views which would now include the dedicated busway, cycle way and updated footpaths. Landscape planting established within the first planting season of the Project’s completion will provide aesthetic qualities and visually soften the widened road corridor. For these viewing audiences it is considered any residual adverse effects will be **very low** adverse.

For those directly opposite the proposed Puhinui BRT bridge, permeant change will be more apparent and depending on the location of the viewing audience in relation to the bridge, views would be of the ramp abutments or columns with the underside of the bridge visible near the crossing of Cambridge Terrace where it will require a 5.8m clearance. For these viewing audiences, properties located on the northern side of Puhinui Road, the change will be particularly adverse. Although there are obvious aspects of the activity that relate to the road environment, the size and scale of the bridge will be contrary to the established character of outlooks for these viewing audiences. As such it is considered that up to **moderate** adverse effects will occur following mitigation.

For those residents set back from the road corridor, as established during the construction phase, partial views of the bridge will be partly influenced by the intervening roof forms of neighbouring properties, and these will likely obscure aspects of their views. It is considered that from these properties and in relation to the Project, the profile of the bridge will be most apparent. Mitigation measures employed to reduce the visual weight of the bridge will be important here. With mitigation measures applied it is considered that any residual effects on these viewing audiences would be **low-moderate** adverse.

Travelling Viewing Audiences

Permanent change for travelling viewing audiences will arise from the slight realignment and change in road width of Lambie Drive and Puhinui Road, in addition to the presence of a new busway bridge. Although changes will take place within the road corridor it is considered that the presence of the bridge will bring about some greater adverse amenity effects for traveling road users due to the height and scale of the structure. Regardless, and with good design outcomes applied to the form and appearance of the bridge, it is considered any residual adverse effects on these road users will be **very low** adverse.

Occupational Viewing Audiences and Visitors to Business Premises and Puhinui School

Following completion of the Project, these viewing audiences will interact with the road corridor in much the same way as they do at present. For those working within or visiting local business or the Puhinui School, it is considered the lower sensitivity these viewing audiences will have to change, combined with clear similarities the visible portions of the Project will have with the receiving environment, any residual effects will be **very low** adverse.

Recreational Viewing Audiences

Following completion of the Project, it is recognised that the entrance to the park along Puhinui Road will have the opportunity to be widened and. The existing stormwater pond, being a tributary to Puhinui Stream will be upgraded and enhanced and therefore provide greater connectivity and amenity values. Overall, it is considered there will be **low** beneficial effect on Puhinui Domain as a result of the Project.

6.4.3 Summary of operational effects on landscape character and values

The table below provides a summary of the operational effects on landscape character and values for Section A, Section B and Section C of NoR 2.

Table 9: Summary of operational effects on landscape character and values for NoR 2

Effect		**Assessment – construction**		
		Section A	**Section B**	**Section C**
Natural Character Effects				
Abiotic		Very Low		Very Low +
Biotic		Very Low		Very Low +
Experiential		Very Low		Very Low +
Landscape Effects				
Landform		Low	Low	Very Low
Hydrology		Very Low	Very Low	Low +
Vegetation	-	-	Very Low	Very Low +
	Manukau Sports Bowl	Very Low		

	Washingtonia Palms	Very Low		
	Ōtara Creek	Very Low		
	Orlando Reserve	Very Low		
Open Space		Very Low	N/A	Low +
Urban Development and Landuse		Very Low	Very Low	Very Low
Aesthetic Qualities	-	-	Very Low +	Very Low +
	Manukau Sports Bowl Vegetation	Low		
	Washingtonia Palms	Low		
	Ōtara Creek	Low		
Visual Amenity Effects				
Residential	-	Very Low	Very Low +	-
	East of proposed BRT bridge			Very Low
	Opposite BRT bridge			Moderate
	Setback BRT bridge			Low-Moderate
Travelling		Very Low +	Very Low +	Very Low
Occupational		Very Low	Very Low	Very Low
Recreational		Low	Very Low	Low +

6.5 Cultural landscape values

It is acknowledged that the Project traverses areas of cultural significance. As set out in the AEE, Manawhenua have been involved as partners through the NoR phase of the Project. To appropriately recognise the cultural landscape in the future phases of the Project, it is recommended that:

- Manawhenua are involved as partners in the future design of the Project;
- Opportunities to provide appropriate wayfinding and signage are explored in partnership with Manawhenua;
- Opportunities are identified to enhance water quality and restore streams within the Project area. With respect to NoR 2, it is recognised that there are opportunities to naturalise parts of Puhinui Stream (within the Puhinui Domain) and expand riparian corridors to enhance the mauri of the stream;
- An integrated stormwater management approach is adopted for the Project. In particular, it is identified that in NoR 2, there are opportunities to integrate proposed stormwater infrastructure within the park environment (Hayman Park);
- Provision is made for tree planting within and adjacent to the Project corridor to represent an urban ngahere; and
- Opportunities are identified to acknowledge cultural narratives in the design of Project elements.

7 Airport to Botany Bus Rapid Transit – NoR 3

This section assesses landscape and visual matters relating to NoR 3 – the Project corridor between Puhinui Station (in the vicinity of Plunket Avenue) and the SH20/20B interchange.

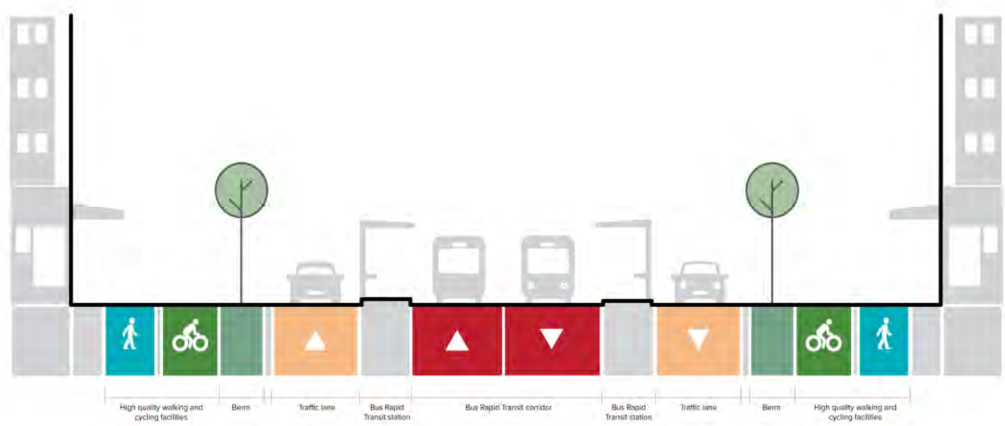
7.1 Overview and description of works

As set out in Table 10 below, the proposed works in NoR 3 include the widening of the existing Puhinui Road to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities. As part of the proposed works, a BRT bridge over the NIMT is proposed to connect to the Puhinui Station.

Table 10: Overview of NoR 3

<table>
<tr><th colspan="2">NoR 3 – Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange</th></tr>
<tr><td colspan="2">
</td></tr>
<tr><td colspan="2">Key features</td></tr>
<tr><td>BRT Corridor</td><td>Centre-running along Puhinui Road connecting to the Puhinui Station concourse via a new BRT bridge structure</td></tr>
<tr><td>BRT Stations</td><td>Puhinui Station</td></tr>
<tr><td>Walking and cycling facilities</td><td>• Walking and cycling facilities on both sides of the corridor; and
• Walking and cycling facilities will be provided along Cambridge Terrace, Bridge Street and Kenderdine Road.</td></tr>
</table>

General traffic	One lane in each direction on Puhinui Road
Access	Limited right turn access
Speed environment	50 km/h
Signalised intersections	• Puhinui Road and Noel Burnside Road; and • Puhinui Road and Wyllie Road.
Stormwater infrastructure	Wetland
NoR 3 typical cross section	



7.2 Existing environment

Refer to **Appendix D** for the suite of Figures.

7.2.1 Location description

NoR 3 includes Puhinui Road from the Puhinui Station to the SH20/SH20B interchange. The existing environment along Puhinui Road consists of a mix of business – commercial, industrial and residential uses, with residential being the most influential land use along this section. The corridor is a busy arterial road with four traffic lanes, few street trees and overhead power lines.

The following sections provide a further description of the receiving environment in addition to a selection of site appraisal photographs.

7.2.2 Landscape characteristics and values

7.2.2.1 Landform and hydrology

This portion of Puhinui Road is located inland from the coast and within an urbanized and heavily developed area. The topography of the area features gentle undulations, broadly sitting at around the 20 mRL mark. To the north of Puhinui Road, these topographical undulations are more legible, inducing a 30 mRL knoll in the vicinity of Hillside Road and Hillside South Park. To the south of Puhinui Road the area has been levelled to accommodate the industrial land uses.

As a historic inland urbanised environment, there are no natural streams remaining, instead overland flow paths exist, following road corridors and traversing across properties. These tend to flow south towards Noel Burnside Road before flowing to Roscommon Road Drainage Reserve to the south of SH20.

7.2.2.2 Vegetation patterns and open space

As an established residential suburb, the primary vegetation types are the garden ornamentals and lawns within the residential lots, which line much of Puhinui Road and the surrounding street, particularly to the north. In recent times, a number of trees have been removed during road upgrades including the provision of a shared use path (**SUP**) on the northern side of the road corridor as part of the recent Puhinui Road and Lambie Drive Improvements. A notable tree does however exist at the Puhinui Road / Vision Place intersection which is a large Flowering Gum[19]. Other notable trees also exist within the grounds of Cambria House however, these are outside of the proposed designation although it should be noted that some mature trees, particular a Magnolia exist at the entrance to Cambria House and sit within the road reserve and Project designation.

In relation to open space, only one area of open space (zoned Open Space – Community Zone) exists along the corridor which is the aforementioned Cambria House grounds. This area of open space is approximately 0.3 ha in size and positioned on the southern side of Puhinui Road, opposite Raymond Road. The open space features a number of mature trees and a historic building (Cambria House). The property falls under a Historic Heritage and Special Character overlay in the AUP:OP. [20]

7.2.2.3 Urban development and landuse

This section of Puhinui Road features residential land uses either side of the road corridor in addition to a mix of light industrial land uses, local convenience shops and businesses. The Puhinui Station features at the eastern end of NoR 3, bisecting Puhinui Road which continues in a north easterly direction after being severed by the rail corridor. Light industrial development is predominately located to the south of Puhinui Road, occupying just under half of the interface with the road corridor. Residential development, local shops and the parcel of Open Space make up the balance of these land uses. Noel Burnside Road forms the only local road on the southern side of the road corridor which meets Puhinui Road at a node of local shops and business.

The northern side of the road primarily contains residential land uses, notwithstanding a light industrial area to the west, focused around Vision Place, nearby the SH20 road corridor. A number of local roads feed into Puhinui Road from the north including Kenderdine Road, Raymond Road, Milan Road, Wyllie Road and Vision Place.

As set out in detail in the AEE, it is anticipated that additional intensification is likely to occur at all residential zoned land, existing centres and around the proposed BRT stations as envisioned by the NPS:UD.

7.2.2.4 Aesthetic qualities including views and visual coherence

Due to the low elevation of the existing road corridor in relation to the surrounding environment, views to distant landmarks are not attainable, with the nature of the views characterized by the mix of land uses. Glimpse views to low intensity residential development beyond Puhinui Road are attainable

[19] Tree ID 1526

[20] ID 1469

where local roads intersect with the road corridor. Whilst views are fleeting, the vegetated frontage and historic nature of Cambria House provides a level of amenity, contributing to historical connections and sense of place to the local area.

The straight alignment of the existing road corridor also provides for a view corridor to the north east and south west. The newly completed Puhinui Station provides a built marker at the eastern termination of NoR 3. The considered architectural qualities of the building signalises the modernisation of Auckland’s passenger rail infrastructure. To the south west, a view corridor towards the SH20 over bridge is obtained. The notable Flowering Gum, while offset from the road, forms a recognisable natural marker in this view, in part defining a book end to this section of road as it approaches the SH20 / SH20B interchange. Cambria House, defined by its open space characteristics, vegetated site and historic buildings also forms a key aesthetic quality to NoR 3.

7.2.2.5 Viewing audiences

The proposed designation boundary extends principally to the south, beyond the Puhinui Road Corridor, removing a number of residential and neighborhood centre properties. The removal of buildings within the designation will form a new ‘edge’ between Puhinui Road and the properties outside of the proposed designation. Due to the low intensity of development, views of the works will in many places be restricted to those existing residential properties that front Puhinui Road, those to the south of Puhinui Road now forming the new interface and road users along Puhinui Road and those on local roads approaching the intersection. Views of the works will also be obtained along Bridge Street and Kenderdine Road where road upgrades are proposed.

NoR 3 includes a BRT bridge over the Southern Line rail corridor which will drop off and pick up bus passengers at the Puhinui Station. Abutments will be required along Puhinui Road. The elevation of the BRT will start increasing around the intersection with Raymond Road before meeting the Puhinui Station building bus concourse. This structure will be more visible than other sections of this NoR due to its elevation. It is considered that views towards the structure will be obtained from a number of locations in the local vicinity. This includes but is not limited to those viewing audiences either side of Puhinui Road, the western end of Milan Road, the southern end of Kenderdine Road and those around Bridge Street, Cambridge Terrace and Clendon Avenue. Most of these viewing audiences are residential, although views from neighbouring light industrial premises (Altus Enterprises), a church (Kingdom Hall of Jehovah’s Witnesses) and a Te Kohanga Reo ki Puhinui (school) will obtain proximate views.

Figure 30: Puhinui Station from Bridge Street. The surrounding area is residential (Single House Zone) to the north of Puhinui Road and industrial to the south

Figure 31: Puhinui Station

Figure 32: Historic Heritage Building “Cambria Homestead” at 250 Puhinui Road

Figure 33: Puhinui Road looking east from Vision Place towards Puhinui Station. Includes Business - Light Industrial Zone, (container storage) land uses at the western end and mixed residential and commercial closer to Puhinui Station

Figure 34: View from Vision Place to the west, includes a notable tree (Flowering Gum) and SH20 bridge over Puhinui Road with planted abutments

7.3 Assessment of construction effects

Construction Areas

Construction compounds, laydowns, construction machinery, earthworks and material storage will be present across the NoR. Night works, where required, will in places introduce artificial light into an existing urban environment. Landscape effects related to activities across the NoR will be associated with the widening of Puhinui Road for the construction of the BRT corridor, high quality walking and cycling facilities and stormwater infrastructure. A bridge structure is also proposed to be constructed along Puhinui Road, directly connecting the BRT corridor to the Puhinui Station.

Vegetation Clearance

Broad areas of vegetation are proposed to be removed to accommodate the widened road corridor of Puhinui Road. This consists of trees and shrubs (including some indigenous trees and a notable tree, Flowering Gum[21]). Grass berms and lawn areas along the corridors will also be impacted.

7.3.1 Effects on landscape characteristics and values

The potential construction effects on the landscape arise from the physical changes to the receiving environment which may change its characteristics and values. When considering the physical change during construction of NoR 3, changes to the landform, hydrology, vegetation, open space, urban development, land use in addition to aesthetic qualities are understood. The presence of elements and activities associated with construction (i.e. Construction machinery such as cranes for the Puhinui Station BRT Bridge, lay down areas, stockpiles etc.) can also temporarily change the values and characteristics of an area.

7.3.1.1 Landform and hydrology

It is not considered that NoR 3 contains any landform features of note, with the topography containing some gentile undulations around the 20m RL mark. Localised grading of this road corridor and immediately adjacent areas within the designation will be required to facilitate the required levels for the new road and bridge structure.

It is also considered that hydrologically this portion of the road corridor is of low value. The change proposed, i.e. the construction of stormwater treatment devices will not meaningfully effect the hydrological values. With the above considered, it is determined the adverse effects during construction will be **very low** adverse.

7.3.1.2 Vegetation patterns and open space

Within NoR 3, the Project will require the removal of 21 protected trees. This includes one notable tree located within the road corridor of Puhinui Road which is considered to be a local landmark. Taking the notable tree into account, the removal of these trees during the construction stages of the Project, will result in **moderate-high** adverse effects particularly when considering that at the time of removal, a number of these trees may be mature native specimens in addition to the significance of the notable tree to be removed.

[21] Tree ID 1526

7.3.1.3 Urban development and land use

The receiving environment includes residential land uses either side of the road corridor in addition to a mix of light industrial land uses, local convenience shops and businesses. Similar to NoR 2 Section C, Puhinui Road is well recognised as an important connector road. The significance of this road is also signalised as much of it is positioned within a walkable catchment of the Puhinui Station.

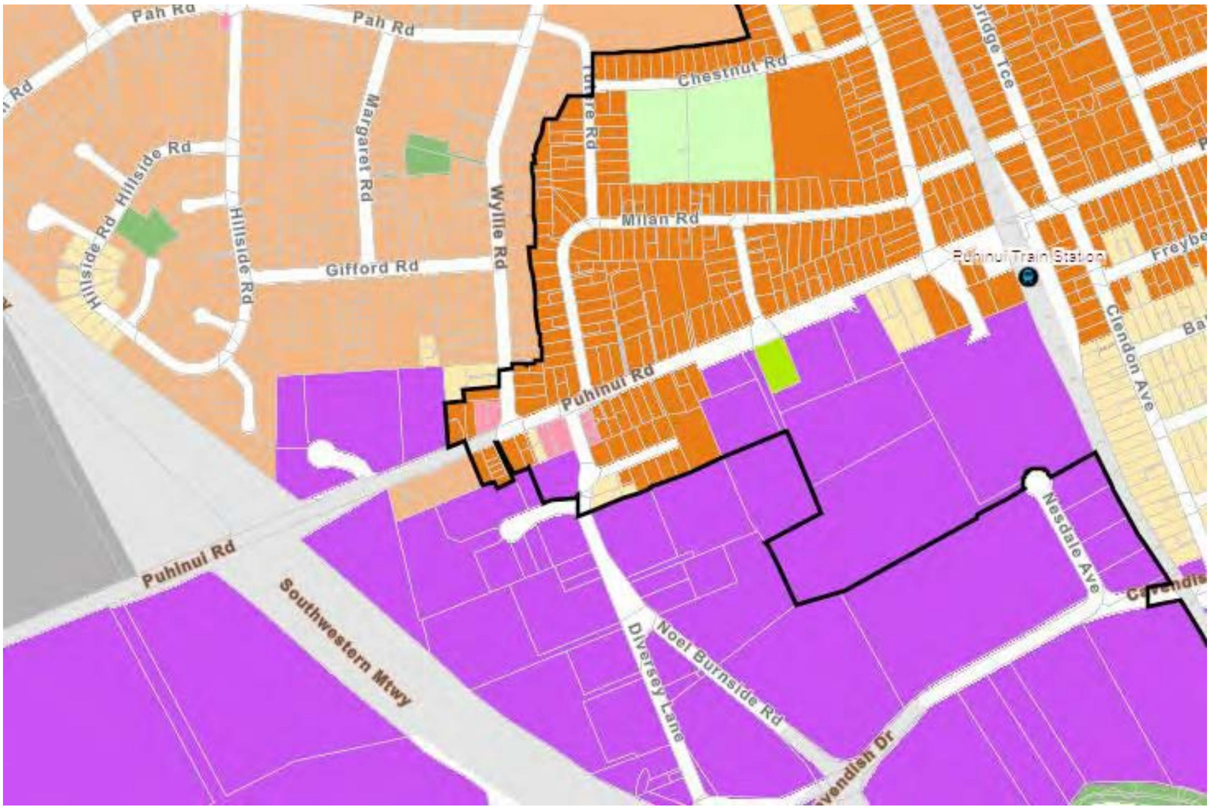


Figure 35: Black line indicating identified Walkable Catchment. Light orange areas represent medium density residential areas, dark orange represent terraced housing and apartment areas. Source, Auckland Council, Plan Change 78 map viewer, 18 August 2022

Aircraft noise overlays follow Puhinui Road with the MANA overlaying land on the northern side of Puhinui Road and the HANA) on the southern side of Puhinui Road. As set out in the AUP:OP, the HANA overlay prohibits new residential development.

With the above in mind, it is considered that the construction of the Project will be an appropriate response to the likely intensified land use. The Project will appropriately tie into these land uses and any adverse effects during construction will be **low** adverse.

7.3.1.4 Aesthetic qualities including views and visual coherence

The affected aesthetic qualities of this section during construction are principally limited to the removal of vegetation along the road corridor, particularly the notable Flowering Gum. It is however noted that construction machinery, particularly in the immediate context of the proposed Puhinui Station BRT Bridge will also impact the aesthetic qualities and legibility of the Cambria House site. It is considered that the adverse effects on the aesthetic qualities during construction will be **moderate**.

7.3.1.5 Visual amenity effects

The temporary visual amenity effects associated with NoR 3, would arise from the presence of construction activities, elements and structures, particularly the Puhinui Station BRT bridge), during the course of the Project. These temporary effects would affect a range of viewing audiences which are located within, adjacent to, and in the wider vicinity of the site.

Residential Viewing Audiences

In relation to residential viewing audiences, those that adjoin Puhinui Road and the southern portion of Kenderdine Road will experience the greatest visual effects during construction. In particular those residential viewing audiences to the east of Raymond Road near the proposed Puhinui Station BRT bridge.

For residents that already meet the road corridor west of the Puhinui Station BRT bridge, the change during construction will be a more expected activity due to their established outlook of an existing road environment. Any effects on these viewing audiences during construction are anticipated to be **low-moderate** adverse.

For residential viewing audiences positioned directly opposite the proposed Puhinui Station BRT bridge, it is anticipated that change will not be in keeping with the low rise residential nature which currently exists. It is considered that adverse effects during construction would be **high** for residents that adjoin this portion of the road corridor.

Residential viewing audiences beyond the immediate road interface will not have the same level of impacts due to intervening building forms in addition to the reduced visual prominence of the structure due to their greater distance. During construction, it is anticipated that residential viewing audiences set back from the road corridor will obtain **moderate** adverse effects.

Travelling Viewing Audiences

Viewing audiences located along the road corridors and footpaths of this section will observe construction activities within or in the immediate context of the existing road corridor environment. Moreover, the broader context, beyond the confines of the road corridor, the fundamental characteristics of this environment would remain intact. Additionally, these viewing audiences would be transient in nature and experience this change for a short duration of time. With the above in mind, it is considered that the temporary adverse visual effects on these viewing audiences would be **low-moderate.**

Occupational Viewing Audiences and Visitors to Business Premises including Te Kohanga Reo ki Puhinui and the Kingdom Hall of Jehovah's Witnesses

Occupational viewing audiences include those associated with Te Kohanga Reo ki Puhinui, the Kingdom Hall of Jehovah's Witnesses Puhinui School, the local shops and industrial business. All except the Te Kohanga Reo ki Puhinui principally support their activities indoors, it is considered effects would be no more than **very low** adverse during construction. For those at Te Kohanga Reo ki Puhinui, outdoor activities appear to be somewhat supported and therefore these viewing audiences are considered to have a greater sensitivity. With this in mind, and due to the proximity of the works it is considered adverse effects up to **low-moderate** may occur during construction.

7.3.2 Summary of construction effects on landscape character and values

The table below provides a summary of the construction effects on landscape character and values for NoR 3.

Table 11: Summary of construction effects on landscape character and values for NoR 3

Effect		**Assessment – construction**
Natural Character Effects		N/A
Landscape Effects		
Landform		Very Low
Hydrology		Very Low
Vegetation		Moderate-High
Open Space		N/A
Urban Development and Landuse		Low
Aesthetic Qualities		Moderate
Visual Amenity Effects		
Residential	West of Proposed BRT Bridge	Low-Moderate
	Opposite BRT Bridge	High
	Setback BRT Bridge	Moderate
Travelling		Low-Moderate
Occupational	Te Kohanga Reo ki Puhinui	Low-Moderate
	Other Occupational Audiences	Very Low
Recreational		N/A

7.4 Assessment of operational effects

As set out in Section 8.1, the following points summarise the key changes to the receiving environment as a result of the Project:

- Realignment and widening of Puhinui Road;
- Centre-running BRT corridor including a central BRT bridge structure starting in the vicinity of Plunket Avenue towards Puhinui Station;
- High quality walking and cycling facilities;
- One lane vehicular carriageway in each direction;
- Berms that can accommodate tree and shrub planting between the carriageway and the walking and cycling facilities;
- A series of stormwater treatment devices alongside Puhinui Road with appropriate planting; and
- Other landscaping – To be confirmed – i.e. along road berms.

The following assessment also considers mitigation measures (as recommended in Section 11), as having been fully implemented. This includes careful consideration and design of structures such as the Puhinui Station BRT bridge, BRT stations, outfalls, stormwater treatment and the like, in addition to the appropriate level of planting to mitigate the removal of vegetation (including trees) and provision of a high-quality amenity environment. The following assessment considers the residual effects once vegetation has become fully established (i.e. 5 years growth), following planting and any plant and tree replacement (in the event of plant failure).

7.4.1 Landform and hydrology

The topographical characteristics of this NoR does not contain any notable features. The permanent effects will as a result of grading to accommodate the new road levels and surfaces in addition to excavations to enable the proposed Puhinui Station BRT bridge (e.g. columns). There will also be no further adverse effects to the NoRs hydrological values. In determining the effect rating, it is considered that the effects would remain consistent with those anticipated under the construction phases. It is therefore determined that the effects on the landform during operation would be **very low** adverse.

7.4.2 Vegetation patterns and open space

It is considered that tree and shrub planting would have been established as part of the construction of the Project and will include a predominantly native planting palette of large scale trees. It is proposed that new tree planting will follow a defined and rhythmic pattern within roadside berms. Although it is acknowledged that the flowering gum will be in part, mitigated by the overall greater number of trees within the corridor, it is not considered that within 5 years of establishment, the landmark values of this tree will be fully mitigated. With that considered, it is determined that adverse effects at 5 years after the completion of the Project will be **low** adverse.

There will be no permanent effects on the open space values of the Community Zone identified in the Cambria House land. Notable trees and the vegetation values of this space will remain protected.

7.4.3 Urban development and land use

These established predominantly residential land uses will remain along the interface of the Project and continue to represent the urban patterns of the area. It is considered the Project which involves the modernisation of public transport and walking and cycling facilities along the existing road corridor will be an appropriate response to the modification to the likely intensified land use. It is therefore considered that the urbanised land use will readily absorb the Project and as such any level of effect following completion would be **very low** adverse.

7.4.4 Aesthetic qualities including views and visual coherence

The key aesthetic qualities of NoR 3 are the street tree planting and the Cambria House site. The deliberate decision to establish predominantly native planting at regular locations along the road corridor, together with occasional tree groupings will relate to the local area. This tree planting will soften the appearance of the widener road corridor, reinforcing the established residential characteristics of the receiving environment. The Cambria House site, which will not be impacted by the works will remain as a landmark historic feature along the road corridor apart from some alteration to the road frontage of the garden. With the above considered, any residual effects in relation to the streetscape environment will be **very low** adverse.

7.4.5 Visual amenity effects

The potential effects on the identified viewing audiences arise from the permanent physical changes to the receiving environment which may change the viewers visual appreciation of the area.

Residential Viewing Audiences

To the west of the Puhinui Station BRT bridge, residential viewing audiences will experience change which would now include the dedicated BRT corridor and walking and cycling facilities. Landscaping established along the road corridor would also feature, visually softening the streetscape and contributing to the residential characteristics of the view. For these viewing audiences it is considered any residual adverse effects will be **very low** adverse.

For those residents directly opposite the BRT bridge, i.e. east of Raymond Road, there will be a greater level of permanent change. Depending on their position along the corridor, they would view one or a combination of the bridge features including ramp abutments or columns with the underside of the bridge visible near the crossing of Kenderdine Road.

It is considered that these viewing audiences will have the greatest levels of effects due to the size and scale of the bridge which will be contrary to the established character of outlooks for these viewing audiences. As set out in detail in the AEE, it is anticipated that additional intensification is likely to occur at all residential zoned land, existing centres and around the proposed BRT stations as envisioned by the NPS:UD. Therefore, there is likely to be an increase in the residential viewing audience on the northern side of Puhinui Road adjacent to the BRT bridge. As such it is considered that if the future developed environment is established after the BRT bridge effects will be up to **high** adverse.

A number of residents set back from the road corridor will also have their views impacted. This partially includes those to the north, i.e. Milan Road and Bridge Street. Views of the Puhinui Station BRT bridge will be partially obscured by the intervening roof forms of neighbouring properties. It is considered that from these properties and in relation to the Project, only the profile of the bridge will be apparent. With mitigation measures to reduce the perceived visual weight of the bridge applied it is considered that any residual effects on these viewing audiences would be **low-moderate** adverse.

Travelling Viewing Audiences

Permanent change for travelling viewing audiences will arise from the slight realignment and change in road width along Puhinui Road, in addition to the presence of a new busway bridge. Although changes will take place within the road corridor it is considered that the presence of the bridge will bring about some greater adverse amenity effects for traveling road users due to the height and scale of the structure. Regardless, and with good design outcomes applied to the form and appearance of the bridge, it is considered any residual adverse effects on these road users will be **very low** adverse.

Occupational Viewing Audiences and Visitors to Business Premises including Te Kohanga Reo ki Puhinui and the Kingdom Hall of Jehovah's Witnesses

Following completion of the Project, most viewing audiences will interact with the road corridor in much the same way as they do at present. It is considered effects on Te Kohanga Reo ki Puhinui would experience **low** residual adverse effects. For other occupational businesses it is expected **very low** adverse effects will arise.

7.4.6 Summary of operational effects on landscape character and values

The table below provides a summary of the operational effects on landscape character and values for NoR 3.

Table 12: Summary of operational effects on landscape character and values for NoR 3

Effect		**Assessment – construction**
Natural Character Effects		N/A
Landscape Effects		
Landform		Very Low
Hydrology		Very Low
Vegetation		Low
Open Space		N/A
Urban Development and Landuse		Very Low
Aesthetic Qualities		Very Low
Visual Amenity Effects		
Residential	West of Proposed BRT Bridge	Very Low
	Opposite BRT Bridge	High
	Setback BRT Bridge	Low-Moderate
Travelling		Very Low
Occupational	Te Kohanga Reo ki Puhinui	Low
	Other Occupational Audiences	Very Low
Recreational		N/A

7.5 Cultural landscape values

It is acknowledged that the Project traverses areas of cultural significance. As set out in the AEE, Manawhenua have been involved as partners through the NoR phase of the Project. To appropriately recognise the cultural landscape in the future phases of the Project, it is recommended that:

- Manawhenua are involved as partners in the future design of the Project;
- Opportunities to provide appropriate wayfinding and signage are explored in partnership with Manawhenua;
- Provision is made for tree planting within and adjacent to the Project corridor to represent an urban ngahere. Manawhenua noted that this was particularly important in the context of NoR 3, as several trees have been removed along Puhinui Road as part of previous road upgrades; and
- Opportunities are identified to acknowledge cultural narratives in the design of Project elements, in particular the proposed BRT bridge connecting to Puhinui Station.

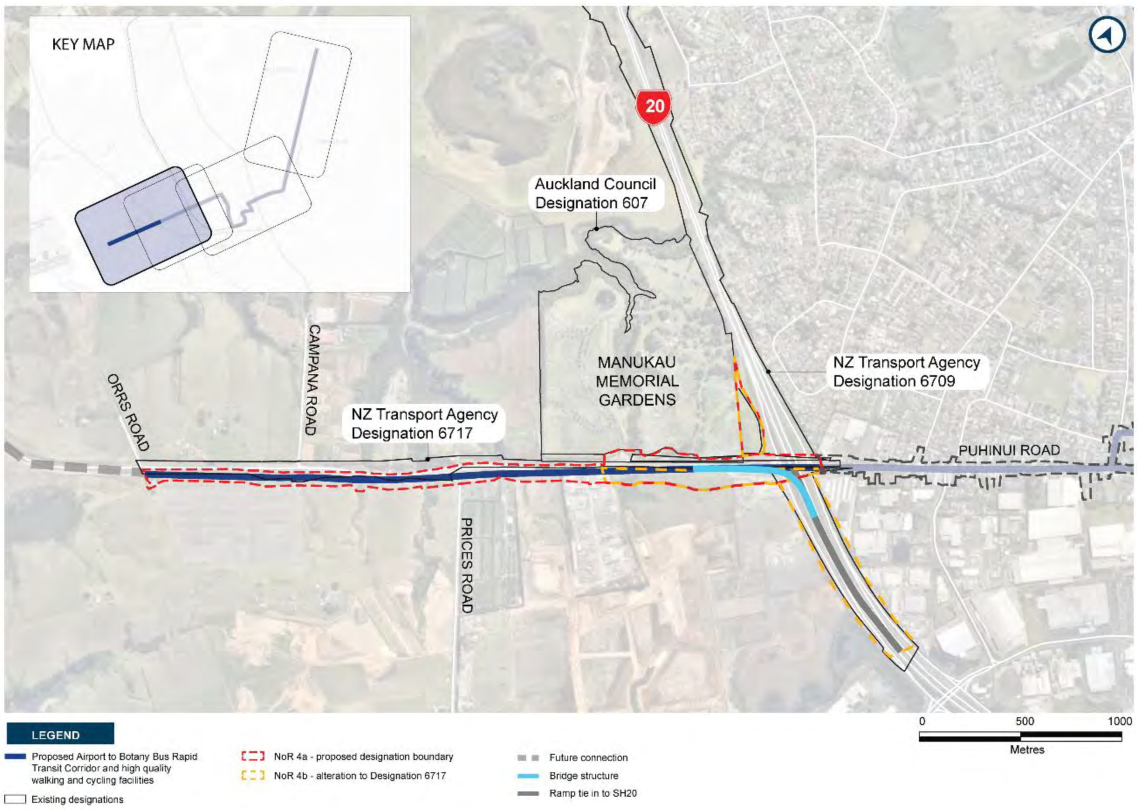
8 Airport to Botany Bus Rapid Transit – NoR 4a and NoR 4b

This section assesses landscape and visual matters relating to NoRs 4a and 4b – the Project corridor between the SH20/20B Interchange and Orrs Road.

8.1 Overview and description of works

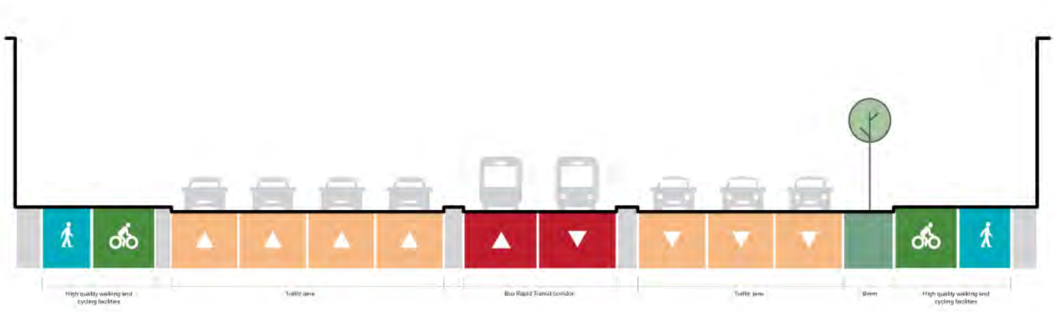
As set out in Table 13 below, the proposed works in NoRs 4a and 4b include the widening of SH20B to accommodate a centre-running BRT corridor until the Manukau Memorial Gardens. From this point, the BRT corridor shifts south of SH20B until Orrs Road. Proposed works also include high quality walking and cycling facilities, eastbound lanes to Auckland Airport and a ramp from SH20B onto SH20 for southbound traffic.

Table 13: Overview of NoRs 4a and 4b

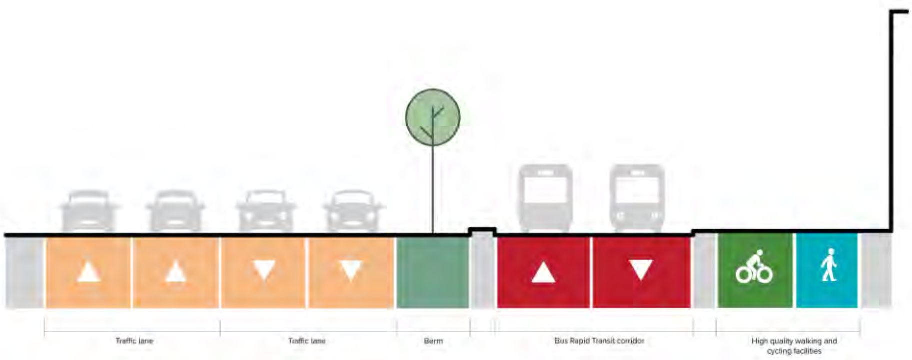
NoRs 4a and 4b – SH20/20B Interchange to Orrs Road	
	
Key features	
BRT corridor	• Centre-running on Puhinui Road through to the Manukau Memorial Gardens intersection (approx. 600 m west of SH20/20B Interchange); and • South running to Orrs Road.
Walking and cycling facilities	Walking and cycling facilities on southern side of the corridor

General traffic	• Two lanes in each direction; and • New southbound ramp from SH20B onto SH20.
Access	• Limited access; and • Access maintained via signals at Manukau Memorial Gardens and Campana Road.
Speed environment	60 km/h
Signalised intersections	• SH20/SH20B Interchange; • Puhinui Road and Manukau Memorial Gardens; and • Puhinui Road and Campana Road.
Stormwater infrastructure	Swales

NoR 4b typical cross section



NoR 4a typical cross section



8.2 Existing environment

Refer to **Appendix E** for the suite of Figures.

8.2.1 Location description

- NoRs 4a and 4b follow the alignment of Puhinui Road (SH20B).
- NoR 4a extends from the SH20/SH20B interchange to the intersection with Orrs Road.
- NoR 4b is a proposed alteration to existing designation 6717 between the SH20/20B interchange and Manukau Memorial Gardens.

The existing designation is principally characterised by the road corridor which features a double lane carriageway (with one lane being a T3 lane), flush central median and Shared Use Path on the northern side, east of SH20 and shifting to the southern side of the road at Manukau Memorial Gardens. Beyond these road extents is a mix of landscape characteristics including at the Manukau Memorial Gardens, commercial premises and agricultural land, some of which is being earth worked for future commercial development.

The following sections provide a further description of the receiving environment in addition to a selection of site appraisal photographs.

8.2.2 Landscape characteristics and values

8.2.2.1 Landform and hydrology

SH20B is located on a broad headland which is defined by the Otaimako Creek, Pūkaki Creek and Waokauri Creek. The topography rises in elevation from the coast, often reaching 10 mRL within 50 m to 100 m from the coastal edge, remaining at around this elevation for much of the area. A series of creeks and small gullies reach into the headland forming a sequence of shallow, rounded shoulders either side of SH20B. The central portion of the SH20B road alignment intersects with some of these features, resulting in a series of crossing points in the form of bridges and culverts. In the vicinity of the Project, there are a number of wetlands notably to the south of SH20B. These wetlands are often located within the current arable farmland environments and sit alongside the road corridor and partly within the existing designation. These wetlands feed into the neighbouring watercourse which include four tributaries of the Waokauri Creek.

8.2.2.2 Vegetation patterns and open space

A variety of vegetation types and patterns feature across the NoR 4a and NoR 4b extents. The agricultural production fields of exotic pasture, whilst much has been removed (currently bare soil), crops remain a defining vegetation type, particularly evident in the western portion of the Project area (Prices Road to Orrs Road). The Manukau Memorial Gardens in the eastern portion of the NoRs feature a mix of street tree planting and mature exotic specimen tree planting interspersed between burial plots. One of the aforementioned creeks (a tributary of Waokauri Creek) reaches into the Manukau Memorial Gardens from the north (intersecting with SH20B) and features a mix of native riparian planting and a predominance of exotic weed species.

Three other tributaries of Waokauri Creek reach in toward SH20B and feature a mix of riparian vegetation, with mangroves occupying the tidal areas also being a key feature. These three tributaries are part of the marine SEA (SEA-M2-27a).

Formal street tree planting is not particularly apparent along the length of SH20B however roadside vegetation does exist, notably in the context of Prices Road, nearby the three branches of the Waokauri Creek. A mix of exotic and indigenous shrub and tree species exist along the roadside in this area, in addition to a green buffer along the interface with the Manukau Memorial Gardens. Other occasional groups of trees occur along the berms of SH20B.

8.2.2.3 Urban development and landuse

The current land use within NoR 4a is primarily rural, featuring grazing and cropping fields. Commercial premises are focused along the southern side of the road corridor, to the east of Prices Road (predominately in NoR 4b). SH20B is located within both NoRs 4a and 4b. A Park and Ride facility which has been partially constructed by Auckland Airport is located on land opposite the Campana Road / SH20B intersection and is characterised by a large car park.

Whilst the above describes the land use at present, a large portion of the surrounding area is zoned as Light Industry Zone including all of the land to the south of SH20B, and a small wedge adjoining the western boundary of the Manukau Memorial Gardens. A portion of this land is already being earth worked in preparation for future land uses and is in a transitional state between its former rural land use and future light industrial use. The Future Urban Zone to the north of SH20B broadly west of Prices Road is anticipated to be business land and is sequenced to be development ready by 2038-2032. It is therefore recognised that the future receiving environment of the Project is likely to, in many places more accurately reflect the activities of the associated zoning.

8.2.2.4 Aesthetic qualities including views and visual coherence

Due to the inherent openness associated with large, broadly flat pasture fields, together with breaks in roadside planting, views of the surrounding landscape are currently obtained from a number of locations along the SH20B road corridor. Views are often terminated by distant tree stands or shelterbelts, with occasional distant pasture covered ridges and maunga attainable to the north (e.g. near Campana Road). Views of old or disused farm buildings are also evident along the corridor, reinforcing the current but transitioning rural characteristics of the area. Glimpsed views of the Waokauri Creek tributaries to the north of SH20B are also attainable from a short section along the road corridor which reinforces the remnant natural qualities and values of the area.

8.2.2.5 Natural character

The areas relevant to the NZCPS within NoR 4a are the margins associated with the Waokauri Creek in addition to identified wetlands within the proposed designations. The key abiotic attributes of NoR 4a include the geology, water catchments and landform, formed predominantly by geological and coastal processes. The geology of NoRs 4a and 4b, considered to be in the region mesozoic and tertiary non-volcanic rocks. Lava rocks and tuff deposits exist within the area but beyond the designation, associated with Pūkaki, Crater Hill and Cemetery Hill. In relation to the hydrological processes, the Project sits in the Pūkaki Waokauri water catchment which is coherently supporting an area undergoing land use transition from a rural environment, to one that supports light industry (land in the future residential), land uses. The tributaries of the Waokauri Creek and associated wetlands appear as legible natural watercourse features although areas of these have been interrupted by the existence of SH20B, including culverts. Overall, it is considered the abiotic attributes of these features are moderate.

The biotic attributes of the receiving environment are the living organisms which shape an ecosystem. This aspect in part relies on the surveys undertaken by the Project Ecologist and Arborist, with their findings outlined in their respective assessments. The margins of the streams and wetlands within the NoR environments feature a mix of native and exotic vegetation in addition to weed species being present. Some areas of these features are shaded and the woody debris provided habitat to a moderate population of shortfin eel in addition to a selection of other species, although in places water quality measurements showed very poor habitat quality. Overall, it is considered that the abiotic attributes are moderate of these streams and wetlands are moderate.

In relation to experiential attributes, whilst some areas may have slightly more elevated attributes, all areas occur within the immediate vicinity of the SH20B road corridor, and human modification in the form of culverts are also nearby, affecting perceived naturalness. While the biotic attributes also contain native species, the introduction of exotic species which remain clearly legible, also reduce these levels. With the above in mind, any experiential attributes associated with these features will be no more than low-moderate.

8.2.2.6 Viewing audiences

Existing viewing audiences in relation to these NoRs include road users of Puhinui Road in addition to those limited road users along Prices Road, Campana Road and Orrs Road. People visiting the Manukau Memorial Gardens will also obtain views of the proposal along Selfes Road[22] (main entry), in addition to some locations in the southern portion of the Manukau Memorial Gardens particularly due to the proposed ramp structure connecting SH20B to southbound traffic on SH20. Low numbers of viewing audiences will also obtain views from the commercial / open area storage facilities to the south of SH20B. Viewing audiences on SH20 will have brief opportunities to view the proposed ramp structure connecting SH20B to SH20. East of SH20, residential viewing audiences and industrial viewing audiences will obtain partial views of the Project. However, these views will be limited due to intervening roof forms within these developed areas.

[22] Internal road for the Manukau Memorial Gardens

Figure 36: Manukau Memorial Gardens looking towards the SH20B/SH20 interchange

Figure 37: Puhinui Road (SH20B) looking east from Prices Road

Figure 38: View south including Waokauri Creek and cultural markers

Figure 39: SH20B, bridge over Waokauri Creek, westerly view towards Auckland Airport

Figure 40: Waokauri Creek Estuary

8.3 Assessment of construction effects

Construction Areas

Construction compounds, laydowns, construction machinery, earthworks and material storage will be present across the NoRs. Night works, where required, will in places introduce artificial light into an urban fringe environment. Landscape effects related to construction activities across the NoRs will be the widening and construction of the BRT corridor, the associated widening of SH20B and the provision for a dedicated SH20 on-ramp bridge in addition to stormwater devices and culverts.

Vegetation Clearance

Broad areas of vegetation are proposed to be removed to accommodate the widened road corridor of SH20B. Primary areas of vegetation to be removed along the northern side of the corridor along the frontage of the Manukau Memorial Gardens which includes a mix of predominantly native roadside buffer vegetation. Other areas of vegetation removal along the road corridor are focused along the southern side of the road corridor and include occasional shelterbelt planting, occasional trees (often exotic including a large macrocarpa), and isolated areas of riparian vegetation within the margins of the affected tributaries and wetlands.

8.3.1 Effects on landscape characteristics and values

The potential construction effects on the landscape arise from the physical changes to the receiving environment which may change its characteristics and values. When considering the physical change during construction of NoRs 4a and 4b, changes to the landform, hydrology, vegetation, urban development, land use in addition to aesthetic qualities are understood. The presence of elements and activities associated with construction can also temporarily change the values and characteristics of an area.

8.3.1.1 Landform and hydrology

The topographical values along the NoRs are limited in relation to the gentle gradient of the pasture fields that have been maintained and managed due to arable farming practices. The tributaries and wetlands of the area and within the designation hold both topographical and hydrological values as well as high value agricultural soils, and these will be impacted by the Project through earthworks and grading of surfaces to prepare the site to the road elements. It is considered that the impacts on these specific areas during construction will be **low** adverse for landform and **high** adverse due to their natural hydrological values.

For the remaining areas of the landform and hydrology that will be impacted by the Project, it is considered these effects will be **low** adverse due to the modified and managed nature of the topography.

8.3.1.2 Vegetation patterns and open space

NoRs 4a and 4b will not require the removal of any protected trees as trees do not occur within the road reserve or open space and are therefore not protected by District Plan rules. Furthermore, only one area of vegetation will be affected and will be as a result of the construction of the ramp structure. An estimated 100 m^2 of riparian vegetation (protected by Regional Plan provisions) of the western and eastern side of the existing stream will be removed to enable the piling works. With the above in mind, it is considered any effects will be **low** during construction.

8.3.1.3 Urban development and landuse

The receiving environment includes limited arable land uses to the south of SH20B. This current land use does not however represent the anticipated land uses of the area which should be considered, given that these developments are likely to precede the Project. These developments include a substantial area of light industry zoned land on the southern side of SH20B, some of which is being earth-worked at the time of writing, in addition to two large segments along the northern side. In addition to the above, Manukau Memorial Gardens is located to the north of SH20B, adjacent to SH20.

Future urban zoning has also been allocated between Orrs Road and proposed light industrial land to the west of the Manukau Memorial Gardens. These land uses will significantly change the current arable land uses of the receiving environment.

In relation to the Project and these land uses, it is considered the established arterial route to the airport has already set the scene as an important connection between the Airport, SH20 and the urban areas further to the east. Upgrades to the corridor have been progressively undertaken to modernise the service and meet current and future capacity. Therefore, it is considered that the Project will appropriately tie into these land uses and any adverse effects during construction will be **low** adverse. It is also possible that the surrounding land use will still be partially undergoing construction at the same time as the Project is constructed.

8.3.1.4 Aesthetic qualities including views and visual coherence

The inherent current openness of the pasture fields that surround large portions of the corridor will in part be impacted during construction of the Project. It is anticipated that the views and visual coherence of the established arable land to the north will remain broadly as they are at present. Views of these land uses will however be affected towards the south. Groups of riparian vegetation in the immediate vicinity of the road corridor will also be impacted during construction. Glimpse views of the tributaries to the north are likely to remain during construction as works take place to the south of the existing road corridor. As views of key aesthetic qualities will remain from the road corridor and works will relate to the road corridor environment, it is considered any adverse effects on the aesthetic qualities will be no more than **low**.

8.3.1.5 Natural character

Effects on the abiotic natural character values will be in relation to the removal of an approximate 48.5m length of intermittent tributary associated with the Waokauri Creek and two natural wetlands also being affected as a result of the Project. The use of bridges rather than culverts may reduce the extent of wetland removal. It is considered that adverse effects on the abiotic and biotic attributes during construction will be **moderate** until mitigation measures take effect following construction. The low experiential attributes in these areas will be further affected due to the impact on these features however as these attributes are already compromised (i.e. by the reduced abiotic and biotic attributes due to the degraded condition), any effects during construction would be **moderate**.

8.3.1.6 Visual amenity effects

The temporary visual amenity effects associated with NoRs 4a and 4b, would arise from the presence of construction activities, elements and structures, particularly the construction of the proposed ramp structure from SH20B to SH20, during the course of the Project. These temporary effects would affect a range of viewing audiences which are located within, adjacent to, and in the wider vicinity of the site.

Residential Viewing Audiences

In relation to residential viewing audiences, these are particularly limited and are primarily associated with the agricultural land uses. For those that are along the northern side of SH20B, the dwellings are offset from the existing road corridor and often behind established vegetation to effectively screen them from the road. Construction activities will be observed on the southern side of the road (away from the viewing audiences and in the context of the road corridor). It is not considered that these viewing audiences will be meaningfully impacted by the proposed ramp structure and these residential viewing audiences may no longer be in place at the time of construction as they are likely to be replaced by uses enabled by the industrial zoning.

Viewing audiences around the proposed ramp structure however, e.g., off Hillside Road, will observe the change in the construction in the context of the existing SH20 motorway any such change will remain in keeping with the nature of their existing outlooks. Therefore, during construction it is considered adverse effects will be no more than **low**.

Travelling Viewing Audiences

Viewing audiences located along the SH20B road corridors and footpaths of this section will observe construction activities to the south of the road and within the context of SH20. Although this will reduce the amenity values of their views, temporarily - due to their sensitivity to change and transient nature, in combination with the nature of works proposed, it is considered any effects during construction will be **low** adverse.

Occupational Viewing Audiences and Visitors to Business Premises

Occupational viewing audiences are particularly limited and their sensitivity to visual change is considered to be low. Construction will appear in keeping with the existing road corridor environment and will result in effects considered **low** adverse.

Visitors to Manukau Memorial Gardens

Manukau Memorial Gardens will have the opportunity to obtain views of the proposed ramp structure in addition to works along SH20B when looking south along the main entrance road (Selfes Road). Some locations within the gardens themselves will provide views of the ramp structure. During construction, any works will appear visually and physically separated to the Manukau Memorial Gardens. Whilst works will temporarily reduce amenity values of the environment, the source of effects will occur beyond the boundaries of the gardens and in the vicinity of existing road corridors and elevated road structures, and for these reasons it is considered any temporary effects on these viewing audiences will be no more than **low**.

8.3.2 Summary of construction effects on landscape character and values

The table below provides a summary of the construction effects on landscape character and values for NoRs 4a and 4b.

Table 14: Summary of construction effects on landscape character and values for NoRs 4a and 4b

Effect	Assessment – construction
Natural Character Effects	

Abiotic	Moderate
Biotic	Moderate
Experiential	Moderate
Landscape Effects	
Landform	Low
Hydrology	High
Vegetation	Low
Open Space	N/A
Urban Development and Landuse	Low
Aesthetic Qualities	Low
Visual Amenity Effects	
Residential	Low
Travelling	Low
Occupational	Low
Recreational	N/A

8.4 Assessment of operational effects

The following points summarise the key changes to the receiving environment as a result of the Project:

- Realignment and widening of Puhinui Road (SH20B);
- Centre running BRT corridor between SH20/SH20B interchange and Manukau Memorial Gardens. Shifting to the southern side of SH20B from Manukau Memorial Gardens to Orrs Road;
- High quality walking and cycling facilities;
- Retention of vehicular carriageway;
- A new elevated ramp structure connecting SH20B to SH20;
- Berms that can accommodate tree and shrub planting between the carriageway and the walking and cycling facilities;
- A series stormwater treatment devices; and
- Other landscaping – including to the east of the Manukau Memorial Gardens.

The following assessment also considers mitigation measures (as recommended in Section 11), as having been fully implemented. This includes careful consideration and design of structures such as the elevated ramp structure, outfalls, storm water ponds and the like, in addition to the appropriate level of planting to mitigate the removal of vegetation (including trees) and provision of a high-quality amenity environment. The following assessment considers the residual effects once vegetation has become fully established (i.e. 5 years growth), following planting and any plant and tree replacement (in the event of plant failure).

8.4.1.1 Landform and hydrology

As established in the baseline study, the topographical characteristics of NoRs 4a and 4b do not contain any notable features apart from the tributaries and wetlands toward the eastern portion of the NoR 4a. The permanent effects will as a result of grading to accommodate the new road levels and surfaces in addition to excavations to enable waterway crossings. It is considered that any residual effects will be **low-moderate** adverse.

8.4.1.2 Vegetation patterns and open space

It is considered that an appropriate number of trees would have been established as part of NoRs 4a and 4b works to mitigate proposed tree and vegetation removal. Riparian planting will also be proposed around affected tributary and wetland margins. This vegetation would notably be of native species and will in time grow to become well suited to, and established within the existing environment, with consideration of the current zoning and anticipated outcomes of the area. It is proposed that this will include a combination of street trees within berms along the road corridor, in addition to tree groups where redevelopment of leftover space is not feasible or practicable. It is considered that initially, following construction, the adverse effects on the vegetation values would be **low-moderate**. Once established, it is considered any residual effects will be no greater than **low** adverse.

8.4.1.3 Urban development and land use

As new land uses in line with the proposed AUP:OP zoning are established, it is considered the Project which involves the modernisation of public transport along the existing road corridor will be an appropriate response. It is therefore considered the urbanised land use will readily absorb the Project and as such any level of effect following completion would be **very low** adverse.

8.4.1.4 Aesthetic qualities including views and visual coherence

The key aesthetic qualities of NoRs 4a and 4b are the views of open areas of pasture, roadside trees and glimpse views of the tributaries. Once construction is complete, it is considered that broadly these aesthetic qualities and values will continue to be observed on the north side of SH20B. It is noted however that such qualities on the southside of SH20B will be impacted in the future following anticipated development of the wider area in line with the Auckland Unitary Plan zoning. Overall, it is considered that any residual effects will be **very low** adverse.

8.4.1.5 Natural character

It is expected that details regarding the effects on streams and wetlands will be addressed as part of future consenting processes. At that time, it is anticipated that any effects will be appropriately managed and any residual adverse effects are anticipated to be **very low**.

8.4.1.6 Visual amenity effects

The potential effects on the identified viewing audiences arise from the permanent physical changes to the receiving environment which may change the viewers visual appreciation of the area.

Residential Viewing Audiences

In relation to residential viewing audiences, there will be some permeant level of change to their views however it is considered that this will be limited. Those along the corridor route may perceive a slightly widened road corridor however due to their low elevation and low elevation of the main Project elements where residents adjoining the corridor are located, any residual effects will be **very low** adverse.

For those residents that obtain views of the completed on-ramp to SH20, the structure will be seen in the locality of the SH20 and SH20B road corridors and the proposed characteristics of the structure will align with the scale of this established infrastructure. Moreover, views of the ramp structure are likely to be partially obstructed by intervening roof forms of neighbouring properties and will form a very small portion of their overall view. With the above considered, it is determined that any residual effects will be **very low** adverse.

Travelling Viewing Audiences

Permanent change for travelling viewing audiences will be limited given the established nature of the existing road corridor along SH20B. The increase in width will signify the importance of the road corridor in connecting the Airport to locations toward the east. New tree planting, following a deliberate native planting regime will provide an appropriate level of visual amenity as expected along such an arterial roue and any effects are likely to be **very low** adverse.

Occupational Viewing Audiences and Visitors to Business Premises

Following completion of the Project, these viewing audiences will interact with the road corridor in much the same way as they do at present. For those working within or visiting local business, it is considered the lower sensitivity these viewing audiences will have to change, combined with clear similarities the visible portions of the Project will have with the receiving environment, any residual effects will be **very low** adverse.

Visitors to Manukau Memorial Gardens

Once the project is completed, views from the entrance to the gardens will continue to capture the upgraded SH20B road corridor, and any residual effects will be **very low**. From within the gardens themselves, views of the at grade components are unlikely to be discernible due to the existing vegetation along the southern edge of the gardens. Views of the completed ramp structure will be attainable from certain locations (particularly the south-eastern corner). Nevertheless, the ramp structure will appear clearly related to the existing infrastructure present and servicing SH20. Whilst the structure will result in an additional built element within the view, given the nature of the existing environment, being the confluence of two major road corridors, it is s not considered there will be any residual effects above **low** adverse as a result of the project on these viewing audiences.

8.4.2 Summary of operational effects on landscape character and values

The table below provides a summary of the operational effects on landscape character and values for NoRs 4a and 4b.

Table 15: Summary of operational effects on landscape character and values for NoRs 4a and 4b

Effect	Assessment – construction
Natural Character Effects	
Abiotic	Very Low
Biotic	Very Low

Experiential	Very Low
Landscape Effects	
Landform	Low-Moderate
Hydrology	Low-Moderate
Vegetation	Low
Open Space	N/A
Urban Development and Landuse	Very Low
Aesthetic Qualities	Very Low
Visual Amenity Effects	
Residential	Very Low
Travelling	Very Low
Occupational	Very Low
Recreational	N/A

8.5 Cultural landscape values

It is acknowledged that the Project traverses the Puhinui peninsula, which is of significant cultural value to Manawhenua, in particular the history, stories, whakapapa (genealogy) and mythology of Te Ākitai Waiohua.

The Puhinui area is part of the cultural landscape which is considered a taonga by the people of Te Ākitai Waiohua. The relationship Te Ākitai Waiohua maintains with the land and waterways of Puhinui reflect the history, whakapapa, values and significance of the area to the iwi.

As such, it is recognised that the development of infrastructure in this area has the potential to negatively impact the cultural landscape through visual, physical and spiritual changes potentially eroding these important connections to Te Ākitai Waiohua's whakapapa.

As set out in the AEE, Manawhenua have been involved as partners through the NoR phase of the Project. To appropriately respond to the cultural landscape in the future phases of the Project, it is recommended that:

Manawhenua are involved as partners in the future design of the Project;

- Opportunities are identified in partnership with Manawhenua to acknowledge cultural narratives in the design of Project elements. In particular, this could include (but is not limited to) how the historic and cultural significance of the Puhinui Historic Gateway can be recognised through the Project design;
- Opportunities to provide appropriate wayfinding and signage are explored in partnership with Manawhenua, particularly in relation to the proposed bridge structure from SH20B to SH20;
- Opportunities are identified to enhance water quality and restore waterways within the Project area. With respect to NoRs 4a and 4b, it is recognised that there are opportunities to enhance the mauri of Waokauri and Pūkaki creeks through revegetation of the riparian areas;

- An integrated stormwater management approach is adopted for the Project. In particular, it is identified that in NoRs 4a and 4b, there are opportunities to integrate the walking and cycling facilities with the proposed stormwater infrastructure to create a natural stream flow effect; and
- Provision is made for tree planting within and adjacent to the Project corridor to represent an urban ngahere.

9 Recommended measures to avoid, remedy or mitigate construction effects

The mitigation measures for all activities and built elements during construction for all NoRs are outlined below. An Urban and Landscape Design Management Plan (**ULDMP**) is recommended as a condition on the proposed designations which should include the following matters:

- **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. Reinstate with grass at the completion of works;
- **Hoarding**: Provision for 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 (e.g. parks and commercial areas with multiple shops), to provide information about the Project and its progress;
- **Vegetation** clearance: wherever possible, limit the removal of noteworthy trees and indigenous vegetation; and
- **Lighting**: Where possible, mitigate effects related to lighting during night time works through the use of directional lighting to prevent glare / spill light falling on residential properties.

10 Recommended measures to avoid, remedy or mitigate operational effects

The following matters outlined below address the key elements of the Project that are likely to have permanent adverse effects on landscape character and values, natural character and visual amenity. It is recommended that a ULDMP is a condition on the proposed designations which should include but not be limited to the following measures to mitigate landscape and visual effects:

10.1 All NoRs

These matters apply to all Project NoRs. Where there are NoR specific recommendations, these are specified in the sections below.

- Urban design details for works including the form and detailing of structures;
- Detailed Landscape design details for works including;
    - Type, number and location of replacement planting (including trees);
    - Lighting, signage and street furniture details; and
    - All large specimen trees to be a minimum planter bag size of 160 litre, small trees to be 45 litre, shrubs 2 litre and ground covers 1 litre.
- Measures to achieve a safe level of transition for cycling and walking modes, including providing advanced warning and signage to cyclists and pedestrians, and safe and convenient cycling transitions at the ends of the Project;
- Design features and methods for cultural expression in order to reflect outcomes agreed through partnership with Manawhenua;
- Design features associated with the landscape integration and management of stormwater, including both hard and soft landscaping;
- A maintenance plan and establishment requirements for landscaping and specimen trees following planting. Further opportunities around stream margins will also be established in which indigenous riparian planting will be considered; and
- Views of neighbouring open spaces and vegetated sections of the neighbouring tributaries of waterways, as well as views to more distant landscape features, will be reinstated following the removal of construction machinery.

Manawhenua Partnership

As set out in the AEE, Manawhenua should be invited to continue their role as partners in the urban design and landscape design of the Project. This includes but is not limited to:

- The appropriate application of the core Māori values in the future phases of the Project;
- Treatment of residual open spaces;
- The selection and supply of plant species and planting designs;
- The potential for enhancement of habitat and other identified areas of customary importance such as awa; and
- Opportunities to enhance cultural values and sites by incorporating cultural recognition elements into features of the Project. Cultural recognition elements may include (but is not limited to) Māori carvings and/or art, pou and/or other cultural features and/or markers to recognise and provide for the cultural relationship of Manawhenua with the land directly affected by the Project.

Transport Corridor

- Design the road to be the minimum width and have the minimum number of lanes practicable, particularly at intersections, to reduce the visual and physical severance impacts of the corridor;
- Provide trees and planting along the transport corridor to reinforce the existing planted character, soften the interface with adjoining uses, reduce the apparent width of the corridor, define views towards landmarks and highlight key nodes;
- Provide a minimum 2 m wide berm for tree planting (where practicable) on both sides of the corridor, separating traffic lanes from footpaths and cycleways; and
- Locate utilities in a dedicated service trench outside of the berms.

BRT Stations

- Design bus stations to reflect high quality design outcomes;
- Provide an opportunity for Mana Whenua to provide local contextual naming of the BRT stations that will support placing making and wayfinding; and
- Incorporate planting including trees to signalise BRT stations along corridor.

Vegetation / Planting

- Initiatives from local iwi should be undertaken to incorporate culturally significant planting or landscaping elements;
- Provide for a predominantly native planting palette;
- Use street tree planting for shade as well as to soften the edges of the transport corridor, creating a pleasant walking and waiting environment; and
- Use planting to screen off the Project from adjacent private properties where adverse effects will require mitigation and frame orientation views, while increasing the amenity of the Project.

Integration with Adjacent Properties

- Consider opportunities to enhance existing interfaces with vegetation and trees;
- Avoid placing infrastructure elements such as transformers in visually prominent positions next to neighbouring properties; and
- Where the edges of elevated structures are visible in close proximity to residents, care should be undertaken to consider introducing better amenity outcomes such design refinement to integrate structural elements, patterning/ textures in addition to planting.

Stormwater Infrastructure

- Avoid unnatural shapes of ponds, introduce naturalised curves where possible;
- Incorporate appropriate planting around margin of ponds to integrate planting areas and species with adjoining vegetation patterns; and
- Where swales are proposed, incorporate suitable low maintenance native planting.

10.2 NoR 2

In addition to the matters outlined above, it is recommended that the following measures are considered to mitigate landscape and visual effects on Hayman Park:

Hayman Park

- Provision of appropriate planting around Hayman Park stormwater pond/ wetland; and
- Upgrades to recreational footpaths within park to ensure the stormwater pond / wetland is integrated into the park and not considered in isolation to the surrounding areas of open space.

10.3 NoR 3

In addition to the matters outlined above, it is recommended that the following measures are considered to mitigate landscape and visual effects associated with the Puhinui Road BRT bridge:

Puhinui Road Bridge

- Consideration given around the form, function and exterior appearance of bridge including embankments, walls, abutments, depth, columns and underside;
- Planting on the southern side of Puhinui Road within the HANA; and
- Street tree and shrub planting in the northern berm of Puhinui Road, in particular adjacent to the Puhinui BRT bridge.

10.4 NoRs 4a and 4b

In addition to the matters outlined above, it is recommended that the following measures are considered to mitigate landscape and visual effects associated with the proposed ramp structure from SH20B to SH20 for southbound traffic:

Ramp structure

- Consideration given around the form, function and exterior appearance of the ramps and bridge including embankments, walls, abutments, depth, columns and underside; and
- Incorporation of any cultural narratives developed with Manawhenua.

11 Conclusion

In Summary the Project will be developed through a largely existing urban environment and for much of the Project area the centre running busway will be built on an existing median that was built into the original road corridor to provide for future rapid transit.

The below table summarises the natural character, landscape and visual amenity effects of each NoR. These effects have been considered with the proposed mitigation measures and recommendations described in Sections 10 and 11 being implemented.

The Airport to Botany Project will occur within or alongside an existing road corridor and clearly relate to and signify significant infrastructure upgrades alongside an established transport orientated environment. Effects during construction are often greater than those during operation (once the project is completed), due to construction activities occurring prior to the completion of mitigation measures such as tree planting and the ultimate appearance of above ground structures and therefore construction effects are temporary.

Once the project is completed and the proposed mitigation measures (such as tree planting) have been established, residual / long term effects can be fully appreciated. On the whole, whilst the Project will result in a level of change to the receiving environment, it is considered that the Project will achieve high quality design and environmental outcomes whilst providing high quality transport facilities (BRT and active modes) for existing and future populations resulting from urban intensification.

The below table summarises the natural character, landscape and visual amenity effects of each NoR. These effects have been considered with the proposed mitigation measures and recommendations described in Section 10 and 11 being implemented.

NoR 1

Effect		**Assessment – construction**	**Assessment – operational**
Natural Character Effects			
Abiotic		Low	Very low
Biotic		Low	Very low
Experiential		Low	Very low
Landscape Effects			
Landform		Low	Low
Hydrology		Low	Very low
Vegetation		Moderate-High	Low +
Open Space		Very Low	Very Low
Urban Development and Landuse		Low	Very Low
Aesthetic Qualities		Low	Very Low
Visual Amenity Effects			
Residential		Low-Moderate	Very Low

Travelling		Low	Very Low +
Occupational		Low	Very Low
Recreational	Kellaway Drive Reserve	Low	Very Low
	Rongomai Park	Low	Very Low

NoR 2, Section A

Effect		**Assessment – construction**	**Assessment – operational**
Natural Character Effects			
Abiotic		Low	Very Low
Biotic		Low	Very Low
Experiential		Low	Very Low
Landscape Effects			
Landform		Low	Low
Hydrology		Low	Very Low
Vegetation	Manukau Sports Bowl	Moderate	Very Low
	Washingtonia Palms	Low-Moderate	Very Low
	Ōtara Creek	Low-Moderate	Very Low
	Orlando Reserve	Low	Very Low
Open Space		Low	Low
Urban Development and Landuse		Low	Very Low
Aesthetic Qualities	Manukau Sports Bowl Vegetation	Moderate-High	Low
	Washingtonia Palms	Low-Moderate	Low
	Ōtara Creek	Low	Low
Visual Amenity Effects			
Residential		Low-Moderate	Very Low
Travelling		Low	Very Low +
Occupational		Low	Very Low
Recreational		Low	Very Low

NoR 2, Section B

Effect	Assessment – construction	Assessment – operational
Natural Character Effects	N/A	
Landscape Effects		
Landform	Very Low	Low
Hydrology	Very Low	Very Low
Vegetation	Moderate	Very Low
Open Space	N/A	N/A
Urban Development and Landuse	Very Low	Very Low
Aesthetic Qualities	Moderate	Very Low +
Visual Amenity Effects		
Residential	Low-Moderate	Very Low +
Travelling	Low	Very Low +
Occupational	Low	Very Low
Recreational	Low	Very Low

NoR 2, Section C

Effect		Assessment – construction	Assessment – operational
Natural Character Effects			
Abiotic		Low	Very Low
Biotic		Low	Very Low
Experiential		Low	Very Low
Landscape Effects			
Landform		Very Low	Very Low
Hydrology		Very Low	Low +
Vegetation		Moderate	Very Low +
Open Space		Very Low	Low +
Urban Development and Landuse		Low	Very Low
Aesthetic Qualities		Moderate	Very Low +
Visual Amenity Effects			
Residential	East of proposed BRT bridge	Low-Moderate	Very Low
	Opposite BRT bridge	High	Moderate
	Setback BRT bridge	Moderate	Low-Moderate

Travelling		Low-Moderate	Very Low
Occupational		Low	Very Low
Recreational		Very Low	Low +

NoR 3

Effect		**Assessment – construction**	**Assessment – operational**
Natural Character Effects		N/A	
Landscape Effects			
Landform		Very Low	Very Low
Hydrology		Very Low	Very low
Vegetation		Moderate-High	Low
Open Space		N/A	N/A
Urban Development and Landuse		Low	Very low
Aesthetic Qualities		Moderate	Very low
Visual Amenity Effects			
Residential	West of Proposed BRT Bridge	Low-Moderate	Very low
	Opposite BRT Bridge	High	High
	Setback BRT Bridge	Moderate	Low-Moderate
Travelling	-	Low-Moderate	Very low
Occupational	Te Kohanga Reo ki Puhinui	Low-Moderate	Very low
	Other Occupational Audiences	Very Low	Very low
Recreational	-	N/A	N/A

NoR 4a and 4b

Effect	**Assessment – construction**	**Assessment – operational**
Natural Character Effects		
Abiotic	Moderate	Very Low
Biotic	Moderate	Very Low
Experiential	Moderate	Very Low
Landscape Effects		
Landform	Low	Low
Hydrology	High	Low-Moderate

Vegetation	Moderate-High	Low
Open Space	N/A	N/A
Urban Development and Landuse	Low	Very Low
Aesthetic Qualities	Low	Very Low
Visual Amenity Effects		
Residential	Low	Very Low
Travelling	Low	Very Low
Occupational	Low	Very Low
Recreational	N/A	N/A

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix A

Assessment methodology

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

Appendix A – Assessment methodology

1.1 Introduction

The Natural Character and Landscape Effects Assessment (**NCLEA**) process provides a framework for assessing and identifying the nature and level of likely effects that may result from a proposed development. Such effects can occur in relation to changes to physical elements, changes in the existing character or condition of the landscape and the associated experiences of such change. In addition, the landscape assessment method includes an iterative design development processes, which seeks to avoid, remedy or mitigate adverse effects (see Figure 41).

This outline of the landscape and visual effects assessment methodology has been undertaken with reference to the *Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines* and its signposts to examples of best practice, which include the *Quality Planning Landscape Guidance Note*[23] and the *UK guidelines for landscape and visual impact assessment.*[24]

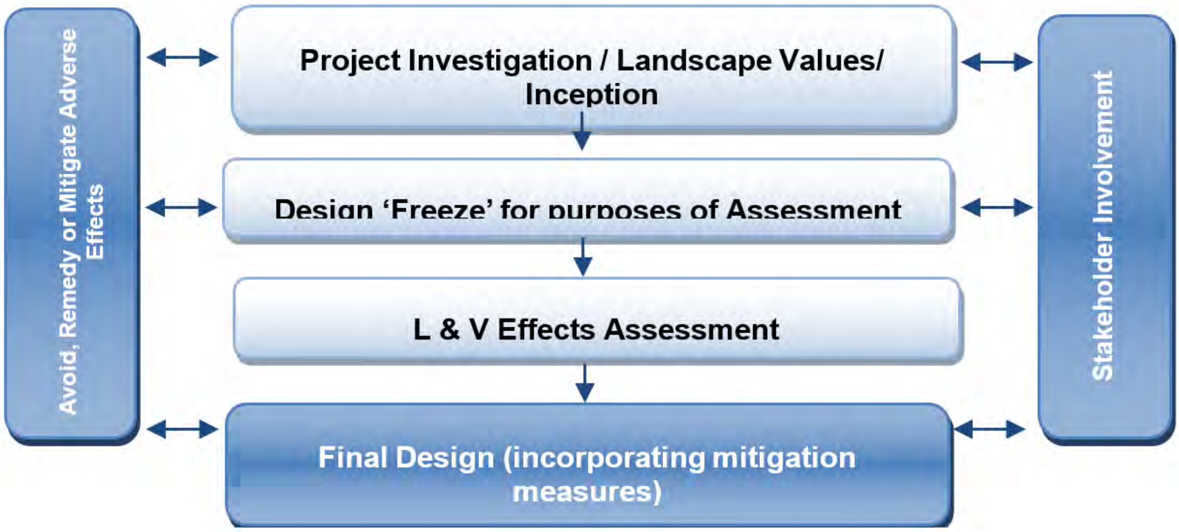


Figure 41: Design feedback loop

When undertaking any landscape assessment, it is important that a structured and consistent approach is used to ensure that findings are clear and objective. Judgement should be based on skills and experience and be supported by explicit evidence and reasoned argument.

While natural character, landscape and visual effects assessments are closely related, they form separate procedures. Natural character effects consider the characteristics and qualities and associated degree of modification relating specifically to waterbodies and their margins, including the coastal environment. The assessment of the potential effects on landscape considers effects on landscape character and values. The assessment of visual effects considers how changes to the physical landscape affects the viewing audience. The types of effects can be summarised as follows:

[23] http://www.qualityplanning.org.nz/index.php/planning-tools/land/landscape

[24] Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)

Natural Character effects: *Change in the characteristics or qualities including the level of naturalness*

Landscape effects: *Change in the physical landscape, which may affect its characteristics and values*

Visual effects: *Consequences of change on landscape values as experienced in views including visual amenity*

The policy context, existing landscape resource and locations from which a development or change is visible, all inform the 'baseline' for landscape and visual effects assessments. To assess effects, the first step requires identification of the landscape's character and values including the attributes on which such values depend. This requires that the landscape is first described, including an understanding of relevant physical, sensory and associative landscape dimensions. This process, known as landscape characterisation, is the basic tool for understanding landscape character and may involve subdividing the landscape into character areas or types. The condition of the landscape (i.e. the state of an individual area of landscape or landscape feature) should also be described together with, a judgement made on the value or importance of the potentially affected landscape.

1.2 Natural character effects

In terms of the RMA, natural character specifically relates to the coastal environment as well as freshwater bodies and their margins. The RMA provides no definition of natural character. RMA, section 6(a) considers natural character as a matter of national importance:

> *…the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.*

Natural character comprises the natural elements, patterns and processes of the coastal environment, waterbodies and their margins, and how they are perceived and experienced. This assessment interprets natural character as being the degree of naturalness consistent with the following definition:

> *Natural character is a term used to describe the naturalness of waterbodies and their margins. The degree or level of natural character depends on:*
>
> - *The extent to which natural elements, patterns and processes occur;*
> - *The nature and extent of modifications to the ecosystems and landscape/seascape;*
> - *The highest degree of natural character (greatest naturalness) occurs where there is least modification; and*
> - *The effect of different types of modification upon the natural character of an area varies with the context and may be perceived differently by different parts of the community.*

The process to assess natural character involves an understanding of the many systems and attributes that contribute to waterbodies and their margins, including biophysical and experiential factors. This can be supported through the input of technical disciplines such as marine, aquatic and terrestrial ecology, and landscape architecture.

1.2.1 Defining the level of natural character

The level of natural character is assessed in relation to a seven-point scale. The diagram below illustrates the relationship between the degree of naturalness and degree of modification. A high level of natural character means the waterbody is less modified and vice versa.

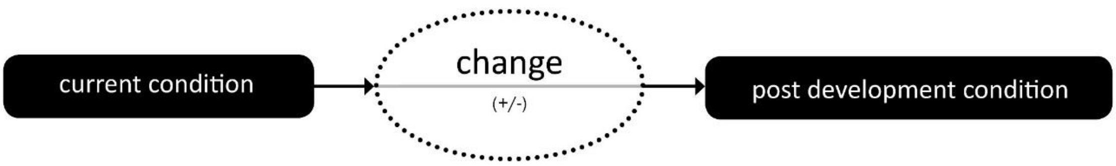
Very High	High	Moderate - High	Moderate	Moderate - Low	Low	Very Low

1.2.2 Scale of assessment

When defining levels of natural character, it is important to clearly identify the spatial scale considered. The scale at which natural character is assessed will typically depend on the study area or likely impacts and nature of a proposed development. Within a district or region-wide study, assessment scales may be divided into broader areas which consider an overall section of coastline or river with similar characteristics, and finer more detailed ‘component’ scales considering separate more local parts, such as specific bays, reaches or escarpments. The assessment of natural character effects has therefore considered the change to attributes which indicate levels of natural character at a defined scale.

1.2.3 Effects on natural character

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. This can be negative or positive.



The natural character effects assessment involves the following steps:

- Assessing the existing level of natural character;
- Assessing the level of natural character anticipated (post construction); and
- Considering the significance of the change.

1.3 Landscape effects

Assessing landscape effects requires an understanding of the landscape resource and the magnitude of change which results from a proposed activity to determine the overall level of landscape effects.

Landscape Resource

Assessing the sensitivity of the landscape resource considers the key characteristics and qualities. This involves an understanding of both the ability of an area of landscape to absorb change and the value of the landscape.

Ability of an area to absorb change

This will vary upon the following factors:

- Physical elements such as topography / hydrology / soils / vegetation;
- Existing land use;
- The pattern and scale of the landscape;
- Visual enclosure / openness of views and distribution of the viewing audience;
- The zoning of the land and its associated anticipated level of development;
- The scope for mitigation, appropriate to the existing landscape.

The ability of an area of landscape to absorb change takes account of both the attributes of the receiving environment and the characteristics of the proposed development. It considers the ability of a specific type of change occurring without generating adverse effects and/or achievement of landscape planning policies and strategies.

1.3.1 The value of the landscape

Landscape value derives from the importance that people and communities, including tangata whenua, attach to particular landscapes and landscape attributes. This may include the classification of Outstanding Natural Feature or Landscape (ONFL) (RMA s.6(b)) based on important physical, sensory and associative landscape attributes, which have potential to be affected by a proposed development. A landscape can have value even if it is not recognised as being an ONFL.

1.3.2 Magnitude of landscape change

The magnitude of landscape change judges the amount of change that is likely to occur to areas of landscape, landscape features, or key landscape attributes. In undertaking this assessment, it is important that the size or scale of the change is considered within the geographical extent of the area influenced and the duration of change, including whether the change is reversible. In some situations, the loss /change or enhancement to existing landscape elements such as vegetation or earthworks should also be quantified.

When assessing the level of landscape effects, it is important to be clear about what factors have been considered when making professional judgements. This can include consideration of any benefits which result from a proposed development. Table 16 below helps to explain this process. The tabulating of effects is only intended to inform overall judgements.

Table 16: Determining the level of landscape effects

Contributing Factors		Higher	Lower
Landscape (sensitivity)	Ability to absorb change	The landscape context has limited existing landscape detractors which make it highly vulnerable to the type of change resulting from the proposed development.	The landscape context has many detractors and can easily accommodate the proposed development without undue consequences to landscape character.

	The value of the landscape	The landscape includes important biophysical, sensory and shared and recognised attributes. The landscape requires protection as a matter of national importance (ONF/L).	The landscape lacks any important biophysical, sensory or shared and recognised attributes. The landscape is of low or local importance.
Magnitude of Change	Size or scale	Total loss or addition of key features or elements. Major changes in the key characteristics of the landscape, including significant aesthetic or perceptual elements.	The majority of key features or elements are retained. Key characteristics of the landscape remain intact with limited aesthetic or perceptual change apparent.
	Geographical extent	Wider landscape scale.	Site scale, immediate setting.
	Duration and reversibility	Permanent. Long term (over 10 years).	Reversible. Short Term (0-5 years).

1.4 Visual effects

Visual effects are a subset of landscape effects. They are consequences of change on landscape values as experienced in views. To assess the visual effects of a proposed development in a landscape, a visual baseline must first be defined. The visual 'baseline' forms a technical exercise which identifies the area where the development may be visible, the potential viewing audience, and the key representative public viewpoints from which visual effects are assessed.

1.4.1 The sensitivity of the viewing audience

The sensitivity of the viewing audience is assessed in terms of assessing the likely response of the viewing audience to change and understanding the value attached to views.

1.4.2 Likely response of the viewing audience to change

Appraising the likely response of the viewing audience to change is determined by assessing the occupation or activity of people experiencing the view at particular locations and the extent to which their interest or activity may be focussed on views of the surrounding landscape. This relies on a landscape architect's judgement in respect of visual amenity and the reaction of people who may be affected by a proposal. This should also recognise that people more susceptible to change generally include: residents at home, people engaged in outdoor recreation whose attention or interest is likely to be focussed on the landscape and on particular views; visitors to heritage assets or other important visitor attractions; and communities where views contribute to the wider landscape setting.

1.4.3 Value attached to views

The value or importance attached to particular views may be determined with respect to its popularity or numbers of people affected or reference to planning instruments such as viewshafts or view corridors. Important viewpoints are also likely to appear in guide books or tourist maps and may include facilities provided for its enjoyment. There may also be references to this in literature or art, which also acknowledge a level of recognition and importance.

1.4.4 Magnitude of visual change

The assessment of visual effects also considers the potential magnitude of change which will result from views of a proposed development. This takes account of the size or scale of the effect, the geographical extent of views and the duration of visual change, which may distinguish between temporary (often associated with construction) and permanent effects where relevant. Preparation of any simulations of visual change to assist this process should be guided by best practice as identified by the NZILA.[25]

When determining the overall level of visual effect, the nature of the viewing audience is considered together with the magnitude of change resulting from the proposed development. Table 17 has been prepared to help guide this process:

Table 17: Determining the level of visual effects

Contributing Factors		**Higher**	**Lower**	**Examples**
The Viewing Audience (sensitivity)	Ability to absorb change	Views from dwellings and recreation areas where attention is typically focused on the landscape.	Views from places of employment and other places where the focus is typically incidental to its landscape context. Views from transport corridors.	Dwellings, places of work, transport corridors, public tracks
	Value attached to views	Viewpoint is recognised by the community such as an important view shaft, identification on tourist maps or in art and literature. High visitor numbers.	Viewpoint is not typically recognised or valued by the community. Infrequent visitor numbers.	Acknowledged viewshafts, Lookouts
Magnitude of Change	Size or scale	Loss or addition of key features in the view. High degree of contrast with existing landscape elements (i.e. in terms of form scale, mass, line, height, colour and texture). Full view of the proposed development.	Most key features of views retained. Low degree of contrast with existing landscape elements (i.e. in terms of form scale, mass, line, height, colour and texture. Glimpse / no view of the proposed development.	Higher contrast/ Lower contrast. Open views, Partial views, Glimpse views (or filtered); No views (or obscured)
	Geographical extent	Front on views. Near distance views; Change visible across a wide area.	Oblique views. Long distance views. Small portion of change visible.	Front or Oblique views. Near distant, Middle distant and Long distant views
	Duration and reversibility	Permanent. Long term (over 15 years).	Transient / temporary. Short Term (0-5 years).	Permanent (fixed), Transitory (moving)

[25] Best Practice Guide: Visual Simulations BPG 10.2, NZILA

1.5 Nature of effects

In combination with assessing the level of effects, the landscape and visual effects assessment also considers the nature of effects in terms of whether this will be positive (beneficial) or negative (adverse) in the context within which it occurs. Neutral effects can also occur where landscape or visual change is benign.

It should also be noted that a change in a landscape does not, of itself, necessarily constitute an adverse landscape or visual effect. Landscape is dynamic and is constantly changing over time in both subtle and more dramatic transformational ways; these changes are both natural and human induced. What is important in managing landscape change is that adverse effects are avoided or sufficiently mitigated to ameliorate the effects of the change in land use. The aim is to provide a high amenity environment through appropriate design outcomes.

This assessment of the nature effects can be further guided by Table 18 set out below:

Table 18: Determining the nature of effects

Nature of effect	Use and Definition
Adverse (negative):	The activity would be out of scale with the landscape or at odds with the local pattern and landform which results in a reduction in landscape and / or visual amenity values
Neutral (benign):	The activity would be consistent with (or blend in with) the scale, landform and pattern of the landscape maintaining existing landscape and / or visual amenity values
Beneficial (positive):	The activity would enhance the landscape and / or visual amenity through removal or restoration of existing degraded landscape activities and / or addition of positive elements or features

1.6 Cumulative effects

This can include effects of the same type of development (e.g. bridges) or the combined effect of all past, present and approved future development[26] of varying types, taking account of both the permitted baseline and receiving environment. Cumulative effects can also be positive, negative or benign.

1.6.1 Cumulative landscape effects

Cumulative landscape effects can include additional or combined changes in components of the landscape and changes in the overall landscape character. The extent within which cumulative landscape effects are assessed can cover the entire landscape character area within which the proposal is located, or alternatively, the zone of visual influence from which the proposal can be observed.

1.6.2 Cumulative visual effects

Cumulative visual effects can occur in combination (seen together in the same view), in succession (where the observer needs to turn their head) or sequentially (with a time lapse between instances

[26] The life of the statutory planning document or unimplemented resource consents.

where proposals are visible when moving through a landscape). Further visualisations may be required to indicate the change in view compared with the appearance of the project on its own.

Determining the nature and level of cumulative landscape and visual effects should adopt the same approach as the project assessment in describing both the nature of the viewing audience and magnitude of change leading to a final judgement. Mitigation may require broader consideration which may extend beyond the geographical extent of the project being assessed.

1.7 Determining the overall level of effects

The landscape and visual effects assessment conclude with an overall assessment of the likely level of landscape and visual effects. This step also takes account of the nature of effects and the effectiveness of any proposed mitigation. The process can be illustrated in Figure 42:

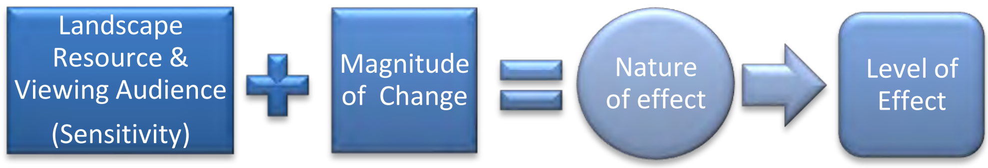


Figure 42: Assessment process

This step informs an overall judgement identifying what level of effects are likely to be generated as indicated in Table 19 below. This table which can be used to guide the level of natural character, landscape and visual effects uses an adapted seven-point scale derived from Te Tangi A Te Manu.

Table 19: Determining the overall level of landscape and visual effects

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. Concise Oxford English Dictionary Definition 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. Concise Oxford English Dictionary Definition Moderate: adjective- average in amount, intensity, quality or degree
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.

	Concise Oxford English Dictionary Definition 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.

1.8 Determination of "minor"

Decision makers determining whether a resource consent application should be notified must also assess whether the effect on a person is less than minor[27] or an adverse effect on the environment is no more than minor.[28] Likewise, when assessing a non-complying activity, consent can only be granted if the s104D 'gateway test' is satisfied. This test requires the decision maker to be assured that the adverse effects of the activity on the environment will be 'minor' or not be contrary to the objectives and policies of the relevant planning documents.

These assessments will generally involve a broader consideration of the effects of the activity, beyond the landscape and visual effects. Through this broader consideration, guidance may be sought on whether the likely effects on the landscape or effects on a person are considered in relation to 'minor'. It must also be stressed that more than minor effects on individual elements or viewpoints does not necessarily equate to more than minor landscape effects. In relation to this assessment, moderate-low level effects would generally equate to 'minor' (see Table 20). Where low effects occur, it may be necessary to assess whether this is minor.

The third row highlights the word 'significant'. The term 'significant adverse effects' applies to particular RMA situations, namely as a threshold for the requirement to consider alternative sites, routes, and methods for Notices of Requirement under RMA s171(1)(b), the requirements to consider alternatives in AEEs under s6(1)(a) of the 4th Schedule. It may also be relevant to tests under other statutory documents such as for considering effects on natural character of the coastal environment under the NZ Coastal Policy Statement (NZCPS) Policy 13(1)(b) and 15(b).

Table 20: Determining adverse effects for notification determination, non-complying activities and significance

<table>
<tr><td colspan="2">very low</td><td colspan="2">low</td><td colspan="2">low-mod</td><td colspan="2">moderate</td><td colspan="2">mod-high</td><td colspan="2">high</td><td colspan="2">very high</td></tr>
<tr><td colspan="3">less than minor</td><td colspan="3">minor</td><td colspan="8">more than minor</td></tr>
<tr><td colspan="3"></td><td colspan="3"></td><td colspan="4"></td><td colspan="4">significant[29]</td></tr>
</table>

[27] RMA, Section 95E

[28] RMA, Section 95D

[29] To be used only about Policy 13(1)(b) and Policy 15(b) of the New Zealand Coastal Policy Statement (NZCPS), where the test is 'to avoid significant adverse effects'.

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix B

NoR 1 Figures

Boffa Miskell

www.boffamiskell.co.nz

This plan has been prepared by Boffa Miskell Limited on the specific instructions of our Client. It is solely for our Client's use in accordance with the agreed scope of work. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate. No liability or responsibility is accepted by Boffa Miskell Limited for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.

0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 1 Designation

AIRPORT TO BOTANY (NoR 1)

Site Location - Map 1

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1A

Boffa Miskell

www.boffamiskell.co.nz

This plan has been prepared by Boffa Miskell Limited on the specific instructions of our Client. It is solely for our Client's use in accordance with the agreed scope of work. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate. No liability or responsibility is accepted by Boffa Miskell Limited for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.

0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 1 Designation

AIRPORT TO BOTANY (NoR 1)

Site Location - Map 2

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2A

Boffa Miskell

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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND
- NoR 1 Designation
- NoR 2 Designation

AIRPORT TO BOTANY (NoR 1)

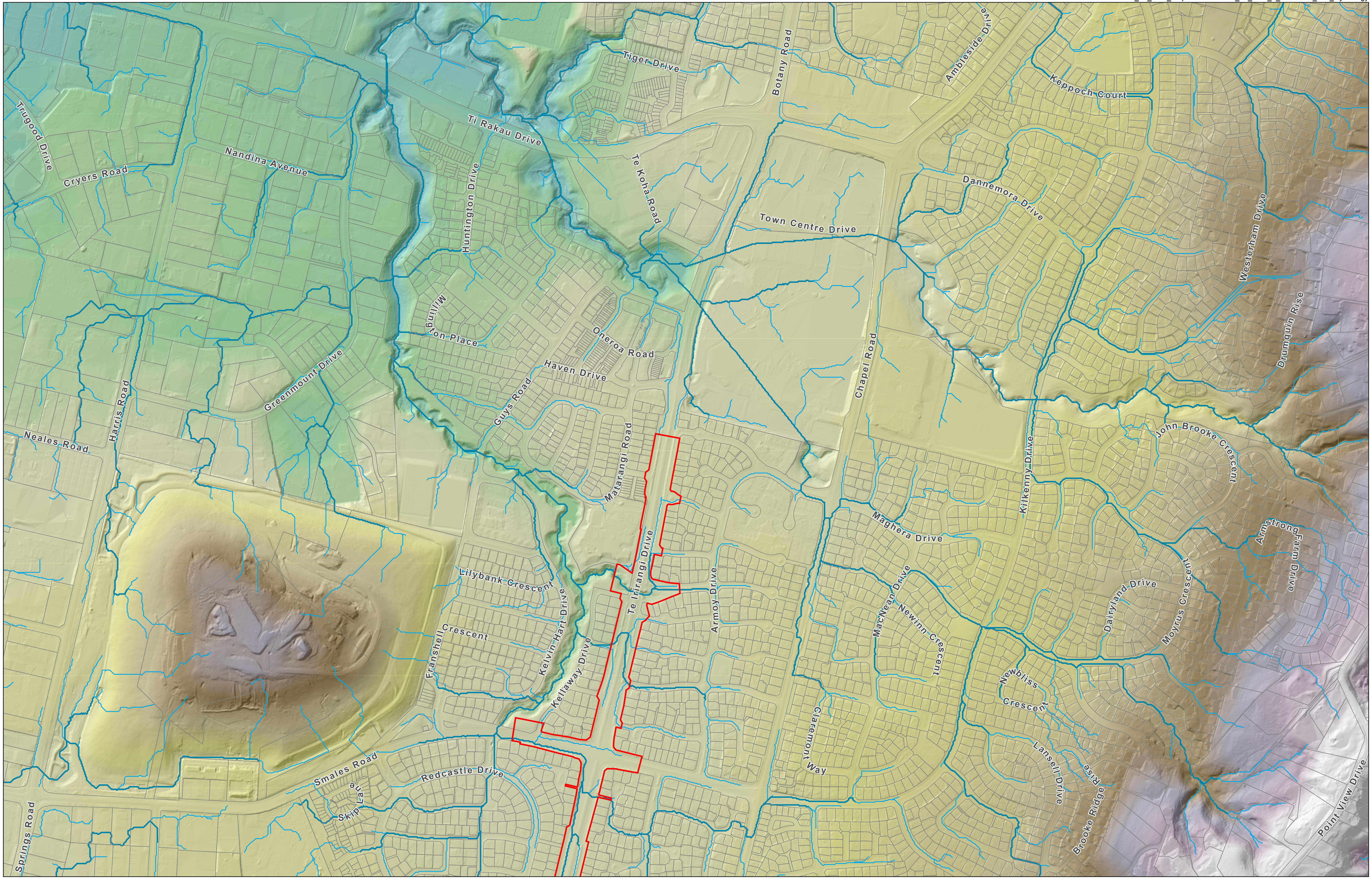
Site Location - Map 3

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 3A



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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- Overland Flow Paths
  - 3 ha and above
  - 4000 m^2 to 3 ha
- Land Parcels

Elevation (m)
123
0.4

AIRPORT TO BOTANY (NoR 1)

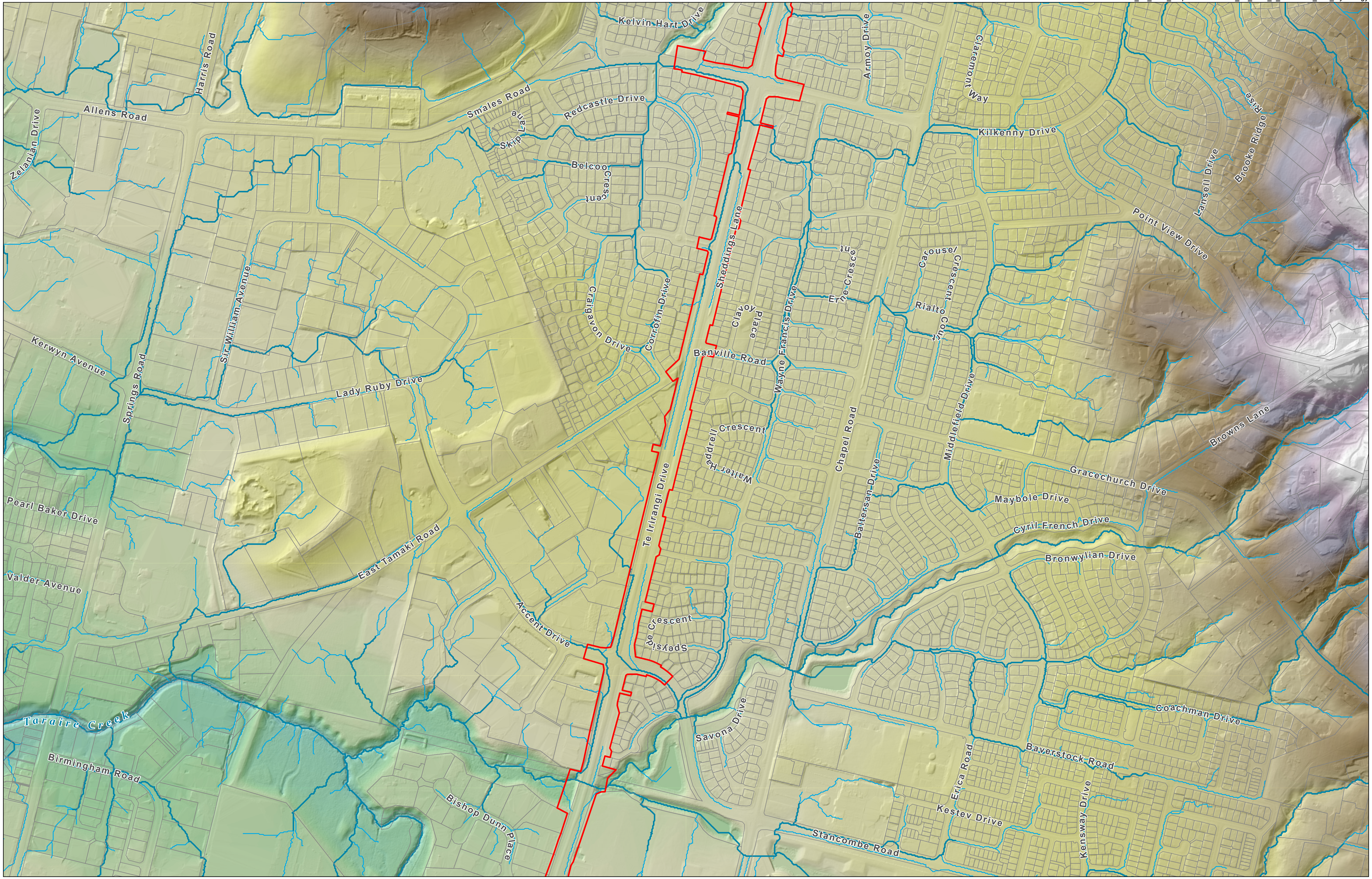
Landform and Hydrology - Map 1

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1B



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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 1 Designation

Overland Flow Paths
- 3 ha and above
- 4000 m^2 to 3 ha

Land Parcels

Elevation (m)
123
0.4

AIRPORT TO BOTANY (NoR 1)

Landform and Hydrology - Map 2

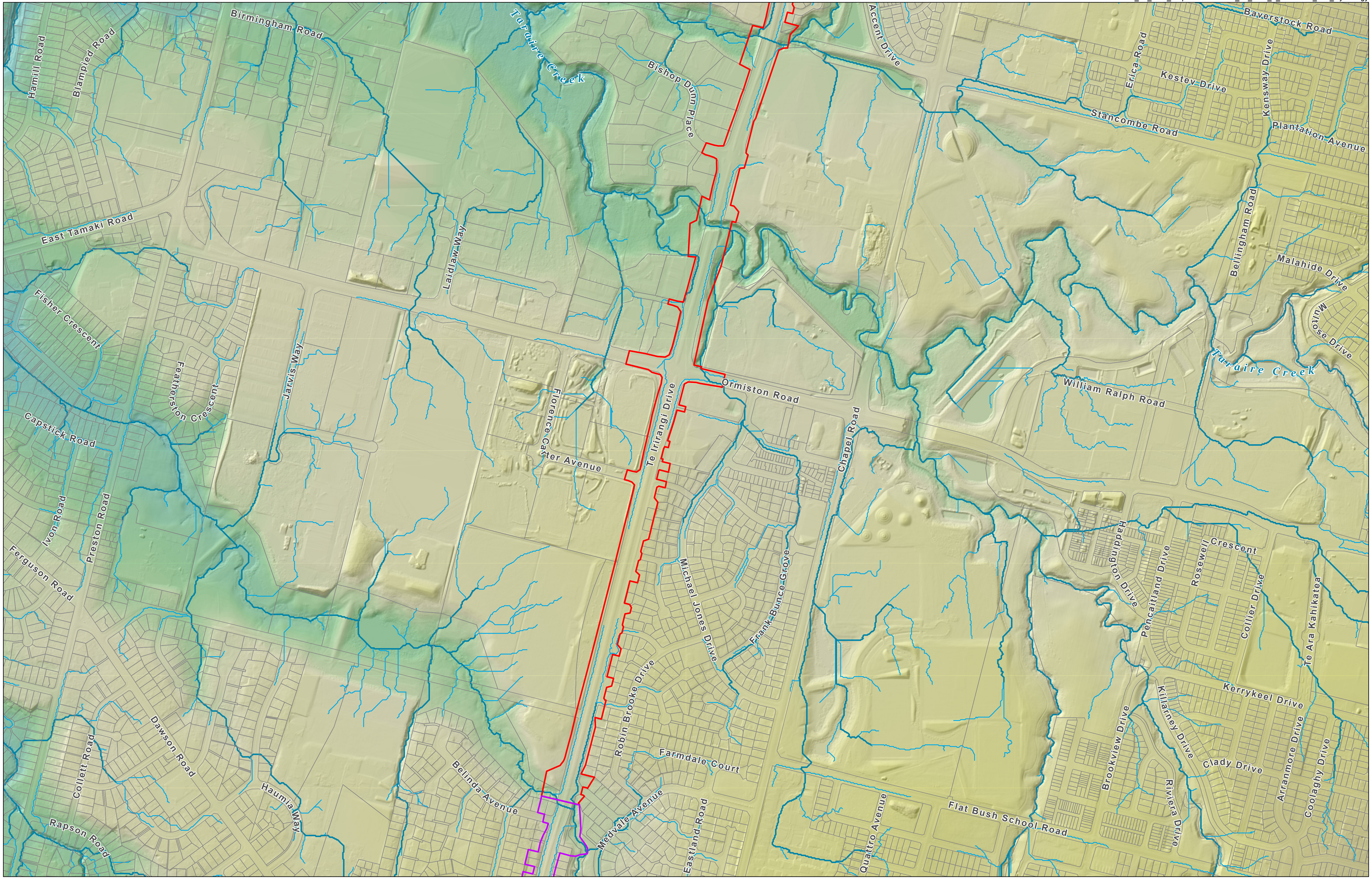
Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2B

File Ref: BM211171_01_NoR_1.aprx / BM211171_02_NoR_1_Landform_and_Hydrology



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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- NoR 2 Designation
- Overland Flow Paths
  - 3 ha and above
  - 4000 m^2 to 3 ha
- Land Parcels

Elevation (m)

123

0.4

AIRPORT TO BOTANY (NoR 1)

Landform and Hydrology - Map 3

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 3B

File Ref: BM211171_01_NoR_1.aprx / BM211171_03_NoR_1_Vegetation_and_Open_Space

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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- Open Space
- Land Parcels

Tree Surveys

- Indigenous
- Exotic
- Group of Trees
- Washingtonia

AIRPORT TO BOTANY (NoR 1)

Vegetation and Open Space - Map 1

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1C

Boffa Miskell

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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- Open Space
- Land Parcels

Tree Surveys
- Indigenous
- Exotic
- Group of Trees
- Washingtonia

AIRPORT TO BOTANY (NoR 1)

Vegetation and Open Space - Map 2

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2C

File Ref: BM211171_01_NoR_1.aprx / BM211171_03_NoR_1_Vegetation_and_Open_Space

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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- NoR 2 Designation
- Open Space
- Land Parcels

Tree Surveys

- Indigenous
- Exotic
- Washingtonia

AIRPORT TO BOTANY (NoR 1)

Vegetation and Open Space - Map 3

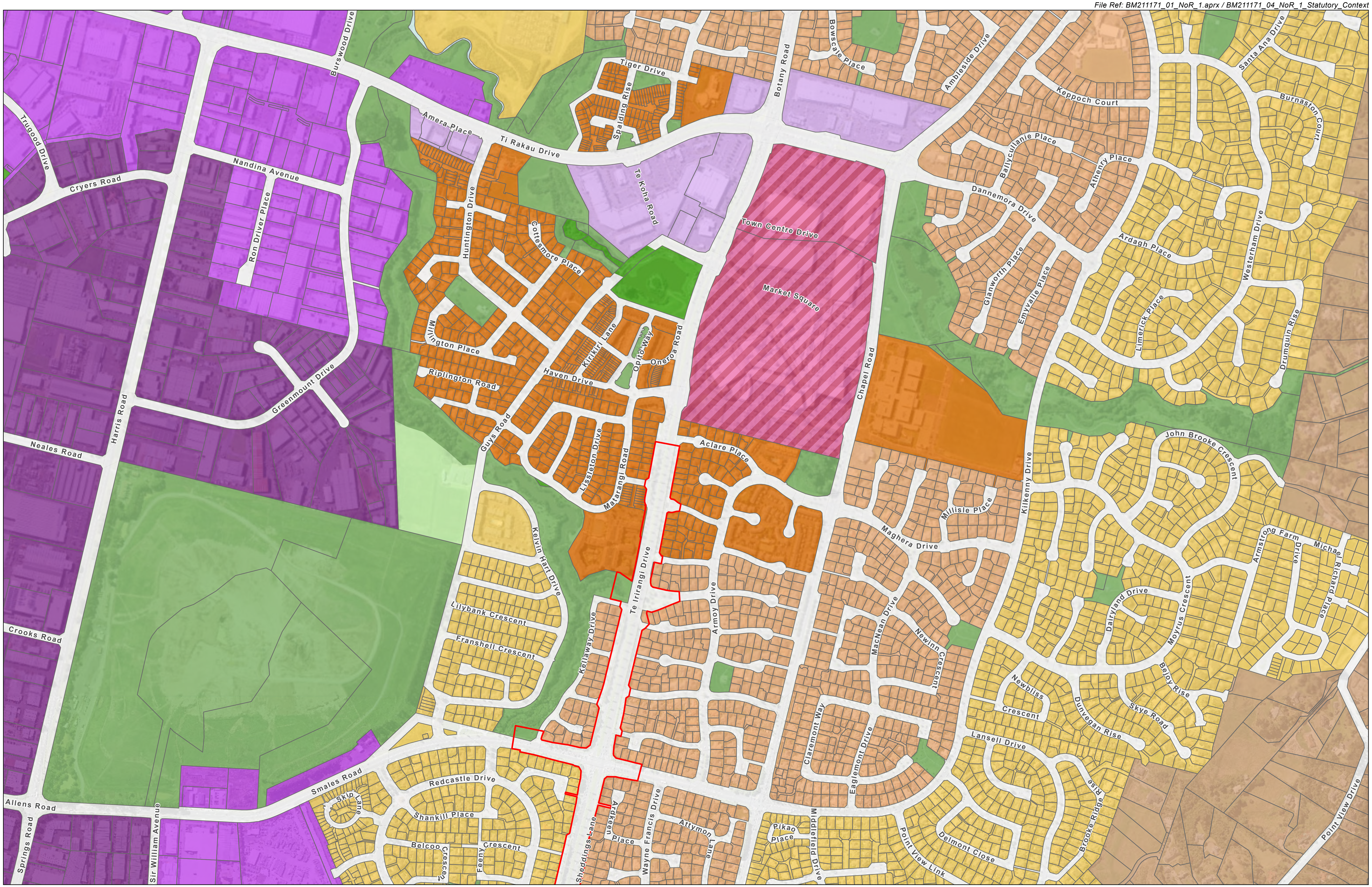
Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 3C

File Ref: BM211171_01_NoR_1.aprx / BM211171_04_NoR_1_Statutory_Context



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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- Unitary Plan Zoning
- Countryside Living
- Mixed Housing Suburban
- Mixed Housing Urban
- Terrace Housing & Apartments
- POS Conservation
- POS Informal Recreation
- Sport and Active Recreation
- Business Metropolitan Centre
- Business Mixed Use
- Heavy Industry
- Light Industry

AIRPORT TO BOTANY (NoR 1)

Statutory Context - Map 1

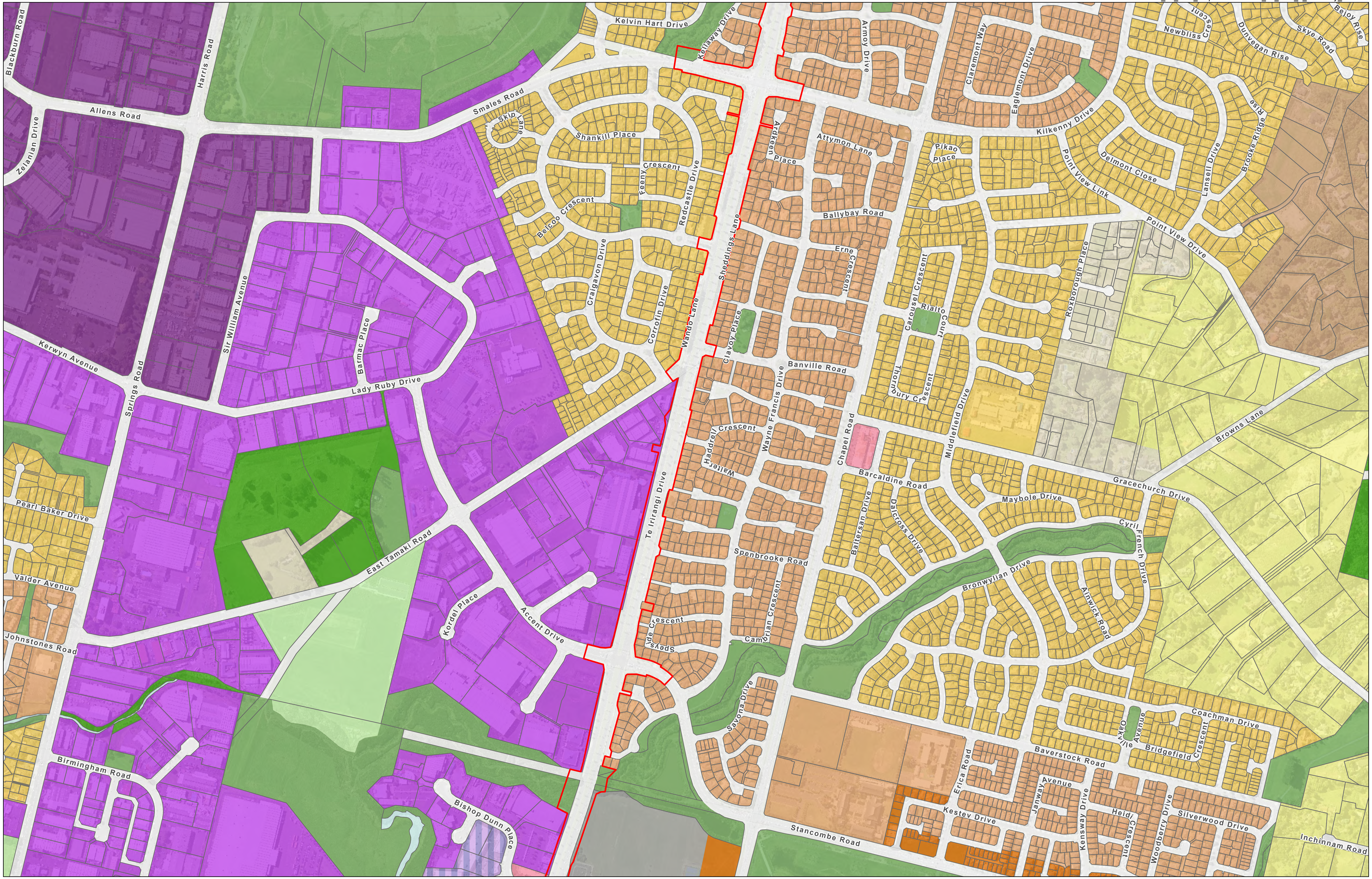
Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1D

File Ref: BM211171_01_NoR_1.aprx / BM211171_04_NoR_1_Statutory_Context



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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- Unitary Plan Zoning
- Countryside Living
- Residential Large Lot
- Single House
- Mixed Housing Suburban
- Mixed Housing Urban
- Terrace Housing & Apartments
- POS Conservation
- POS Informal Recreation
- Sport and Active Recreation
- Neighbourhood Centre
- Business General Business
- Heavy Industry
- Light Industry
- Special Purpose

AIRPORT TO BOTANY (NoR 1)

Statutory Context - Map 2

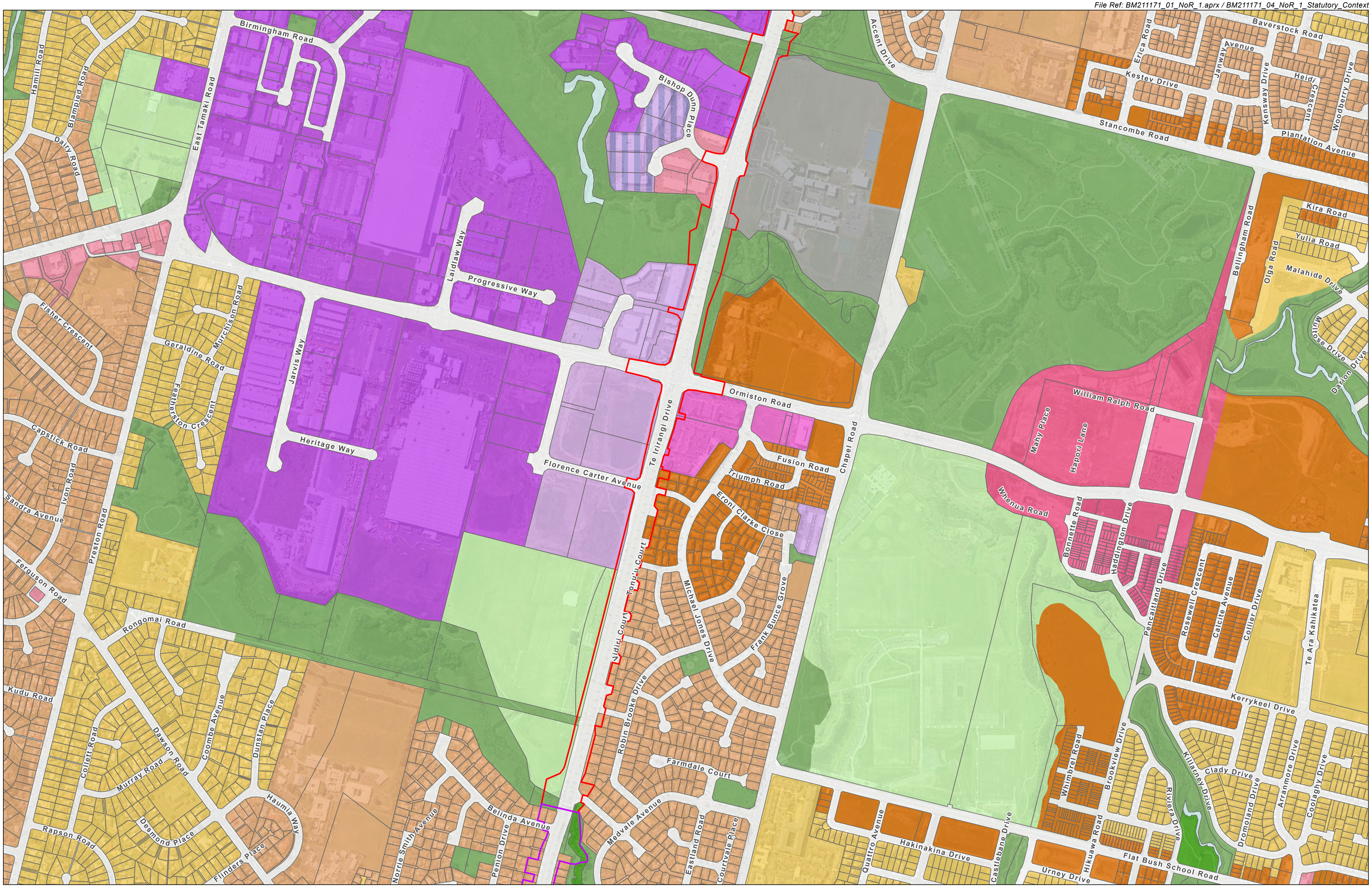
Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2D

File Ref: BM211171_01_NoR_1.aprx / BM211171_04_NoR_1_Statutory_Context



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0 100 200 m

1:8,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 1 Designation
- NoR 2 Designation

Unitary Plan Zoning

- Mixed Housing Suburban
- Mixed Housing Urban
- Terrace Housing & Apartments
- POS Conservation
- POS Informal Recreation
- Sport and Active Recreation
- Business Town Centre
- Business Local Centre
- Neighbourhood Centre
- Business Mixed Use
- Business General Business
- Light Industry
- Special Purpose

AIRPORT TO BOTANY (NoR 1)

Statutory Context - Map 3

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 3D

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix C

NoR 2 Figures

File Ref: BM211171_02_NoR_2.aprx / BM211171_05_NoR_2_Site_Location

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Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

AIRPORT TO BOTANY (NoR 2)

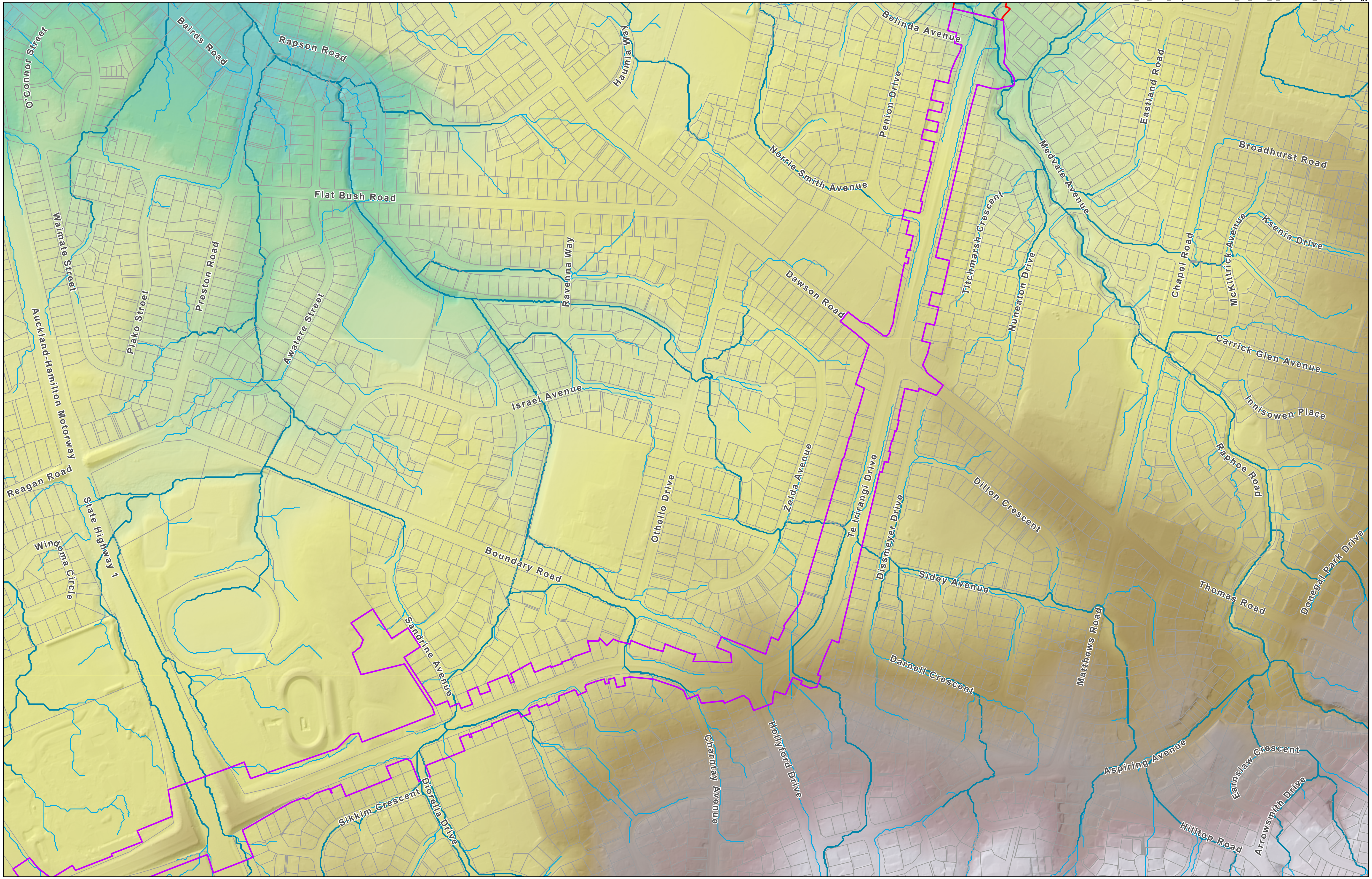
Site Location - Map 1: Section A

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1A



Boffa Miskell

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 2 Designation
- NoR 1 Designation
- Overland Flow Paths
  - 3 ha and above
  - 4000 m^2 to 3 ha
- Land Parcels

Elevation (m)

70

8

AIRPORT TO BOTANY (NoR 2)

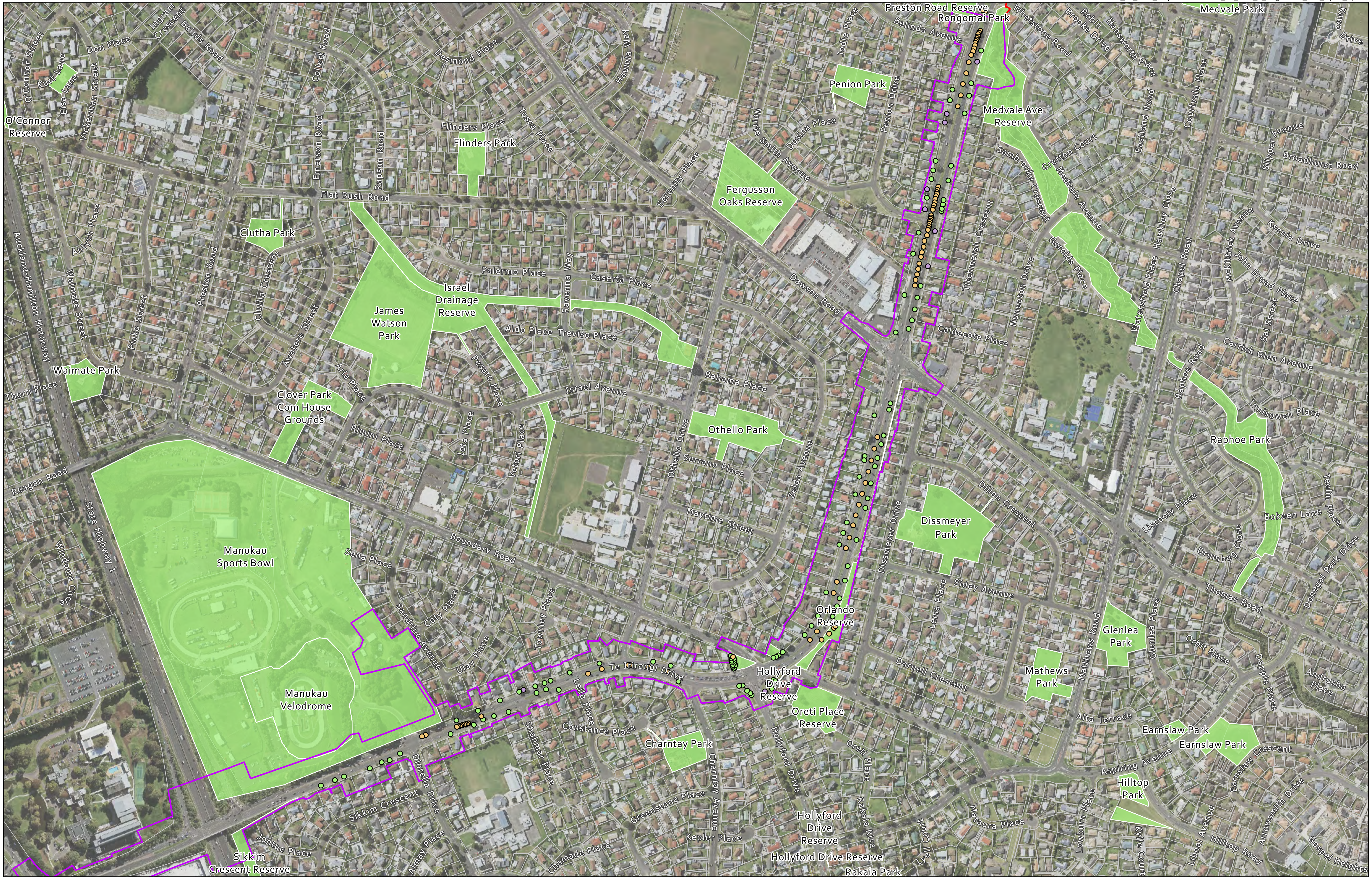
Landform and Hydrology - Map 1: Section A

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1B



Boffa Miskell

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 2 Designation
- NoR 1 Designation
- Open Space
- Land Parcels

Tree Surveys

- Indigenous
- Exotic
- Washingtonia

AIRPORT TO BOTANY (NoR 2)

Vegetation and Open Space - Map 1: Section A

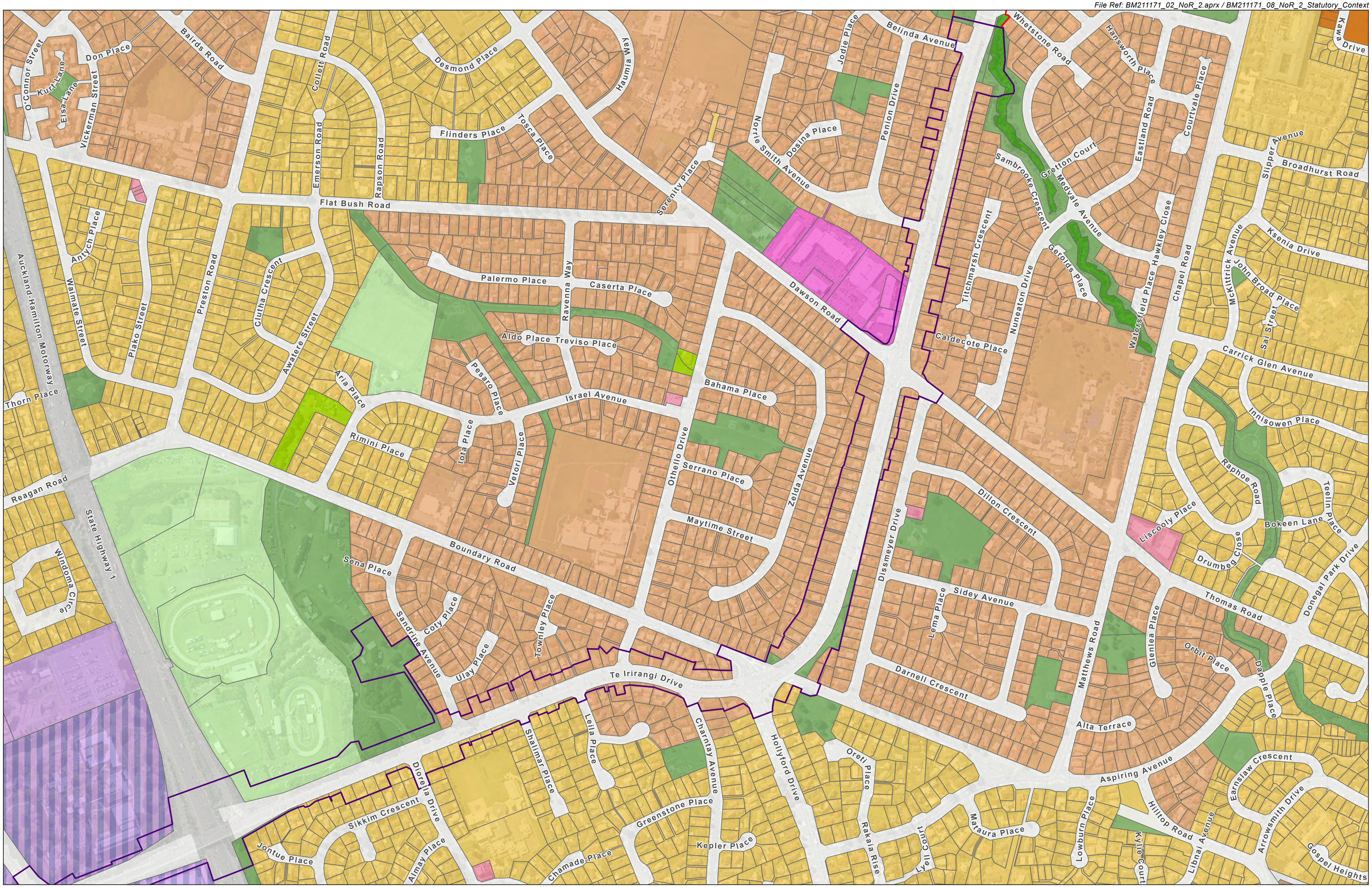
Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1C

File Ref: BM211171_02_NoR_2.aprx / BM211171_08_NoR_2_Statutory_Context



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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 2 Designation
- NoR 1 Designation

Unitary Plan Zoning

- Countryside Living
- Mixed Housing Suburban
- Mixed Housing Urban
- Terrace Housing & Apartments
- POS Conservation
- POS Informal Recreation
- Sport and Active Recreation
- Open Space Community
- Business Local Centre
- Neighbourhood Centre
- Business Mixed Use
- Business General Business
- Strategic Transport Corridor

AIRPORT TO BOTANY (NoR 2)

Statutory Context -

Map 1: Section A

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1D

File Ref: BM211171_02_NoR_2.aprx / BM211171_05_NoR_2_Site_Location

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 2 Designation

NoR 3 Designation

AIRPORT TO BOTANY (NoR 2)

Site Location - Map 2: Section B and C

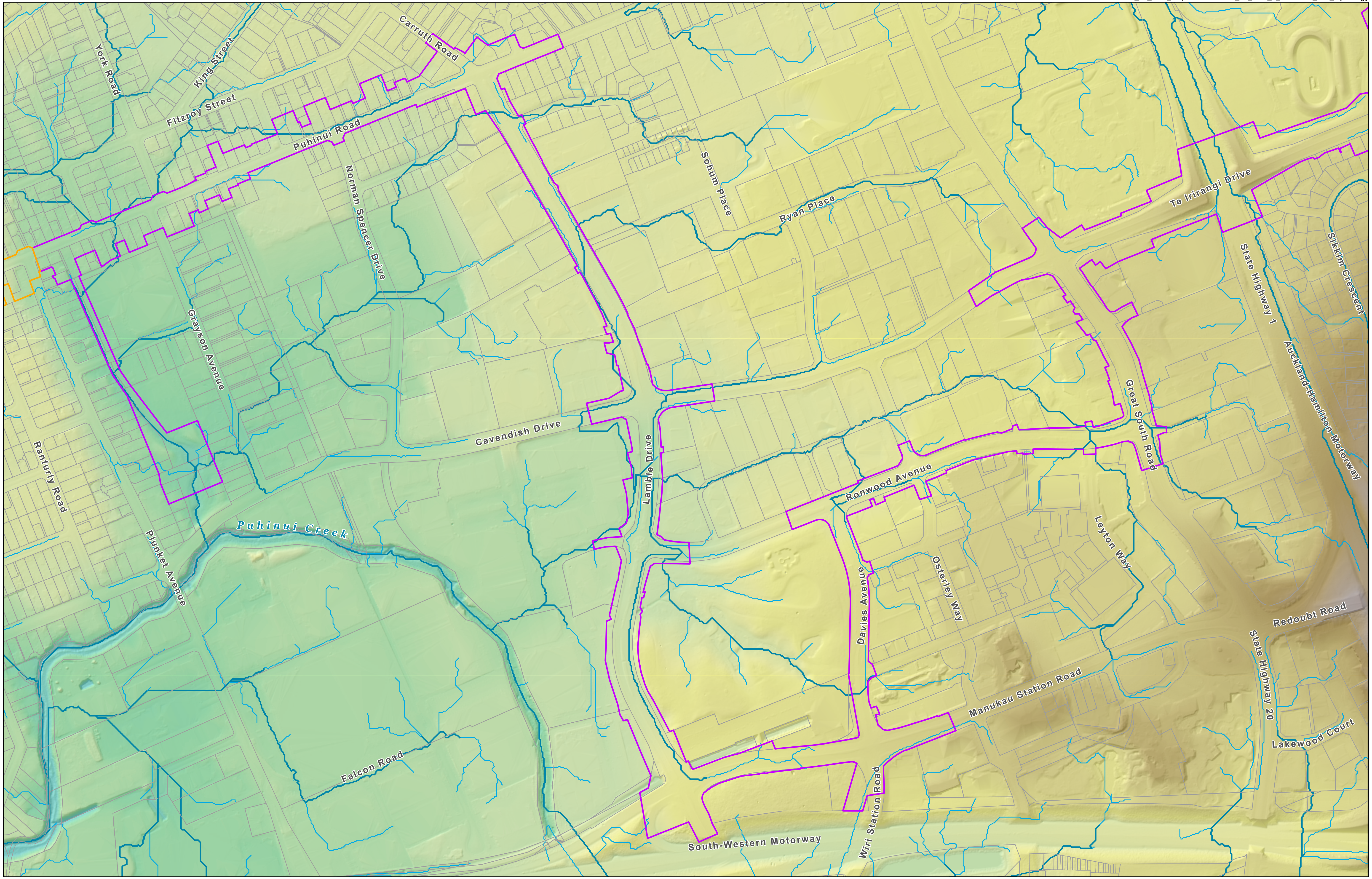
Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2A

File Ref: BM211171_02_NoR_2.aprx / BM211171_06_NoR_2_Landform_and_Hydrology



Boffa Miskell

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 2 Designation

NoR 3 Designation

Overland Flow Paths

3 ha and above

4000 m^2 to 3 ha

Land Parcels

Elevation (m)

70

8

AIRPORT TO BOTANY (NoR 2)

Landform and Hydrology - Map 2: Section B and C

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2B

Boffa Miskell

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 2 Designation
- NoR 3 Designation
- Open Space
- Land Parcels

Tree Surveys

- Indigenous
- Exotic
- Washingtonia

AIRPORT TO BOTANY (NoR 2)

Vegetation and Open Space - Map 2: Section B and C

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2C

File Ref: BM211171_02_NoR_2.aprx / BM211171_08_NoR_2_Statutory_Context

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 2 Designation
- NoR 3 Designation
- Notable Trees

Unitary Plan Zoning

- Single House
- Mixed Housing Suburban
- Terrace Housing & Apartments
- POS Conservation
- POS Informal Recreation
- Sport and Active Recreation
- Business Metropolitan Centre
- Neighbourhood Centre
- Business Mixed Use
- Business General Business
- Heavy Industry
- Light Industry
- Strategic Transport Corridor
- Special Purpose

AIRPORT TO BOTANY (NoR 2)

Statutory Context -

Map 2: Section B and C

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2D

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix D

NoR 3 Figures

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

Boffa Miskell

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 3 Designation
- NoR 4a/b Designation
- NoR 2 Designation

AIRPORT TO BOTANY (NoR 3)

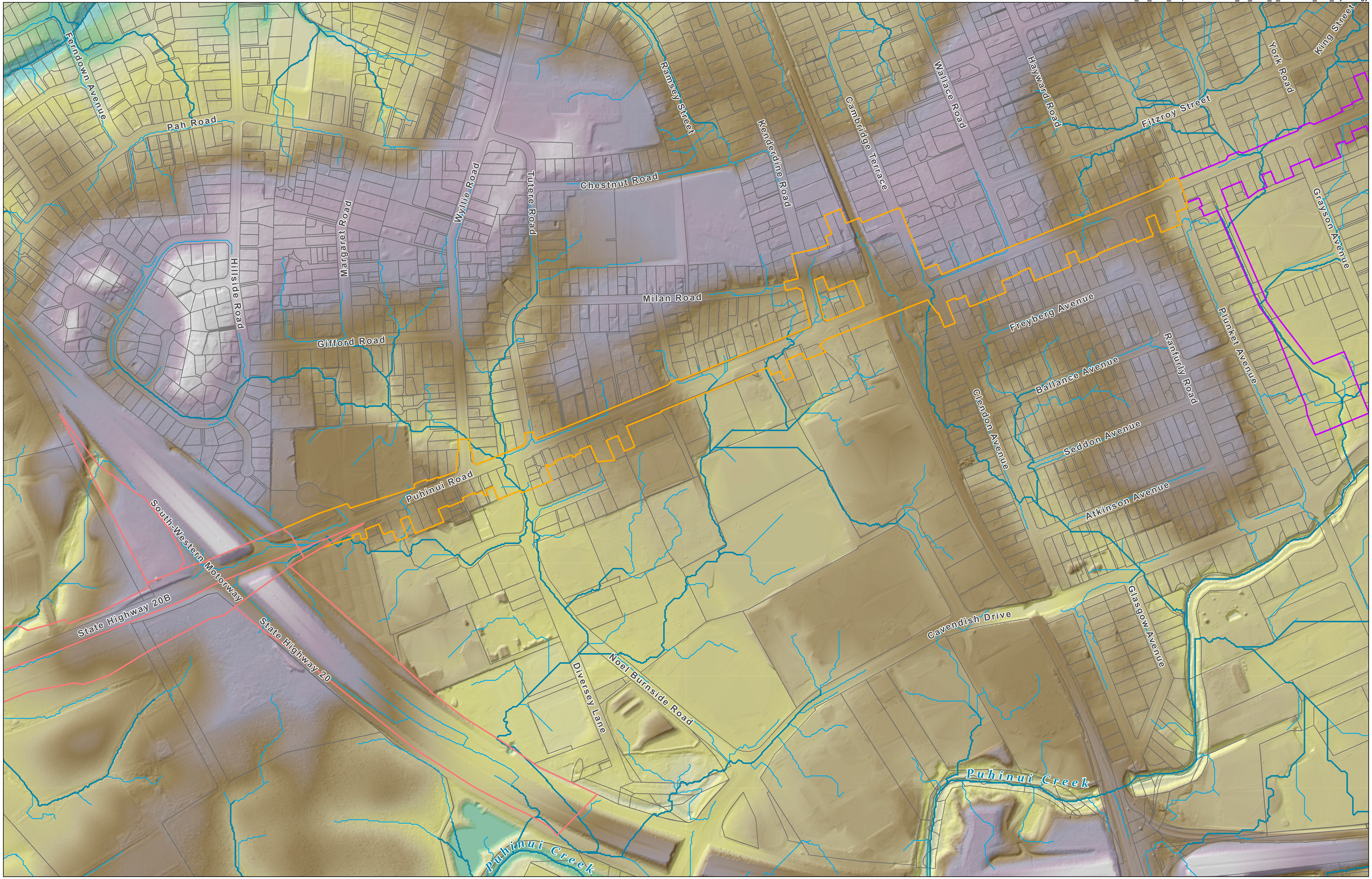
Site Location

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1



Boffa Miskell

www.boffamiskell.co.nz

0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 3 Designation
NoR 4a/b Designation
NoR 2 Designation
Overland Flow Paths
3 ha and above
4000 m^2 to 3 ha
Land Parcels
Elevation (m)
33
4

AIRPORT TO BOTANY (NoR 3)

Landform and Hydrology

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2

Boffa Miskell

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0 100 200 m

1:6,000 @ A3

DRAFT

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- NoR 3 Designation
- NoR 4a/b Designation
- NoR 2 Designation
- Open Space
- Land Parcels

Tree Surveys

- Notable Trees
- Indigenous
- Exotic
- Group of Trees

AIRPORT TO BOTANY (NoR 3)

Vegetation and Open Space

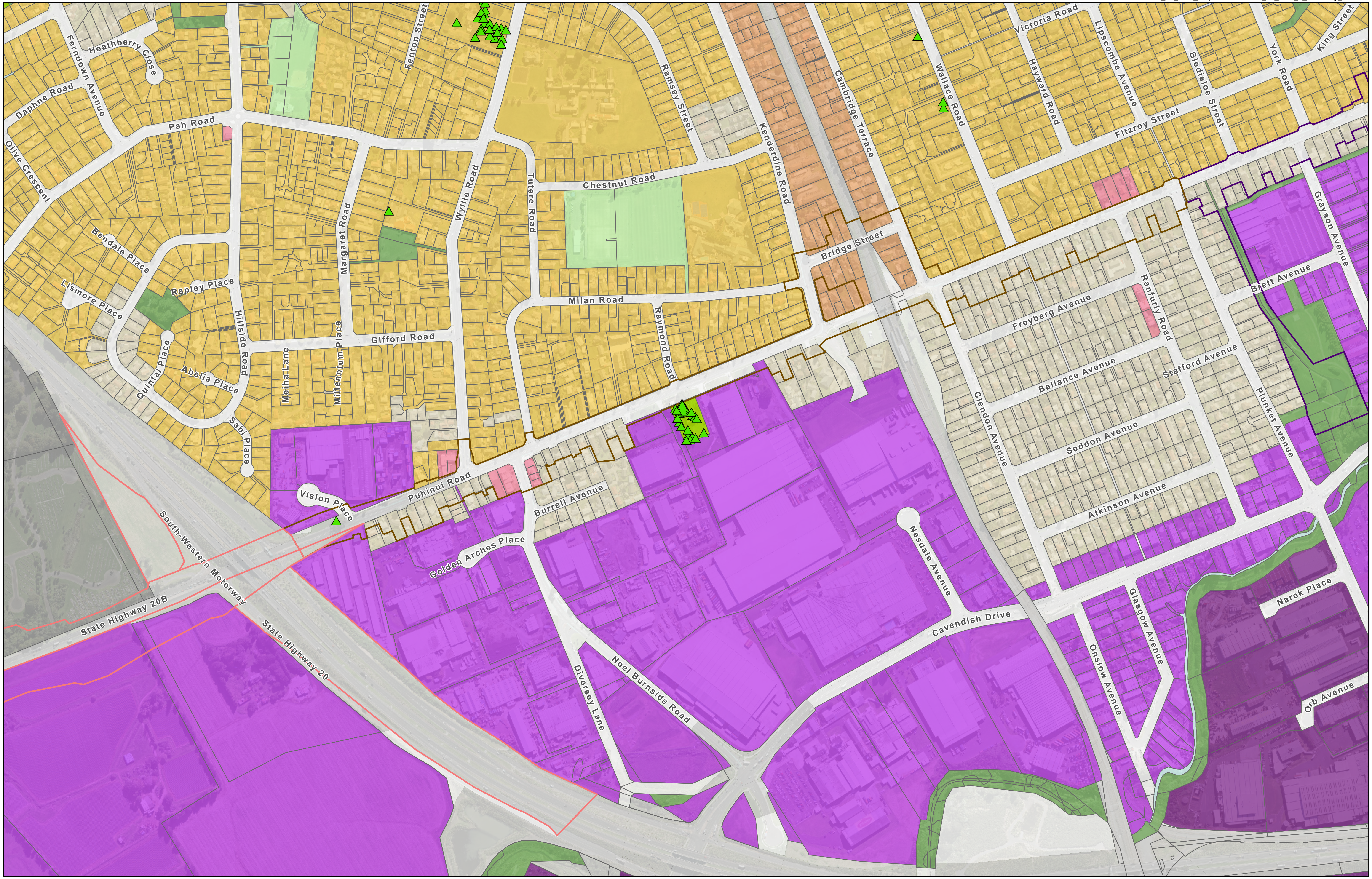
Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 3

File Ref: BM211171_03_NoR_3.aprx / BM211171_12_NoR_3_Statutory_Context



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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- Land Parcels
- Notable Trees
- Unitary Plan Zoning
- Single House
- Mixed Housing Suburban
- Mixed Housing Urban
- POS Informal Recreation
- Sport and Active Recreation
- Open Space Community
- Neighbourhood Centre
- Heavy Industry
- Light Industry
- Strategic Transport Corridor
- Special Purpose

AIRPORT TO BOTANY (NoR 3)

Statutory Context

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 4

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix E

NoRs 4a and 4b Figures

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0 100 200 m

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Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 4a/b Designation

NoR 3 Designation

AIRPORT TO BOTANY (NoR 4a/b)

Site Location - Map 1

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1A

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Data Sources: Auckland Council (Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

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LEGEND

NoR 4a/b Designation

AIRPORT TO BOTANY (NoR 4a/b)

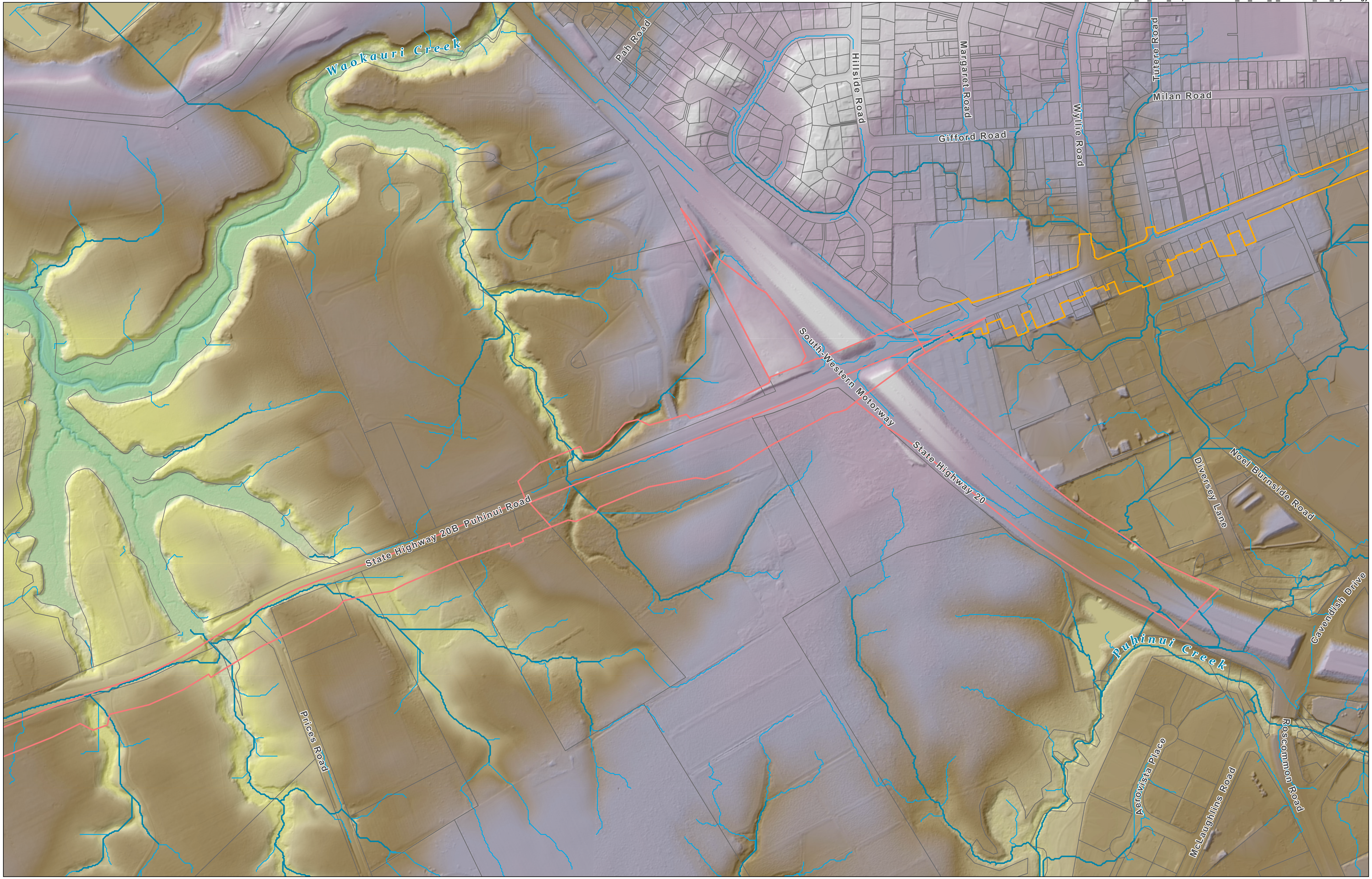
Site Location - Map 2

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2A



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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 4a/b Designation
- NoR 3 Designation
- Overland Flow Paths
  - 3 ha and above
  - 4000 m^2 to 3 ha
- Land Parcels

Elevation (m)

33

0

AIRPORT TO BOTANY (NoR 4a/b)

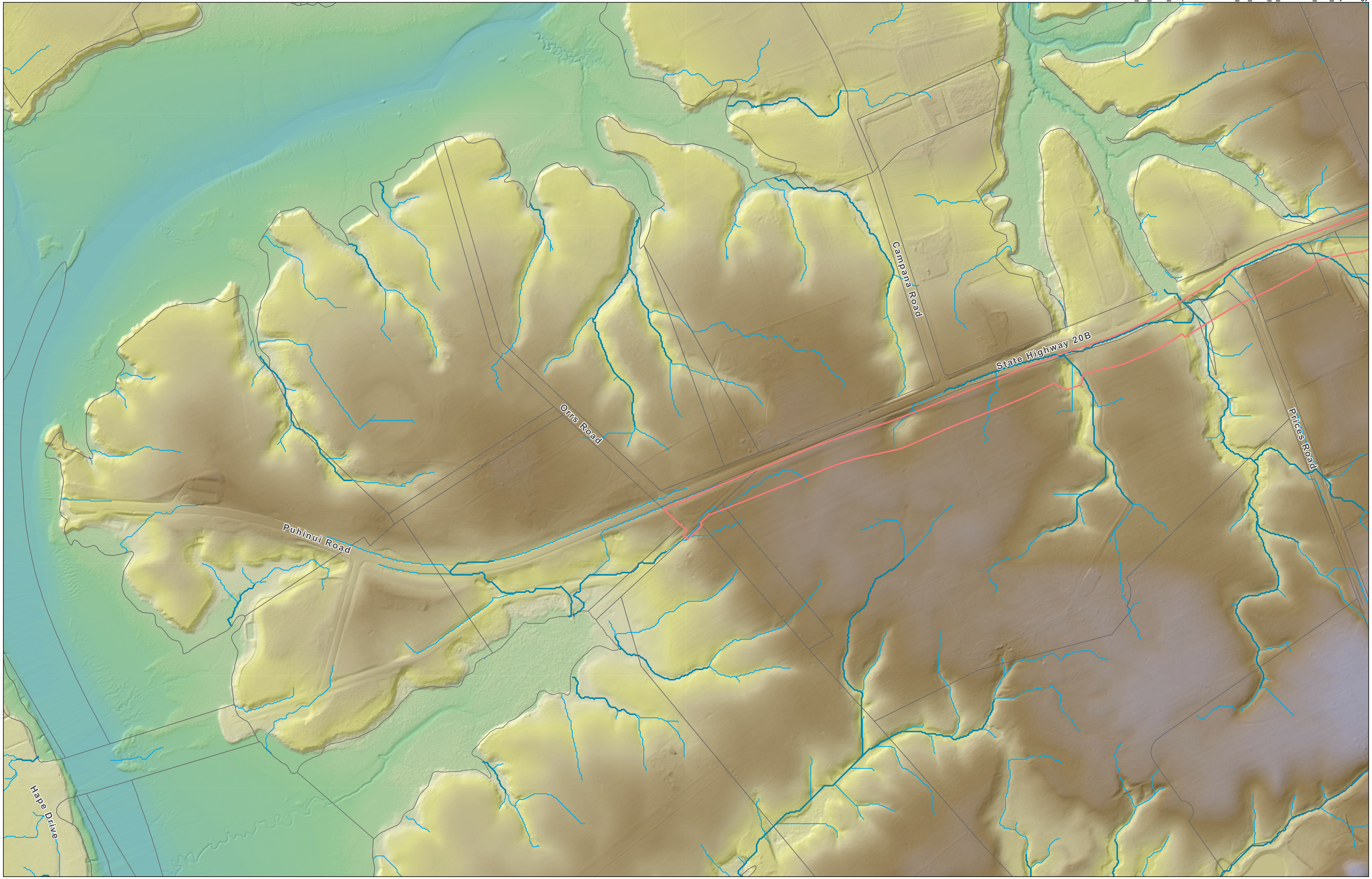
Landform and Hydrology - Map 1

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1A



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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

NoR 4a/b Designation

Overland Flow Paths

3 ha and above

4000 m² to 3 ha

Land Parcels

Elevation (m)

33

0

AIRPORT TO BOTANY (NoR 4a/b)

Landform and Hydrology - Map 2

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2A

File Ref: BM211171_04_NoR_4.aprx / BM211171_15_NoR_4_Vegetation_and_Open_Space

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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 4a/b Designation
- NoR 3 Designation
- Open Space
- Land Parcels

Tree Surveys

- Notable Trees
- Indigenous
- Exotic

AIRPORT TO BOTANY (NoR 4a/b)

Vegetation and Open Space - Map 1

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1C

File Ref: BM211171_04_NoR_4.aprx / BM211171_15_NoR_4_Vegetation_and_Open_Space

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Data Sources: Auckland Council (Aerials, LiDAR 2016), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 4a/b Designation
- Open Space
- Land Parcels

AIRPORT TO BOTANY (NoR 4a/b)

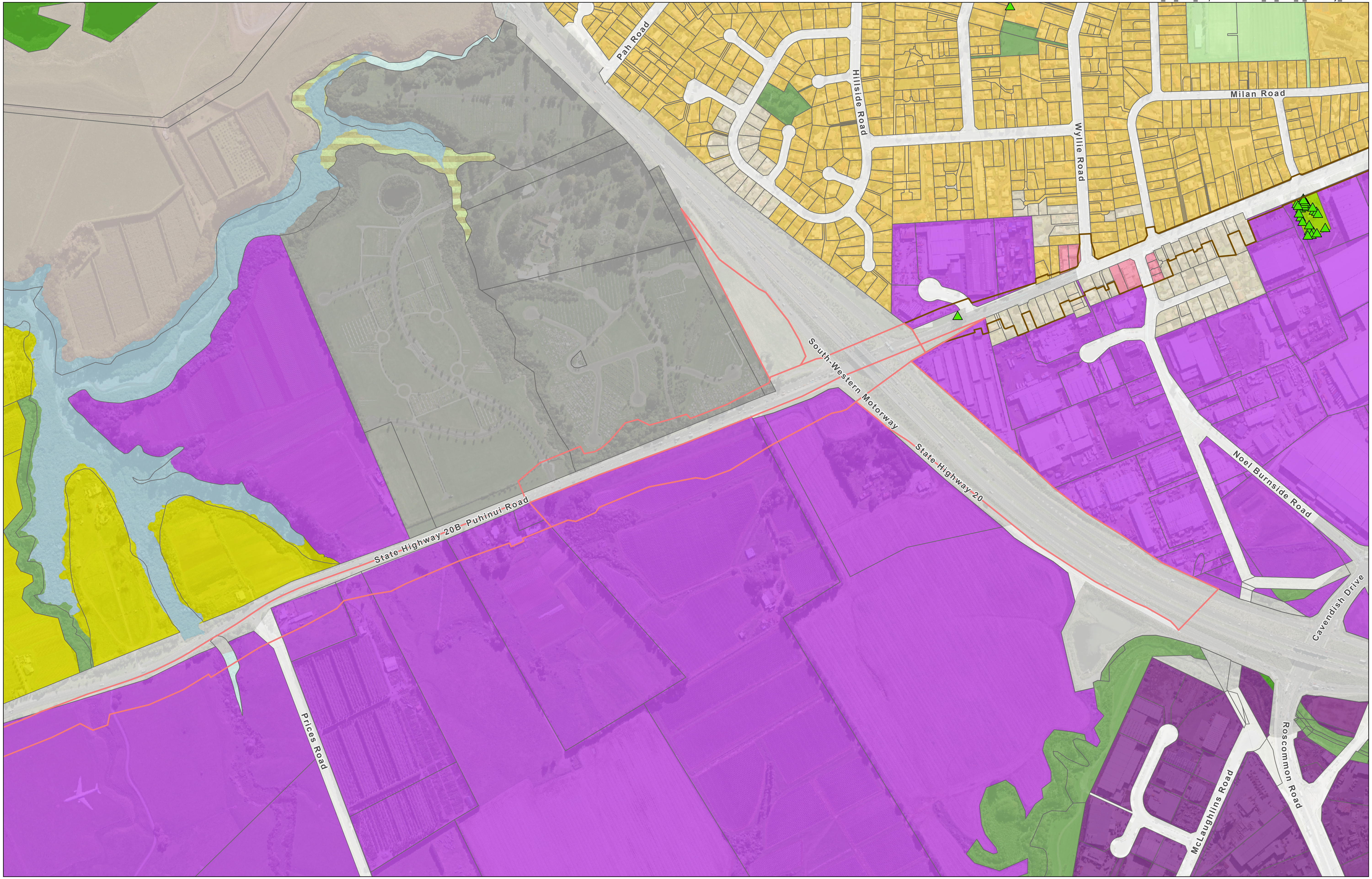
Vegetation and Open Space - Map 2

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2C



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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 4a/b Designation
- NoR 3 Designation

Unitary Plan Zoning

- Rural Production
- Single House
- Mixed Housing Suburban
- POS Conservation
- POS Informal Recreation
- Sport and Active Recreation
- Open Space Community
- Neighbourhood Centre
- Heavy Industry
- Light Industry
- Future Urban
- Strategic Transport Corridor
- Special Purpose
- General Coastal Marine
- Coastal Transition
- Notable Trees

AIRPORT TO BOTANY (NoR 4a/b)

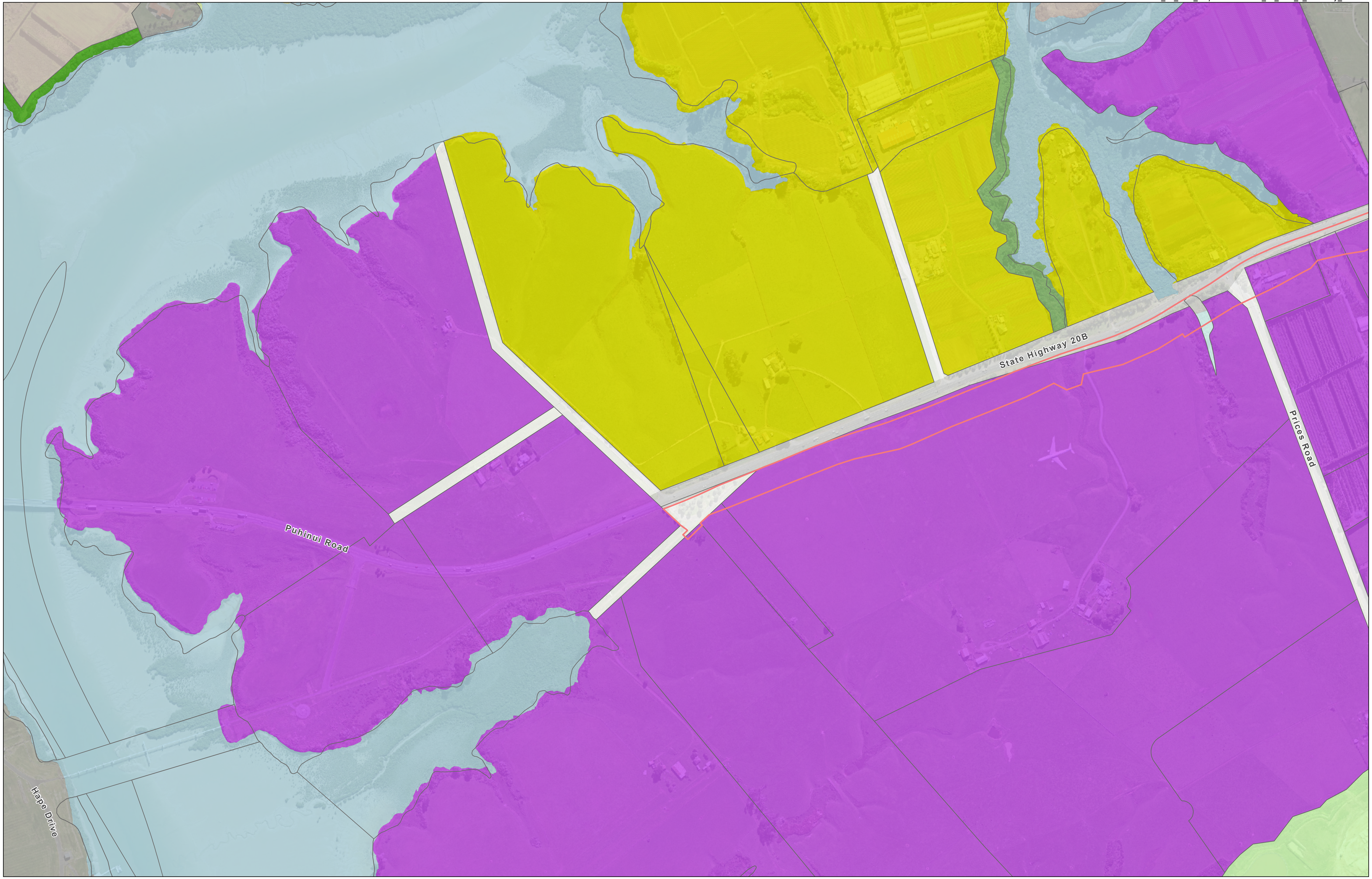
Statutory Context - Map 1

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 1D



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0 100 200 m

1:6,000 @ A3

Data Sources: Auckland Council (Zoning, Aerials), BML

Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- NoR 4a/b Designation
- Unitary Plan Zoning
- Rural Production
- POS Conservation
- POS Informal Recreation
- Sport and Active Recreation
- Light Industry
- Future Urban
- Strategic Transport Corridor
- Special Purpose
- General Coastal Marine
- Coastal Transition

AIRPORT TO BOTANY (NoR 4a/b)

Statutory Context - Map 2

Date: 25 November 2022 | Revision: C

Plan prepared by Boffa Miskell Limited

Project Manager: Chris.Bentley@boffamiskell.co.nz | Drawn: SGa | Checked: TLi

Figure 2D

TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

Airport to Botany Social Impact Assessment

December 2022

Version 1

Document Status

Responsibility	Name
Author	Julie Boucher
Reviewer	Julie Boucher
Approver	Adam Jellie

Revision Status

Version	Date	Reason for Issue
1.0	9 December 2022	Final for lodgement

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Appendices

Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
AUP:OP	Auckland Unitary Plan: Operative in Part
BID	Business Association District
BRT	Bus Rapid Transit
CVA	Cultural Values Assessments
HANA	High Aircraft Noise Area
IAIA	International Association for Impact Assessment
ONF	One Network Framework
N/A	Not Applicable
NIMT	North Island Main Trunk railway
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Airport to Botany Bus Rapid Transit (Botany Town Centre to Rongomai Park)
NoR 2	Notice of Requirement 2: Airport to Botany Bus Rapid Transit (Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue)
NoR 3	Notice of Requirement 3: Airport to Botany Bus Rapid Transit (Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange)
NoR 4a	Notice of Requirement 4a: Airport to Botany Bus Rapid Transit (SH20/20B Interchange to Orrs Road)
NoR 4b	Notice of Requirement 4b: Alteration to NZ Transport Agency Designation 6717 – State Highway 20B
MANA	Moderate Aircraft Noise Area
Programme partners	Te Ākitai Waiohua, Auckland Airport, Auckland Transport and Waka Kotahi
RCA	Road Controlling Authority
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
RTN	Rapid Transit Network
SEA	Significant Ecological Area
SH1	State Highway 1
SH20	State Highway 20

Acronym/Term	Description
SH20B	State Highway 20B
SIA	Social Impact Assessment
SWGP	Southwest Gateway Programme
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Introduction

This Social Impact Assessment (**SIA**) has been prepared to inform the Assessment of Environmental Effects (**AEE**) for the Notices of Requirement (**NoRs**) to protect the land required for the future development of the Airport to Botany Rapid Transit Project (the **Project**).

For the purposes of the SIA Report, the following definition of SIA, as provided by International Association for Impact Assessment (**IAIA**)[1] has been adopted:

> *Social Impact Assessment includes the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment.*

1.1 The Project

The overall Project is proposed to be an 18 km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations. It is part of Auckland's wider Rapid Transit Network (**RTN**) connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany.

As set out in the AEE, this Report specifically relates to a portion of the overall Project (approximately 14.9 km) which extends from the Botany Town Centre in the vicinity of Leixlep Lane to Orrs Road in the Puhinui peninsula, off SH20B. The Project primarily involves the upgrade and widening of existing transport corridors to provide for a dedicated BRT corridor and high-quality walking and cycling facilities.

Nine BRT stations are proposed as part of the Project. These stations are generally located at signalised intersections and will be staggered on either side of the intersection.

These stations are situated in the following locations:

- Smales Road;
- Accent Drive;
- Ormiston Road – Botany Junction Shopping Centre;
- Dawson Road;
- Diorella Drive;
- Ronwood Avenue (Manukau Central);
- Manukau Station;
- Puhinui Road/Lambie Drive; and
- Puhinui Station.

As part of the Project, two new structures are proposed:

- A BRT bridge crossing the North Island Main Trunk (NIMT) and connecting to the concourse level of the Puhinui Station; and

[1] https://www.iaia.org/wiki-details.php?ID=23

- A southbound ramp from SH20B to SH20.

Upgrades to existing structures are proposed at the:

- Bridge over Otara Creek (NoR 1);
- Bridge over SH1 (NoR 2);
- Bridge over NIMT (NoR 3); and
- Bridge over Waokauri Creek (NoR 4a).

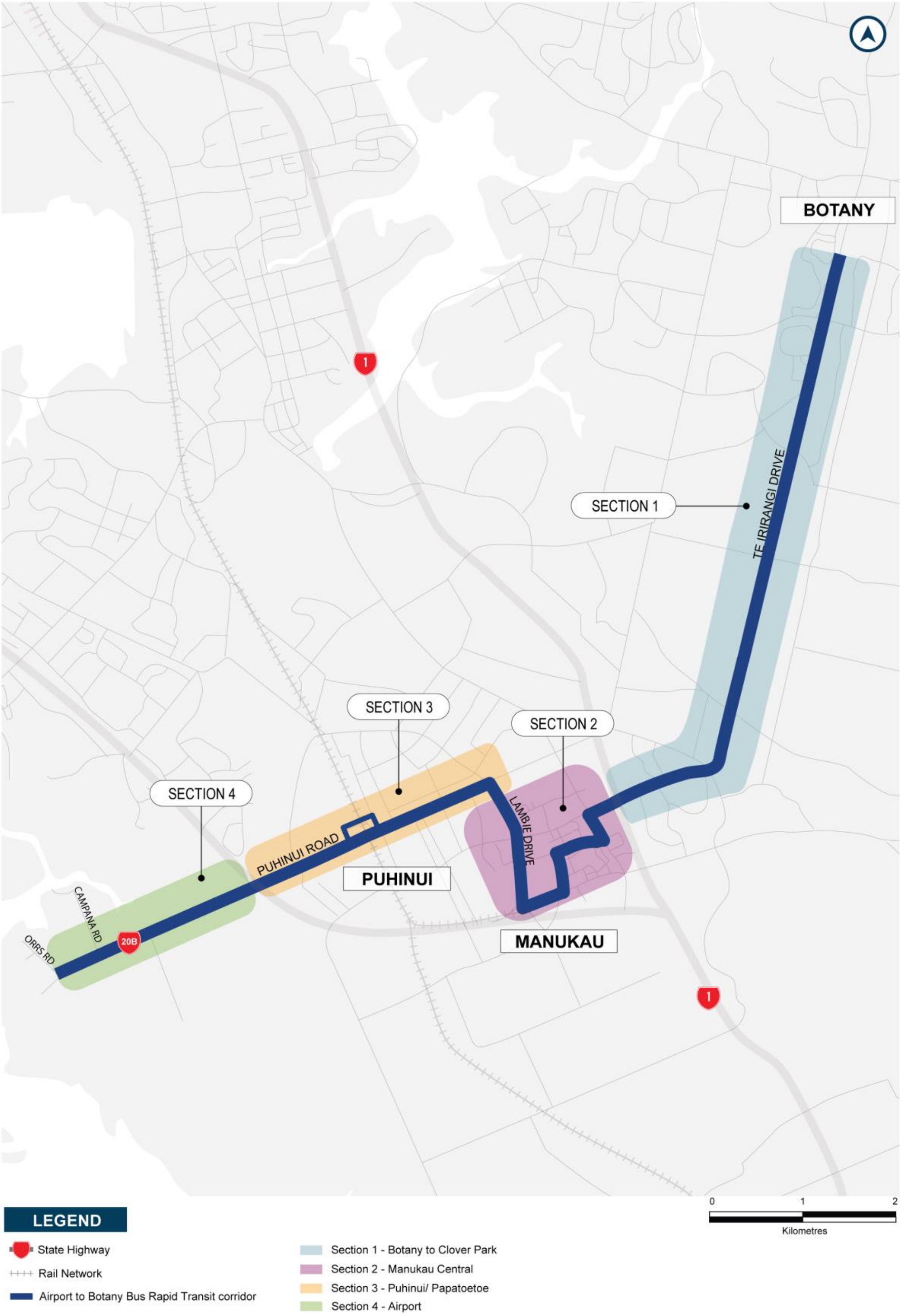

Figure 1: Overview of the Project showing SIA localities

It is noted that the sections of the Project shown in Figure 1 differ from the NoRs presented in the AEE. The SIA localities have been defined by community activity / use as further described in Section 3 of this SIA. The NoR boundaries have been defined based on different criteria.

1.2 Report structure

This report is structured as follows:

Table 1 Report structure

Sections	Section number
Introduction – provides an overview of the Project, the background and purpose of the SIA	Section 1
SIA Methodology - an overview of the SIA methodology and definition of social impacts	Section 2
Social Environment -— an overview of the existing social environment	Section 3
Social Baseline - an overview of the social area of influence and social indicators	Section 4
Review of Social Impacts of Rapid Transit Corridors – a review of other similar projects	Section 5
Potential Social Impacts and management strategies - a summary of likely social impacts and potential management strategies	Section 6
Conclusion	Section 7

2 Social impact assessment methodology

The process undertaken to complete this assessment is shown in Figure 2. Information sources for the review of other rapid transit projects and to understand the existing and planned future communities adjacent and nearby the Project are provided in **Appendix A** References, and **Appendix B** Summary of Engagement.

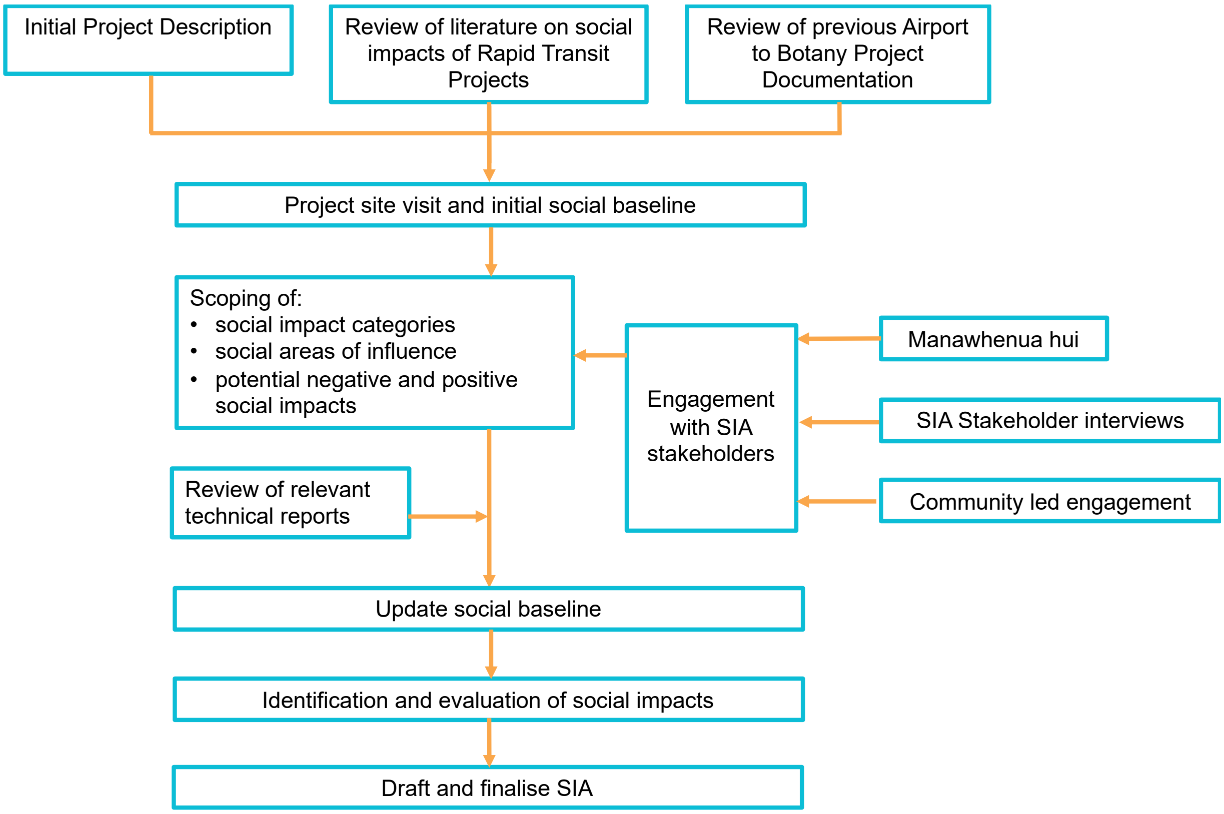

Figure 2: Summary of the social impact assessment methodology

2.1 Definition of social impacts

Based on the definition of Social Impact Assessment, the categories of likely impacts used in this report are:

- **Way of life** – including:
  - How people live, for example, how they get around and access to adequate housing;
  - How people work, for example, access to adequate employment;
  - How people play, for example, access to recreational activities;
  - How people access services and facilities; and
  - How people interact with one another on a daily basis.
- **Cultural impacts** – including shared beliefs, customs, values and stories, and connections to land, places and buildings (note Māori culture and values are considered separately in Cultural Values Assessments (**CVA**) undertaken by iwi);
- **Family and community impacts** – including its composition, cohesion, character, how it functions and sense of place;

- **Quality of the environment** – including access to and use of ecosystem services; public safety and security; access to and use of the natural and built environment, and its aesthetics value and/or amenity; the quality of the air and water people use; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation; their physical safety; and their access to and control over resources;
- **Decision making systems** – particularly the extent to which people can have a say in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose;
- **Health and wellbeing** – health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity. It includes psycho-social impacts such as solastalgia (a form of mental or existential distress caused by environmental change);
- **Personal and property rights** – including whether economic livelihoods are affected, and whether people experience personal disadvantage or have their civil liberties affected;
- **Fears and aspirations** – perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children;
- **Equity impacts** – distribution of impacts across the community and generations (intergenerational impacts); and
- **Socio-economic impacts** – including standard of living, level of affluence, economic prosperity and resilience, property values, employment, replacement costs of environmental functions and economic dependency.

2.2 Conceptual model of impact identification

Social impacts were identified using a conceptual model from Slootweg *et al* 2013. The Slootweg *et al* (2013) model shown in Figure 3 identifies the pathways by which environmental and social impacts may result from proposed projects.

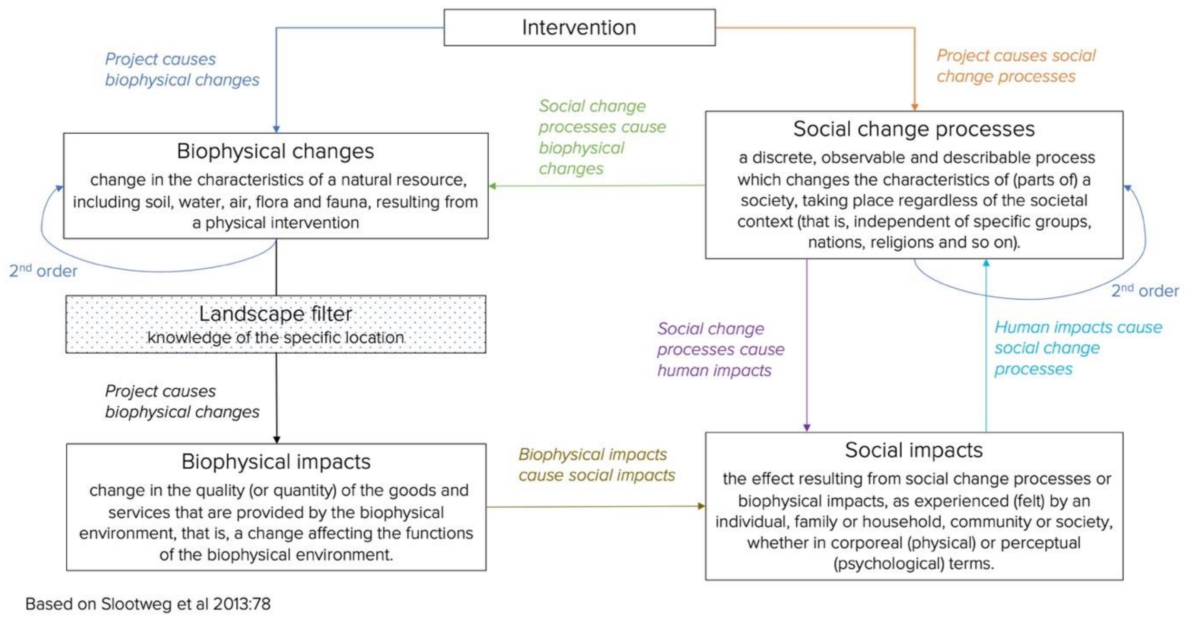

Figure 3: Slootweg *et al* (2013) impact identification model

The social risk / opportunity methodology for the Project is based on the methodology outlined in Esteves *et al* (2017)[2]. The work undertaken by Esteves *et al* builds on the IAIA's SIA Guidance and considers the concept of risk and differentiates social risk from business risk so it conforms with the United Nations Guiding Principles on Business and Human Rights. The methodology is based on a mining project in Canada (Esteves 2020 *pers comms*) and has been tailored to the Project and the social area of influence. This methodology includes drawing upon information from engagement for this Project and experience from other similar projects as part of determining the likelihood of impacts.

Further detail about the significance methodology is provided in **Appendix C** Significance Methodology.

2.3 Limitations and assumptions

2.3.1 Limitations

The limitations to this Report are as follows:

- Findings of this report are based on the information available at the time of writing the Report;
- At the time the Project is anticipated to proceed, the social environment will be expected to be different from when the social baseline was undertaken, therefore the social area of influence and potential social impacts may also change;
- While the potential future environment has been anticipated, as it cannot be determined with any degree of accuracy what that future environment will look like, the assessment is based on the existing environment, acknowledging it will have changed. No assessment has been made based on the future environment. A description of the potential future environment can however provide context to some of the potential social impacts;
- The following AEE technical reports were received in August and September 2022 and have been considered when assessing social impacts:
  - Construction Noise and Vibration Assessment;
  - Traffic Noise Assessment;
  - Landscape and Visual Assessment;
  - Built Heritage Assessment; and
  - Arboriculture Assessment.
- Activities undertaken during SIA engagement (**Appendix B**) are based on the available Project information at the time of the stakeholders' participation; and
- Not all stakeholders invited to participate in the SIA engagement accepted the invitation to participate or were able to participate due to existing commitments during the engagement timeframe (e.g. managing the impact of COVID 19 on their business and/or organisation).
- Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

2.3.2 Assumptions

The assumptions that have been made influencing this Report are as follows:

[2] Esteves, A. M., Factor, G., Vanclay, F., Götzmann, N. and Moreira, S. (2017) Adapting social impact assessment to address a project's human rights impacts and risks *Environmental Impact Assessment Review* 67 pp. 73-87

- Considerable growth and intensification of residential development is likely to occur before construction of the Project starts, particularly in areas with older housing such as Puhinui and Clover Park. This means the social environment as identified for this assessment will have changed at the time the Project is constructed. This is acknowledged as part of identifying potential social impacts with regards to the ability of the community to accommodate the change the Project will bring.
- The durations of construction for areas along the Project corridor is as per the information presented in Section 6.2 of the AEE.

2.4 Legislative context

This assessment is informed by an understanding of the statutory context in which the construction and operation of the Project will occur. This also assists in understanding the likely aspirations of the local, wider and regional communities in regard to what sort of changes they wish to see in their community in the future.

The Resource Management Act 1991

The Resource Management Act 1991 (**RMA**) requires the decision-making process to include consideration of the actual and potential effects of activities on the environment. The RMA interpretation of the environment in Part 1, Section 2 includes (**emphasis** added):

Environment includes –

a) *Ecosystems and their constituent parts, including people and communities; and*
b) *All natural and physical resources; and*
c) *Amenity values; and*
d) ***The social, economic, aesthetic, and cultural conditions** which affect the matters stated in paragraphs (a) to (c) or which are affected by those matters.*

This interpretation is central to considering the social impacts with respect to the environment. Other sections of the RMA integral to an assessment of social effects include Section 5 which defines the purpose of the RMA as ‘to promote the sustainable management of natural and physical resources’.

Sustainable management in the RMA 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 wellbeing and for their health and safety**…”*

Section 7 Other Matters, states that:

> *“…all persons exercising functions and powers [under the RMA]… shall have particular regard to- […]*
>
> *(c) the maintenance and enhancement of **amenity values**.”*

Schedule 4 (7) Matters that Must be Addressed by Assessment of Environmental Effects, states that an assessment of an activity’s effects on the environment must address the following:

> *"Any effect on those in the neighbourhood and, where relevant, the wider community, **including any social, economic, or cultural** effects."*

Regional and Local Planning Context

The Auckland Plan 2050 provides high level guidance on how issues such as population growth, transport and environmental degradation will be addressed. Key outcomes of the Auckland Plan that are relevant to this assessment are:

- Opportunity and prosperity: Auckland is prosperous with many opportunities and delivers a better standard of living for everyone;
- Transport and access: Aucklanders will be able to get where they want to go more easily, safely and sustainably; and
- Homes and places: Aucklanders live in secure, healthy and affordable homes, and have access to a range of inclusive public places.

National Policy Statement on Urban Development

The National Policy Statement on Urban Development (**NPS:UD**) enables higher density dwellings for sites adjacent to the BRT corridor. We anticipate that:

- Zoning within a walkable catchment of BRT stations along the corridor will enable at a minimum, apartment buildings of six storeys; and
- Beyond walkable catchments, residential zoning will provide for three dwellings up to three storeys in height (subject to meeting the relevant development standards).

3 Social environment

This section describes both the existing social environment and the potential future social environment in which the Project will likely be taking place. Understanding the social context is critical to identifying and assessing the potential social impacts of the Project. Due to the length of the Project and the changing environment in which the Project passes, the description of the social environment has been split into four sections as described in Table 2 and Figure 1. The descriptions of the existing social environment are presented for each of these areas.

Table 2: Social environments for the Project

Extent	SIA communities	Rationale
Te Irirangi Drive from Botany Town Centre to SH1 Interchange	Section 1 – Botany to Clover Park	Urban environment, predominantly residential with some commercial
SH1 Interchange to Ihaka Place	Section 2 – Manukau Central	Highly commercial Manukau Central Limited residential, apart from a multi-story apartment building over 10 storeys high
Ihaka Place to SH20/20B Interchange	Section 3 – Puhinui / Papatoetoe	Urban environment, predominantly residential with a commercial focus between SH20 and Puhinui Station Puhinui Road is a single corridor with strong community connection and activity along the corridor either side of Puhinui Station (station, schools, suburban shops, etc.)
SH20/20B Interchange to Orrs Road	Section 4 – Airport	Currently rural in nature and a state highway environment. Future industrial area.

With the Project not currently anticipated to be operational for 15 years, meaning active property acquisition and construction activity is approximately 10 years away, the existing social environment can be expected to have changed. Understanding how the social environment might change is important for understanding what the potential social impacts might be. An outline of how these communities might also change over that period is also presented.

3.1 Section 1: Botany to Clover Park

This locality is primarily residential in nature with an area of commercial activity on the northern side within the East Tāmaki business area. Te Irirangi Drive for the most part is a four-lane road with a wide centre median with mature Washingtonia Palms. The section of road between Dawson Road and Ti Rakau Drive was built in the early 2000's with a wide median intended for future use as a Rapid Transit Corridor. There is limited access along this section and it currently has an 80 kph[3] speed environment. Properties are accessed either at intersections or via one-lane slip-lanes. At the western end Te Irirangi Drive travels through the well-established Clover Park residential area and connects to SH1 with north-facing motorway ramps. It is a key corridor for commuting, freight and commercial activity providing a strong east-west connection across southern and eastern Auckland.

The Manukau Sports Bowl at the western end, and Rongomai Park are the main recreation and leisure destinations. The Manukau Sports Bowl is a regionally significant facility which caters to a

[3] To be reduced to 60 kph in January 2023 (Auckland Transport Speed Limits Bylaw 2022).

number of sports and includes function rooms. Retail and commercial activity stretches along parts of the road with some large format retail including Mitre 10 Mega. There are a number of schools in the area, including Sancta Maria College (Year 7 to Year 13) and Redoubt Road Primary School which are in closest proximity to the corridor. South of the corridor there are the large residential areas of Flat Bush and Ormiston along with Barry Curtis Park. To the north of the corridor are the expansive business parks of East Tāmaki with a focus on technical, manufacturing, and industrial.

Figure 4: Rongomai Park and Sports Centre (Te Irirangi Drive)

The Metlifecare Retirement Village is near the eastern end of the Project area. There are several accommodation providers accessed via slip roads including:

- Botany Motor Inn uses Kellaway Drive;
- Academy at Botany Motor Inn uses Leixlep Lane; and
- Nesuto Newhaven Hotels uses Haven Drive.

There are several service stations and two medical centres along the route.

Figure 5: Entrance to Academy at Botany Motor Inn on Lenford Drive

This locality falls within both the Ōtara-Papatoetoe and Howick Local Board areas and comprises 13 census areas. In 2018 there were 29,250 people living in the locality and a median age of 32.7 years. In the western parts of the locality there is a higher proportion of Māori and Pacific people. There is a higher proportion of Asian people towards the eastern end.

At the western end (Clover Park, Rongomai, Ormiston and East Tāmaki) there are higher levels of deprivation with a deprivation score of 8. By contrast, the eastern end of Te Irirangi Drive has much lower levels of deprivation.

Kāinga Ora has a large landholding along the Project corridor of around 135 properties, with most of this being within the Clover Park area. The housing within the Clover Park area is dated. The Project Team has engaged with Kāinga Ora to discuss potential opportunities to coordinate and align the timeframes of the Project with their future development plans. There was general support for the Project, particularly related to the transport and access benefits provided through the Project.

Neighbourlytics™ data presented graphically in Figure 6 shows the level of activity in areas as a 'heat map'. The Project corridor is shown as the pink/purple line in each of the heat maps. The greater the density of activity, the greater the area of shading in the heat map. Figure 6 shows activity in the area is clustered around the commercial areas.

Figure 6: Vitality of the Botany - Clover Park area

3.2 Section 2: Manukau Central

The Manukau Central area is a major commercial and retail centre for southern Auckland with a large Westfield shopping mall, the Supa Centa large format retail area, many government agencies and support services and numerous small commercial businesses. MIT, AUT and the University of Auckland all have campuses in Manukau Central providing tertiary education opportunities. The Manukau Transport Interchange integrates local and inter-regional bus services with rail services. Hayman Park and Rainbows End are popular entertainment and leisure destinations along with many gyms in the area. While commercial in nature there is increasing residential development in the area.

The area falls within the Ōtara-Papatoetoe Local Board area and in 2018 had a population of only 771 people. The average wage for this area was around $37,600 which is the highest among all three localities. It also has the highest proportion of residents receiving some form of benefit (20%) with 10% of residents receiving superannuation. This supports the high median age for the area at 36.1 years. European and Asian are the dominant ethnicities with Pacific peoples and Māori only being 17% and 14% respectively. Residents are generally higher educated than in other areas with almost half of residents having a Level 4-6 Diploma or higher qualification. Given the proximity of the residential units to the tertiary education facilities, this could indicate a high number of students. Manukau Central has a high deprivation score of 8 which could be attributed to a higher number of people receiving benefits, including superannuation.

Neighbourlytics™ data presented graphically in Figure 7 and Figure 8 show the character and vitality of the area respectively. The Project corridor is shown as the pink/purple line in each of the maps.

Neighbourhood character is defined by the dominant reasons to visit, spend and stay. Each dot on the map is a business of importance to the community. Different coloured dots represent different categories as shown by the key.

The character of the Manukau Central area shown Figure 7 shows the area is characterised by business and services. The most common business and service category is retail followed by technical and industrial services[4]. This supports the area as a significant employment area.

[4] Neighbourlytics Assessment, June 2022

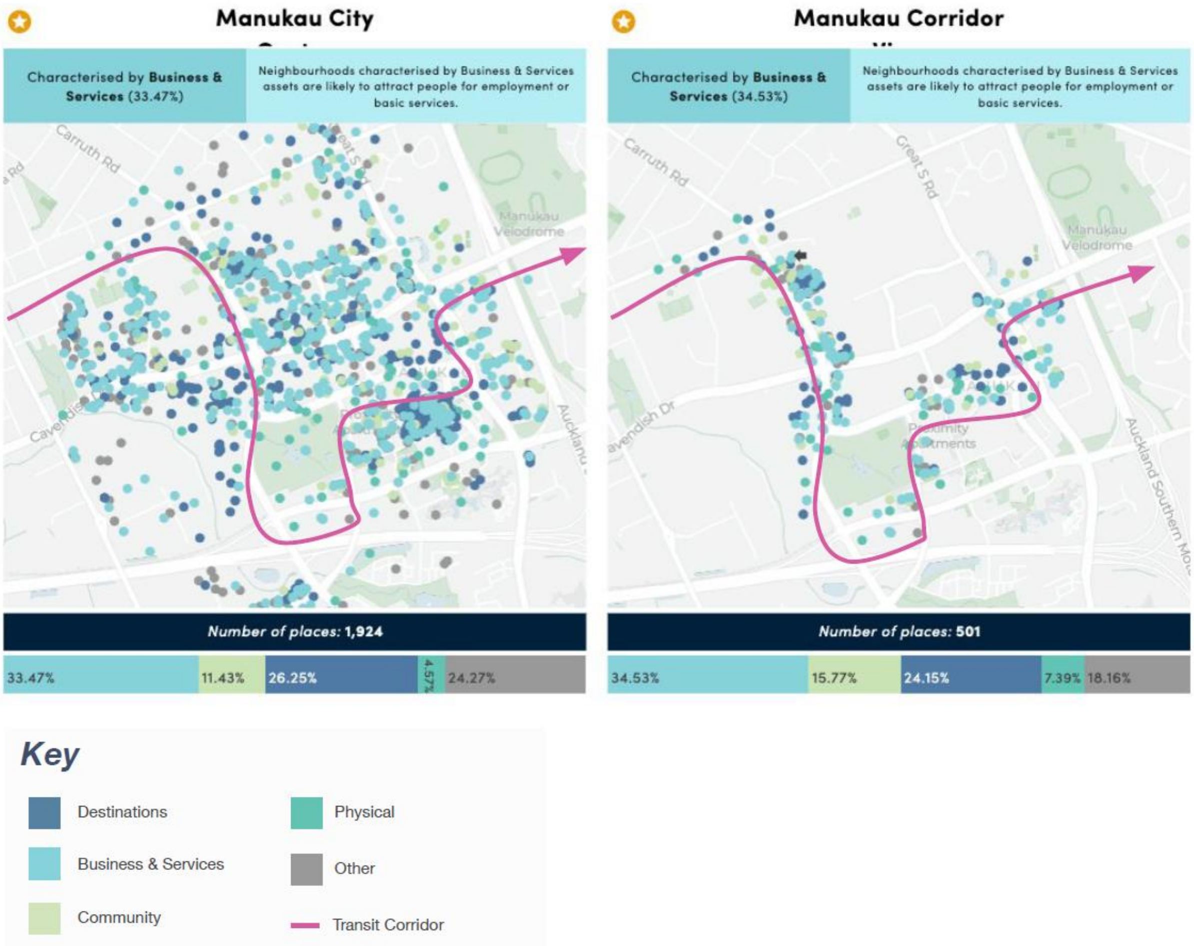

Figure 7: Character of Manukau City Centre

Neighbourlytics data has identified the most relevant places within the Manukau Central area, in order of relevance, as the Westfield Shopping Centre, Supa Centa, “Easy Auto”, PB Tech, Pak’n Save, K-Mart, Bunnings, McDonalds and Krispy Kreme. These places, with the exception of “Easy Auto” have a destination focus on retail and hospitality.

In Figure 8 the ‘heat map’ shows the greater the density of activity, the greater the area of shading in an area.

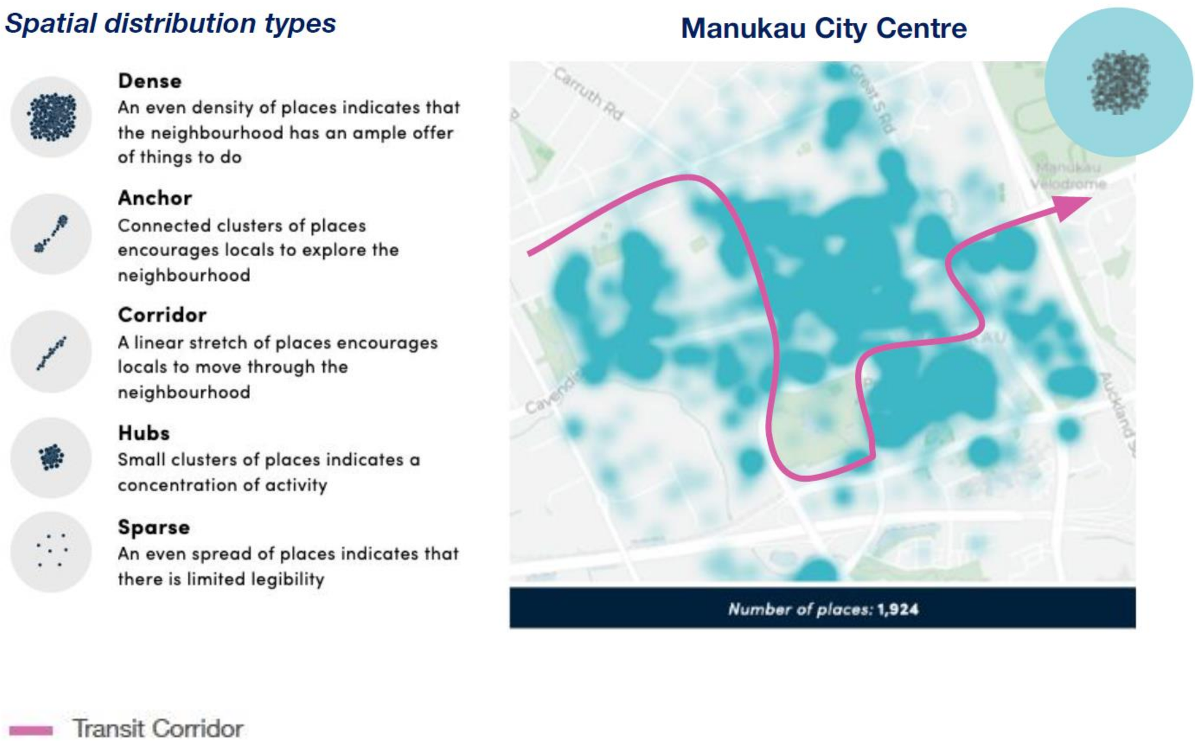

Figure 8: Vitality of Manukau City Centre

3.3 Section 3: Puhinui/Papatoetoe

Puhinui Road is situated in the Ōtara-Papatoetoe Local Board Area and spans through five census areas. It is primarily residential in nature with a mixture of commercial and residential between the Puhinui Station and the SH20/20B interchange. Most residential properties are privately owned with limited Kāinga Ora properties.

Within this area there are manufacturing, industrial, storage and logistics companies operating and distributing product from this area. East of the Puhinui Station the route is almost entirely residential. The area is impacted by the High and Moderate Aircraft Noise overlays (**HANA** and **MANA**), as outlined in Section 7 of the AEE. This does limit some of the activity anticipated in these areas and how development can occur, particularly in relation to noise mitigation. In particular the residential use within the HANA, which is south of Puhinui Road is generally older housing. There is some newer housing along Puhinui Road itself which is within the MANA.

Information from meetings with potentially affected landowners as part of landowner engagement indicates there are a number of residential properties with larger homes and several generations of the same family living at the property. Census data (refer Table 4 in **Appendix D**) does show 19% of houses have eight or more rooms and 8% of houses have five or more bedrooms.

Puhinui Road has several clusters of stores which are primarily focused on takeways and food outlets including the Wyllie Road shops which include a Chinese Choice Takeaways, Mama's Desserts, and Yumilicious Lunchbar n café. The Mobil service station and Hari Superette are opposite and further down the road. Adjacent to Raymond Road there is a block of shops set back from Puhinui Road and includes Nice Spice Eatery, The Bottle O Puhinui, and the Puhinui Minimart. The Whanau Ora Community Clinic is also within this complex and Age Concern is adjacent.

Figure 9: Mobil Puhinui Road and Hari Superette

The Puhinui Train Station sits in the centre of this area creating a barrier on Puhinui Road and a 'dog-leg' in the road. Directly adjacent to the train station and accessed through the bus interchange area is the Te Kohanga Reo ki Puhinui. The Kingdom Hall of Jehovah's Witnesses neighbours the train station/bus interchange on the western side.

On the eastern side of the Puhinui Train Station commercial activity is primarily focused on takeaways and food. Businesses include a bakery, butcher, takeaways, two dairies, a hair salon and a pawnbroker.

Figure 10: Puhinui Road business cluster (Puhinui Road opposite Ranfurly Avenue)

The Pukeko Preschool Papatoetoe is on the southern side of Puhinui Road opposite the Puhinui Road business cluster, with Puhinui School (Primary School) further east along Puhinui Road.

The Puhinui Medical Centre operates from a residential property near to the Puhinui Road business cluster.

Figure 11: Puhinui Medical Centre

Within the area the Mobil service station at 286 Puhinui Road and the suburban shopping area on Puhinui Road, opposite Ranfurly Road are two of the most relevant places for the community[5]. Figure 12 shows the vitality of the area as a heat map and shows the Mobil service station and the suburban shops as key activity areas along Puhinui Road. It is likely the Medical Centre is captured within the relevance of the Puhinui Road shops due to its proximity.

[5] Neighbourlytics assessment, June 2022

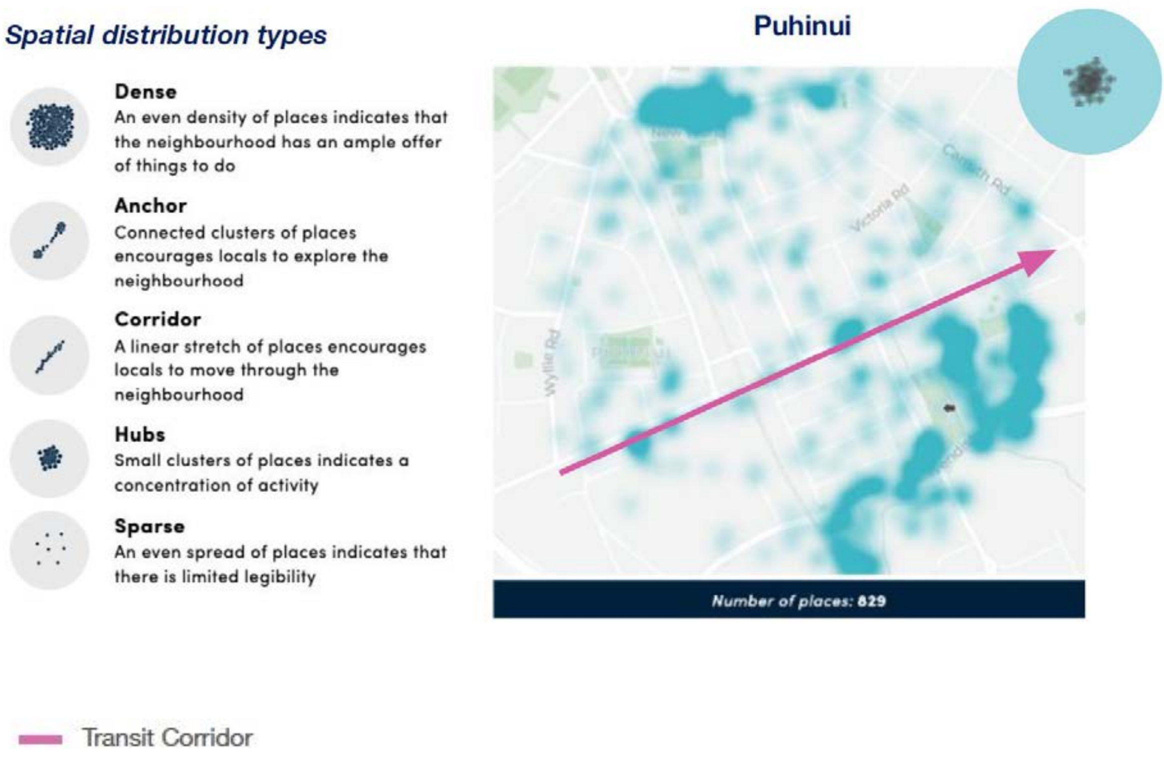

Figure 12: Vitality of the Puhinui/Papatoetoe area

This area has a young population with 12,786 people living in the area in 2018 and a median age of 29.5 years which is the lowest average across all the social environments.[6] It is predominantly Asian with almost half of residents identifying as Asian. Indian is the dominant Asian ethnicity. Around a quarter of people are Pacific people, 17% European and just over 10% Māori.

Compared to Auckland as a whole, and all other localities it has one of the highest deprivation rates. The lowest income levels with the average wage $28,700 and almost half of residents earning $30,000 per year or less. Almost 10% of the residents are on some form of benefit and around 13% of residents receive a superannuation payment. The quality of housing in this locality is also low compared to other localities with half of households experiencing dampness in their homes.

Despite this, the community demonstrates strong connections and resilience such as that shown in response to a tornado which struck the area in late 2021.[7] The community pulled together to help clean up the damage and support each other to recover. The event revealed community leaders like Sulendra Raju, a local builder who took a key role in the cleanup. The community has also been described by those living and working in the area as being resilient “to construction projects like these” primarily due to the demographic makeup of the community considered to come from countered where busy urban construction environments are ‘normal’. It is also acknowledged that some people living in the area will have experienced conflict and/or displacement in other countries and will not be as resilient.

[6] 2018 Census data

[7] June 2021 NZ Herald article “Papatoetoe tornado brought a South Auckland community together”

People from this area are more likely to use modes of transport like their personal vehicle or a company vehicle which equated to almost 80% of the vehicles commuting to work. Many workers are shift workers and/or work in areas where public transport is not a viable option for their family life.

3.4 Section 4: SH20/20B Interchange to Orrs Road

This area is dominated by a currently rural environment and SH20B as the "southern gateway" from Auckland International Airport connecting to Manukau and areas south of Auckland. In April 2021, the new transit lanes were completed on SH20B for the Airport Link service and a shared walking and cycling path was created along the southern side of the state highway. There are currently a handful of private residences primarily on the northern side associated with market gardening and grazing activity.

This section of the Project is located within the Ōtara-Papatoetoe Local Board area and is part of the large Manukau Central census area which also includes the Wiri Industrial area and Manukau Central. As a result, census data for this section of the Project includes residential as well as a large area of commercial and industrial land use. There are few residents within Section 4. In 2018 there were only 159 residents within the SLA1 area, shown in Figure 13, in 2018. Along the Project corridor there are only around 5-6 homes.

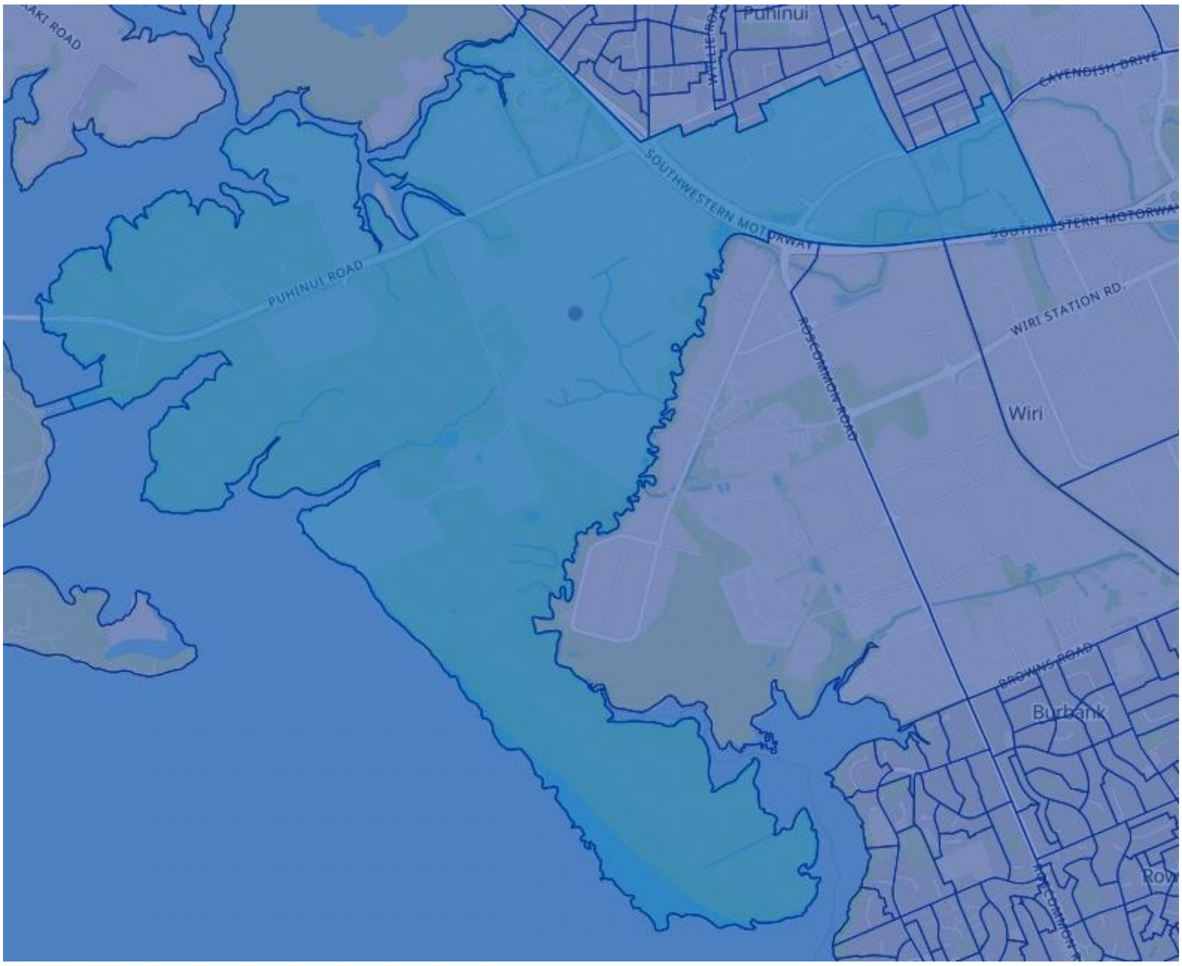

Figure 13: Boundary of SA1 area for the SH20/20B Interchange to Orrs Road locality

The 2020 Local Board Plan aims for this wider area to grow tourism and trade industry and maximise job opportunities for the community within the Auckland Airport precinct. The plan notes that the Airport and associated businesses create significant pressure on local roads.

Land use along SH20B is currently rural in nature with only a handful of commercial activities, primarily on the southern side. Manukau Memorial Gardens, a significant regional cemetery facility, providing chapel services, a viewing room and function lounge with a crematoria and burial plots occupies about a third of the land on the northern side of SH20B, including currently undeveloped areas. Market gardening and grazing occupy remaining land on the northern side.

The southern side, opposite Manukau Memorial Gardens is currently being used as a storage yard. Black Bridge large tree nursery is located adjacent to Prices Road, with direct access from SH20B.

Auckland Council's Colin Dale Park is a developing motorsports complex accessed off Prices Road which currently includes a BMX Club, motorsport track and the SuperThriller Jetsprint facility. It is anticipated this facility will continue to grow as a regional motorsports facility. The remaining land is Auckland Airport property, including a Park and Ride facility which is being constructed.

Figure 14: Manukau Memorial Gardens

3.5 Potential future social environment

A range of known public and private initiatives are planned along the 18 km overall Project corridor. These vary in scale from single property development to large scale transformation of an area, and include land use changes, housing and commercial development, enhancement of parks and green space, stormwater and transport infrastructure upgrades. This section provides an overview of some of these known plans and projects that will influence, and in some cases be a catalyst for change in the social environment over the next 10-15 years.

3.5.1 Eke Panuku

Auckland Council's urban development agency has provided information about their plans for the corridor through previous engagement with the Project. Their 'Transform Manukau' and 'Unlock Papatoetoe' programs include significant developments in those communities, and their land holdings along the route and near stations provide opportunities for the Project to enhance social outcomes through considered land use.

3.5.2 Auckland Council

Plan Change 78 to the Auckland Unitary Plan: Operative in part (**AUP:OP**) identifies areas for potential intensification which, if approved, will result in increased growth and density of housing as indicated in Figure 15. Further discussion about this is included in Section 7.5 of the AEE.

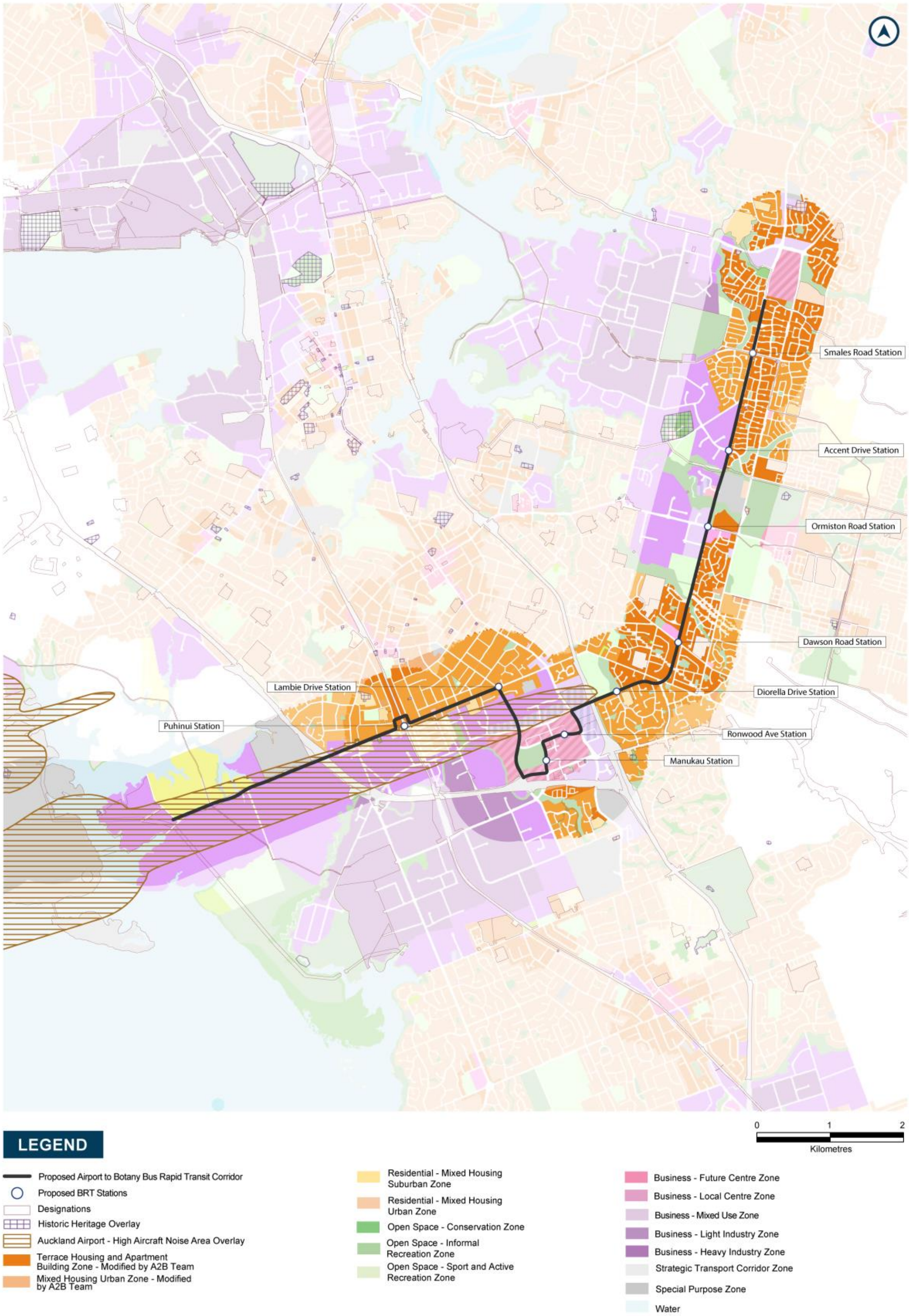

Figure 15: Indication of potential future intensification

3.5.3 Kāinga Ora-Homes and Communities

Central government's social housing agency, Kāinga Ora owns significant property along the corridor and in surrounding areas with significant developments planned in Manukau Central and Papatoetoe.

3.5.4 Local Boards

Local Boards have funding to develop and deliver initiatives in their communities as well as supporting those of Council. The Project area spans the Howick and Ōtara-Papatoetoe Local Boards both of whom, significantly for this Project, prioritise and support development of green spaces for walking and cycling within their Local Board Plans.

3.5.5 Auckland Transport

As the regional transport authority and project partner, interfaces with Auckland Transport are many and complex. This baseline focuses on Auckland Transport Future Connect which prioritises transport improvements at four key sections along the corridor, (Airport to Manukau, whole of Manukau Central, Te Irirangi/Ormiston intersection, and Te Irirangi/Ti Rakau intersection) within a 10 year timeframe, affecting significant transport and traffic changes before construction commences.

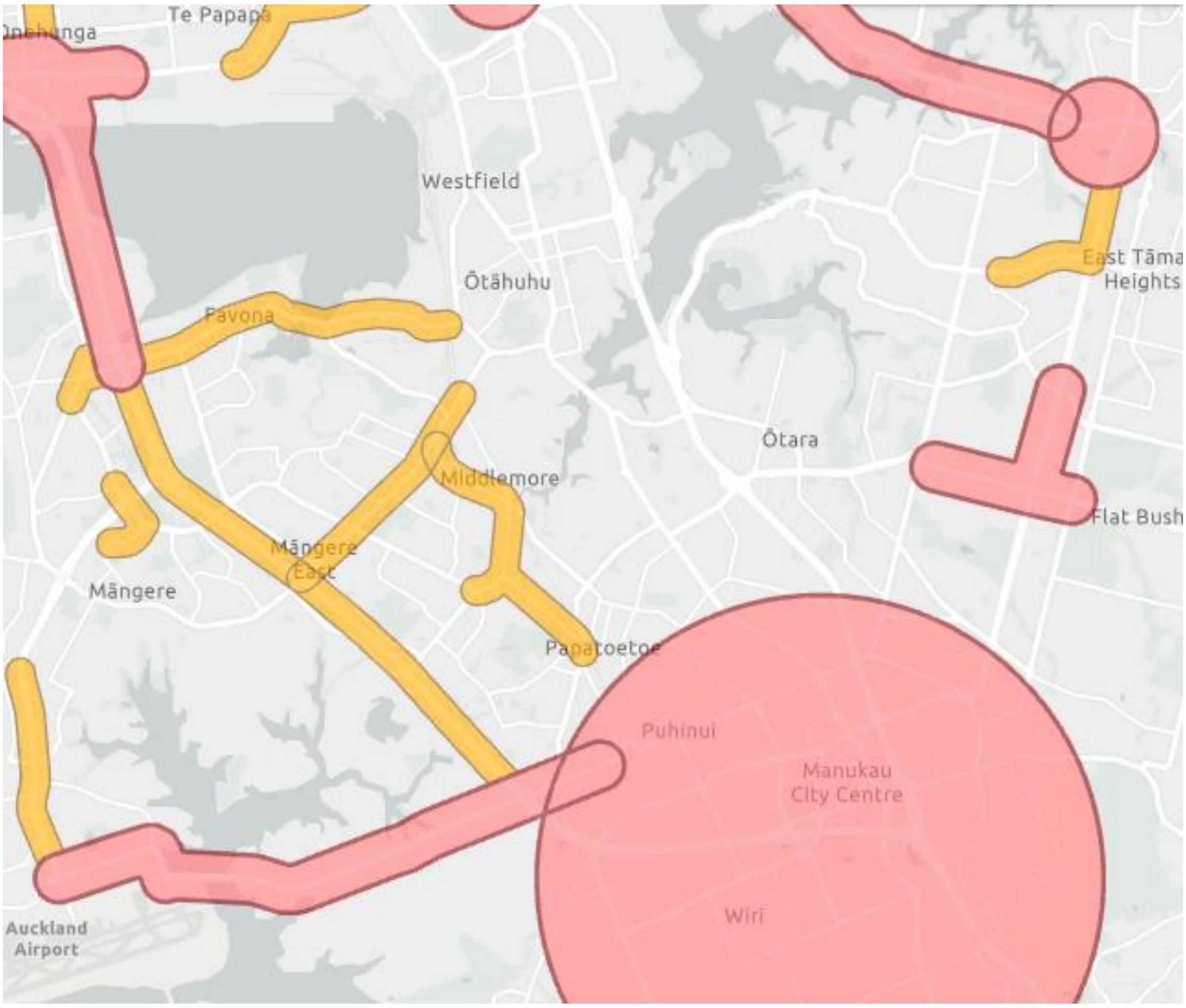

Figure 16: Auckland Transport Future Connect Focus areas for first 10 years

3.5.6 Manawhenua

As set out in the AEE, the Project traverses a significant cultural landscape which has been established through regular hui and site visits with Manawhenua and Cultural Values Assessments (CVA) prepared for the previous phases of the Project. The impacts on cultural landscape are not assessed or included in this Report. It is recognised that these matters will be addressed through ongoing partnership with Manawhenua in the future phases of the Project including detailed design.

Notwithstanding this, where appropriate, this baseline considers outputs from previous engagement with Manawhenua including projects they are involved with, and approaches for the Project to consider. It is noted that Manawhenua and the Ōtara-Papatoetoe Local Board are working together with respect to Puhinui Reserve – a green space with vital walking and cycling connection is proposed as part of the Project.

3.5.7 Auckland Airport

With significant land holdings that include expansive commercial and industrial developments, the Airport is more than just an anchor destination for the Project. Auckland International Airport has a $300 million transport hub underway which will place public transport connections within the terminals, including connections for the Project and future light rail. The HANA and MANA overlays impact much of the Project corridor at the western end as noted within the description of the existing environment. These overlays will also impact future development in areas, especially the Puhinui / Papatoetoe locality. Section 7 of the AEE also refers to these Aircraft Noise Area Overlays.

3.5.8 Private property owners

The corridor runs adjacent to and will serve private commercial and town centre developments, notably Ormiston Town Centre and Botany Town Centres, both of which have proposed BRT stations. Engagement with these property owners is not in scope for this baseline.

3.6 Potential change within Social Impact Assessment communities

This section looks at the likely combined outcomes of the players and plans described above for each of the five communities to paint a picture of how each community may change over the next 15 years – the timeframe to construction. It is noted that this section is provided as additional context in which to understand the social impacts which have been assessed based on the existing environment. While all areas are likely to undergo significant change, the pace and exact nature of that change cannot be determined. An assessment of social impacts based on the potential future change as described below would therefore lack any robustness.

3.6.1 Botany to Clover Park section: Rongomai Park to SH1 Interchange

Largely residential, the section of Te Irirangi Drive from Rongomai Park to the SH1 is also home to the Manukau Velodrome and Sports Bowl and the Rongomai Park sports clubrooms and fields. There is a petrol station, laundromat, and liquor store at the intersection with Dawson Road. The stretch of Te Irirangi Drive between Rongomai Park and Ti Rakau Drive is largely residential with two commercial centres along the way and Botany Town Centre at the eastern end.

- Higher density development:

  The AUP:OP provides for more intense residential development along the corridor, notably around the Ormiston Road intersection which is enabled for terrace housing and apartment buildings, and business mixed use within the Florence Carter Precinct adjoining Te Irirangi Road. Provision is made for development of the Ormiston Town Centre through a Business – Metropolitan Centre zoning.

  Significant social housing assets owned by Kāinga Ora in Clover Park are set for redevelopment and intensification under the change to the AUP:OP and the upzoning to the Residential – Mixed Housing Urban Zone. The plan also zones land around the Dawson Road intersection (Penion Drive) for development of terrace housing and apartment buildings with a local business centre zoning at that intersection. Publicly owned properties along the western side of the corridor could be redeveloped as residential or commercial. Higher residential density is enabled to a lesser extent (Mixed Housing Urban) along the rest of Te Irirangi Drive on both sides.

- Manukau Sports Bowl redevelopment:

  Eke Panuku has extensive redevelopment plans for the Manukau Sports Bowl and Velodrome. With upgraded and additional sporting facilities as well as walking tracks, playgrounds, and spaces for leisure and events, the sports bowl will become a popular destination for organised sports, community events and leisure with family and friends.

- Green corridors enabled for Smales Station:

  Walking and cycling paths are likely to be created through redevelopment of local green spaces Greenmount Reserve and Kellaway Reserve providing local access to Smales Station. It is anticipated Eke Panuku and Auckland Council will upgrade the reserves for community leisure and play, drawing more visitors to the area.

3.6.2 Manukau Central section: SH1 Interchange to Ihaka Place

Largely commercial, this section includes the retail, government, legal/financial services and hospitality businesses of Manukau Central with expansive commercial and industrial areas along the corridor to the east and west. The AUP:OP has zoned Manukau Central as a Business – Metropolitan Centre Zone, with areas of Business – General Business Zone and Business – Light Industrial Zone to the north and west respectively.

- More people calling Manukau Home:

  A multi-agency commitment to substantially increase the resident population of Manukau Central will be realised with residential developments from Kāinga Ora including a 16-level building with around 123 apartments proposed on Osterley Way, terrace housing development underway around Barrowcliffe Place and terraced housing and apartment buildings newly enabled by the AUP:OP along the Puhinui Stream through Wiri.

- The commercial and cultural heart of southern Auckland:

  Significant commercial developments are planned by Eke Panuku, utilising Auckland Council owned properties on Davies Avenue and Manukau Station Road for 10-12 level office buildings. Coupled with a mixed-use development planned at the Westfield carpark and a five-level building west of MIT, hundreds of new jobs will be located within an easy walk of Manukau Train Station.

Eke Panuku's planned community hub – Te Papa Manukau – along with a new Metro School will bring even more people into Manukau Central.

- A transport hub for city-wide journeys accessible by local walking and cycling networks:

  Putney Way will be redeveloped as the new main street of Manukau Central, connecting the existing train station to a revitalised Manukau Plaza and community centre in Osterley Way. Running adjacent, Davies Avenue will offer priority to walking and cycling, enabling local access to the bus interchange and train station, and connecting into local cycleways created during the upgrade of Hayman Park, and the green corridor of Puhinui Stream linking Papatoetoe through to Wiri.

  Safer walking and cycling and public transport (bus) improvements delivered by Auckland Transport and the Ōtara Papatoetoe Local Board provide car-free local and city-wide journeys.

3.6.3 Puhinui section: Ihaka Place to SH20/20B Interchange

Puhinui Road from Lambie Drive/Ihaka Place to the SH20/20B Interchange is largely residential with two blocks of neighbourhood retail and services on Puhinui Road and commercial and retail on Lambie Drive. Two of blocks north of the corridor (approximately 1 km) is Papatoetoe Town Centre, a busy commercial, industrial, and community hub, and the corridor detours around the newly redeveloped Puhinui Train Station which provides the primary public transport link to the Airport for Aucklanders via the southern and eastern train lines.

- Papatoetoe – a humming town centre:

  Significant urban development is in the pipeline for Papatoetoe town centre. The Eke Panuku plan 'Unlock Papatoetoe' aims to create a community hub through town hall and community centre improvements and enhancing open space to provide greater access and connectivity to the recreation centre and stadium.

- Higher density living around train stations:

  The application of the Residential – Terraced Housing and Apartment Buildings zone that covers the town centre and existing Papatoetoe Train Station, then stretching south towards Puhinui Station will see housing intensification and population growth in this area with many more residents in walking distance of Papatoetoe and/or Puhinui Station.

- More jobs, more shops, more services around Puhinui Station:

  Substantial commercial land use opportunities lie in public land holdings around Puhinui Station – largely with Eke Panuku, plus a few properties held by Auckland Council, and some residential properties owned by Kāinga Ora along Puhinui Road and within one block of the corridor.

- Lambie Drive Station:

Eke Panuku has land holdings around the future Lambie Drive Station at the intersection with Puhinui and Carruth Roads, offering the opportunity for jobs and businesses to be clustered around the station.

- A regenerated Puhinui Stream is the cradle of the local walking and cycling network:

In addition to the regeneration of Puhinui Stream, planned upgrades to Puhinui Domain, and stormwater upgrades (Eke Panuku, Auckland Transport, Manawhenua and the Ōtara-Papatoetoe Local Board) provide a green corridor to accommodate a local walking and cycling network linking residents in Papatoetoe with key destinations including Papatoetoe Town Centre, Papatoetoe Station, Puhinui Station, and Manukau Station further along. The Ōtara-Papatoetoe Local Board Plan prioritises funding and development of walking and cycling routes in their local paths plan.

3.6.4 Airport section: SH20/20B Interchange to Orrs Road

Land here is owned by Auckland Council, the Airport and privately owned properties all of which have a light industrial zoning for the most part. A small area of land on the northern side near Orrs Road has a Future Urban Zone which is planned for industrial use, under the HANA overlay. There are significant industrial/commercial growth plans along this section of road with new developments in progress to the south of the corridor. Council noise regulations apply through HANA and MANA overlays.

- Public transport and cycle connections are prioritised while maintaining movement of vehicles and freight:

– The Waka Kotahi One Network Framework (**ONF**) is a tool to help establish transport network function, performance measures, operating gaps and potential interventions for each road and street type. Waka Kotahi is currently completing the modal classification of its network, with this stage due to be completed in March 2023;
– Auckland Transport Future Connect assigns Puhinui Road from the Airport to SH20 as a major route for cycling and micro mobility, as an RTN corridor, and as a strategic arterial for general traffic. The significance of this section as a goods movement corridor is reflected in the level 1A freight classification – highest strategic value to freight; and
– The 15 years to construction timeframe will see change along this corridor with the development of industrial land, particularly on the southern side. Increased traffic volumes can be expected from this development, along with ongoing development and expansion of the Manukau Memorial Gardens and activity in the Airport precinct including cycleway extensions and improvements, and development of public transport facilities or services connected with the $300 million Airport Transport Hub.

4 Social baseline

The social baseline has two parts:

- A description of the Project's social area of influence; and
- Quantitative and qualitative descriptions of indicators relevant to each potential social impact (refer to **Appendix D** for details).

4.1 Social areas of influence

4.1.1 Different social groups likely to be affected

Based on an understanding of the Project, the existing social environment, desktop research, social groups most likely to be affected by the Project are considered to be:

- Landowners of potentially affected properties;
- Leaseholders, tenants and other occupiers of potentially affected properties;
- Business owners and operators;
- People employed in local businesses;
- Near neighbours;
- People living and working in the area;
- Surrounding local communities – Botany, Ormiston, Clover Park, Manukau, Papatoetoe, Puhinui;
- People who purchase goods and services from the area;
- People who use community facilities and open space areas within the area;
- People travelling through the area, including commercial road users;
- People in Local Board areas, especially Ōtara-Papatoetoe and Howick; and
- People in the wider Auckland Region.

4.1.2 Places of social value or importance

Places of social value or importance are the built and natural features located on or near the Project site or the surrounding area that have been identified as having social value or importance.

Based on the description of the existing environment and a review of literature including local government planning documents, the built and natural features located near the Project area or surrounding area that have been identified as having social value or importance are listed and described in Table 3 and also shown in Figure 17.

Table 3: Socially significant built and natural features

Type of facility or place	Feature	Significance	For whom
Botany – Clover Park			
Education	Redoubt North School	A combination of a preschool and elementary school. A quarter of attendees are Māori and half have Pacific heritage, with Samoan being the largest group.	Families in the Clover Park area with school aged children

Type of facility or place	Feature	Significance	For whom
Education	Chapel Downs Primary School	A primary school that incorporates Te Reo into formal class settings.	Families in the Clover Park area with school aged children
Education	Tangaroa College Haumia Way, Ōtara	Secondary School for years 9 – 13 with just over 1000 students, with around 80% Pacific people.	Families in the Clover Park, East Tāmaki area with secondary school aged children
Education	Sancta Maria College	Co-ed Catholic School providing education to around 1000 students from years 7 – 13.	Families in the Flat Bush, Dannemora and wider area with secondary school aged children
Education	Little Learners Childcare	Childcare facility located in the Botany South area.	Families in the Botany South and Dannemora area with pre-school aged children
Health and Medical	Dannemora Medical Centre and Pharmacy	Local medical centre and a pharmacy for the Dannemora and East Tāmaki Heights area.	Residents in the East Tāmaki Heights and Dannemora areas
Health and Medical	Metlifecare - Dannemora Gardens	Retirement village with a variety of services for residents.	Residents of the village
Health and Medical	Botany South Medical Centre	Providing medical services to the Botany and Dannemora communities.	Residents in the Botany South and Dannemora areas
Manukau Central			
Education	MIT Manukau	Manukau campus for the Manukau Institute of Technology providing tertiary education.	Residents of southern Auckland
Education	AUT South Campus	Southern campus for AUT providing tertiary education.	Residents of southern Auckland
Health and Medical	Turuki Healthcare	A local medical centre that is located in the central area of Manukau.	Residents primarily from the Manukau area
Local Community Facility	Greyhound Conference & Function Centre	Part of the Manukau Sports bowl. A greyhound racing track and conference/event facilities.	Greyhound racing community across Auckland. Organisations within and outside of southern Auckland having events
Local Community Facility	Business Manukau	The Business Association District (**BID**) serving the needs of all businesses in the Manukau area. Includes most businesses potentially affected by the Project.	Business owners and operators in the Manukau BID area
Local Community Facility	Manukau Library	Local library within Manukau Central providing access to computers, internet access, printing and copying and books.	Residents and visitors to Manukau

Type of facility or place	Feature	Significance	For whom
Local Community Facility	Manukau Tennis, Sports and Community Centre	Part of the Manukau Sports bowl complex at the northern end. Part of Tennis Auckland providing tennis coaching and facilities in southern Auckland. Has three different outdoor areas and two meeting rooms, all are available for hire.	Residents of southern Auckland, and visitors who hire facilities
Recreation / Open Space	Hayman Park	Suburban open space park with a large playground, natural play space, toilets, skate park, basketball court, picnic tables and seating.	Those living within or near to, and those working within the Manukau Central area
Recreation / Open Space	Manukau Sports Bowl	Developed for the Commonwealth Games in the 1980's, it currently caters for cycling, tennis and soccer and cultural gatherings like Polyfest. Currently within the planning states of a redevelopment proposal. Eke Panuku, the Local Board and Council are working to prepare a plan for redevelopment of the whole sports bowl area.	Residents of southern Auckland and visitors from other areas attending events
Government	Inland Revenue Manukau	Provides services to the local Manukau community.	Residents of the Manukau and wider southern Auckland community
Government	Ministry of Social Development	Provides employment, income support and superannuation services to the local Manukau area.	Residents of the Manukau and wider southern Auckland community
Government	Careers New Zealand	Provides support to the local Manukau community to finding job opportunities.	Those within the Manukau area and wider southern Auckland seeking support in gaining or changing employment
Government	Ministry of Pacific Peoples	Northern Region Office of the Ministry providing voices to the Pacific communities.	Pacific people from Auckland, Northland, Waikato and Bay of Plenty
Government	Work and Income	Social support services for people in the Manukau area relating to employment and income support.	Residents and employers in the Manukau area
Government	Manukau Public Defence Service	Independent criminal law practice providing advice and representation to defendants who have legal aid in criminal cases. Also oversee the duty lawyer services in the Manukau courts.	People within the Manukau area who require legal aid in relating to criminal proceedings
Community services	The Cause Collective	A Pacific social change agency working in the South Auckland area.	Pacific people of southern Auckland

Type of facility or place	Feature	Significance	For whom
Emergency Services	Papatoetoe Fire Station	A 24/7 crewed station responding to Fires, Medical emergencies, Motor vehicle accidents, Search and rescue, Civil Defence and natural disaster responses.	Southern Auckland community
Puhinui / Papatoetoe			
Education	Puhinui School	Primary school for around 600 years 1 – 6 children.	Families in the Puhinui area with school aged children
Education	Te Kōhanga Reo ki Puhinui	Pre-school facility near the Puhinui Train Station.	Predominantly Māori families from the Puhinui area with pre-school aged children
Education	Pukeko Preschool Papatoetoe	Pre-school facility.	Families in the Puhinui area with pre-school aged children
Health and Medical	Puhinui Medical Centre	Medical centre with two GP's providing general practitioner services.	Residents in the Puhinui area
Place of Worship	Kingdom Hall of Jehovah's Witnesses	Spiritual place of worship.	Parishioners and visitors primarily from the Puhinui and Papatoetoe area
Transport Interchange	Puhinui Station	Major bus and train interchange providing connections to the Airport. Also the primary stop for those travelling by train from the south and wanting to access Manukau Central.	People from across Auckland and beyond, some traveling to the Airport
SH20/SH20B Interchange – Orrs Road			
Cultural or spiritual	Manukau Memorial Gardens	Regional cemetery providing chapel services a viewing room, function lounge, crematoria and burial plots.	People across the Auckland area visiting burial plots or participating in funerals, memorials and associated activities
Recreation / Open Space	Colin Dale Park	Regional motorsports facility including a motorsports track, jetboat course, BMX track and horse trail.	People across the Auckland area and beyond participating in motorsport

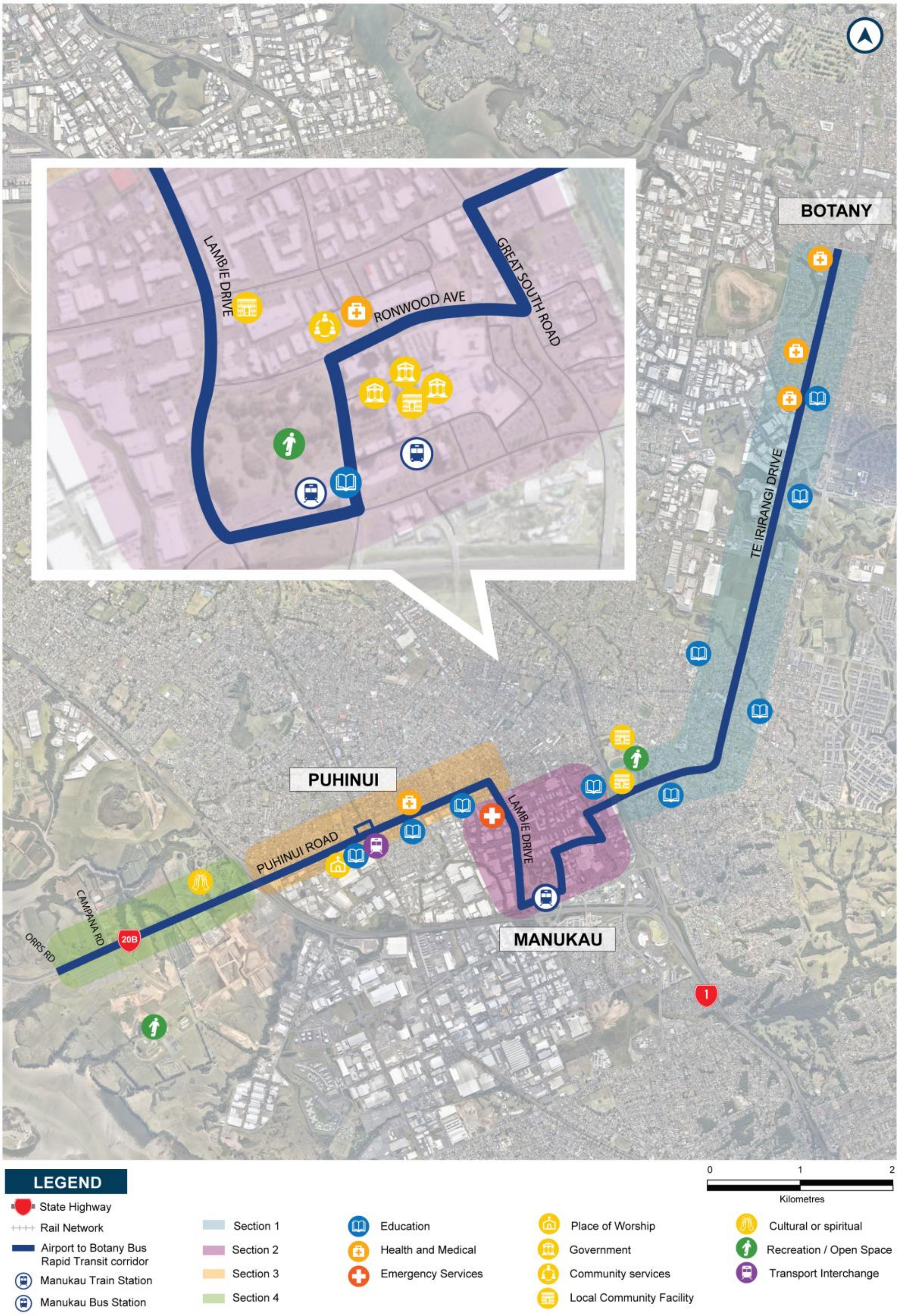

Figure 17: Map showing places of social value or importance

4.1.3 Geographical social areas of influence

The social areas of influence for the project have been defined as the areas shown in Figure 18 and noted as follows:

- Localities, being areas generally within a 400-500 m radius of the Project; and
- Local Board areas of Ōtara-Papatoetoe and Howick as the local board areas the project traverses.

These social areas of influence have been determined by considering the different social groups likely to be affected, the places of value or importance and social trends or change. While the Project will have a differential distribution of social impacts (positive and/or negative) on the wider Auckland Region it has not been included as a specific social area of influence for the identification and assessment of social impacts. Data for the Auckland Region is shown for some indicators for data comparison only.

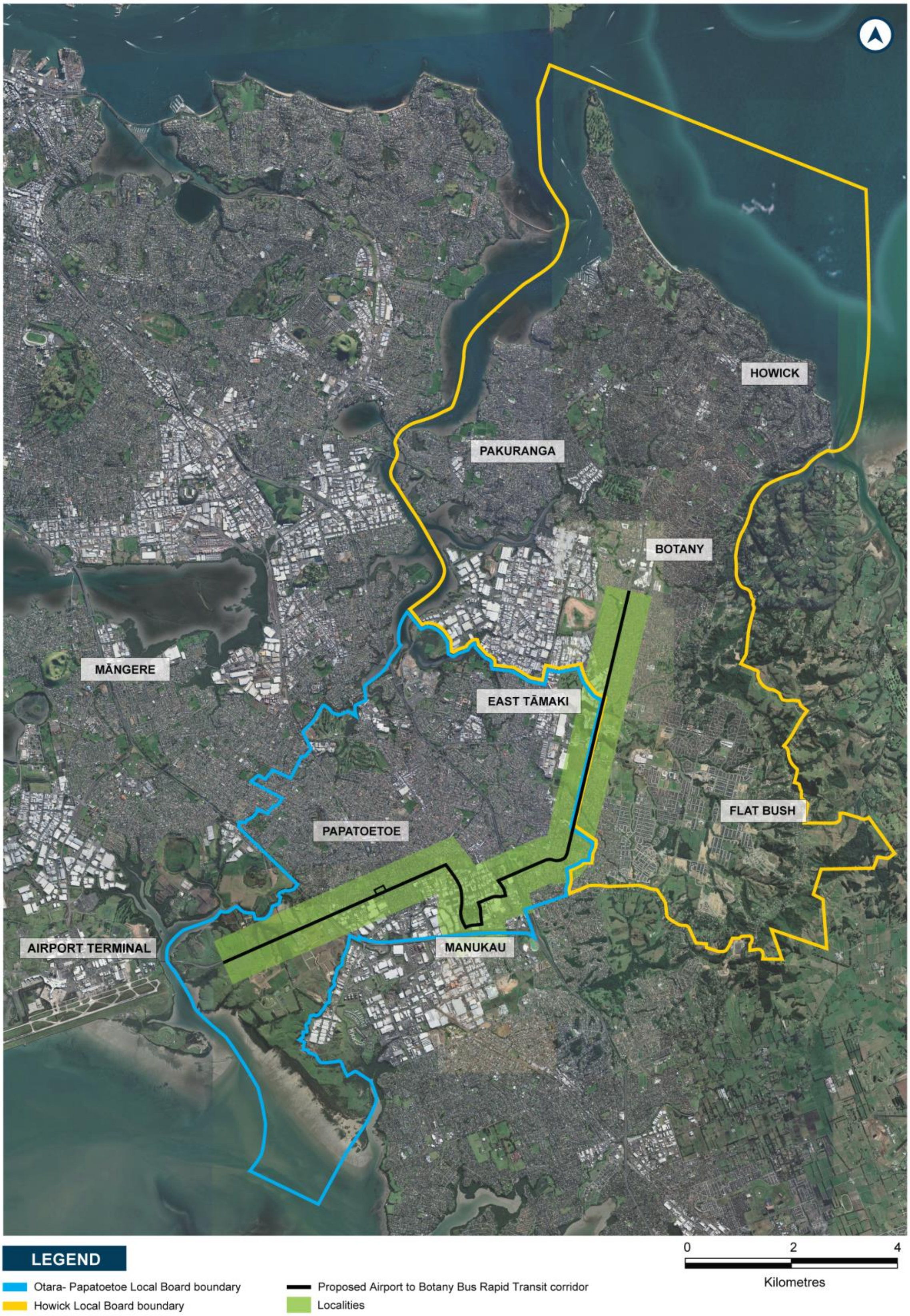

Figure 18: Geographical social areas of influence for the Project

4.2 Indicators for social impacts and baseline information

The choice of indicators for each social impact was based on stakeholder engagement, known available data and where possible, the ability for data collection to potentially be repeated in a timely and cost-effective way. Indicators are shown below in Table 4.

Table 4: Social Indicators

Impact area	Social Indicators	Comment
Way of life	Travel to work	One of the primary objectives of the project is to increase accessibility of high quality rapid public transport to populations in south and eastern Auckland.
Family and community impacts	Urban life	Urban life is the everyday activity that goes in within and between buildings in a city and includes data on behaviour and activity.
Quality of the environment	Urban life	Urban life is the everyday activity that goes in within and between buildings in a city and includes data on behaviour and activity. An increase in urban life activity can indicate an improved urban environment.
Health and wellbeing	Physical and mental heath	Improved footpaths and cycleways as part of the Project provide for more active lifestyles which could impact people's physical and mental health.
Equity	Deprivation from the Index of Multiple Deprivation	With the project providing opportunities for increased access to education and employment in particular and an improved more vibrant urban environment in Manukau Central in particular it could be expected that this has a positive impact on deprivation indicators included in the Index of Multiple Deprivation.
Socio-economic impacts	• Income; • Education; and • Employment status.	Increased access to education and employment opportunities are anticipated as a result of the Project.

Data for the social baseline was collected from the following sources:

- SIA engagement (refer to **Appendix B**);
- Desk based research (references provided in **Appendix A**); and
- Professional experience of the SIA practitioner.

This section is a summary of the baseline information for each social impact area. **Appendix D** outlines the indicators and includes more detailed baseline data for indicators with quantitative data sets.

Way of life

In 2018, the vast majority of residents identified that their main method of transport to work was traveling by private vehicle. Despite this, the use of private or company vehicles for journeys to work was lower than the Auckland Region for all localities except the Botany to Clover Park locality which has poor public transport accessibility.

Social housing is located across the Auckland Region, with the Ōtara-Papatoetoe Local Board area having the second highest number of social housing in Auckland. Despite this, demand for social housing is considerably higher than supply and has been increasing.

Cultural impacts

Cultural impacts include shared beliefs, customs, values and stories, and connections to land, places and buildings.

Impacts to culture can be influenced by ethnicity which can drive beliefs and attitudes. Along the Project corridor, there are a higher proportion of people who identify as being of Pacific or Māori decent compared to the Auckland Region. Additionally, residents who identified as Asian increased from the 2013 Census to the 2018 census by around 10% which is substantially higher than the Auckland Region.

With regard to Manawhenua, it is noted in the AEE that the Project traverses a significant cultural landscape which has been established through regular hui and site visits with Manawhenua and Cultural Values Assessments (**CVA**) prepared for the previous phases of the Project. The impacts on cultural landscape are not assessed or included in this Report. It is recognised that these matters will be addressed through ongoing partnership with Manawhenua in the future phases of the Project including detailed design.

Family and community impacts

Family and community impacts, including its composition, cohesion, character, how it functions, and sense of place can be measured considering the age of the population, insights into housing and measures if neighbourhood character, vitality, variety and relevance.

Along the Project corridor, there is a significant proportion of people who have been in their homes for four years or less. The Puhinui/Papatoetoe area also experienced a considerable number of bond lodgements in the past year. This data could indicate considerable building activity in the area enabling more people to move into areas, or a more mobile population.

Lifestyle data analysed through the Neighbourlytics™ report noted the character, variety, vitality, and relevance of the various neighbourhoods the Project traverses. The Project corridor is primarily characterised as being "Business and Service" orientated indicating residents have a strong relationship to their local area as a result of the services provided. Variety along the Project area is diverse with highly dominant retail destinations. Vitality showed strong networks of activity in Manukau Central. As acknowledged earlier, the area will change over time and it is expected there will be an increased vibrancy in some areas.

The age of residents along the transit corridor is lower than the Auckland Region. There are younger populations in the Puhinui/Papatoetoe and the Clover Park to Botany localities compared to the Manukau Central locality which has a low overall population. This could be indicative of a tertiary student and locally employed demographic.

Quality of the environment

Quality of the environment includes access to and use of ecosystem services; public safety and security; access to and use of the natural and built environment, and its aesthetics value and/or amenity; the quality of the air and water people use; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation; their physical safety; and their access to and control over resources.

Crime in Auckland over the last year has decreased in some areas like sexual assault and abductions but it has increased in other areas like burglaries and theft. Manukau Central is rated highly compared to other areas along the locality.

Decision making systems

Decision making systems relates to the extent to which people can have a say in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose.

The ability to have a say in decisions during this current phase of the project is limited to potentially affected landowners in relation to the potential impacts on their property, and other stakeholders in relation to their specific interests, such as other government agencies the project interacts with (Eke Panuku and Kāinga Ora) and Manawhenua.

Since 2019 when engagement was undertaken during the business case stage when decisions in relation to the route of the Project were made some people have moved away from the area and new people have moved in. This in turn has led to a lack of knowledge about the Project for many and a feeling they have been excluded from the ability to influence decision making *"I don't know about this project and now you tell me the decision is made already."*

Health and wellbeing

Health and wellbeing indicators measure physical, mental, social and spiritual wellbeing, as well as disease and disability. It also includes psycho-social impacts such as solastalgia (a form of mental or existential distress caused by environmental change).

Deprivation along the corridor was relatively high in areas like the Puhinui/Papatoetoe locality and the Manukau Central locality. Areas like Clover Park and surrounding SA2s experienced similar experiences to the Puhinui/Papatoetoe locality and the Manukau Central locality whereas Dannemora onwards towards Botany experienced lower levels of deprivation.

As noted in the NZ Health Survey, Māori and Pacific adults are 1.6 and 1.4 times as likely to experience psychological distress compared to non-Māori and non-Pacific adults. With a higher Māori and Pacific peoples population across the corridor compared to the Auckland Region, psychological impacts of the Project could be greater.

Personal and property rights

Personal and property rights, including whether economic livelihoods are affected, and whether people experience personal disadvantage or have their civil liberties affected can be measures qualitatively.

Stakeholder feedback has identified impacts associated with feelings of loss of autonomy of decision making about future of land, specifically for landowners affected by the designation.

Fears and aspirations

People's perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children can only be measured in a qualitative manner.

Engagement feedback identified there is uncertainty for business owners in planning for the long term, particularly for commercial landowners who may only be affected by a partial land requirement. This could impact the ability to retain and/or secure ongoing or future tenancies prior to the land being acquired.

Equity impacts

Equity impacts relate to the distribution of impacts across the community and generations (intergenerational impacts). How people could be impacted is based on where they live and work and their relationship with the Project now and in the future.

People who live, work and run businesses closest to the Project are more likely to experience negative social impacts. People who might potentially work for or be a supplier to the Project in the future are likely to receive the benefits. In addition, those who are more deprived tend to be more vulnerable than those from less deprived communities.

Deprivation scoring identified that residents who live in areas like Puhinui, Manukau Central and Clover Park were more deprived than residents who lived in the Botany area.

Within all Project localities, the percentage of residents without access to a motor vehicle has been slowly decreasing. The percentage of residents without access to telecommunication has decreased overall. Areas who have higher percentages of residents receiving social services may not have access to some form of telecommunications.

Socio-economic impacts

Socio-economic impacts include the standard of living, level of affluence, economic prosperity and resilience, property values, employment, replacement costs of environmental functions and economic dependency

Income within the localities were within the middle-class income bracket. It is noted that income one of a number of measures determining deprivation. Other factors such as employment, housing, crime, heath access and education all influence deprivation scores.

Education is a vital pathway that shows the ability for residents to have flexibility in job opportunities. Residents from Manukau Central locality had higher qualifications than other areas that are of similar deprivation levels.

5 Review of social impacts of rapid transit projects

5.1 Social impacts in other rapid transit projects

This section provides the findings of a high-level review of publicly available information on comparable rapid transit projects to test and justify the magnitude and likelihood of social impacts included in this assessment. A description of each of the projects is below and Table 5 notes the impacts (positive and negative) identified during the review of published information about each project and a further description of impacts by social impact area is provided. Rail, including light rail, has been used as a comparison as that is generally the type of RTN projects which have published research relating to experienced social impacts. While bus rapid transit line construction usually is less intensive and shorter construction periods than light rail, research has determined that the impacts on businesses would be similar[8].

It is possible that the projects reviewed below generated additional social impacts, both positive and negative, that have not been reported on publicly and are therefore not part of this review. A summary of impacts from each project is presented in Table 5.

California High-Speed Rail, California, USA[9]

The California High-Speed Rail project is estimated to cost $105 billion (USD) and is managed through the California High-Speed Rail Authority. The intent is to connect six of the largest 10 cities in the state of California between Sacramento and San Diego with 1,287 km of high-speed rail. The project is currently underway.

City Rail Link – Aotea Station, Auckland, New Zealand[10]

The City Rail Link (**CRL**) is a $4.4 billion (NZD) project and the largest infrastructure project New Zealand has ever built. It is being led by City Rail Link Ltd and funded jointly by the Crown and Auckland Council. City Rail Link Ltd will handover CRL to Auckland Transport to run the services when completed.

The CRL will provide a 3.45 km twin-tunnel underground rail link up to 42 m below the Auckland City Centre. CRL will include the transformation of Waitematā Station (Britomart) into a two-way through-station that better connects the city's rail network. CRL will at least double Auckland's rail capacity when fully operational. The project is currently under construction and planned to be completed in late 2024 however, the impact of the Covid-19 pandemic may impact on the completion time.

Brisbane Cross River Rail, Australia[11]

Cross River Rail is a 10.2 km rail line which includes 5.9 km of twin tunnels under the Brisbane River and CBD. It also includes several new stations and upgrades to existing stations. It is funded via a

[8] Business Impact Mitigations for Transit Projects Prepared for the Oakland Sustainable Neighborhoods Initiative November, 2013 accessed at https://www.policylink.org/sites/default/files/FINAL%20PolicyLink%20Business%20Impact%20Mitigation%20Strategies_0.pdf

[9] https://hsr.ca.gov/

[10] https://www.cityraillink.co.nz/

[11] https://crossriverrail.qld.gov.au/

capital contribution of $5.4 billion (AUD) and 1.5 billion secured through a Public Private Partnership. Construction commenced in 2019 and the first services are expected to be in operation in 2025.

Sydney Light Rail, Australia

Sydney light Rail (**SLR**) incorporates two light rail construction projects, the Inner West Light Rail CBD extension (which was opened in 2014) and the CBD and South East Light Rail (completed in 2020). Together these a create a 12 km route with 19 stops. SLR was a Transport for New South Wales, government programme. The total cost exceeded $3.1 billion (AUD).

City to Gungahlin Light Rail, Canberra, Australia

This is a 12 km light rail route connecting the northern area of Gungahlin to Canberra's city centre. It's the first phase of a planned city-wide light rail network. Construction commenced July 2016 and light rail started operating in April 2019. There are 13 stops along the route with services every six minutes during peak periods and every 10-15 minutes at other times.

In September 2018 the ACT Government undertook an assessment of the impact of all ACT Government led construction activities on local business in the Gungahlin Town Centre and in May 2020 published the Benefits Realisation Snapshot for Major Projects Canberra.

Paramatta Light Rail, Australia[12]

Paramatta Light Rail is estimated to be a $2.4 billion (AUD) project. It includes construction of 20+ km of light rail linking key parts of Western Sydney. It is being led by Transport for New South Wales and is being delivered in two stages - Westmead to Carlingford; and Paramatta CBD to Sydney Olympic Park. Construction of Westmead to Carlingford is underway and is expected to be completed in Dec 2023. Funding has been secured for Paramatta CBD to Sydney Olympic Park.

Table 5: Summary of social impacts in comparable Rapid Transit Projects

Social Impacts (Positive and negative)	**Rapid Transit Projects**						
	California High Speed Rail	**CRL – Aotea Station**	**Brisbane Cross River Rail**	**Sydney Light Rail**	**Sydney Metro West**	**City to Gungahlin Light Rail**	**Paramatta Light Rail**
Project Phase: Planning							
Community dissatisfaction	✓		✓				
Project Phase: Construction							
Noise and vibration (hours of activity, excessive, etc.)	✓	✓	✓	✓	✓	✓	✓
Business disruption, incl visibility, wayfinding, timing of deliveries, utilities shutdowns	✓	✓	✓	✓	✓	✓	✓

12 https://www.parramattalightrail.nsw.gov.au/

Social Impacts (Positive and negative)	Rapid Transit Projects						
	California High Speed Rail	CRL – Aotea Station	Brisbane Cross River Rail	Sydney Light Rail	Sydney Metro West	City to Gungahlin Light Rail	Paramatta Light Rail
Businesses loss in revenue	✓	✓		✓		✓	✓
Access and parking, incl blocking loading zones, lack of loading zones, traffic layout changes		✓				✓	✓
Active parking management strategies, including onsite parking for construction workers to mitigate public parking shortages			✓				
Amenity (litter, cleanliness, lighting, worker behaviour – smoking near businesses)		✓					✓
Communication – poor comms to businesses, not enough notice, accuracy of info		✓				✓	
Good communication with community	✓	✓	✓				
Air quality (dust, and congestion)		✓				✓	✓
Safety (pedestrian access and trip hazards, lighting, antisocial workforce behaviour)			✓				
Stress – mental health and wellbeing	✓						✓
Worker health and safety incidents							✓
Property acquisition	✓		✓				
Increased traffic congestion			✓				✓
Business support during construction	✓		✓	✓		✓	✓
Increased employment	✓		✓	✓		✓	

Social Impacts (Positive and negative)	**Rapid Transit Projects**						
	California High Speed Rail	**CRL – Aotea Station**	**Brisbane Cross River Rail**	**Sydney Light Rail**	**Sydney Metro West**	**City to Gungahlin Light Rail**	**Paramatta Light Rail**
Increased education and skills development opportunities for the communities				✓			
Disruption to way of life and daily living routines.	✓			✓			✓
Loss in local employment (inc. due to business relocation or acquisition)	✓						✓
Changes to social cohesion and community composition due to loss of community meeting spaces and social services.	✓	✓					✓
Reduction in shoppers in retail areas in proximity to construction activity						✓	
Project Phase: Operation							
Permanent loss of heritage buildings / places of significance to affected communities	*Not complete*	*Not complete*	*Not complete*		*Not complete*		✓
Increased access to employment, education and community facilities				✓			✓
Boosted local business activity and visitation						✓	✓
Provision of local employment during project development, delivery and/or operation						✓	
Catalyst for other investment in the area – resulting in desired intensification and population growth						✓	

Social Impacts (Positive and negative)	Rapid Transit Projects						
	California High Speed Rail	**CRL – Aotea Station**	**Brisbane Cross River Rail**	**Sydney Light Rail**	**Sydney Metro West**	**City to Gungahlin Light Rail**	**Paramatta Light Rail**
Increased amenity in areas						✓	

5.2 Positive impacts of rapid transit corridors

There are a number of studies into the benefits of light rail as a form of rapid transit. The Tourism and Transport Forum of Australia (2010) researched a number of international light rail projects and the Paramatta Light Rail Business Impact Assessment (HillPDA Consulting, 2017) included an extensive literature review of international light rail projects. As noted above, while bus rapid transit line construction usually is less intensive and shorter construction periods than light rail, research has determined that the impacts on businesses would be similar[13].

This research found significant benefits including:

- Increased connectivity and interaction between communities as a result of increased accessibility.
- Improvements in liveability and amenity of adjacent areas through increased transport choice and investment activity.
- Positive physical and mental health and wellbeing outcomes.
- Contributions towards reducing congestion and therefore vehicle emissions.
- Increased productivity through greater urban mobility and transport choice.
- Changes in urban travel behaviour through mode shift.
- Further details on other positive impacts identified in the studies is outlined below.

Economic development and productivity

Improvements to public transport can provide economic benefits to businesses. This is particularly evident in metropolitan areas where cost savings and productivity gains tend to be higher than in other areas. An increase in the use of public transport along with it as a catalyst for, or support to, more efficient and intensive land use, can result in savings and efficiency gains for businesses, including congestion reduction, road and parking cost savings and consumer savings. HillPDA notes *"these economic savings and efficiency benefits filter through the economy as savings to consumers, businesses and governments, making a city and region more productive, attractive to investment and competitive."*

Productivity gains can be realised by making labour markets more accessible as more people have access to better transport choices enabling greater participation in employment activity.

Urban renewal and development

[13] Business Impact Mitigations for Transit Projects Prepared for the Oakland Sustainable Neighborhoods Initiative November, 2013 accessed at https://www.policylink.org/sites/default/files/FINAL%20PolicyLink%20Business%20Impact%20Mitigation%20Strategies_0.pdf

Light rail can also help strengthen development in existing neighbourhoods, rejuvenate declining areas and attract new clusters of development and businesses around stations/stops. Research indicates these benefits are more evident in areas with existing poor levels of public transport.

There are also significant benefits to be gained where the light rail system is planned with complementary land use policies. When stops/stations are in areas where the existing surrounding land uses and policies are conducive to high-density development, they can also have positive impacts to business development and quality of life. It can also stimulate local investment activity including urban renewal and residential and commercial projects. Some areas that have developed light rail routes have experienced an increase in retail activity in areas adjacent to the light rail line, the development of new residential and commercial areas, and increased employment nodes.

It is noted that since the completion of the City to Gungahlin Light Rail Project a number of new commercial complexes have been developed in neighbouring suburbs. In addition, the population in Gungahlin itself grew substantially, increasing the local customer base in Gungahlin Town Centre, which is anticipated to, in the future, contributing to changing behaviours and consumer trends in the area.

Land values

As a relatively permanent investment along a fixed corridor, light rail can influence land uses and increase nearby property values. Research has shown there is a strong positive connection between light rail and land values, even in the planning (or pre-construction) phase of projects. Increased land values for businesses can incentivise redevelopment while maximise returns for investment property owners. Increased redevelopment can revitalise an area increasing its amenity and popularity with potential consumers and employees.

Studies show that plans for light rail can increase land values and discourage low-density development that does not make effective use of the identified stops/stations and land values increase approximately three years after plans for the project are announced or one year prior to construction (assume whichever is earlier).

Table 6: Increase in value of properties in proximity to light rail[14]

Project	Property type	Distance from station	Increase in value
Metrolink	House	30m	32%
Santa Clara Valley Transport Authority (VTA)	Apartment	400m	45%
Santa Clara Valley Transport Authority (VTA)	Office	400m	120%
Dallas Area Rapid Transit (DART)	Retail	400m	30%

[14] From the Tourism and Transport Forum of Australia (2010)

5.3 Potentially relevant negative social impacts by impact area

Way of life

- Changes to daily living routines as communities and neighbourhoods were disrupted through construction. It is noted that once projects became operational, previously disconnected areas gained improved connection to key regional employment hubs, creating greater employment opportunities. Additionally, the construction project, as well as later operational stages, attracted an increased amount of people to the area, resulting in boosted local business activity and visitation in some cases.
- Local residents and businesses were subjected to reduced amenity and health outcomes due to construction noise, dust and vibration impacts, as well as loss in local open space and community facilities. Construction also caused negative visual impacts due to the establishment of hoarding and changed wayfinding.
- Increased traffic congestion resulted in road blockages, truck and heavy vehicle movements and cumulative impacts associated with other construction of nearby projects. Reduction in parking availability also occurred due to changed road conditions and demand for parking from the construction workforce.
- Loss in revenue for local businesses directly affected by construction as road blockages or disruptive construction may redirect regular businesses customers.
- Loss of local employment/ livelihood due to acquisition of local businesses or businesses voluntarily relocating to avoid significant construction impacts.
- Workers' safety can be compromised due to poor safety policy and monitoring, as seen in the Crossrail project where there was one fatality and two severe workplace incidents occurred.
- Changes to pedestrian and vehicular accessibility to local town centres, including commercial and residential land use. Changes to local road access and through-routes.

Family and community

- Loss of valued public spaces such as parks, churches and community centres due to property acquisition or temporary construction of commercial accommodation, as seen in the Brisbane Cross River Rail project, whereby five community properties were acquired and in the California High Speed Railway where a number of community / social services facilities were demolished.
- Changes to community character and sense of place due to loss or modification to valued landscape, parks, gardens, local businesses and social infrastructure, along with places of particular local cultural or historic significance. This was particularly evident in the Brisbane Crossrail project, as historic buildings including several Victorian Buildings and the Astoria Theatre were demolished. A significant number of buildings were demolished including a heritage listed hotel.
- Changes to the social cohesion and community composition due to temporary or permanent loss of community meeting spaces and social services. Disruption to social relationships and connections to community through impacts to schools, sporting clubs, community groups and neighbour connections and trust.
- Reduced amenity due to noise, dust and vibration impacts and establishment of construction sites.
- Loss of business serving smaller communities.

Fears and aspirations

- Community fears towards social dislocation caused by acquisition as community members with strong ties leave the area, affecting local schools, sporting clubs, and regular social events.
- Concern around changes to hours of works, increases in noise, and community safety.

Socio-economic

- Loss of employment and livelihood as a result of property acquisition or business disruption.

5.4 Responses and mitigation measures by other projects that could be relevant

Early engagement

- Early community consultation was a common activity across the reviewed projects to provide community members with input on construction effects, record complaints and inform and involve the community throughout the detailed design and construction. This was intended to help mitigate community concerns and fears, as well as to work with the community to mitigate negative construction impacts. Nearly all projects included clear and timely communication with communities about construction plans and processes which is essential to mitigate community fears and manage expectations. Engagement strategies included means for community members to express concerns, including through direct contact hotlines etc.
- Various plans were created to ensure the construction impacts were mitigated as best possible, including creating a detailed traffic management plan for different precincts for lengthy projects. Examples of these management measures include operating the majority of truck movements outside of peak periods, designating construction haulage routes away from local street networks and identifying ways of moving excavated material away from construction work sites and onto arterial roads as quickly and efficiently as possible.

Co-design of mitigation measures

- A number of the reviewed projects undertook engagement to co-design mitigation measures to address social impacts of the projects, and respond to community concerns:
- Brisbane Cross River Rail engaged with local community groups throughout the project in the design of public art or rehabilitation of open space areas which may assist in strengthening community bonds.
- Community reference groups were created across the majority of projects including California High Speed Rail and Auckland City Rail Link. It is likely that these groups were involved in informing the project team on the development of social mitigation measures to respond to community concerns.

Ensuring access to community infrastructure

- To mitigate shortages in public parking availability due to parking demands from construction workers, Brisbane Cross River Rail provided workers across all sites with on-site parking.
- Close consultation with the Network Utility Operator was carried out in the Auckland CRL to minimise and reduce all possible disruption potential to local residents and businesses. All residents were also shown images of how the construction would look prior to the commencement of works to allow the community to understand how accessibility would be affected.

Maintaining community character

- Changes to the local community character and sense of place are a significant impact to communities. The Brisbane Cross River Rail involved local community groups through the project such as design in the public art or rehabilitation of open spaces areas in an attempt to strengthening community bonds.

Support to affected owners and occupiers

- The Paramatta Light Rail and Brisbane Cross River Rail projects are implementing a range of mitigation measures aimed to provide the community with greater certainty, expectations and information about the project. This includes early community engagement and easily contactable members of the project team 24/7, appointing a social worker to assist with households moving, providing a central point of contact for affected households, consulting with the community on how the design will align with the concept design, and approaching relocation on a case-by-case basis.

Proactive management of disruption to businesses

A number of projects developed a business assistance programme which varied in what it included. The Sydney Light Rail approach was noted as 'unprecedented' in a post project review, despite also being 'too little too late'. Paramatta Light Rail has also developed a multi-faceted approach to manage the impacts of construction on businesses. Brisbane's Cross River Rail connects small—medium businesses to Queensland State Government support and resources which can assist them in becoming suppliers to infrastructure projects.

Paramatta Light Rail has implemented a number of activities to support businesses, with the work to develop the 'package' of business support initiatives being developed in conjunction with businesses prior to construction commencing. Several Business Advisors, with skills in sectors relevant to the local businesses, have been appointed to support businesses along with the development of a number of plans and strategies. There is a close working relationship with the business community through a formalised Business Reference Group which as well as being a forum to share information, is also used to develop initiatives to assist small businesses.

The City to Gungahlin project implemented an ACT Government funded Light Rail Business Link programme which was independently delivered and included initiatives to help businesses be 'project ready', both to take advantage of the local business participation opportunities the project presented, and to also help manage the impacts of construction activity on businesses. During construction and as a launch for operation place based activities were delivered including street parties to celebrate the completion of various stages of the project and re-opening of areas closed during construction.

Some businesses in proximity to specific areas of construction for the City to Gungahlin project when interviewed once the line was open noted if they had they been given the option of closing for the construction period in a structured and agreed way, working with landlords, etc) they would have considered it. There was an underlying assumption that this may have enabled some of the work to be expedited.

Place activation and campaigns to encourage activity in business areas affected by construction works feature in a number of projects. Campaigns include some that are financially supported by the project via giveaways, prizes, vouchers, etc.

Placemaking

Integrated into a number of projects is development outside of the project area in and around focus areas for neighbourhoods, both residential and commercial. Brisbane Cross River Rail has five Precinct Plans, one for each of the new station precincts. Working with other stakeholders in the development of the plans, these placemaking developments are intended to integrate the stations into the area and enhance amenity providing spaces that help connect people, communities and businesses. It is hoped these new spaces provide urban renewal opportunities that unlock new economic growth through private sector investments that strengthen the local economy and increase employment opportunities. The approach to development of these placemaking strategies is being driven by overseas research and review of other successful placemaking projects.

Education, employment and training

Projects currently in construction, including Brisbane Cross River Rail, Paramatta Light Rail and the California High Speed rail all have on their project websites advertised employment opportunities with both the Project organisation as well as their main construction contractors.

Brisbane Cross River Rail has an Experience Centre which offers excursion opportunities for Queensland School students with interactive, digital visualisation technologies, STEAM and HASS learning resources, cultural heritage content, project progress information, and geological artefacts. They also work directly with education providers to develop bespoke learning opportunities. A “Passport to the Future” programme has also been developed based on the Australian school curriculum and is available for schools to use.

6 Potential social impacts and management strategies

A summary of the potential social impacts (positive and negative) is provided below for the planning, construction and operation stages with a full assessment of impacts provided in **Appendix E**. Potential social impacts of the Project are based on data from the following sources:

- SIA Engagement;
- Desk based research (references provided in **Appendix A**); and
- Professional experience of the SIA practitioner.

6.1 Potential impacts of doing nothing

As well as considering the potential impacts of the Project, it is important to consider the potential impacts of the Project not proceeding.

- Longer journey times reducing family or leisure time, especially travelling to the Airport employment precinct;
- Increased stress associated with car travel in congestion;
- Increased possibility of road crashes;
- Detrimental impact on the environment due to increased air and noise pollution;
- Household budget impacts as a result of high fuel costs impacting on disposable incomes and lack of viable transport alternatives;
- Reduced growth in land values due to access difficulties;
- Loss of appeal for different localities as desirable places to live, work or visit; and
- Reduced competitiveness compared to other areas (e.g. Botany) with the Eastern Busway.

6.2 Planning: Potential social impacts

6.2.1 Positive

Positive social impacts during the planning phase relate primarily to people’s fears and aspirations and positive impacts on personal and property rights.

Designation of land for the Project can provide confidence in future investment in the area as well as the area of impact of the Project. Some businesses and landowners may then be able to undertake their own planning for their future enabling them to realise aspirations. It also signals future investment in the transport network which can support more intensive development. In some areas that could trigger development. Efficient transport networks are vital for the success of centres and neighbourhoods as they provide safe, accessible and sustainable travel choices that connect communities and encourage a shift from private vehicles to public and active transport.

6.2.2 Negative

There will be changes to people’s way of life. As properties are acquired for the Project people may move away from the area, and businesses will close and potentially be lost to the area if alternative sites cannot be found. Within the Puhinui/Papatoetoe area a number of businesses important to the community will potentially be lost, including:

- Mobil Puhinui Road;
- Hari Superette;
- Puhinui Superette; and
- Pukeko Preschool Papatoetoe.

While there will be temporary impacts to businesses in other sections of the corridor, structures (i.e. buildings) are not affected therefore businesses are not ‘lost’. There will be impacts to some existing on-street parking for some businesses.

A loss of some businesses within the area will mean changes to some routines and convenience for some residents due to the acquisition of properties containing several local businesses. They will then need to access those same goods and services from other businesses, potentially from other areas.

Impacts to residential properties are greatest within the Clover Park and Puhinui Road areas. Approximately 100 current Kāinga Ora properties are impacted in the Clover Park area. The project team has engaged with Kāinga Ora to discuss potential opportunities to coordinate and align the timeframes of the Project with their future development plans. There was general support for the Project, particularly related to the transport and access benefits provided through the Project. Notwithstanding this, social change will occur in the area as these homes are removed and Kāinga Ora implements their own redevelopment plans in the wider area on their remaining property holdings. Social change will occur in the Puhinui/Papatoetoe area as well as properties are acquired, affected businesses close, and people move from the area.

Impacts on residential properties in the Puhinui road area are along the southern side of the corridor, at the boundary between the HANA and MANA overlays. Because of the location of the HANA and MANA more intensive residential development within the existing residential areas on the southern side of Puhinui Road is less likely. Those residential properties directly behind properties fronting Puhinui Road are likely to, over time, redevelop as commercial use being wholly impacted by the HANA.

The environment will change during this time. As properties are acquired, which could occur anytime in the years leading up to construction, some properties might remain vacant and/or buildings empty. Vacant buildings in particular can attract anti-social behaviour which can adversely affect people’s perceptions of personal safety. There is currently anti-social behaviour associated with the vacant “Gardner’s Cottage” on Puhinui Road which many in the community would like to see removed.

People’s health and wellbeing will potentially be affected with potential for increases in stress and anxiety for landowners and occupiers, business owners and operators and those employed by directly affected businesses. Because the planning phase for the Project is long (around 10-12 years) and includes the period just prior to construction when properties are acquired it can result in considerable stress and anxiety related to uncertainty for many in the community. For those within the community that are not directly affected, including businesses, not knowing or understanding what to expect during construction can create anxiety. For businesses in particular it can be expected there will be high levels of stress and anxiety in the period of active property acquisition as it signals that construction is close and they may not at that stage have an understanding of what construction might mean for them.

There may also be increased stress and anxiety for landowners, both commercial and residential during active acquisition as they are uncertain whether they can remain within the community or have to leave.

Because of the period of 10 – 12 years before directly affected properties need to be purchased, property owners and occupiers, including business owners and operators, are encouraged to remain on the properties. Having a designation on a property does place some restrictions on how the property can be used, particularly in relation to changes or improvements. This could feel to some landowners as an impact on their personal and property rights. This feeling might also be present during the active acquisition stage, especially should some properties have to be compulsorily acquired. Many people have strong emotional ties to properties and the thought of losing all or part of their property in the future can result in considerable mental anguish with feelings of loss of autonomy over their own properties and an uncertain future.

Conversely, for some the certainty can be positive, knowing they can plan for the future.

As businesses close and leave the area it will also result in a loss of employment and livelihood for people working within those businesses, unless the businesses are able to relocate and retain their existing staff.

6.3 Planning: Recommended management strategies

Given the expected time between the completion of this assessment and the time at which the Project is anticipated to proceed the community will undoubtedly have changed. People will have moved out of the area, new people will have moved in, businesses will have changed, more intensive residential development is likely to have occurred in some places. It is therefore suggested that closer to the time of detailed design and active property acquisition it will be important to review the current social baseline, review the proposed management strategies and develop more detailed social impact management strategies that address social impacts in what is likely to be a different social environment.

Strategies to manage social impacts (positive and negative) during the planning phase include:

- Community and Stakeholder Engagement Strategy;
- Development Response Plan; and
- Community Health and Wellbeing Strategy.

Community and Stakeholder Engagement Strategy

Engagement with stakeholders and community is an important component to managing and monitoring the potential social impacts and opportunities of the Project. During times of change, effective communication and engagement with communities enhances their understanding and builds resilience. Awareness of changes that might arise as a result of the Project can also reduce fear and uncertainty.

A Communication and Engagement plan is also essential to understand the different groups that will interact with the Project and to establish how and when they will be engaged, and by whom.

Ongoing engagement should continue during the planning stage of the Project to continue to maintain and build relationships with the community and provide an opportunity for those new to the area to find out about the project. Access to information for directly affected landowners about how they can continue to use their properties prior to active acquisition might help reassure and reduce anxiety for some.

It is recommended a Community and Stakeholder Engagement Strategy be developed for the project and include strategies that focus on:

- Maintaining the current good relationships between Auckland Transport and Waka Kotahi and the community, particularly directly affected landowners;
- Establishing contact with community members and landowners and community stakeholders as new issues arise;
- Disseminating information to, and having discussions with, the community and stakeholders on issues raised;
- Identifying and responding to issues and concerns of directly affected landowners, the community and all stakeholders;
- Addressing specific concerns of the community and various stakeholders on an ongoing basis;
- Preparing relevant documents for review by government agencies and other stakeholders;
- How the business community is going to be engaged during the active acquisition phase to understand businesses and help get them ready for construction.

The Strategy should be developed in consultation with stakeholders and community groups and organisations and identify appropriate methods to ensure people are informed about the Project, it's timeframes, potential impacts and where they can find more information. It should also include methods to facilitate the ongoing involvement of stakeholders and community groups and organisations in the development of potential mitigation strategies.

During the ongoing planning phase of the Project it is recommended information about the Project should be available for the community, in particular affected landowners. The existing Project webpage on the Auckland Transport website could be an appropriate means for this. It is recommended it is regularly updated and include information for landowners as well as business owners and operators.

Development Response Plan

Development Response is the coordinated planning and implementation of tools to mitigate the impacts of large-scale development and cumulative impact of construction activity on people, in particular businesses. The Development Response Plan is prepared during the planning stage prior to construction and implemented just prior to and during construction. It is agile and evolves during implementation to respond to what is happening at the time.

Development Response Frameworks have been applied in several projects in Auckland and in Queenstown. While applied within urban commercial environments, many of the strategies can be applied in residential areas as well, especially those related to communications, site management, and way finding.

The frameworks start with great communications and engagement and operations planning, and bring together in a coordinated way specific strategies such as business advisory services, wayfinding, cleanliness, noise monitoring, placemaking, pedestrian access and improvements to building frontages. This can also include partnerships with local businesses, schools and community groups in the design of public art and use of space during construction.

Auckland Council has a Development Response Framework and Auckland Transport is developing their own approach at present. It is expected that by the time the Project proceeds to detailed design and active property acquisition a few years prior to construction, that Auckland Transport will have a well developed and tested approach to Development Response the Project can build upon.

Based on research undertaken there are key features of successful strategies for the management impacts of infrastructure construction on businesses. As part of preparing a Development Response Plan for the Project in accordance with Auckland Transport's Development Response Framework (in the period 18 months to two years prior to construction, i.e. in the pre-implementation phase), the following should be taken into consideration:

- Appropriate assistance package

  An assistance package is important to support businesses affected by projects both to help them manage impacts of construction and to help them maximise the opportunities the projects present. The more successful packages are administered by a committee/steering group comprised of members of the business community as well as the Project Team.

- Outreach in advance / early planning

  Early engagement is required, 18 months – 2 years before construction activity starts. Planning well in advance can help ensure the right support can provided at the right time in the project lifecycle. Early planning would include analysis of businesses to establish a baseline, early business engagement and early landlord engagement in order to work collaboratively in preparing the Development Response Plan. Business Associations are key to this activity and the Project should also work collaboratively with them and other stakeholders including community groups and organisations in both development and implementation of the Development Response Plan to ensure appropriate mitigation measures relevant to the community. A co-design approach to this could be considered.

- Easy access / constant communications / agility

  Provide early information and make it easy to access. Businesses will then know what to expect and when and have easy seamless access to information. Consistent and timely information is also important. Businesses can also advise which forms of communication are preferred. The business support programme, including the assistance package needs to be agile and able to make changes quickly to improve the experience for businesses. Easy access to information and constant communications can assist with this.

- Business technical assistance

  Provide proactive assistance to businesses to help them take advantage of other assistance programmes that are put in place, as well as strengthen the business overall to prepare them for long-term changes ahead.

- Strong advocacy

  Advocacy from the business community and other community-based organisations and community development organisations on behalf of the business community who look to them for support enables the Project to work with a range of organisations to provide consistent information and support to businesses. Those organisations can also then develop information for businesses.

- Leadership and commitment

Auckland Transport as the Requiring Authority will support the development of appropriate strategies and commit to resourcing the development and implementation, including funding. Suitably qualified and experienced engagement and stakeholder management personnel will be engaged 18 months to two years prior to construction to develop, implement and monitor the Development Response Plan.

- Coordination

  In some areas of the Project there could be other construction activity underway, especially within the Manukau Central associated with development plans of Eke Panuku and Westfield, and Kainga Ora development in the Clover Park area. A coordinated response, joined with other projects in the same area or nearby will provide single points of contact and consistent and coordinated information about all projects to businesses.

- Health and wellbeing

  Recognise the impacts on the health and wellbeing of business owners and operators and establish appropriate support, including access to confidential and independent support services.

Community Health and Wellbeing Strategy

A community health and wellbeing strategy can increase resilience and reduce anxiety and frustration during the period between designations being in place and construction starting. It can include a specific focus for landowners and occupiers and business owners and operators of land which is designated.

The strategy can include initiatives that ensure those directly affected by the Project know where and how to access information about the Project and who to go to in order to get the information they need. It can also include partnerships with support agencies, potentially local, to provide confidential and independent support to those that need it.

Property Management Strategy

A Property Management Strategy will outline the processes for managing properties that are acquired and vacated prior to construction to reduce the potential for anti-social behaviour. This could include maintaining residential and commercial tenancies or removing buildings and enabling the land to be used by the community or others for another temporary purpose that maintains activity on the site, such as a community garden or pocket-park.

Social Outcomes Strategy

As part of the pre-implementation phase of the project undertake further stakeholder engagement and apply strategic thinking in the development of a Strategy to develop tangible actions which can be applied and embedded throughout the Project so that it is planned, designed, constructed and managed in a way that delivers broader Social Outcomes through project planning, procurement, construction and operation. The Strategy should reflect the social, economic, cultural and environmental sustainability needs of people living, working, learning and playing along the local area of the project and ensure their needs are incorporated into project planning, design, delivery and operation.

Consider the following in development of the strategy:

- Opportunities to generate shared economic opportunity for South Aucklanders and targeted groups including:
  - Ways in which to support, incubate and provide contracting/supply chain opportunities for target businesses during procurement, construction and after completion; and
  - Developing targets for local, Māori and Pasifika owned and diverse supplier businesses (such as social enterprises, women-owned businesses, disability enterprises etc) to provide goods, services and works either directly or indirectly (as subcontractors) to support the Project.
- Strategies to increase access to education and workforce skills development pathways for people within affected communities, including those experiencing disadvantage. This could include:
  - Partnering with local tertiary institutions to understand the skills that are required to deliver the Project and support relevant courses and qualifications to support this;
  - Engaging with primary and secondary schools in the affected communities throughout the project to educate them on the broad range of further education and quality employment opportunities in their areas (and opportunities that are sustainable after the completion of the Project); and
  - Partnering with relevant community organisations to provide pastoral care to local people to support work readiness, cultural awareness training and other support measures.

6.4 Construction: Potential social impacts

As noted in Section 6.2 of the AEE, construction of the Project will likely involve disruption to the surrounding existing road network and property accesses. Additional traffic will be generated from general staff and workforce for the Project as well as construction specific traffic such as traffic movements for material delivery and movement within construction areas. Construction areas will also be located along the areas for varying durations, associated with construction duration as indicated in Section 6.2 of the AEE.

6.4.1 Positive

The most significant positive impact of the Project during construction is the employment opportunities for people from within the local community, wider southern Auckland area and beyond. There are opportunities for training and education pathways to be identified during the planning stage of the Project to enable people to gain relevant qualifications and training to enable them to gain employment in the Project. Local education providers have the opportunity to review their curriculums and provide education and training opportunities that would align with project needs.

Construction to some is exciting and is the realisation of their aspirations associated with investment and positive transformation of areas. It can result in excitement and anticipation of improved public transport across the Project area and particularly to and from Manukau Central as a major metropolitan centre.

With construction activity there are generally more people in the area. This can result in an increase in people’s perception of personal safety as a result of less anti-social behaviour due to the presence of construction activity.

Some businesses can also benefit from construction activity becoming suppliers to the project or benefiting from increased business activity as a result of the construction workforce, particularly cafés and food businesses.

6.4.2 Negative

Construction activity can impact people's way of life as a result of changes to access routes for both road users and pedestrians and cyclists. Streets that don't usually have a lot of activity may be used as temporary detours which could affect both the amenity of those streets, but also the ability for those residents/businesses to undertake their usual activities.

Access to existing public transport services such as bus stops and the Puhinui and Manukau train stations is likely to affected. Parking will be affected and access to some businesses or facilities that are important to the community will be affected. This will be particularly evident in Manukau Central where there is on street parking. Bus lanes and/or no stopping lines exist along most of the Project route in other localities.

With limited or no physical barriers within the corridor along Puhinui Road there is currently an ability for pedestrians and cyclists to informally cross the corridor at almost any point. Construction activity will create a barrier to this, increasing severance. While there are already 'barriers' across the rest of the corridor, these are able to be traversed by pedestrians enabling informal crossing of the corridor along the rest of the Project. There are already a number of formal crossing points along the corridor generally at traffic signal-controlled intersections which tend to be in proximity to places people visit such as businesses. There are also signal controlled mid-point crossings in in proximity to the Puhinui School and suburban shopping area on Puhinui road.

There will be a sense of disruption to the daily lives of people living and working in proximity of the Project, especially as construction activity affects routes people usually take and the ways in which they access many activities. This will be experienced by those who work for or visit businesses or places that cater to those with disabilities and may also be more prevalent in areas where people access social services, such as Manukau Central. People accessing social services tend to be those more vulnerable and might therefore feel the impacts more than others.

Construction activity changes the environment and as well as changing the way people move around an area, it can also change sightlines and restrict access to some areas. This can result in a decrease in business activity in areas as people find it more difficult to access business or are less aware they are continuing to operate and are accessible. Decreased business activity could result in a loss of employment for some and/or closure of some businesses.

People living and working in areas can feel less safe, especially at night. Changes to access and sightlines as a result of hoardings, etc. can reduce access to and the visibility of businesses leading to a potential loss of business for some.

Noise, dust and vibration can also reduce the amenity of an area, especially community facilities and open spaces and can also affect structures through movement. Depending on construction activity and the time of day and day of week it is undertaken, it can also affect the ability of people to sleep I their homes, particularly those that are shift workers. Construction of the southbound ramp from SH20B to SH20 in particular may reduce the amenity in some areas of the Manukau Memorial Gardens, and construction activity on Davies Avenue and Lambie Drive may reduce the amenity of Hayman Park. Construction of the Puhinui BRT ramp is expected to impact the amenity for neighbouring residents with potential impacts on privacy as a result of workers working at heights. Those neighbouring residents on the eastern side of the train station and south of the ramp in particular are likely to experience a loss of privacy and shading with the structure being built on their northern boundary.

With significant other developments planned in many areas there is potential for cumulative impacts in some areas.

6.5 Construction: Recommended management strategies

Development Response

Implementation, monitoring, reporting on, and updating the Development Response Plan.

Community and Stakeholder Engagement Strategy

Implementation, monitoring, reporting on, and updating the Community and Stakeholder Engagement Strategy.

Good neighbour policy

Alongside other Project policies developed by the contractor, a Good Neighbour Policy will focus on the role of the workforce as guests in the community and how the Project can support communities to thrive around the construction sites, and to minimise disruption to people's daily lives. The Policy can be developed using the Waka Kotahi Being Good Neighbours Guide.

Respite and Relocation Policy

Stakeholders, particularly business stakeholders have suggested construction activity could be undertaken at different times, outside of normal business hours to potentially reduce impacts. In some areas this would require consideration for 'sensitive receivers' such as education providers, healthcare facilities and residents (including shift workers). In order to enable that flexibility for construction hours while mitigating the potential impacts it is recommended a Respite and Relocation Policy be developed. Respite to residents could be provided by way of temporary relocation. For example, while noise standards during construction could be met, a shift worker could be relocated temporarily to enable them to sleep undisturbed.

Prior to construction (excluding preparatory works), prepare and implement a Respite and Relocation Policy to be offered to residents whose amenity is significantly affected by construction activities (e.g. out of hours works or sustained loss of amenity during the day for residences with special circumstances such as shift workers) or who are subject to loss of access. The Respite and Relocation Policy will only apply during the period in which residents are (or are likely to be) affected.

The Policy should contain:

- The criteria that must be met for relocation to be offered to affected residents;
- Consideration of special circumstances such as language or cultural need, special needs related to health conditions or home businesses; and
- The type and duration of out-of-hours work covered by the policy.

Other mitigations

Implementation of recommendations in the following technical reports:

- Landscape and Visual;
- Construction Noise and Vibration;
- Built Heritage;
- Ecology; and
- Urban Design Evaluation.

6.6 Operation: Potential social impacts

6.6.1 Positive

Following completion of the Project, the operation of the BRT and the walking and cycling facilities will result in long term inter-generational impacts with increased connectivity for people without vehicles or with limited access to vehicles improving access to employment, education, recreation and services. It will also improve equity increasing access for people with no, limited or poor access to transport before the Project, including students, from areas with higher deprivation rates.

As noted in *Appendix D of the AEE: Urban Design Evaluation*, the route and function of the Project can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres and open spaces.

The Project prioritises public transport and active modes to provide direct access to both housing and employment areas at Botany, East Tāmaki, Clover Park, Manukau City Centre, Papatoetoe, Wiri and the Airport. The combination of the core corridor functions and alignment to key destinations will maximise the benefits of modal shift and provide a positive contribution to the vibrancy and activation of the varied urban environments along the corridor. Improved pedestrian facilities and new cycling facilities will provide an opportunity to improve health and wellbeing with increased access to active transport modes leading to healthier lifestyles.

As noted in Section 9.3 of the AEE, overall, the Project will provide a much safer transport system which significantly reduces the number of deaths and serious injuries (**DSIs**) and results in positive effects for all road users. The proposed segregated walking and cycling facilities and dedicated and controlled pedestrian and cyclist crossings will also improve safety for vulnerable road users, including young people, older people and those with disabilities.

For some, the Project may provide long term employment for people who have been employed in the construction and developed skills and experience enabling them to gain other employment within infrastructure and construction.

Design elements of the project associated with cultural values and aspirations may also increase people's connection to the land.

6.6.2 Negative

There will be permanent changes to access for some properties along the route as a result of a physical barrier along the entire length of the project preventing right-turn movements from properties. There is likely to also be increased community severance as a result of the BRT corridor. There will be fewer, but formal (and safer), pedestrian crossing points. The Urban Design Evaluation notes that to enable equitable local connectivity and cross corridor access to commercial centres and areas of high density, especially in areas where no severance exists, further consideration during the detailed design stage should be undertaken to determine the most appropriate crossing points along the corridor.

6.7 Operation: Recommended management strategies

Maintenance of RTN stations.

6.8 Significant social impacts

In accordance with the methodology in **Appendix C**, social risk/opportunity ratings were assigned to each of the identified social impacts based on the assessed significance (gravity, extent, vulnerability and remediability/opportunity) and likelihood. The ratings were assigned to allow for prioritisation of the identified social impacts for mitigation and management. It should be noted that ranking a social impact as high or extreme indicates that due consideration should be given to opportunities to apply mitigation (for negative impacts) or enhancement measures (for positive impacts).

The key social impacts that were assessed as the highest priority (all negative and positive impacts with a priority 1 or 2 rating) are outlined in detail in **Appendix E** Impact Assessment.

In almost all cases, the mitigation measures recommended reduce the priority rating. There are impacts that remain priority 1 or 2, which are generally negative impacts associated with loss of homes and businesses and associated employment, sense of community and psychological impacts. Significant positive social impacts are related to increased employment opportunities.

7 Conclusion

Both positive and negative social impacts will be experienced whether the Project proceeds or not. The social impacts experienced will depend on location, relationship to the Project (e.g. as a directly impacted landowner or business operator, near neighbour, employee, wider community member, etc.), and the mitigation applied.

The areas through which the Project traverses are anticipated to experience significant change in the period between designation and construction, as a result of existing and approved development, planned development and intensification expected as a result of anticipated changes to the AUP:OP. The communities along the Project route will need to understand and adapt to this change before this Project commences construction.

The environment in which this Social Impact Assessment has been undertaken is therefore expected to be very different to the environment which will exist at the time of construction. A review and update to baseline data, along with stakeholder engagement to understand the community as it exists at the time mitigations are developed prior to procurement and construction will be an important step in ensuring recommended mitigations are relevant and therefore more effective at the time.

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Appendix A

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Appendix A – Reference List

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Appendix B

Summary of Engagement

Appendix B – Summary of engagement

SIA Engagement

Information from engagement used in the SIA has been drawn from interviews with Social Impact Assessment stakeholders, community led engagement, information from engagement in 2022 and a review of information from consultations undertaken in earlier phases of the Project.

Interviews with SIA Stakeholders

Interviews were undertaken with a cross section of people/organisations likely to be impacted by the Project. Not all stakeholders were able to participate in the SIA or were able to complete the Social Impact Assessment process. Table 1 sets out the interviews held with stakeholders. The Project was explained at the start of each meeting and discussion was held to ensure an understanding of the Project by stakeholders. An Information and Consent form was provided to stakeholders as part of the interview process.

Table 1: Interviews with SIA stakeholders

SIA Stakeholder Group	Social Impact Assessment stakeholder
Business	Business Manukau; Wiri Business Association; Business East Tamaki; and Scentre Group (Westfield Manukau).
Education	Manukau Institute of Technology; AUT; and Puhinui School.
Elected Members	Howick Local Board; Ōtara-Papatoetoe Local Board; Manurewa Local Board; Māngere-Otahuhu Local Board; and Papakura Local Board.
Health Providers	Puhinui Medical Centre
Infrastructure Projects	Puhinui Train Station Construction Project Manager
Private Property Owners	Mr Ali Shakir; and Shop owner, Puhinui Road

1.1 Community led engagement

The purpose of community led engagement was to empower people who are usually harder to reach or under-represented to lead engagement about the Project in a way they were comfortable at a peer to peer level. This approach also goes some way towards removing actual or perceived power imbalance between the ‘authorities’ (in this case the Requiring Authorities: Auckland Transport and NZ Transport Agency Waka Kotahi) and communities who often face inequities.

Information from this engagement provided inputs into the social baseline and enabled a better understanding of the potential social impacts and opportunities of the Project.

We identified advocacy groups, social enterprises, and other groups representing community interests and business and community networks and contacted them. Not all organisations contacted were able to, or agreed to participate.

After an initial phone introduction we provided information about the project and describing what a Social Impact Assessment is, how it works and why we're doing it, and invited them to participate, either as facilitators to gather feedback for their communities, or on behalf of their communities. Project information was provided to each organisation along with a voluntary survey. The voluntary survey was selected as it provided a structured question format for those who wanted it, while others could use it as a guide. It also enabled flexibility and an ability for groups to navigate restrictions on engagement due to COVID-19 and provide the surveys to individuals.

The groups who facilitated engagement from their communities were:

- The Chinese New Settlers Trust;
- Fiji Girmit Association;
- The Cause Collective;
- University of the 3rd Age Ormiston; and
- Flat Bush Residents and Ratepayers group.

Engagement undertaken by these groups provided inputs from a wide demographic within both the project locality and the wider area including:

- Chinese community in Botany Downs, Botany Junction, Flat Bush, Dannemora and Ormiston with a focus on older people and youth;
- The Fijian Indian community in Flat Bush, Ormiston, Clover Park and the Airport Precinct;
- The Pasifika community in Otara, Clover Park, Wiri, Flat Bush, Manukau City Centre and Ormiston, age groups 18-49; and
- Residents in the Flat Bush and Ormiston area.

Figure 1: Members of the Chinese community discussing the project following a presentation

Social Impact Assessment engagement interview notes

Puhinui Medical Centre

The Puhinui Medical Centre has around 1,500 people registered, of which around 80% are from the local area. It is a family-owned business that has been in the Puhinui Community for 25 years with 22 of those being on the existing site, which is owned by the operators of the Medical Centre. They provide GP services with two GPs at present. Within the next 10-15 years it is anticipated one of the existing GP's will retire. At this stage there are no plans to expand the Medical Centre, however the site they have does enable this to occur.

Access to the Medical Centre will be impacted with the removal of the ability for right turning movements in and out of the property, however this is considered by the Medical Centre to be minor impact. Experience during construction of the existing bus lanes meant that many people visiting the Medical Centre were confused about how to access it and traffic management personnel were required to help people enter and exit the site. It was suggested implementing a left in – left out arrangement from day one of construction for this Project (ie the permanent solution) would reduce confusion for those visiting the Medical Centre.

During construction of the existing bus lanes the Medical Centre did provide initial medical response services a couple of times when there was a Health and Safety incident on side. This was not a formal arrangement and was just because of proximity. It is anticipated they would likely do the same for this project (noting this is informal and ad hoc).

Early and ongoing regular communication with the Medical Centre is important to ensure they are aware well in advance what construction activity is proposed and when so they can also communicate to patients.

Puhinui School

Puhinui School provides a space for around 670 students with an estimated increase expected to hit 850 by 2030. The school is currently working with the Ministry of Education to develop two additional six classroom two buildings over the next 5+ years in preparation of this increase. They have a wide range of students with many coming from migrant families who have just moved to the area. The school enforces a strict zoning in the area which means students are predominantly from the local area with exceptions for a few families who were enrolled with the school but later moved to another area.

Students are either walked to school or driven to school by their parents which means that peak congestion hours for the schools are between 8:30am-8:50am and 2:30pm-3:10pm.

The impacts that the school will face are in relation to the traffic disruptions during construction. Parents already have issues with the current drop-off allocations which will be elevated during construction. The school is actively working to reduce parents from dropping their children off at school in unsafe areas. Past experiences with construction was when the lights were being installed on Puhinui Road outside the front of the school. The school felt that this project gave excellent communication and kept the school informed throughout the construction process which was done in an efficient manner as there was extra manpower provided to complete this project in a timely manner.

The school would like to see a conversation between the Ministry of Education and the Project to see what the options for adding in a drop-off zone either outside the front of the school or down Grayson Avenue. Adding in other safety measures like railing and speed reduction zones to ensure the students wellbeing is something that the school sees as achievable by the Project.

Westfield Manukau

Westfield Manukau is one of the large centres that occupy the Manukau city centre. The centre has around 100 stores with a diverse range of retail stores and service providers.

The mall has currently got a master plan in place which include a more accessible space for Public Transport and the MIT at the entry point of the Friendship House, introducing an outdoor beverage and leisure precinct along Ronwood Avenue and Osterley Way and expanding the building footprint in the carpark area that faces Great South Road to allow for more retail spaces and/or commercial activities.

The impacts the mall will face will be surrounding construction. If construction was done in stages to reduce the impacts of the entry points and surrounding businesses. Providing adequate signage in the areas where construction is happening to show customers that there are other entry points to the centre is vital. Westfield would also like to mention that construction should be concluded and minimal construction materials left on site from the end of October to the end of December as this is businesses busiest sales periods.

The mall is aware that McDonalds is heavily reliant on Leyton Avenue for their customers which would mean that during construction, their will have restricted access for customers.

Westfield Manukau sees an opportunity for a bus stop to be placed along Ronwood Avenue which can be connected to the Public Transport hub which is already in the process of being designed. They are also interested to see if this project will consider putting coverage along Putney Way and Amersham Way to add to the urban design and social connectivity.

Manukau Institute of Technology (MIT)

There are two campuses in Manukau which are located above the train station and at Tech Park. The campuses provide a range of courses like Nursing, Business, Finance and a trade training facility (Tech Park). Currently, their roles are down due to Covid-19 and the increased need in the workforce except for Nursing and Tech Park. Generally, students come from Isthmus and south but a decent portion of students come from outside of this area.

The school is aware the Project will have several impacts including the potential land removal of sites like parking spaces from the Tech Park site which will cause issues due to these parking spaces being a minimum requirement for their resource consent. The school is pleased for the better access to public transport for students will have but there are concerns about some non-student commuters may attempt to take advantage of the facility's parking for linkage as this has been a previous issue.

With increasing development and improvements to the transport network in Manukau, the potential for ongoing improvements to integration with the airport, such as off-airport check-in facilities in Manukau was also raised as something which could be explored by others at a later date.

Business Manukau

Business Manukau provides services to over 1,700 members with around 900 of them being business owners. Members are predominantly retail but a small portion of businesses are commercial and industrial related. They span from a wide area which goes from Plunket Avenue all the way through the Wiri BID.

Business Manukau is concerned about the construction period especially around the pre-Christmas period. They are also concerned about the bus rapid transit corridor down the centre of the road – would prefer to have the lane on the edge. Providing the construction in stages that are developed to work with the affected businesses is essential. Spaces like the Great North Road section only have a motel which could open room for night construction to complete this section faster. Business Manukau sees positive impacts in term of more job opportunities once this project has been implemented.

Business Manukau sees an opportunity to integrate native tree species like the Pōhutukawa or native Hibiscus to be planted in spaces like Te Irirangi Drive where current trees will be removed for this project.

Two workshops were held with the Business Association to discuss potential social impacts during construction and mitigation measures. Mitigation measures proposed, including the preparation and implementation of a Development Response Plan were received positively. Working closely with the Business Association early in the development of mitigation strategies will be very important.

Wiri Business Association

The Wiri Business Association is relatively new to the Wiri area and were still in the process of understanding and building relationships with the businesses within the area. As the area is predominantly industrial businesses, it is uncertain what the impacts will be for the businesses that will be affected. The community has said that they rely on private vehicles more than they want to.

Providing connectivity into growing and emerging areas is something that will become vital for the businesses in this the Wiri area.

There may be opportunities for local businesses to participate in the Project during construction as suppliers. These opportunities can be explored further at the appropriate time.

The potential mitigation strategies including a Development Response Plan (including an appropriate financial assistance package for businesses) and working with the Business Association to supporting it in developing information for your members were provided to the Wiri Business Association. Feedback on this approach was:

"I think these are excellent suggestions below and am pleased that thinking is going into the impacts of these types of works ahead of major projects."

Mr Ali Shakir

Mr Shakir is a potentially directly affected resident with a home at the eastern end of the Project.

<u>The current environment</u>

Demographics of the area include Asian, Arab, Indian, Māori and pakeha. Many immigrants who have moved from countries, many having experienced traumatic events and be experiencing post trauma stress. We are also coming out of a pandemic so there is a lot of stress on people already.

<u>Background</u>

Ali has experienced three wars. Threats to life forced him and his family to leave their home in Baghdad. He lived with his parents and is responsible for protecting them.

Left behind their home and life and in 2008 came to NZ to find peace and respect for family life. Has learned from the Māori world view and cares about everything.

While in NZ continued to negotiate sale of property in Baghdad which was very challenging and finally successful. Once that was complete spent 3 years trying to find the right property which was also challenging with high property prices. Finally found 'home' and expected to be settled there with his mother for the rest of his life.

A qualified architect, now through his writing shares stories of experiences of minorities in Iraq. Has authored the chapter "Gardenias" in the book "Ko Aotearoa Tatou/We Are New Zealand: An Anthology" written post the Christchurch terror attack.

Lives in the home he has next door to the Botany Town Centre so he doesn't need a car, can walk everywhere.

<u>Impacts</u>

The memories of trauma suffered never go away. Receiving the letter about the Project bought all those memories back and resulted in significant anxiety. It has impacted sleep and he has stopped writing.

The first letter was a but vague and jargon filled so was unsure what it meant. Between the first and second letter he was not provided with an opportunity to influence the decision and was told by a Project team member to not do anything – then it was too late.

“What have we done wrong”

Would like to see alternative design such as a tunnel to avoid the property impact. A tunnel would protect the community.

Stress and anxiety for people as a result of this project could result in people losing their lives.

<u>Additional Information</u>

The following information has been added by Mr Shakir following a review of the above notes.

- Misinformation

“As an impacted property owner, I was misinformed by [project team member]. I called the Supporting Growth Team the next day I found their letter in our mailbox on July 11. [They] said the project was a work in progress and that only parts of our garden or driveway could be acquired. The house will not be demolished. [They] also discouraged me from seeking legal advice, taking to the press or calling Botay MP’s office. I could have used the two months that followed for explaining our situation to the officials in charge at AT, but was deprived the opportunity. On September 5th, I received an email from [them] telling me the whole property will be confiscated. It’d been confirmed.”

- Forcefulness

“It would have been fair—and made perfect sense too—had they bothered to contact us prior to making their decision and used our input to plan accordingly. That’s how growth projects are being carried out in the countries that care about their citizens. That’s how we Kiwis deserve to be treated.”

- Inconsideration

“Not relying on statistics or in-depth studies. Do we know how many of the impacted households are first- or second-generation migrants, refugees or survivors of wars who might have been forcefully evicted from their houses in their motherlands? Couldn’t a second displacement be detrimental to their mental health? Is AT willing to take responsibility for possible unfortunate consequences, including life-threatening ones?”

- Disregard for housing shortage

“In a city that’s been suffering for years under a flagrant housing shortage, consecutive governments have been working hard (often unsuccessfully) to provide decent housing for Aucklanders, the project wants to demolish hundreds of the city’s rarest and probably most precious commodities: healthy, modern and well-built houses to make the ride from the airport a few minutes shorter and adding cycleways that will hardly be used.”

- Financially damaging

“I was told that hundreds of letters were sent, assuring impacted property owners that compensations will be provided although works are not likely to begin before 10-15 years, and the money will only be paid shortly before that. Meanwhile, Notices of Requirements (aka designations) are going to be lodged before the end of this year. They will appear on our LIM reports, causing the values of our properties in the market to plummet, making them nearly unsellable and un-loanable.”

- Anti-community and asocial

"The project is indifferent to the ramifications of dismantling a versatile, vibrant and coherent community. I have a bachelor's degree in architecture, but it doesn't take an architect to tell that this type of urban design is suitable for new cities that are being planned and built from scratch. There is no sense in bulldozing massive roads through longstanding neighbourhoods like Botany in a densely populated city like Auckland. The route will act like an ugly separation wall that slices up Botany and not pay any attention to the importance of incorporating human scale in urban planning and designs."

- Discouraging public interaction and activism

"Almost every person I've talked with so far told me that my chances of stopping the designations from being submitted, or revoking them after they are lodged are slim, close to non-existent. While I appreciate honesty, I cannot justify this intimidating and frustrating approach. We are living in a 21st century democracy and all voices should be heard and taken into account."

Ali has written about the negative impact of the project on his and his family's wellbeing. His article was published in the New Zealand Herald newspaper and online on September 23, entitled "Sacrifice for Auckland". He asked that a reference to the article be added to his notes.

https://www.nzherald.co.nz/nz/ali-shakir-taking-our-sanctuary-and-security-for-the-airport-to-botany-rapid-transit-project/7BLEJ3N6LDRGMQKAGQBD5CMB3A/

Suburban shop owner, Puhinui Road

The suburban shop owner is one of three owners of the block of shops between 153 and 169 Puhinui Road. He also operates his own business from one of the shops. They have owned the properties and run the business since 2018. Much of their business is from 'passing trade' from people working in the area or driving through the area. There are approximately eight on-street carparks outside the shops. Current construction work underway outside the shops, presumably associated with recently installed bus lanes and a pedestrian crossing point is being managed to maintain on-street parking for the shops. It is also apparent that the on-street parking is being maintained with the bus lanes stopping before the carparks then starting again after the shops. Buses will have to merge into the traffic lane at this point.

It was evident during the meeting held on site that the on-street parking was well utilised with people coming and going relatively frequently entering a range of shops within the block.

Of significant concern to the property owner is the potential loss of on-street parking and the associated impacts on both his own business and other businesses within the block of shops. As a landlord he is also concerned about the long term viability of his tenants businesses should on-street parking be removed. He has been speaking to the other two property owners who have expressed the same concerns to him.

Information from other engagement

Meetings have also been held by other members of the Project team. Table 2 lists those stakeholders where meetings have been held and information that has informed the SIA has been used.

Table 2: Meetings with Project stakeholders

SIA Stakeholder Group	Social Impact Assessment stakeholder
Business	Mobil; Z Energy; Brixton Investments Group; Supa Centa; Mitre 10 Mega; Westfield Manukau; and Pekin Holdings
Government Agencies	Eke Panuku; and Kāinga Ora
Education	Manukau Institute of Technology; AUT; and Puhinui School
Potentially affected landowners	Approximately 85 of the 475 landowners

Summary of impacts identified through engagement

The impacts identified through engagement included potential impacts on water, quality of the living environment, visual amenity, access, housing, community services, culture, the local economy, employment and community cohesion. Table 3 presents positive and negative impacts and opportunities in each of the social impact areas.

Table 3: Potential impacts (positive and negative) and mitigation measures from engagement

Impact area	Positive	Negative	Opportunities or mitigation identified
Way of life, including: • how people live, for example, how they get around and access to adequate housing • how people work, for example, access to adequate employment • how people play, for example, access to recreational activities and • how people interact with one another on a daily basis.	Enhanced opportunities for connectivity from the Westfield mall to Hayman Park Connection into the wider RTN network increasing PT access to other parts of Auckland. Frequent and all hours access to jobs meaning people don't have to keep using their cars, especially for those households with only one car.	Adding more 'busyness' to the existing public transit area. Increased pressure on long-term parking around the Manukau Station and businesses as people seek to Park and Ride Roads could look confusing with different lanes, could make it harder to get around. Restrictions on movement (right turns) can impact the normal routes for people Parents are already causing conflict around not enough parking. Construction will mean that longer than usual wait times should be expected outside the Puhinui School.	Full and open communication strategy so businesses are able to prepare and advise customers ahead of time about changes Requests traffic control person in front of the medical centre during construction (Puhinui Medical Centre) Improved access to the Manukau Memorial Gardens. The Memorial Gardens are a very important place for ethnic communities who go there regularly to pray and be with loved ones. Having public transport that goes to/from the Gardens is important. With good passenger transport business could review working hours - Instead of the typical start at 9 am finish at 5 pm job, the operating time for businesses could change to better suit some families and ease congestion on roads.
Cultural impacts – including shared beliefs, customs, values and stories, and connections to land, places and buildings	Opportunity to integrate values or cultural values that sit alongside ISCA tool. Iwi/Mana Whenua decision. Early engagement with iwi can define resourcing needs and the process of engagement.		Integrate a Matauranga Māori framework approach which can assist in determining success eg. 'Take Hono, Take Mauri', iwi models such as 'Tai Tumu, Tai Pari, Tai Ao' (to plant, grow, foster, bloom-Waikato-Tainui) or 'Te Whare Tapa Whā' model for wellbeing. Develop a Māori baseline for all projects and how can we improve and measure success. Can be utilised in all reporting.
Family and community its cohesion, stability, character, access services and facilities		Increased community severance, especially in residential areas	

Impact area	Positive	Negative	Opportunities or mitigation identified
		Potential land take could compromise educational facilities and therefore an ability to provide quality training and education opportunities to students Will mean buying people's homes, where will they go?	
Quality of the environment – including access to and use of ecosystem services; public safety and security; access to and use of the natural and built environment, and its aesthetics value and/or amenity; the quality of the air and water people use; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation; their physical safety; and their access to and control over resources		Potential health and safety concerns regarding the route including ability to cross the roads were raised. (Ōtara-Papatoetoe Local Board) Protecting water quality is important. Will it be safe to use at night?	
Decision making systems – particularly the extent to which people can have a say in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose		Lack of knowledge about the project and an ability to influence decision making as new people have moved into the area since previous project stages and engagement at that time. "I don't know about this project and now you tell me the decision is made already'	
Health and wellbeing - health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity. It includes psycho-social impacts such as solastalgia (a form of mental or existential distress caused by environmental change)	Increased walking and cycling	Mental distress and potentially life-threatening impact on some property owners	
Personal and property rights, including whether economic livelihoods are affected, and whether people experience personal disadvantage or have their civil liberties affected		Loss of businesses from within the Manukau City Centre area – loss of commercial tenants and need to reconfigure sites.	

Impact area	Positive	Negative	Opportunities or mitigation identified
		Impact on business owners/operators in the Manukau City Centre where properties leased are required for the Project. Loss of businesses in the Puhinui area, including complete loss of livelihoods for some small business owners and operators where property is required for the Project. Loss of land due to designations that are being put in place. This will affect the ITC facilities in the building and the foul water storage facilities located in the area. Consideration needs to be made into how much land is being taken from which sites and whether it is being targeted towards larger companies like AUT who can support the designations at a smaller loss (AUT).	
Fears and aspirations - perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.		Uncertainty for business owners to plan for the long term. Timeframes for communication needs to be more regular during planning as the designating of land is for 15 years can cause uncertainty for businesses, especially where only partial land is required	Significant opportunity to integrate the Ronwood Ave Station into development of Westfield Manukau
Socio-economic impacts – including standard of living, level of affluence, economic prosperity and resilience, property values, employment, replacement costs of environmental functions and economic dependency	Will make it easier for people to access Manukau Central and Westfield Manukau	Cost of project will be very high and will end up a cost on all of us through increased cost of living Loss of employment for those working for businesses on sites where land is required for the project	Set employment and business participation targets for Māori outcomes on the project e.g. Porirua housing projects 180 jobs for Māori.
Equity impacts – distribution of impacts across the community and generations (intergenerational impacts)		There are potential Auckland Council zoning changes and other impacts on the community that may result in higher	

Impact area	Positive	Negative	Opportunities or mitigation identified
		rates. Communities need to be consulted on this so the changes do not just happen to them. It is expected that the environment will change over the years and there will be more intensive development around the stations and a lot of change experienced in area (Ōtara-Papatoetoe Local Board)	

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix C

Significance methodology

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

Appendix C – Significance methodology

Introduction

The social risk/opportunity methodology for the Airport to Botany Project is based on the methodology outlined in Esteves *et al* (2017)[1]. The work undertaken by Esteves *et al* builds on the IAIA's SIA Guidance and considers the concept of risk and differentiates social risk from business risk so it conforms with the United Nations Guiding Principles on Business and Human Rights. The methodology is based on a mining project in Canada and has been tailored to the Airport to Botany Project and the social area of influence. This methodology has been adapted and applied previously in New Zealand in determining potential social impacts of options for wastewater treatment as part of a Multi-Criteria Assessment of Options.

Adaptation of the methodology

The methodology has been tailored for this project in the following ways:

- Introduction of another level of 'gravity' to specifically acknowledge those within the proposed designation area for the Project;
- Introduction of another level of 'extent' to specifically acknowledge those within the proposed designation area for the Project; and
- Vulnerability has been tailored to the Project. Access criteria within the New Zealand Index of Multiple Deprivation (2018)[2] was selected as the measure of vulnerable as it is directly attributable to the project. Impacts on Employment, Income, Crime, Housing, Health and Education cannot solely be attributed to the Project. The access criteria is defined by the New Zealand Index of Multiple Deprivation (2018) as being:

  "Distance to the three nearest:

  - GP's or Accident and Medical centres;
  - Supermarket;
  - Service Stations;
  - Primary or Intermediate Schools; and
  - Early Childhood Education Centres."

Methodology

The overall significance methodology has four steps:

1. Determine significance (significance and consequence);
2. Estimate likelihood;
3. Calculate social risk/opportunity rating; and
4. Prioritise.

[1] Esteves, A. M., Factor, G., Vanclay, F., Götzmann, N. and Moreira, S. (2017) Adapting social impact assessment to address a project's human rights impacts and risks *Environmental Impact Assessment Review* 67 pp. 73-87

[2] Criteria within the New Zealand Index of Multiple Deprivation (2018) can be access at https://imdmap.auckland.ac.nz/download/

Step 1 - Determine significance

After social impacts have been identified, the first step is to determine significance. This involves classifying each impact on the basis of significance criteria as set out in Table 1.

Table 1: Significance criteria

Criteria	**Description of Level**		**Level**
	Negative impacts	Positive impacts[3]	
Gravity	Impact could or will cause death or adverse health effects that could lead to significant reduction of life/or longevity; and or continued exposure is generally likely to lead to long term illness or disability	n/a	G1
	Complete loss of access to: • Basic life necessities (including education, livelihoods, employment, housing etc.); and/or • Cultural, economic, natural or social infrastructure/assets that have been identified as highly valued by identified groups or subject matter experts in assessment; and/or • Ecosystem services identified in the SIA assessment process as priority to livelihoods, health (including wellbeing and social networks), safety or culture.	Access to new: • Basic life necessities (including education, livelihoods, employment, housing etc.); and/or • Cultural, economic, natural or social infrastructure/assets that have been identified as highly valued by identified groups or subject matter experts in the assessment; and/or • Ecosystem services identified in the SIA assessment process as priority to livelihoods, health (including wellbeing and social networks), safety or culture.	G2
	Reduced access to: • Basic life necessities (including education, livelihoods, employment, housing etc.); and/or • Cultural, economic, natural or social infrastructure/assets that have been identified as highly valued by identified groups or subject matter experts in assessment; and/or • Ecosystem services identified in the SIA assessment process as priority to livelihoods, health (including wellbeing), safety or culture.	Increased access to • Basic life necessities (including education, livelihoods, employment, housing etc.); and/or • Cultural, economic, natural or social infrastructure/assets that have been identified as highly valued by identified groups or subject matter experts in the assessment; and/or • Ecosystem services identified in the SIA assessment process as priority to livelihoods, health (including wellbeing), safety or culture.	G3
	All other impacts	All other impacts	G4
	Region, being a widespread geographic area comprising multiple Local Board areas and beyond	Region, being a widespread geographic area comprising multiple Local Board areas and beyond	E1

[3] Esteves *et al* does not include descriptions for positive social impacts, benefits or opportunities. These have been developed based on the descriptions in the negative impact column.

Criteria	Description of Level		Level
	Negative impacts	Positive impacts[3]	
Extent[4]	Suburb, being areas likely to experience impacts through their populations along the route – beyond the locality.	Suburb, being areas likely to experience impacts through their populations along the route – beyond the locality.	E2
	Locality, considered as a 400m catchment around the project, and individual properties within the locality	Locality, considered as a 400m catchment around the project, and individual properties within the locality	E3
	Within the project corridor	Within the project corridor	E4
Vulnerability[5]	Negative impact on access criteria within the NZ Index of Multiple Deprivation 2018 being distance to three nearest: • GP's or Accident and Medical centres; • Supermarket; • Service Stations; • Primary or Intermediate Schools; and • Early Childhood Education Centres.	Positive impact on access criteria within the NZ Index of Multiple Deprivation 2018	V1
	No impact on access criteria within the NZ Index of Multiple Deprivation 2018	No impact on access criteria within the NZ Index of Multiple Deprivation 2018	V2
Ability to remediate or accomplish	Difficult to remediate	Easy to accomplish	R1
	Moderate to remediate	Moderate to accomplish	R2
	Easy to remediate	Difficult to accomplish	R3

Once the gravity, extent, vulnerability and ability to remediate or accomplish the impact has been determined, the consequence category is identified using Table 2.

Table 2: Consequence category

Consequence category	Specification of conditions for assigning consequence category
Significant[6]	G1 (regardless of any other criteria) or
	G2 and V1 and R1 or R2 (regardless of extent)
Major	G2 and V1 and R3 (regardless of extent) or
	G2 and V2 and E1/E2 and R1/R2
Moderate	G2 and V2 and E3 (regardless of ability to remediate or accomplish) or

[4] Refer to the social areas of influence in Section 5 of the SIA.

[5] For this project, the access criteria within the New Zealand Index of Multiple Deprivation (2018) has been used to determine vulnerability. The access criteria are the only criteria the Project can directly attribute and measure impact on. Impacts on Employment, Income, Crime, Housing, Health and Education cannot solely be attributed to the Project.

[6] Esteves *et al* used the term severe, we have replaced it with significant so the category can be applied to both positive and negative social impacts and aligns with the category of insignificant.

Consequence category	Specification of conditions for assigning consequence category
	G3 and V1 (regardless of extent and ability to remediate or accomplish) or
	G3 and E1/E2 and R1/R2 (regardless of vulnerability)
Minor	G3 and E1/E2 and V2 and R3
	G3 and E3 and R2 (regardless of vulnerability)
Insignificant	G3 and E3 and R3

Step 2 - Estimate likelihood

The next step is estimating the likelihood of each social impact occurring using the scale set out in Table 3.

Table 3: Likelihood category

Category	Identified by SIA stakeholders[7]		Experienced in other similar projects[8]		Identified elsewhere[9]
Almost Certain	✓	+	✓	+	✓
Likely	✓	or	✓	+	✓
Possible	×		✓	+	✓
Unlikely	✓		×		×
Rare	×		×		✓

Step 3 - Social Risk/opportunity rating

A social risk/opportunity rating for positive and negative social impacts has been developed based on Esteves *et al* (2017) are set out in Table 4 and Table 5 respectively.

Table 4: Social impact rating (negative impacts)

			Consequence level				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Significant
Likelihood level	A	Almost Certain	A1	A2	A3	A4	A5
	B	Likely	B1	B2	B3	B4	B5
	C	Possible	C1	C2	C3	C4	C5
	D	Unlikely	D1	D2	D3	D4	D5
	E	Rare	E1	E2	E3	E4	E5
Social risk rating							

[7] Identified by SIA stakeholders during engagement for the SIA.
[8] Determined by literature review of publicly available information for other similar projects in NZ and overseas.
[9] Peer reviewed journal articles or SIA practitioner experience.

		Consequence level				
		1	2	3	4	5
		Insignificant	Minor	Moderate	Major	Significant
	Low		Moderate		High	Extreme

Table 5: Social opportunity rating (positive impacts)

			Consequence level				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Significant
Likelihood level	A	Almost Certain	A1	A2	A3	A4	A5
	B	Likely	B1	B2	B3	B4	B5
	C	Possible	C1	C2	C3	C4	C5
	D	Unlikely	D1	D2	D3	D4	D5
	E	Rare	E1	E2	E3	E4	E5
Social risk rating							
	Low		Moderate		High		Extreme

Step 4 - Prioritisation

Once social impacts have been allocated a social risk/opportunity rating, the next step is to prioritise the social risks for action as per the hierarchy set out in Table 6.

Table 6: Social risk hierarchy for action

Priority	Definition
1	All social impacts with a high or extreme risk
2	All other social impacts with significant or major consequences, irrespective of likelihood
3	All remaining social impacts with a moderate risk
4	All remaining low risk social impacts are monitored to ensure they do not escalate

Additional information included in the assessment

In addition to the above criteria against which the potential impacts are scored, the following additional information is provided in the assessment:

- Affected group, generally defined as those in Section 5 SIA;
- Extent, based on those described in Section 5 of the SIA; and

- Duration, which is as described in Section 6.2 of the AEE. Note that this can vary in some areas as the durations of construction vary across areas and specific locations. More information about this is provided in Section 6.2 of the AEE.

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Appendix D

Indicators of social impacts and baseline data

Appendix D – Indicators

Table of Contents

List of Figures

1 Introduction

Baseline data for social impacts provides a benchmark for social impacts to be measured against in the future. For a project with a long period of time between the time the Social Impact Assessment is undertaken and the time of implementation considerable change can be expected to have occurred within the communities. A smaller select number of social indicators is also presented to enable this change to be measured and considered as part of developing detailed mitigation and management strategies at an appropriate time in the future when the project is closer to implementation. They also enable post-project evaluation to be undertaken to understand the actual impacts of the project.

2 Indicators of Social Impacts

The indicators shown in Table 1 are suggested as relevant for this Project. Data sources and baseline data is presented in Section 3. Not all impact areas have social indicators and some social indicators use data presented as a baseline for other impact areas.

Table 1: Social Indicators

Impact area	Social Indicators	Comment
Way of life	Travel to work	One of the primary objectives of the project is to increase accessibility of high quality rapid public transport to populations in south and eastern Auckland.
Family and community impacts	Urban life	Urban life is the everyday activity that goes in within and between buildings in a city and includes data on behaviour and activity.
Quality of the environment	Urban life	Urban life is the everyday activity that goes in within and between buildings in a city and includes data on behaviour and activity. An increase in urban life activity can indicate an improved urban environment.
Health and wellbeing	Physical and mental heath	Improved footpaths and cycleways as part of the Project provide for more active lifestyles which could impact people's physical and mental health.
Equity	Deprivation from the Index of Multiple Deprivation	With the project providing opportunities for increased access to education and employment in particular and an improved more vibrant urban environment in the Manukau City Centre in particular it could be expected that this has a positive impact on deprivation indicators included in the Index of Multiple Deprivation.
Socio-economic impacts	Income Education Employment status	Increased access to education and employment opportunities are anticipated as a result of the project.

3 Baseline data

Baseline data is either quantitative or qualitative or a combination, depending on the social impact. Where possible, the most direct datasets for social impacts have been selected and where this has not been possible, proxy indicators have been selected. Data for each impact has been sourced from desktop research and primary data collection.

Quantitative datasets for areas of social impact have been identified as shown in

which also shows which data sources are used along with the limitations within the data sources. Qualitative data from SIA and Project engagement has been used for those social impact areas not included in Table 2 and this is presented in Appendix B (Summary of Engagement). Data is presented for each of the social areas of influence identified in Section 6.1 of the SIA. Data from the 2018 Census is used for each of the localities as outlined in the table. Data at a SLA2 level has been used where this generally fits. SLA1 data has been used by exception where SLA2 data is too large a data set to be meaningful for the area.

Table 2: Social areas of influence and data sets for localities

SIA Locality	Census 2018 areas	Local Board area
Clover Park to Botany	SLA2 areas: • Clover Park South; • Clover Park North; • Rongomai East; • Botany Junction; • Chapel Downs; • Ormiston North; • Dannemora South; • Dannemora North; • Redcastle; • Botany South; and • Huntington Park.	Ōtara-Papatoetoe Local Board Howick Local Board
Puhinui / Papatoetoe	SLA2 areas: • Papatoetoe South West; • Puhinui East; • Puhinui South; and • Puhinui North. SLA1 area 7008682	Ōtara-Papatoetoe Local Board
Manukau City Centre	The Manukau SLA2 area includes the Orrs Road to SH20 area so the following SLA1 areas have been used: • 7008786; • 7008785; and • 7008784.	Ōtara-Papatoetoe Local Board
Airport - Orrs Road to SH20	SLA1 area 7008321 The SLA2 area in which this locality fits also includes the higher populated Manukau City Centre area so data from the SLA2 area is not reflective of this locality. While the SLA1 area extends outside of this locality, it generally only includes parts of the Wiri industrial/commercial area near Puhinui Road.	Ōtara-Papatoetoe Local Board

Table 3: Qualitative data sources and data limitations

Data	Source	Comments and limitations
Way of life – including: • how people live, for example, how they get around and access to adequate housing • how people work, for example, access to adequate employment • how people play, for example, access to recreational activities • How people access services and facilities, and • how people interact with one another on a daily basis.		
Travel to work	Census 2018, Statistics New Zealand	One of the primary objectives of the project is to increase accessibility of high quality rapid public transport to populations in south and eastern Auckland.
Social housing	Social housing data from Kainga Ora accessed at https://kaingaora.govt.nz/publications/housing-statistics/ Social housing register https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/statistics/housing/housing-register.html#DownloadthelatestnumbersfortheHousingRegister3	The amount of social housing in an area and the wait times for social housing can provide an indication of access to adequate housing, acknowledging that this Project requires the removal of a number of residential homes.
Cultural impacts – including shared beliefs, customs, values and stories, and connections to land, places and buildings (note Māori culture and values are considered separately in Cultural Values Assessments undertaken by iwi)		
Ethnicity	Census 2018, Statistics New Zealand	This data does not classify or count separately the groups making up the cultural groups “Pacific” or “Asian”. Both groups include a range of different cultures and ethnicities with different needs in terms of equity.
Family and community impacts – including its composition, cohesion, character, how it functions and sense of place		
Housing and community cohesion	Rental bond data for the period 01 Nov 2021 and 30 Apr 2022 accessed at https://www.tenancy.govt.nz/rent-bond-and-bills/market-rent/ Census 2018, Statistics New Zealand	Bond information can provide an indication of the permanency or cohesion of a community and provide an indication of how mobile or transient it might be. The market rent tool shows bond information for properties where bonds have been lodged in the time period. Data is for

Data	Source	Comments and limitations
		private bonds only. Data is for the SA2-2019 area definitions from Statistics NZ.
Urban Life	Urban Life data from Neighbourlytics (commissioned report) which includes: • Character • Variety • Vitality • Relevance • Rhythm - day/night and weekday/weekend	Urban life is the everyday activity that goes in within and between buildings in a city and includes data on behaviour and activity. Data is collected for a 1km catchment around a point as a 'walkable' catchment. Data is from publicly available third party sources reflective of behaviour and lifestyle and can include map based information, business and community pages, event pages, ratings and reviews.
Age	Census 2018, Statistics New Zealand	Data collected from the individual section of the 2013 census. Median age for each CAU used, as well as grouped age brackets (e.g. under 15, over 65). Medians for CAUs may not reflect smaller specific areas with the CAU.
Quality of the environment – including access to and use of ecosystem services; public safety and security; access to and use of the natural and built environment, and its aesthetics value and/or amenity; the quality of the air and water people use; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation; their physical safety; and their access to and control over resources		
Crime	https://www.police.govt.nz/crime-snapshot https://www.police.govt.nz/about-us/publications-statistics/data-and-statistics/policedatanz/victimisation-time-and-place	Crime statistics can provide an indication of public safety and security. Victimisation time and place data is displayed at a SLA2 level with a sliding colour scale showing indicating the number of victims. Data is for the period 1/8/2021 to 31/7/2022.
Health and wellbeing - health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity. It includes psycho-social impacts such as solastalgia (a form of mental or existential distress caused by environmental change)		
Physical health	Index of Multiple Deprivation (Exeter et al. 2018) for Health accessed at https://imdmap.auckland.ac.nz/download/	Health deprivation score based on: Standardised Mortality Ratio; Hospitalisations related to selected infectious diseases; Hospitalisations related to selected respiratory diseases; Emergency admissions to hospital; People registered as having selected cancers.

Data	Source	Comments and limitations
Mental health	Index of Multiple Deprivation (Exeter et al. 2018) accessed at https://imdmap.auckland.ac.nz/download/ New Zealand Health Survey 2020/21 accessed at https://www.health.govt.nz/publication/annual-update-key-results-2020-21-new-zealand-health-survey	Mental health statistics are not available at the geographic level required for this piece of work. However, rates of deprivation serve as one indicator of rates of mental health issues compared to the wider New Zealand population. This information can be inferred, to some degree, from the New Zealand Health Survey (2019) and the Index of Multiple Deprivation, which correlates higher levels of mental health problems with higher rates of deprivation.
Disability	New Zealand Health Survey 2020/21 accessed at https://www.health.govt.nz/publication/annual-update-key-results-2020-21-new-zealand-health-survey	Disability rates, and prevalence of disability for particular groups is not given at a geographic level suitable for this work. However, both the New Zealand Health Survey (2020/21) and the New Zealand Disability Survey (2013) give indications of disability rates within particular demographic groups, including Māori, Pasifika, Asian, and those living in areas with high levels of socio-economic deprivation
Equity impacts – distribution of impacts across the community and generations (intergenerational impacts)		
Deprivation	Index of Multiple Deprivation (2018) accessed at https://imdmap.auckland.ac.nz/download/ and https://imdmap.auckland.ac.nz/viewdata/NZIMD2018_Single_animation_w_logos/atlas.html Access to a vehicle, Census 2018, Statistics New Zealand	The Index of Multiple Deprivation (2018) uses its own geographic boundaries to deliver deprivation scores for New Zealand. The IMD18 comprises 29 indicators grouped into seven domains of deprivation: Employment, Income, Crime, Housing, Health, Education and Access to services. Access to vehicles can be an indicator of transport disadvantage, especially in areas that do not have high proportions of high density living.
Socio-economic impacts – including standard of living, level of affluence, economic prosperity and resilience, property values, employment, replacement costs of environmental functions and economic dependency		
Income	Census 2018, Statistics New Zealand	
Education	Census 2018, Statistics New Zealand	
Employment Status	Census 2018, Statistics New Zealand	

3.1 Way of life

Travel to work

A significant portion of those who travel to work use some form of private or company vehicle to travel to work. Higher rates of walking/jogging to work for those in the Manukau Central locality indicates many people live and work in the same area. Across all localities, there is less use of public transport compared to the Auckland region with the exception of trains within the Manukau City locality where train use is higher than the Auckland average.

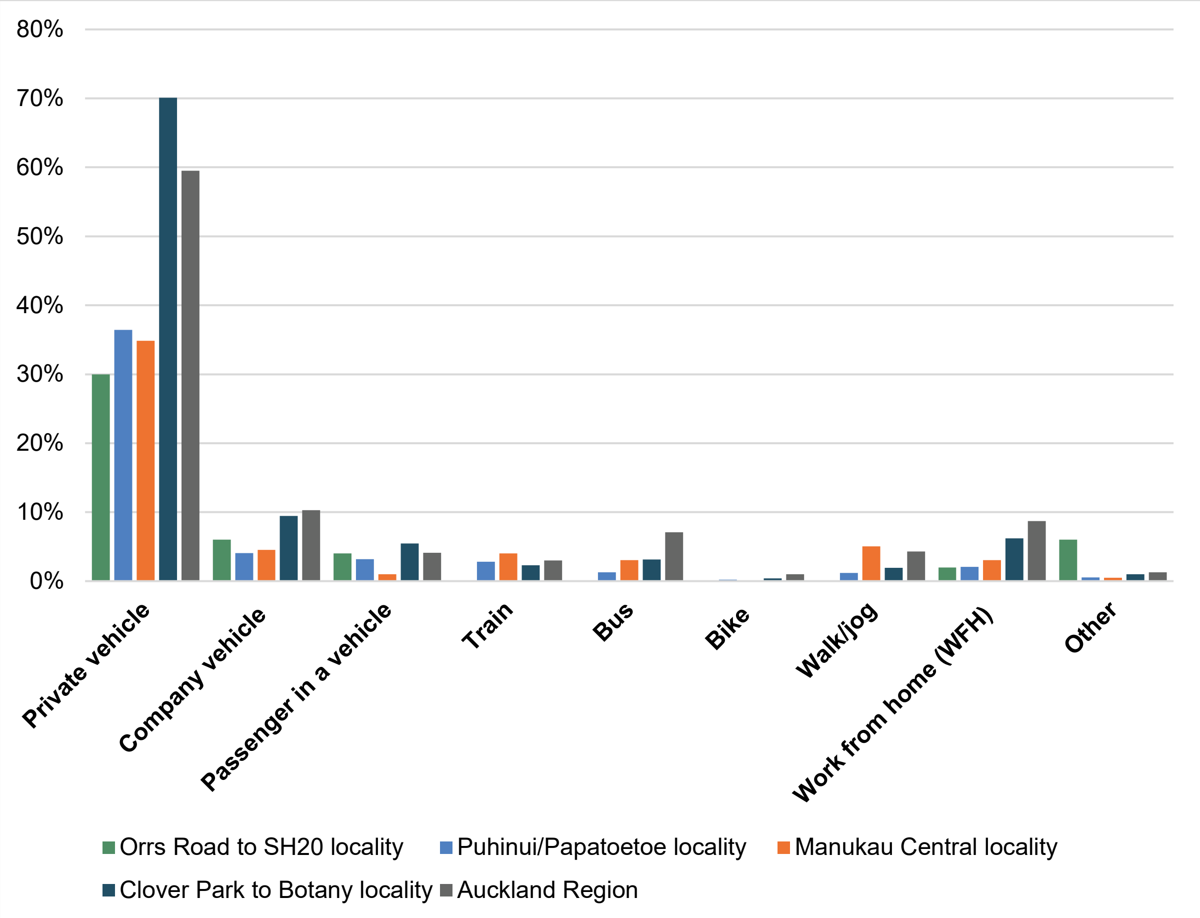

Figure 1: Method of travel to work

Note ferry's are not shown as a mode as it is not a readily available form of transport for the majority of people in the vicinity of the Project.

Social housing

The demand for social housing in the Ōtara-Papatoetoe and Howick Local Board areas has been steadily increasing with minor fluctuations in demand since March 2021. The demand for social housing in the Ōtara-Papatoetoe Local Board areas is significantly higher than in the Howick Local Board area.

As shown in Figure 2, there has been a strong increase in the need for social housing especially in the Ōtara-Papatoetoe Local Board area. Table 4 shows that the demand for social housing compared to the supply is high in both Local Board areas.

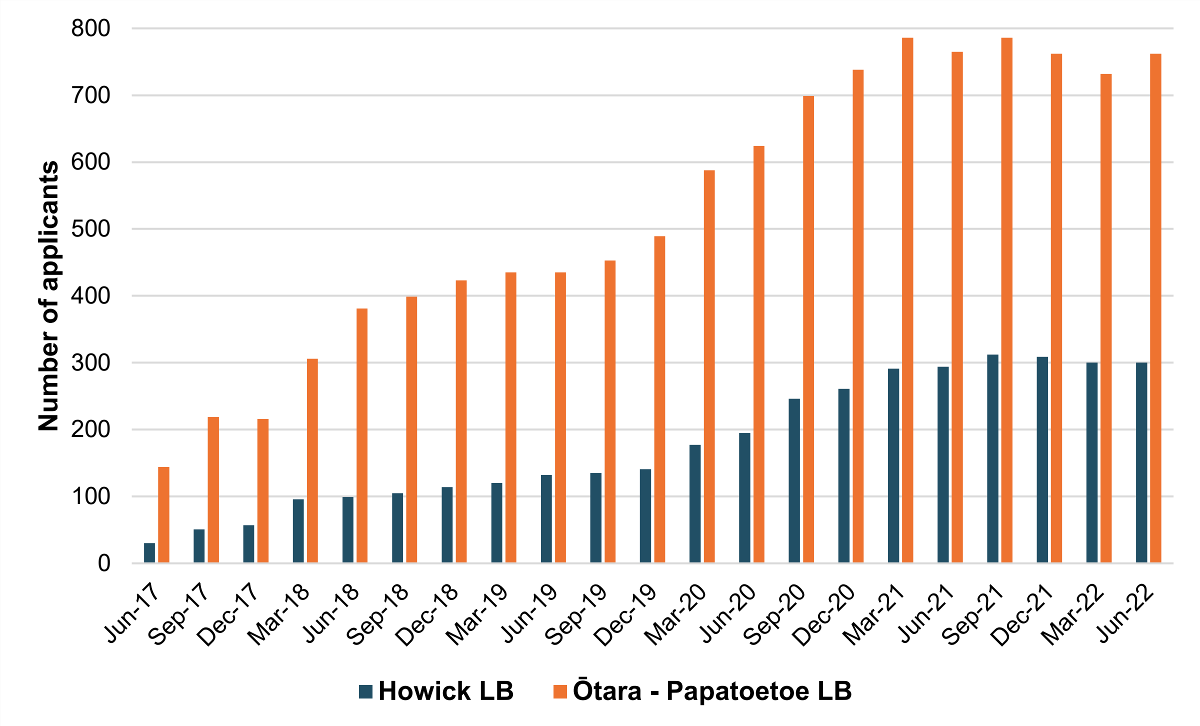

Figure 2: Demand for social housing June 2017 to June 2022

Around 12% of Kainga Ora properties in Auckland are in the Ōtara-Papatoetoe Local Board area. This is second only to Māngere-Ōtahuhu which has the highest proportion of Kainga Ora housing with 15% of properties. As at 30 June 2022 only 2% of those properties were vacant and only 1% were ready to let.

Table 4: Vacant Kāinga Ora Rental Properties by Auckland Council Local Board as at 30 June 2022

Local Board	Total Units	Total Vacant	Ready to Let	% Total Units in LB area	% Total Vacant in LB area	% Ready to let in LB area
Howick	706	14	12	2%	2%	2%
Kaipatiki	966	41	8	3%	4%	1%
Māngere-Ōtāhuhu	4,621	68	5	15%	1%	0%
Manurewa	3,413	72	16	11%	2%	0%
Maungakiekie-Tāmaki	2,310	151	25	8%	7%	1%
Ōrākei	758	43	0	3%	6%	0%
Ōtara-Papatoetoe	3,680	70	20	12%	2%	1%
Papakura	1,621	57	20	5%	4%	1%
Puketāpapa	2,417	76	26	8%	3%	1%
Rodney	55	1	1	<1%	2%	2%
Upper Harbour	45	—	—	<1%	—	—
Waiheke	14	—	—	<1%	—	—

Local Board	Total Units	Total Vacant	Ready to Let	% Total Units in LB area	% Total Vacant in LB area	% Ready to let in LB area
Waitākere Ranges	478	5	2	2%	1%	0%
Waitematā	1,170	72	8	4%	6%	1%
Whau	2,207	39	8	7%	2%	0%
Auckland Total	29,920	973	258			

3.2 Cultural impacts

Ethnicity

All localities are ethnically diverse with significant populations identifying as Māori, Pacific people and Asian. Both the Orrs Road to SH20 and Puhinui/Papatoeotoe localities have higher numbers of residents who identified as being Māori or Pacific people compared to the Auckland Region.

Proportions of people identifying as Asian in the Puhinui/Papatoetoe locality has increased by around 10% since the 2013 Census, with a smaller decrease in those identify as being of European decent.

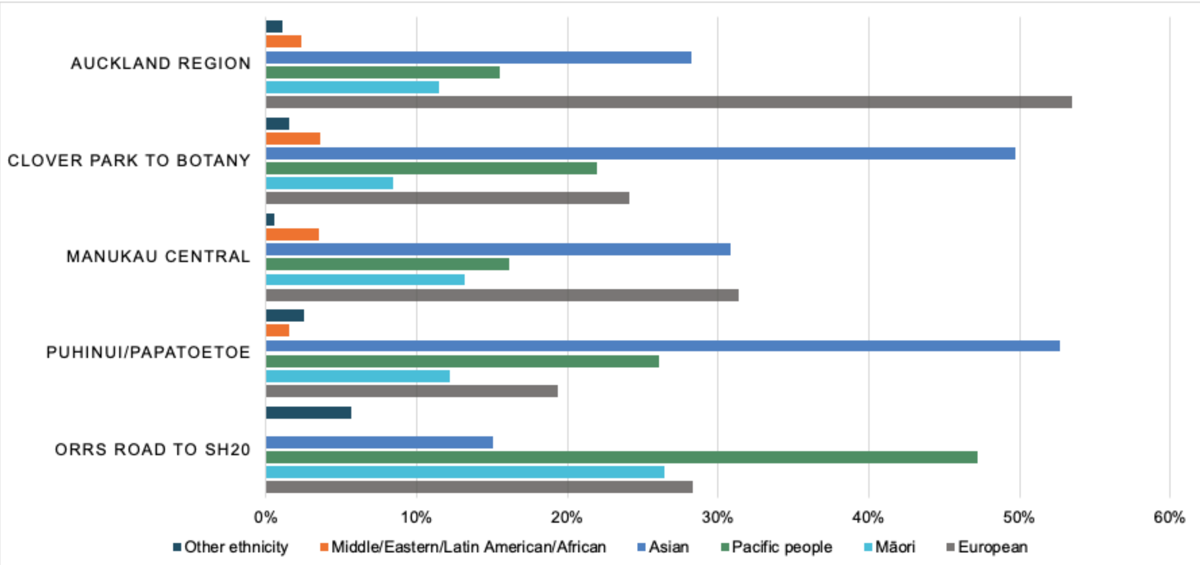

Figure 3: Ethnicity

Note respondents were able to select more than one ethnicity which is why the overall percentage equals greater than 100%.

3.3 Family and community impacts

Across all localities, over 30% of residents had lived in their homes for less than 1 year and more than 60% of people for four years or less. High numbers of residential building activity could account for the higher proportion of people residing in the area for shorter periods of time.

Housing and community cohesion

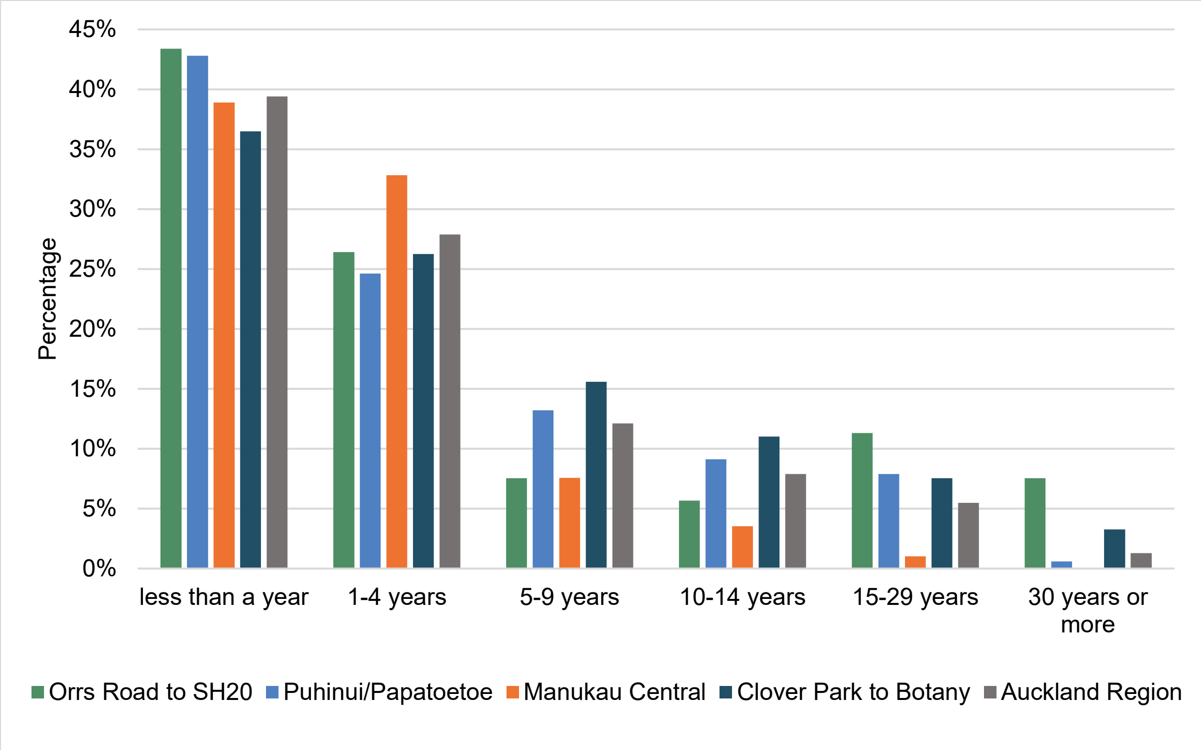

Figure 4: Duration of residence

Figure 5 shows that the Puhinui/Papatoetoe locality has a high number of bonds lodged with tenancy services indicating a high number of private rental properties. It could also be a consequence of the residential building activity within the area. This does not take into consideration the amount of social housing in the area.

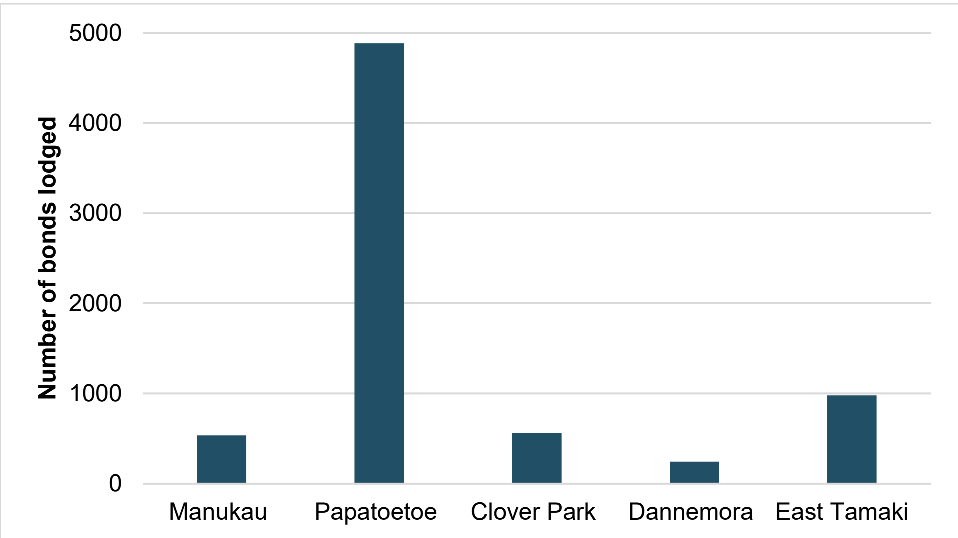

Figure 5: Number of bonds lodged for each area November 2021 - 30 April 2022

Urban Life

Urban life is the everyday activity that goes on within and between buildings in urban areas. It's the gap between what we know from the physical environment and what we hear from community engagement. Urban life data is collected for a range of places, for a variety of activities and interactions from multiple sources to provide insights into neighbourhood interactions (ie what's important), what's happening, and how places are being used.

Insights from urban life analysis show:

- The business ecosystem along the Project corridor is highly characterised by Technical and Industrial services. It likely caters to a range of workers within these industries, as well as locals.
- Destinations are largely dominated by Retail rather than Hospitality.
- A majority of the neighbourhoods are characterised by Business & Services, but have a good proportion of Destinations - meaning they have good place variety and cater to a range of daily needs.
- 2/3 of the corridor areas are characterised by Destinations, indicating that retail and hospitality is clustered around the corridor. This is also likely due to the proximity of shopping centres to main arterials the Project follows.
- Manukau City Centre, Clover Park and Botany Junctions corridor areas are characterised by Business and Services, indicating these areas have employment clusters around the Project corridor, particularly in the Manukau central area.

The dominant neighbourhood character across all localities, being the main reason to visit, spend and stay, is business and services, meaning the area as a whole is known for essential services, business and employment.

In terms of variety, many of the neighbourhoods within localities have a technical and industrial based business ecosystem with the area being important for employment. Retail activity dominates those neighbourhoods with a higher 'destination' ranking, indicating an opportunity to increase hospitality, attractions and arts & culture. The Papatoetoe area has one of the greatest variety in terms of its character and the SH20/SH20B – Orrs Road area the least variety.

Great neighbourhoods have clusters of activity which increase local vibrancy. Activity is naturally very high within the Manukau Central area, with the proposed Project corridor running through the densest part of the neighbourhood. This can also indicate it will be the area that is likely to undergo the most disruption during construction. Botany Town Centre and Botany Junction also have high vitality compared to other neighbourhoods along the Project corridor.

Relevance of areas can be measured by looking at the number of local places that area highly valued by the community. Within the Botany to Clover Park area important places to the community include open spaces, particularly Barry Curtis Park, retail food outlets, service stations and health care facilities. Within Manukau Central the large retail areas of Westfield and the Supa Centa rank highly along with supermarkets and Rainbow's End theme park. Within vicinity of the Project area within the Puhinui/Papatoetoe area local convenience shopping (dairies, takeaways) rank highly along with the Mobil Service Station and laundromats in the area.

Age

The age of people within proximity to the Project is lower on average than the Auckland region. There are younger populations in most localities particularly in the Puhinui/Papatoetoe locality. The Manukau Central locality, which has a low overall population, has a significantly lower proportion of residents 15 years and under compared to the Auckland Region indicative of the tertiary student, locally employed demographic.

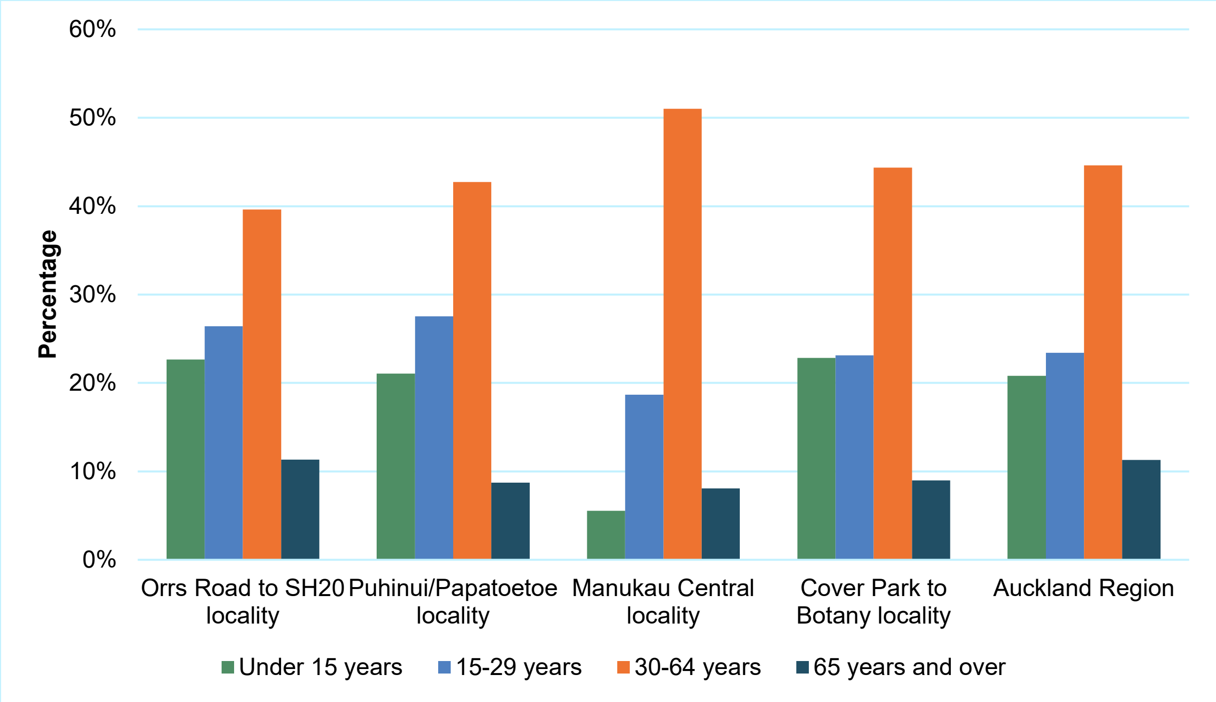

Figure 6: Age distribution of residents

3.4 Quality of the environment

This area of social impact is about people's perceptions about their safety, fears about the future of their community, and their aspirations for their future and the future of their children. As it is related to perceptions, engagement feedback is the best way to measure this, however no qualitative data has been collected as part of this Project. Overall crime data could provide an indication of potential community safety.

Crime

Within the Project area, crime rates overall are much higher in the Manukau Central area compared to all other areas. Victimisation rates are the number of victims of all reported crime in an area, regardless of the nature of the crime.

Figure 7 shows that Manukau Central as a SA2 has a higher rate of crime than other areas along the transit corridor with over 30% of all crime. Perceptions of safety within the Manukau Central area might be lower than other areas as a result of this data.

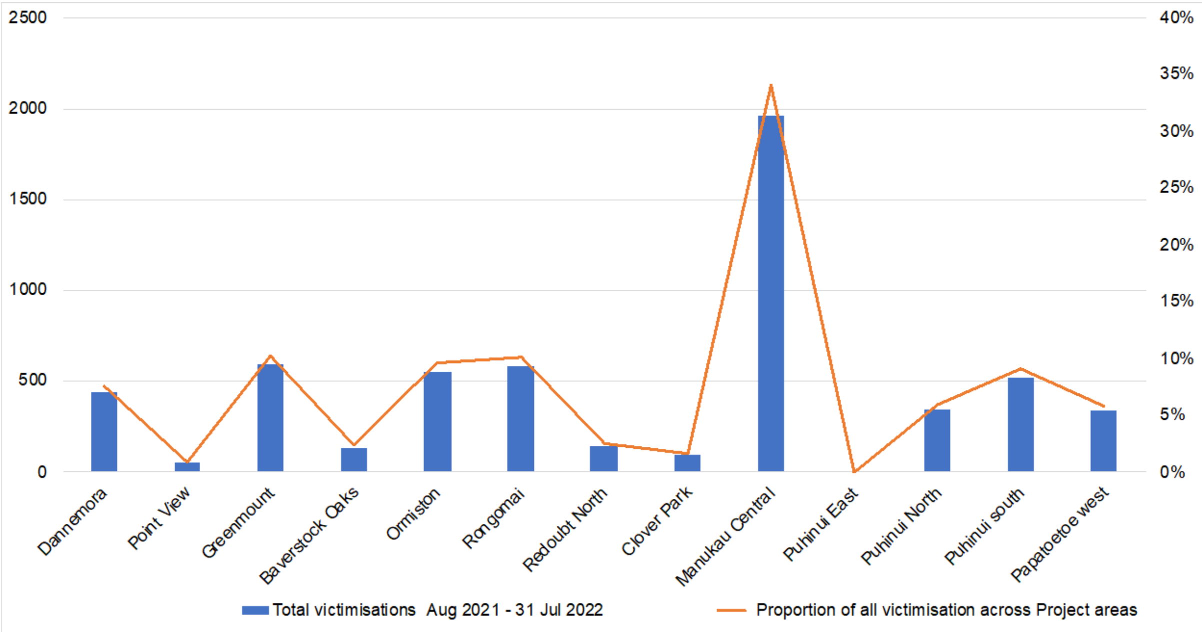

Figure 7: Overall Victimisations at a relative SA2 level, 1 August 2021 – 31 July 2022

3.5 Decision making systems

This refers to the extent to which people can have a say in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose. It relates to both the level of influence the Project is providing to people to influence Project decisions and also people's perceptions about their ability to participate in, or the extent to which they feel they can have a say in, Project decisions.

The ability to have a say in decisions during this current phase of the project is limited to potentially affected landowners in relation to the potential impacts on their property, and other stakeholders in relation to their specific interests, such as other government agencies the project interacts with (Eke Panuku and Kainga Ora) and Manawhenua.

There have been several years since engagement was undertaken on the Project during the Detailed Business Case stage when decisions in relation to the route of the Project were made. Since then some people have moved away from the area and new people have moved in. This in turn has led to a lack of knowledge about the project for many and a feeling they have been excluded from the ability to influence decision making *"I don't know about this project and now you tell me the decision is made already."*

3.6 Health and wellbeing

Health is one of the areas of measurement that comprise the IMD 2018, and includes a range of indicators such as mortality, hospitalisations for specific diseases, etc. In 2018, health deprivation scores across the Project area were higher in the western and central areas of the Project and lower in the east towards Botany.

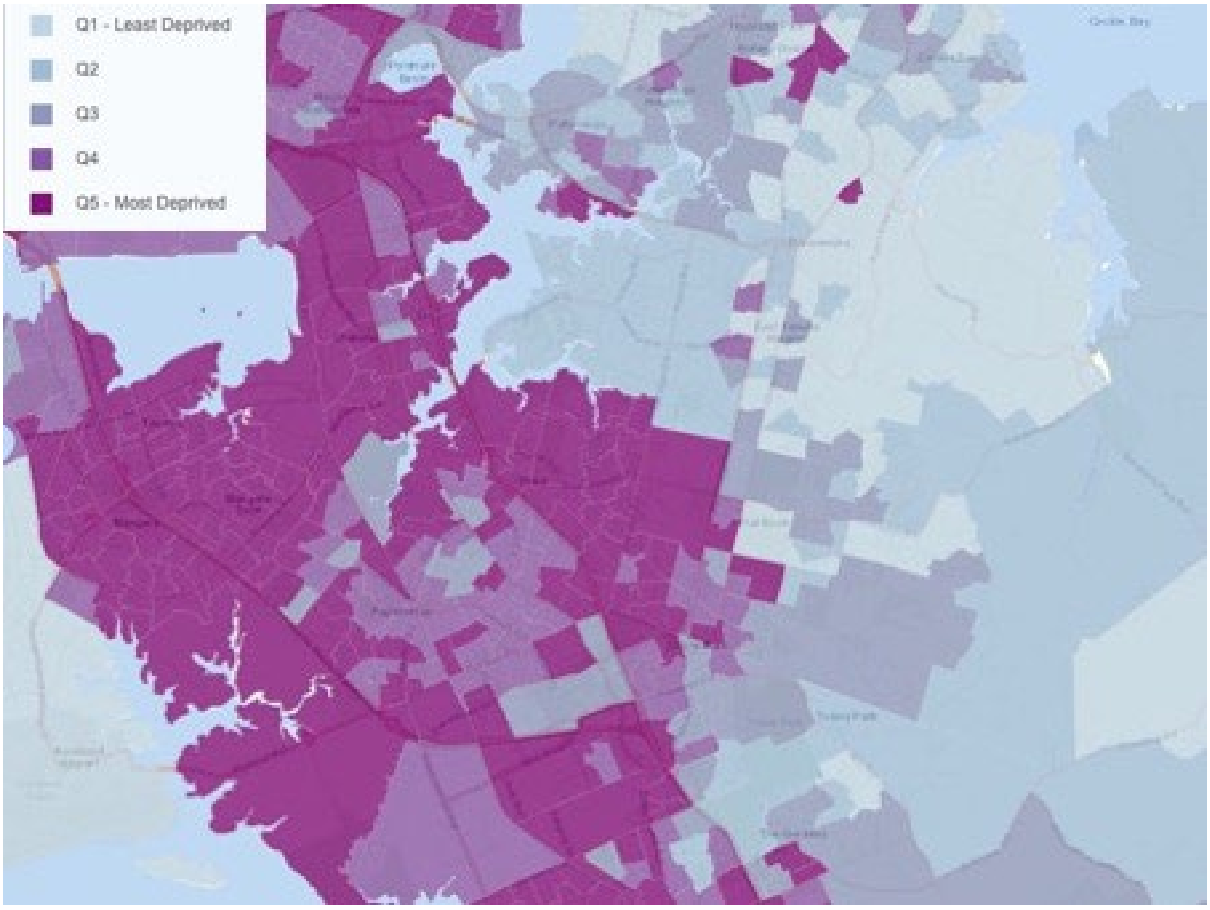

Figure 8: Health deprivation, IMD 2018

The 2020/21 New Zealand Health Survey results, shown in Figure 9 showed similar, and higher, rates of psychological distress in Māori and Pacific peoples compared to others. This is a slight increased from the 2011/12 data which showed Māori (13.7%) and Pacific (12.4%) and a reduction for European/Other (8.0%) and Asian (5.8%).

The survey showed that Māori and Pacific adults were 1.6 and 1.4 times as likely to have experienced psychological distress compared to non-Pacific and non-Māori adults, respectively. As shown in

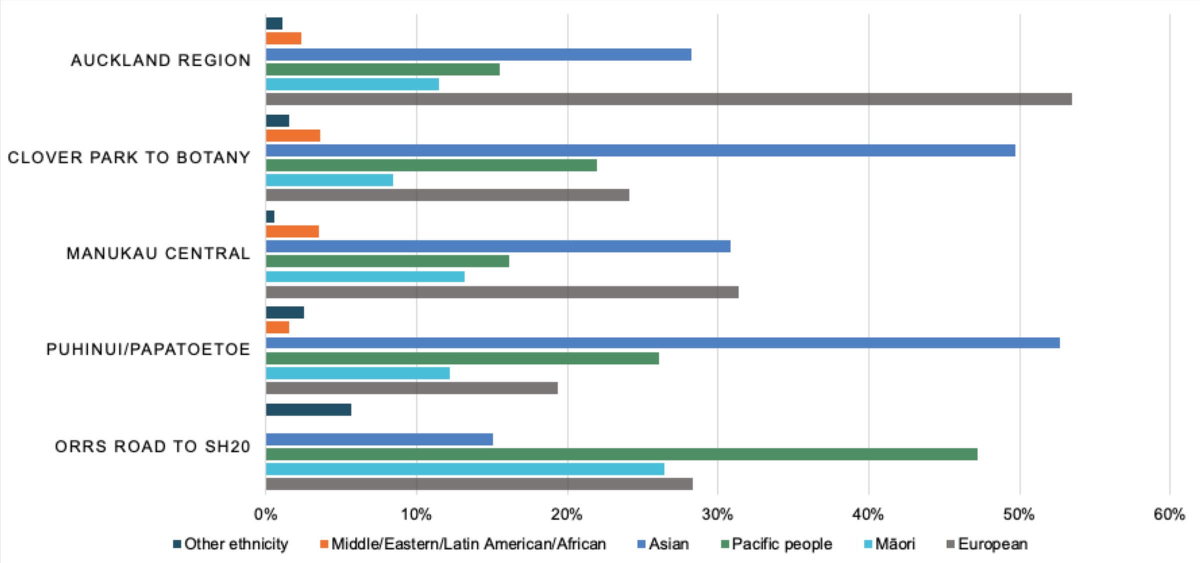

Figure 3, there is a strong percentage of the transit corridor that is of either Māori of Pacific decent.

Adults who lived on some of the most deprived areas were 2.2 times as likely to have experienced psychological distress compared to those who are living in the least deprived areas. This is a slight increase from the 2011/12 survey which showed that they were 2.1 times as likely.

There was a significant increase in disabled adults who experienced psychological distress four weeks prior to the survey compared to the 7.9% of non-disabled adults. Around 16% of disabled adults said that they did not visit a GP due to the cost.

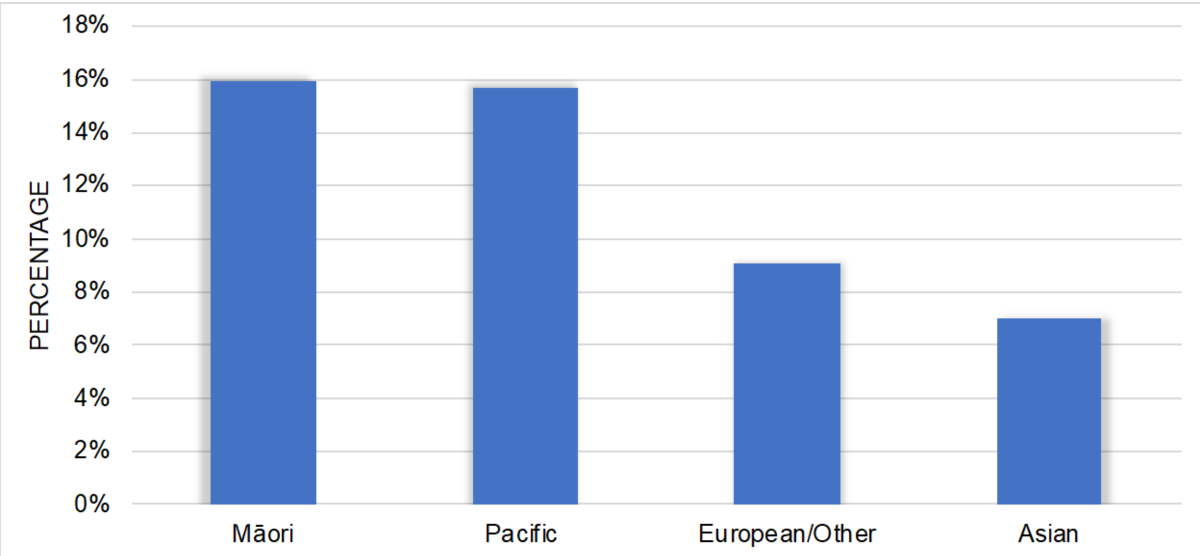

Figure 9: Proportion of people who experienced psychological distress 2020/21

3.7 Personal and property rights

For the purposes of this assessment, whether people are economically affected or experience personal disadvantage which might include violation of their civil liberties is considered to be limited to issues related to physical property – it's acquisition (partial or complete) and physical impacts such as damage. Indicators related to potential personal economic effects such as income, employment, etc are included in other areas of social impact.

Stakeholder feedback has identified impacts associated with feelings of loss of autonomy of decision making about future of land, specifically for landowners affected by the designation.

3.8 Fears and aspirations

This area of social impact is about people's perceptions about their safety, fears about the future of their community, and their aspirations for their future and the future of their children. As it is related to perceptions, engagement feedback is the best way to measure this.

Engagement feedback identified there is uncertainty for business owners in planning for the long term, particularly for commercial landowners who may only be affected by a partial land requirement. This could impact the ability to retain and/or secure ongoing or future tenancies prior to the land being acquired.

3.9 Equity

Areas around the Project are some of the most deprived areas. Areas in the north west towards Botany are some of the least deprived areas.

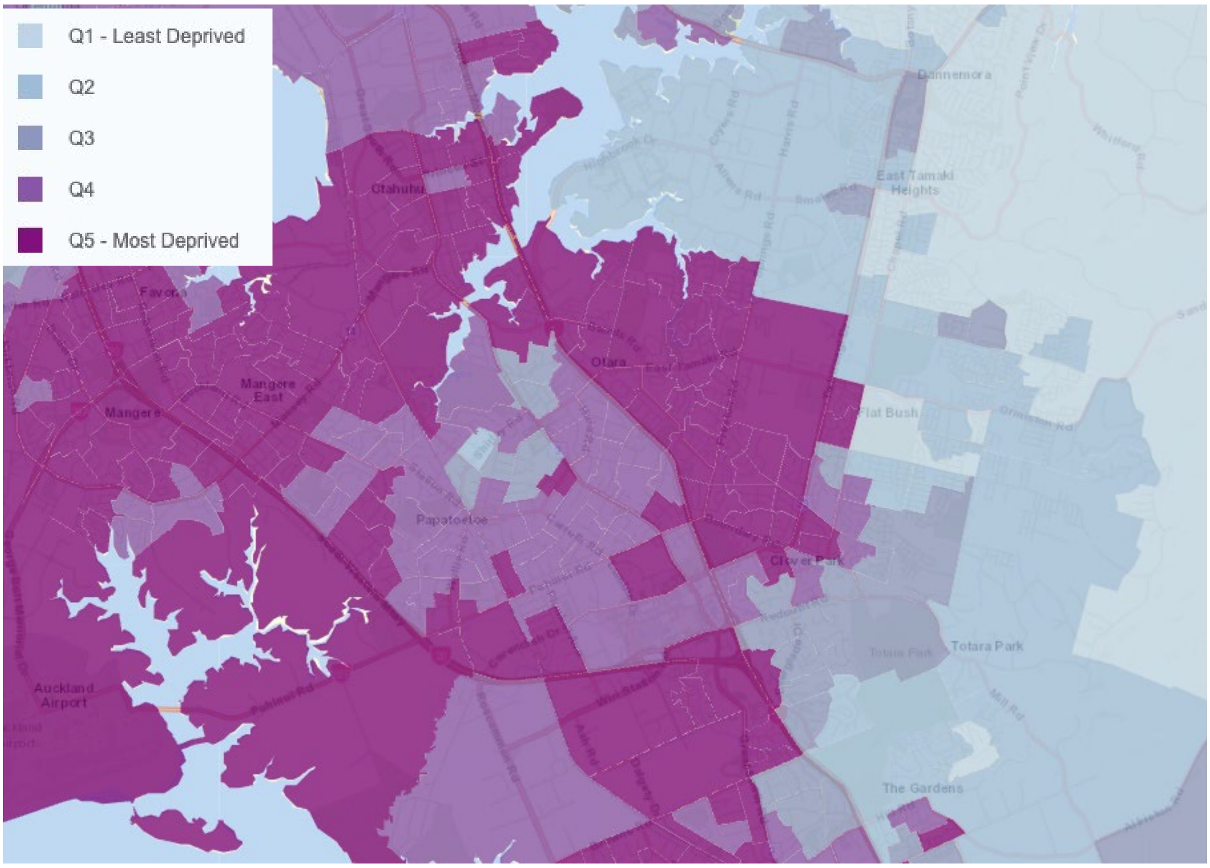

Figure 10: Socio-economic deprivation, IMD 2018

The proportion of the population without access to a vehicle has been slowly decreasing over time in all areas with the exception of the Orrs – SH20 locality and Manukau Central. Access to vehicles is less likely to correlate with transport disadvantage where many people live in proximity to their work, such as in the Manukau Central area.

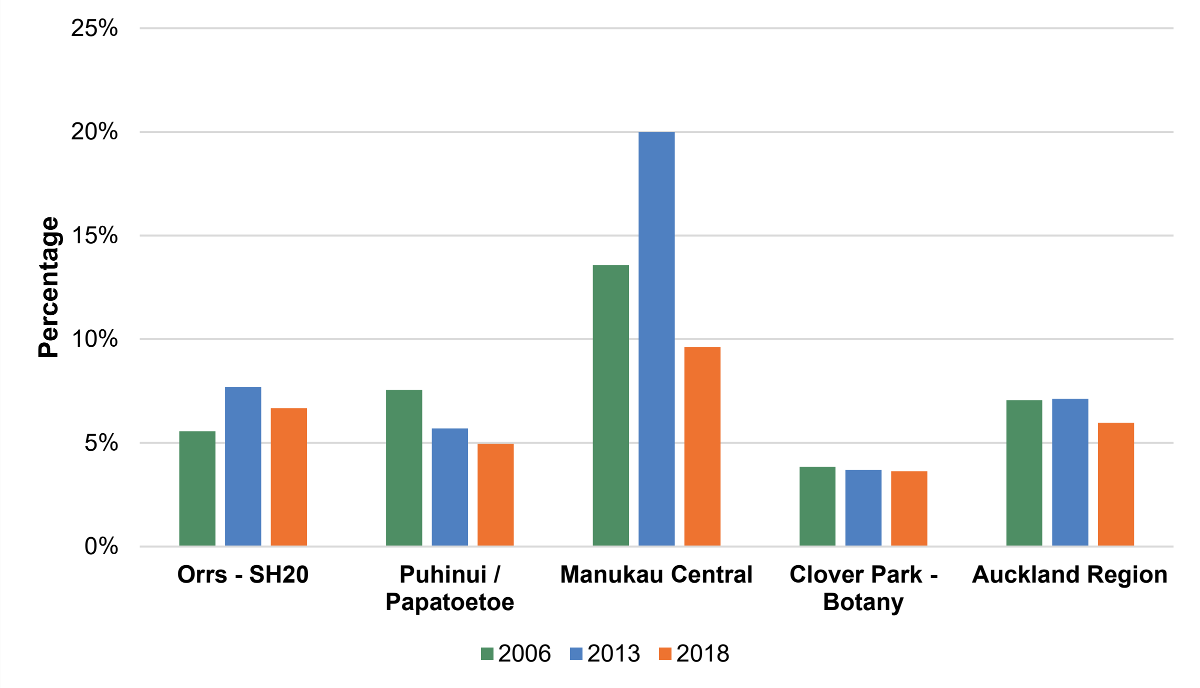

Figure 11: Households with no access to a motor vehicle

3.10 Socio-economic impacts

Across all areas except Orrs Road to SH20, the highest proportion is residential income fell within the $30,000-$70,000 income bracket, generally consistent with Auckland Region. There are much lower numbers of people in higher income bracket across all localities compared to the Auckland Region.

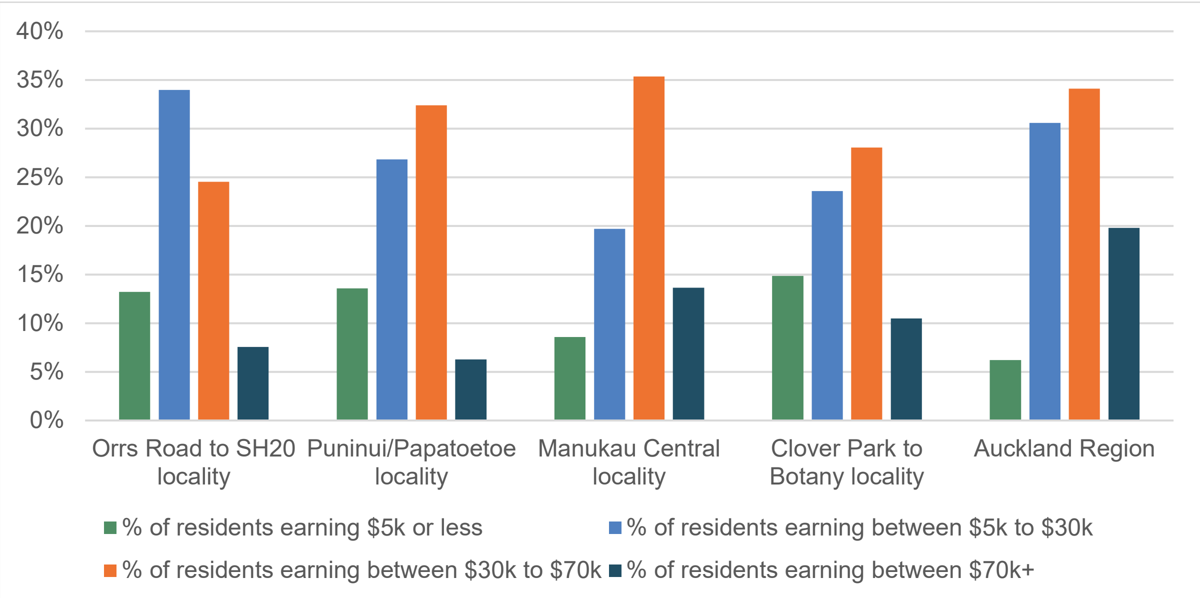

Figure 12: Income

Figure 13 shows the proportion of the population with educational qualifications is generally lower than the Auckland average, particularly those with certificate/diploma qualifications.

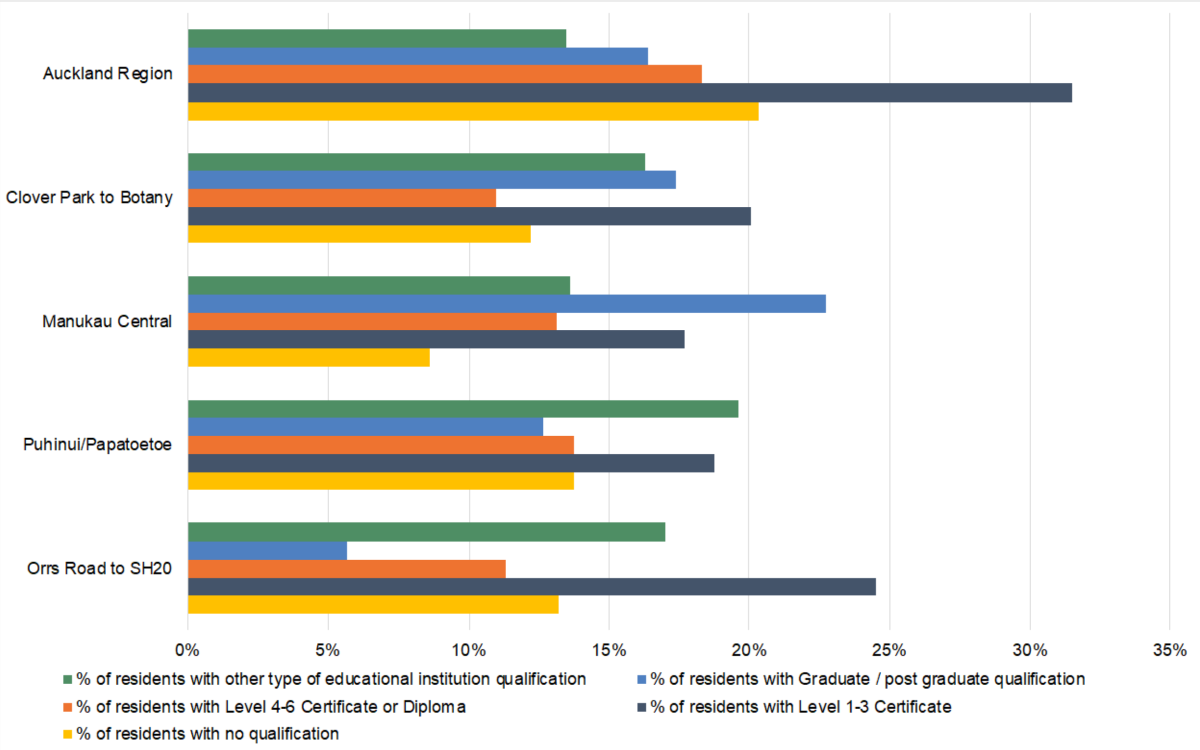

Figure 13: Level of education

Table 5: Statistical Data for Social Impact localities

Category	Botany to Clover Park locality	Manukau Central locality	Puhinui / Papatoetoe locality	Orrs Road to SH20	Ōtara-Papatoetoe LB	Howick LB	Whole corridor (all localities)	Auckland Region
Income								
Median individual income (annual)	$31,300	$42,300	$29,100	$22,600	$25,900	$34,900	$34,233	$34,400
% of residents earning $5k or less	15%	9%	14%	13%	18%	17%	12%	6%
% of residents earning between $5k to $30k	24%	20%	27%	34%	36%	28%	23%	31%
% of residents earning between $30k to $70k	28%	35%	32%	25%	39%	34%	32%	34%
% of residents earning between $70k+	10%	14%	6%	8%	7%	20%	10%	20%
% of residents with no source of income	8%	3%	7%	6%	7%	8%	6%	9%
% of residents earning wages	56%	66%	59%	51%			60%	
% of residents earning other	8%	8%	4%	4%			7%	
% of residents earning a benefit	9%	15%	9%	23%			11%	
% of residents earning superannuation	11%	7%	13%	9%			10%	
Employment status								
% of residents who are paid employee	43%	53%	48%	42%			48%	
% of residents who are employers	2%	2%	2%	2%			2%	
% of residents who are self employed	3%	4%	2%	2%			3%	
% of residents who are unpaid family worker	0%	0%	0%	0%			0%	

Category	Botany to Clover Park locality	Manukau Central locality	Puhinui / Papatoetoe locality	Orrs Road to SH20	Ōtara-Papatoetoe LB	Howick LB	Whole corridor (all localities)	Auckland Region
Age Structure								
% of residents who are under 15 years	23%	6%	21%	23%	24%	19%	16%	21%
% of residents who are 15-29 years	23%	19%	28%	26%	27%	20%	23%	23%
% of residents who are 30-64 years	44%	51%	43%	40%	34%	47%	46%	45%
% of residents who are 65 years and over	9%	8%	9%	11%	8%	3%	9%	11%
% of residents who identify as Māori	11%	14%	13%	30%	16%	6%	13%	12%
Median Age (years)	32.7	38.5	30.1	30.2	29.1	37.3	33.79	34.7
Household composition								
% of households with no children	40%	31%	40%	31%	33%	30%	37%	35%
% of households with 1 - 3 children	68%	22%	62%	56%	47%	60%	51%	54%
% of households with 4+ children	15%	5%	15%	31%	18%	8%	11%	9%
Dwelling Structure (Occupied Private Dwellings)								
% of dwellings that are separate houses	80%	36%	75%	81%			64%	
% of dwellings that are joined dwellings	15%	66%	20%	13%			34%	
% of dwellings that are other private dwellings	0%	1%	0%	6%			0%	
Tenure Type (Occupied Private Dwellings)								
% of dwellings that are owner occupied	42%	10%	11%	8%	38%	50%	21%	45%

Category	Botany to Clover Park locality	Manukau Central locality	Puhinui / Papatoetoe locality	Orrs Road to SH20	Ōtara-Papatoetoe LB	Howick LB	Whole corridor (all localities)	Auckland Region
% of dwellings that are not owned and not held in family trust	44%	65%	15%	68%	57%	33%	41%	41%
Number of rooms per house								
% of houses with one room	0%	6%	0%	6%	0%	0%	3%	0%
% of houses two rooms	0%	12%	0%	0%	1%	0%	3%	1%
% of houses three rooms	2%	29%	2%	6%	3%	1%	10%	4%
% of houses four rooms	6%	27%	14%	19%	12%	6%	17%	9%
% of houses five rooms	11%	15%	18%	6%	18%	9%	13%	14%
% of houses six rooms	24%	10%	25%	38%	31%	20%	24%	24%
% of houses seven rooms	17%	3%	16%	19%	16%	18%	14%	17%
% of houses eight or more rooms	33%	1%	19%	6%	19%	45%	15%	31%
Number of bedrooms per house								
% of houses One bedroom	4%	67%	5%	13%	6%	3%	22%	7%
% of houses two bedrooms	13%	28%	28%	25%	23%	13%	24%	20%
% of houses three bedrooms	37%	7%	38%	44%	45%	35%	31%	39%
% of houses four bedrooms	28%	1%	16%	19%	17%	31%	16%	24%
% of houses five or more bedrooms	13%	0%	8%	0%	9%	17%	5%	10%
Rental costs per week								

Category	Botany to Clover Park locality	Manukau Central locality	Puhinui / Papatoetoe locality	Orrs Road to SH20	Ōtara-Papatoetoe LB	Howick LB	Whole corridor (all localities)	Auckland Region
% of renters paying under $100	4%	1%	2%	0%	9%	2%	2%	6%
% of renters paying $100 - $149	7%	0%	4%	13%	15%	3%	4%	7%
% of renters paying $150 - $199	3%	2%	3%	13%	5%	2%	2%	3%
% of renters paying $200 - $299	4%	9%	6%	13%	8%	3%	6%	6%
% of renters paying $300 - $399	5%	34%	23%	19%	16%	8%	21%	14%
% of renters paying $400 - $499	16%	18%	32%	6%	27%	23%	22%	24%
% of renters paying $500 - $599	16%	1%	19%	6%	16%	28%	12%	20%
% of renters paying $600 and over	45%	2%	11%	0%	5%	32%	19%	20%
Stability of residents								
Number of bonds lodged 01 Nov 2021 - 30 Apr 2022	1,785						1785	
% of residents living in residents for less than a year	37%	39%	43%	43%			39%	
% of residents living in residents for 1-4 years	26%	33%	25%	26%			28%	
% of residents living in residents for 5-9 years	16%	8%	13%	8%			12%	
% of residents living in residents for 10-14 years	11%	4%	9%	6%			8%	
% of residents living in residents for 15-29 years	8%	1%	8%	11%			5%	
% of residents living in residents for 30 years or more	3%	0%	1%	8%			1%	
Attended Education (% of those attended)								

Category	Botany to Clover Park locality	Manukau Central locality	Puhinui / Papatoetoe locality	Orrs Road to SH20	Ōtara-Papatoetoe LB	Howick LB	Whole corridor (all localities)	Auckland Region
% of residents with no Qualification	12%	9%	14%	13%	35%	15%	12%	20%
% of residents with Level 1-3 Certificate	20%	18%	19%	25%	32%	30%	19%	32%
% of residents with Level 4-6 Cert / Diploma	11%	13%	14%	11%	14%	20%	13%	18%
% of residents with Graduate / post graduate	17%	23%	13%	6%	7%	17%	18%	16%
% of residents with other type of educational institution	16%	14%	20%	17%	12%	17%	17%	14%
Method of Travel to Work								
% of residents who use a private vehicle	70%	35%	36%	30%	69%	67%	47%	60%
% of residents who use a company vehicle	9%	5%	4%	6%	8%	12%	6%	10%
% of residents who use a passenger in a vehicle	5%	1%	3%	4%	7%	4%	3%	4%
% of residents who use the train	2%	4%	3%	0%	4%	2%	3%	3%
% of residents who use the bus	3%	3%	1%	0%	4%	3%	2%	7%
% of residents who use the ferry	0%	0%	0%	0%	0%	1%	0%	1%
% of residents who use a bike	0%	0%	0%	0%	0%	0%	0%	1%
% of residents who walk/jog	2%	5%	1%	2%	2%	2%	3%	4%
% of residents who work from home (WFH)	6%	3%	2%	6%	4%	8%	4%	9%
% of residents who use other	1%	1%	1%	6%	1%	1%	1%	1%
Ancestry								

Category	Botany to Clover Park locality	Manukau Central locality	Puhinui / Papatoetoe locality	Orrs Road to SH20	Ōtara-Papatoetoe LB	Howick LB	Whole corridor (all localities)	Auckland Region
European	24.1%	31.3%	19%	28%	17%	46%	24.9%	54%
Māori	8.5%	13.1%	12.2%	26.42%	16%	6%	11.3%	12%
Pacific people	22.0%	16.2%	26.1%	47.17%	46%	6%	21.4%	16%
Asian	49.7%	30.8%	52.7%	15.09%	35%	47%	44.4%	28%
Middle/Eastern/Latii American/African	3.6%	3.5%	1.5%	0.00%	1%	3%	2.9%	2%
Other ethnicity	1.5%	0.5%	2.5%	5.66%	1%	1%	1.5%	1%
Social Housing								
Kainga Ora Rental properties by local board area as at 30 June 2022					3680	706		
Housing register priority A June 2022					648	240		
Housing register priority B June 2022					114	57		

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix E

Impact assessment

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

Appendix E: Impact assessment

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1 Impact assessment process

The potential positive and negative social impacts have been identified and assessed in accordance with the methodology presented in Appendix C. Once social impacts have been allocated a social risk/opportunity rating, they received a prioritisation rating, based on the social risks hierarchy. Social impacts with a priority 1 or 2 are outlined further below along with recommended mitigation strategies and a priority rating following mitigation noted.

A summary of this is included within the main *Airport to Botany Social Impact Assessment* report.

2 Impact Assessment

2.1 Botany to Clover Park

⊕ Positive impact ⊖ Negative impact

Table 1: Botany to Clover Park potential social impacts (planning)

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊖	Temporary disruption (but not closure or loss) of access to locally significant businesses and services including: Z Service station Suburban shops adjacent to the Z Service Station including a laundromat and liquor store Botany Junction - specifically the retail area on the south western corner of the intersection of Te Irirangi Drive and Ormiston Road	Leaseholders, tenants and other occupiers of potentially affected properties	Individual properties and businesses	Ongoing or until such time businesses re-establish or new businesses start	G3	E3	V2	R2	Minor	x	x	x	Almost Certain	**Moderate**	3
⊖	Potential for changes to some convenience for some residents due to temporary changes to access to	People living and working in the area	Individual properties and businesses	Ongoing or until such Time	G3	E2	V2	R2	Moderate	_	x	x	Likely	**Moderate**	3

[1] See Appendix C for methodology
[2] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	places of importance to the community, including: Z Service station Suburban shops adjacent to the Z Service Station including a laundromat and liquor store Botany Junction - specifically the retail area on the south western corner of the intersection of Te Irirangi Drive and Ormiston Road			businesses re-establish or new businesses start											
Impacts on culture[3]															
	Potential impacts on local social ties and community relationships to place due to acquisition and loss of residential properties particularly Kāinga Ora housing in the Clover Park area.	Landowners of potentially affected properties	Individual properties and businesses	Ongoing or until such time businesses re-establish or new businesses start	G3	E2	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
Family and community															
	Changes to local community within the Clover Park locality associated with property acquisition and families moving out of the area.	Landowners of potentially affected properties	Individual properties and businesses	Permanent	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
Quality of the environment															

[3] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Perceived reduction in the safety of the area as properties are acquired and homes vacated. Vacant buildings can attract antisocial behaviour before they are removed during construction.	Landowners of potentially affected properties	Individual properties and businesses	Until construction starts, i.e. the whole of the planning phase	G3	E3	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3
Impacts on health and wellbeing															
⊖	Stress and anxiety (Psycho-social impacts) for some more vulnerable community members resulting from a loss of social networks and social support a result of property acquisition and people having to move out of the Cover Park area.	Landowners of potentially affected properties	Individual property	Ongoing	G1	E3	V2	R2	Significant	x	_	x	Likely	**High**	1
⊖	Increased anxiety and uncertainty for directly affected landowners between now and when active property acquisition commences	Landowners of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G1	E3	V2	R2	Significant	_	x	x	Likely	**High**	1
⊖	Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences	Leaseholders, tenants and other occupiers of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G1	E3	V2	R2	Significant	_	x	x	Likely	**High**	1
⊖	Increased anxiety and uncertainty for those employed in directly affected businesses between now and when active property acquisition commences	People employed in local businesses	Widespread, depending on where employees come from	Until properties are acquired - est 10 years	G3	E3	V2	R2	Minor	_	_	x	Rare	**Low**	4

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on personal and property rights															
	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisitions processes, including tenants being relocated by Kainga Ora. Tenant may be relocated to areas with reduced access to basic life necessities or vulnerability criteria	Directly affected landowners and occupiers	individual property	Until properties are acquired	G3	E3	V1	R2	Moderate	_	x	x	Likely	**Moderate**	3
	Impacts caused by the Public Works Act property acquisition process – land/property acquisition or severance within a property, potential land redistribution between different or new owners	Landowners of potentially affected properties	Individual property		G3	E4	V2	R2	Major	_	x	x	Likely	**High**	1
	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Landowners of potentially affected properties	Individual property		G4	E4	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Occupiers of potentially affected properties, including Business owners and operators, leaseholders and tenants	Individual property		G4	E4	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊕	Certainty for landowners and business owners/operators about future development enabling long term planning about the future of properties/businesses	Directly affected landowners and occupiers Leaseholders, tenants and other occupiers of potentially affected properties	Individual property	Until properties are acquired	G3	E2	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
Fears and aspirations															
⊖	Potential concern and anxiety about future security for residents or landowners affected by property acquisition in the Clover Park area (including those privately owned residential properties in the area), and associated uncertainty for business owners, employees and residents for their next steps once acquisition has been completed.	Directly affected landowners and occupiers	individual property	Until construction starts, i.e. the whole of the planning phase	G3	E2	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Potential negative impacts associated with fear of disruption to local community character, and perceptions about potential long term changes to the fabric of the community, particularly in combination with other potential construction activity such as the Eke Panuku redevelopment of the Manukau Sports Bowl and Kainga	Directly affected landowners and occupiers	Individual property	Ongoing	G4	E2	V1	R2	Moderate	x	_	x	Likely	**Moderate**	3

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	Ora redevelopment of residential land.														
⊖	Potential concerns associated with uncertainty about urban renewal (of which this project is a part), and potential concern about significant changes to the local community, including significant residential intensification by both Kainga Ora and private landowners. Especially around the five station locations along the route.	People living and working in the area	Southern Auckland community	Ongoing	G4	E3	V2	R2	Moderate	x	_	x	Likely	**Moderate**	3
⊕	Potential positive impacts and aspirations associated with perceived investment in the area and potential for transformation of the area. This could increase certainty for private developers who could commit to investment in the area.	All groups	Locality	Ongoing	G4	E2	V2	R1	Minor	x	x	x	Almost Certain	**Moderate**	3
Socio-economic impacts															
⊖	Loss of employment / livelihood as a result of acquisition of businesses.	People employed in local businesses People employed in local businesses	Locality	Until construction starts, i.e. the whole of the planning phase	G2	E2	V1	R1	Significant	x	x	x	Almost Certain	**Extreme**	1

Table 2: Clover Park to Botany potential social impacts (construction)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊖	Impacts on pedestrians and cyclists – people walking along the footpath, cycling on Te Irirangi to access shops, school, work, etc. Changed wayfinding and temporary closures could mean people chose not to walk or cycle. Especially those accessing Sancta Maria College adjacent to the Project and nearby schools like Chapel Downs Primary and Redoubt North School from the northern side of Te Irirangi Drive (i.e. need to cross Te Irirangi Drive).	Pedestrians and cyclists	Locality	4 - 6 years	G3	E3	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Changes to daily living routines could be possible due to changes to local access routes as a result of construction, including temporary relocation of the Manukau Sports Bowl Bus stops near Sandrine Ave in Clover Park, and access to regional and local facilities such as the Manukau Sport Bowl and Rongomai Park.	People living and working in the are People who purchase goods and services from the area People who visit the area and use community facilities and open space areas	Locality	4 - 6 years	G3	E2	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Impacts on locally significant businesses and services as a result of construction activity	People who visit the area and	Southern Auckland	4 - 6 years	G3	E2	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1

[4] See Appendix C for methodology
[5] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	including changes to access and parking, particularly those with direct access off Te Irirangi Drive.	purchase goods and services													
⊖	Delays to traffic and flow on impacts to local and regional economy and business operators	Commercial road users	Region wide	4 - 6 years	G3	E1	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3
Family and community															
⊖	Potential changes to community character and people's sense of place and belonging associated with the possible change to the residential character of this area due to increased construction activity and changes to the streetscape and an influx of unfamiliar construction workers into the area.	People living and working in the area	Locality	4 - 6 years	G3	E3	V2	R1	Moderate	_	x	x	Likely	**Moderate**	3
⊖	Potential changes to the accessibility of social infrastructure in the locality, including schools – for people travelling by bus or on foot – due to adjustments to transport infrastructure in the immediate vicinity of the construction site (including active transport). People using bus services in the area may experience some changes to access routes or minor increases in travel time.	People living and working in the area	Locality	4 - 6 years	G3	E3	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
Quality of the environment															
⊖	Reduced amenity and subsequent potential impacts to people's enjoyment of everyday activities in the local area due to construction noise and vibration, particularly in open space and recreation areas such as Rongomai Park and the Manukau Sports Bowl	Near neighbours People living and working in the area	Locality	4 - 6 years	G3	E2	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Temporary changes to the appearance and use of local surroundings associated with reduced amenity due to construction noise, vibration, changes to the streetscape and establishment of a construction site in a residential area. This may potentially result in reduced personal enjoyment of adjacent residences and nearby outdoor activities for residents and users, including accommodation providers.	Near neighbours People living and working in the area	Locality	4 - 6 years	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
⊖	Construction noise and vibration may be particularly experienced by sensitive receivers surrounding the construction site which could affect local social interactions. This includes the Dannemora Gardens Metlife Care, various accommodation facilities along Te Irirangi Drive, the Dannemora and Botany South Medical Centres, early childhood centres (Little Learners and Best Start) and the residential communities in close proximity to the construction. Noise and vibration has the potential to negatively affect people's experience of everyday activities including physical activities and social interactions.	Near neighbours People living and working in the area	Locality	4 - 5 years	G3	E3	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Perceived and potential actual safety impacts associated with changed sightlines, establishment of the acoustic shed and hoardings, and changes to wayfinding	Near neighbours People living and working in the area People who purchase goods	Locality	4 - 6 years	G3	E3	V2	R2	Minor	x	x	x	Almost Certain	**Moderate**	3

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
		and services from the area													
⊕	Increased personal safety as a result of less anti-social behaviour due to the presence of construction activity, particularly in the Clover Park area.	People living and working in the area	Locality	4 - 6 years	G3	E3	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3
Impacts on health and wellbeing															
⊖	Perceived safety impacts associated with the influx of unfamiliar construction workers in a local neighbourhood setting, adjacent to a primary school, which may cause anxiety and concern to local residents.	People living and/or, working in, and people visiting the area	Locality	4 - 6 years	G3	E3	V1	R2	Moderate	_	x	x	Likely	**Moderate**	3
⊖	Distress caused by environmental change from construction activity (Solastalgia), including removal of homes from properties in the Clover Park area.	Project neighbours and near neighbours, particularly those who will become neighbours of the ramp	Locality	4 - 6 years	G3	E3	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Impacts to health and wellbeing associated with impacts of construction noise, dust and vibration, regardless of meeting required standards e.g. ability to sleep undisturbed in ones home, cumulative impacts of long durations of construction activity	Near neighbours	Individual properties	4 - 6 years	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
Impacts on personal and property rights															
⊖	Perceived impacts to personal and property rights, livelihoods and individuals'	Near neighbours	Individual properties	4 - 6 years	G3	E3	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	experiences of personal disadvantage may be perceived through construction processes.														
⊖	Perceived impacts to housing and businesses, e.g. potential for cracking of structures associated with vibration from nearby construction sites.	Near neighbours	Individual properties	4 - 6 years	G4	E3	V2	R2	Moderate	_	_	x	Rare	**Low**	4
Fears and aspirations															
⊖	People who live, work and run businesses in the area are frustrated by construction and do not understand what it is for and how they might benefit from it.	People living and working in the area Business owners and occupiers	Locality	4 - 6 years	G4	E2	V2	R1	Minor	x	_	x	Likely	**Moderate**	3
⊖	Potential negative impacts associated with fear of disruption to local community character, and perceptions about potential long term changes to the fabric of the Clover Park community, particularly in combination with other construction activity which could include development of the Manukau Sports Bowl and intensive residential development.	People living and working in the area	Locality	4 - 6 years	G4	E2	V2	R1	Minor	x	_	x	Likely	**Moderate**	3
⊕	Potential positive impacts and aspirations associated with investment in the area.	All affected groups	Auckland Region	4 - 6 years	G4	E2	V2	R1	Minor	x	x	x	Almost Certain	**Moderate**	3
Socio-economic impacts															
⊕	Employment for people from within the local community, wider southern Auckland area and beyond.	People living and working in the area People in Local Board areas, especially Ōtara-	Auckland region	4 - 6 years	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
		Papatoetoe and Howick People in the wider Auckland Region.													
⊖	Reduced business activity and customers/clients as a result of disruption from construction activity, including changes to access and visibility of businesses.	Business owners and operators	locality	4 - 6 years	G3	E2	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊕	Increased business activity as a result of the construction workforce, such as cafés and food businesses.	Business owners and operators	locality	4 - 6 years	G3	E3	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Cumulative impacts															
⊖	Potential cumulative impacts within the broader Clover Park and Botany Town Centre area associated with other developments which could include urban intensification which may disrupt community connection to place, and potentially result in 'construction fatigue'. Other development could include the Manukau Sports Bowl, Kainga Ora housing redevelopment, and construction of the Botany Town Centre station for the Eastern Busway.	People living and working in the area	locality	4 - 6 years	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3

Table 3: Clover Park to Botany potential social impacts (operation)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
		Impacts on way of life													
⊕	Increased connectivity for people without vehicles or with limited access to vehicles.	Pedestrians and cyclists who use this path	Individual properties and businesses	Permanent	G3	E2	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Impacts on culture[8]															
⊕	Reflection of cultural values and aspirations in the project increasing people's connection to the land	Surrounding local communities	Southern Auckland community	Permanent	G2	E2	V2	R2	Major	–	–	x	Rare	**Moderate**	2
Impacts on health and wellbeing															
⊕	Improved health and wellbeing with increased access to active transport modes leading to healthier lifestyles.	People living and working in the area People travelling through the area	People in Local Board areas, especially Ōtara-Papatoetoe and Howick	Permanent	G3	E2	V1	R1	Moderate	–	x	x	Likely	**Moderate**	3
⊕	Reductions in Death or Serious Injuries (DSIs) as a result of adoption of the Vision Zero Philosophy.	People travelling through and within the area, including pedestrians and cyclists	Locality	Permanent	G4	E4	V2	R1	Moderate	–	x	x	Likely	**Moderate**	3
Socio-economic impacts															

6 See Appendix C for methodology

7 Based on affected groups identified in Section 5.1 of this SIA.

8 Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊕	Long term employment for people who have been involved in construction and participated in skills and workforce development pathways that may lead to other jobs within infrastructure and construction.	People in the wider Auckland Region People in Local Board areas, especially Ōtara-Papatoetoe and Howick	Auckland region	Ongoing	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊕	Increased access to employment, education and recreation opportunities, especially employment within the airport precinct. Particularly beneficial to those who do not have access to a private vehicle.	People in Local Board areas, especially Ōtara-Papatoetoe and Howick	People in Local Board areas	permanent	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Equity impacts															
⊕	Increased access to employment, education and recreation opportunities for people with no, limited or poor access to transport before the project, including people with disabilities, students and those from areas with higher deprivation rates.	People in Local Board areas, especially Ōtara-Papatoetoe and Howick	People in southern Auckland	Permanent	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

2.2 Manukau Central

⊕ Positive impact ⊖ Negative impact

Table 4: Manukau Central potential social impacts (planning)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊖	Potential for changes to convenience for some people as a result of loss of some on-site parking for some businesses. Note no businesses or homes are acquired in this section of the project	People living and working in the area	Individual properties and businesses	Ongoing or until such time businesses re-establish or new businesses start	G3	E3	V2	R2	Minor	x	x	x	Almost Certain	**Moderate**	3
Impacts on health and wellbeing															
⊖	Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences impacting on-site parking	Leaseholders, tenants and other occupiers of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G1	E3	V2	R2	Significant	_	x	x	Likely	**High**	1
⊖	Increased anxiety and uncertainty for those employed in directly affected businesses between now and when	People employed in local businesses	Widespread, depending on where	Until properties are	G3	E3	V2	R2	Minor	_	_	x	Rare	**Low**	4

[9] See Appendix C for methodology
[10] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	active property acquisition commences		employees come from	acquired - est 10 years											
⊖	Increased anxiety and uncertainty for directly affected landowners between now and when active property acquisition commences. Many commercial landowners in this area are not resident within the area and do not operate businesses in the area.	Landowners of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G4	E3	V2	R2	Moderate	_	x	x	Likely	**Moderate**	3
Impacts on personal and property rights															
⊖	Impacts caused by the Public Works Act property acquisition process – partial acquisition of some areas	Landowners of potentially affected properties	Individual property	During property acquisition process – est 12 months	G3	E4	V2	R2	Major	_	x	x	Likely	**High**	1
⊖	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Landowners of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G4	E4	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Occupiers of potentially affected properties, including Business owners and operators, leaseholders and tenants	Individual property	Until properties are acquired - est 10 years	G4	E4	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	Certainty for landowners and business owners/operators about future development enabling long term planning about the future of properties/businesses	Directly affected landowners and occupiers Leaseholders, tenants and other occupiers of potentially affected properties	Individual property	Until properties are acquired	G4	E2	V2	R2	Minor	x	x	x	Almost Certain	**Moderate**	3
	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisition processes.	Directly affected landowners and occupiers	Individual property	Until properties are acquired	G4	E3	V2	R2	Moderate	_	x	x	Likely	**Moderate**	3
Fears and aspirations															
	Potential concern and anxiety about future security for business owners, employees for their next steps once acquisition has been completed.	Directly affected landowners and occupiers	Individual property	Until construction starts, i.e. the whole of the planning phase	G3	E1	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
	Potential concern and anxiety about future security for business owners about what the potential impacts of construction might mean and whether they should remain in the area with that uncertainty	Business owners and operators	Individual property	Until construction starts, ie the whole of the planning phase	G3	E1	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Potential concerns associated with uncertainty about urban renewal (of which this project is a part), and potential concern about significant changes to the local community, particularly in association with other projects including ongoing development of the city centre by Eke Panuku and development of Westfield Manukau.	People living and working in the area	Southern Auckland community	Ongoing	G4	E1	V2	R2	Minor	x	_	x	Likely	**Moderate**	3
⊕	Potential positive impacts and aspirations associated with perceived investment in Manukau Central as a major centre and shopping destination and potential for transformation of the area.	All groups	Locality	Ongoing	G4	E3	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Socio-economic impacts															
⊖	Reduced commercial activity in the area as businesses relocate/close as a result of property acquisition leaving empty buildings/tenancies. Businesses may not renew leases and seek other locations as they are uncertain about what construction impacts might be and how they might be managed. People also change their shopping habits and shop in other areas as services and businesses they used have been displaced as a result of property acquisition.	People who visit the area and purchase goods and services	Locality	Until construction starts, ie the whole of the planning phase	G3	E2	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Potential loss of employment / livelihood for owners and employees of businesses that close or relocate prior to construction.	People employed in local businesses People employed in local businesses	Locality	Until construction starts, i.e. the whole of the planning phase	G2	E3	V2	R1	Major	x	x	x	Almost Certain	**High**	1

Table 5: Manukau Central potential social impacts (construction)

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊖	Reduced amenity on alternative routes used as temporary detours during construction	All road users	Locality	4 - 6 years	G3	E2	V2	R1	Moderate	_	_	x	Rare	**Low**	4
⊖	Changes to daily living routines due to changes to access routes as a result of construction, including changed access arrangements to properties (primarily businesses), temporary relocation of bus stops along the route to alternative locations, pedestrian access, and access to significant destinations such education, employment, shopping and recreation places. These changes may impact	People living and working in the area People who purchase goods and services from the area People who	Locality	4 - 6 years	G3	E1	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1

[11] See Appendix C for methodology
[12] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	the perceived convenience and amenity of the area.	visit the area and use community facilities and open space areas													
⊖	Reduced access to parking in Manukau Central as the works would result in the removal of all existing on-street parking on affected sections of roads and potentially impact access to parking at Hayman Park (off Lambie Drive). This could lead to people going to other areas.		Locality	4 - 6 years	G3	E1	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	A sense of disruption to daily activities for drivers, pedestrians and local community members from increased traffic and associated noise due to heavy vehicle movements within Manukau Central (noting potential cumulative impacts associated with other construction projects in the vicinity by Eke Panuku and Westfield).		Locality	4 - 6 years	G3	E2	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Delays to traffic and flow on impacts to local and regional economy and business operators		Locality	4 - 6 years	G3	E1	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3
⊖	Loss of access to parts of Hayman Park during construction	People who live, work or visit the area and use open space areas	Locality	4 - 6 years	G3	E2	V1	R1	Moderate	x	_	x	Likely	**Moderate**	3
Family and community															

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Potential temporary changes to some access routes to social infrastructure within walking distance of the construction site. There are a number of social services within walking distance of the Project locality, including Work and Income and justice support services. The use of these facilities may be affected by construction noise and vibration within the locality. Potential construction impacts would potentially be disproportionately felt by some users, particularly if people are experiencing disability or disadvantage, and therefore would be more sensitive to noise, vibration and/or changed access arrangements.	People living and working in the area People travelling through the area	Locality	4 - 6 years	G3	E1	V1	R2	Moderate	_	x	x	Likely	**Moderate**	3
Quality of the environment															
⊖	Construction noise and vibration may be particularly experienced by sensitive receivers surrounding the Project which could affect local social interactions. This includes residential communities in close proximity to the construction site in the apartment complexes on Ronwood Ave and Amersham Way. Noise and vibration has the potential to negatively affect people's experience of everyday activities including physical activities and social interactions.	Near neighbours People living and working in the area	Locality	4 - 6 years	G4	E3	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Reduced amenity and subsequent potential impacts to people's enjoyment of everyday activities in the local area due to construction			4 - 6 years	G3	E2	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	activity, noise and vibration, including access to Hayman Park.														
	Temporary changes to the appearance and use of local surroundings associated with reduced amenity due to construction noise, vibration, changes to the streetscape and establishment of a construction site. This may potentially result in reduced enjoyment of outdoor spaces such as Hayman Park.	Near neighbours People living and working in the area	Locality	4 - 6 years	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
	Perceived and potential actual safety impacts associated with changed sightlines, establishment of construction site, and changes to wayfinding and reduced accessibility of streets during construction as access is limited, particularly Amersham and Osterly Ways. May reduce perceptions of safety, particularly at night. Some visitors may be experiencing illness and disability, and / or stress and concerns which may mean they are more sensitive and could result in these changes being felt more acutely, particularly as some social infrastructure such as the Manukau Library, Work and Income and the IRD are accessed from these streets.	Near neighbours People living and working in the area People who purchase goods and services from the area	Locality	4 - 6 years	G3	E3	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1
	Perceived safety impacts associated with changed sightlines; hoardings; reduced accessibility associated with loss of local businesses; reduced permeability of city blocks due to temporary closure of some accesses	Business owners and operators	Locality	4 - 6 years	G3	E3	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	(esp to Westfield), and changes to pedestrian routes and wayfinding														
⊕	Increased personal safety as a result of less anti-social behaviour due to the presence of construction activity	People living and working in the area	Locality	4 - 6 years	G3	E3	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3
Impacts on health and wellbeing															
⊖	Potential impacts to health and wellbeing associated with ongoing construction activity across Manukau Central, resulting in ongoing stress and disruption for residents, visitors and businesses, also known as ‘construction fatigue’	Near neighbours People living and working in the area	Locality	4 - 6 years	G4	E2	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
⊖	Potential negative impacts associated with concern about disruption to, and the ongoing transformation of, Manukau Central which will undergo significant changes. The scale and pace of change can impact people’s sense of place and belonging (solastalgia).	Near neighbours People living and working in the area	Locality	4 - 6 years	G4	E3	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Impacts on personal and property rights															
⊖	Perceived impacts to personal and property rights, livelihoods and individuals’ experiences of personal disadvantage may be perceived through property acquisitions and construction processes.	Near neighbours	Individual properties	4 - 6 years	G3	E3	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Perceived impacts to housing and businesses, e.g. potential for cracking of structures associated with vibration from nearby construction sites.	Near neighbours	Individual properties	4 - 6 years	G4	E3	V2	R2	Moderate	_	_	x	Rare	**Low**	4

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Fears and aspirations															
⊕	Potential positive impacts associated with excitement and anticipation of improved public transport to and from Manukau Central, and ongoing investment in continuing to develop the area as a major metropolitan centre.	All affected groups	Auckland region	4 - 6 years	G4	E2	V2	R1	Minor	x	x	x	Almost Certain	**Moderate**	3
Socio-economic impacts															
⊕	Employment for people who have been involved in construction and/or participated in skills and workforce development pathways that may lead to jobs within infrastructure and construction	People living and working in the area People in Local Board areas, especially Ōtara-Papatoetoe and Howick People in the wider Auckland Region.	Auckland region	4 - 6 years	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Reduced business activity and customers/clients as a result of disruption from construction activity, including changes to access and visibility of some businesses or the need for temporary business closures.	Business owners and operators	Locality	4 - 6 years	G3	E2	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊕	Increased business activity as a result of the construction workforce, such as cafés and food businesses.	Business owners and operators	Locality	4 - 6 years	G3	E3	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Cumulative impacts															

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	The potential for community sensitivity to impacts would be increased by the relative number of other major construction projects underway at the time of construction, which potentially may already be impacting amenity in the vicinity of the Project and broader area. Cumulative impacts related to ongoing construction and works associated with major infrastructure and development projects within 400 metres from the construction site could include development led by Eke Panuku and Westfied. The number and scale of projects underway in the area would contribute to communities' cumulative sense of disruption and 'construction fatigue'.	People living and working in the area	Locality	4 - 6 years	G4	E3	V2	R2	Moderate	_	x	x	Likely	**Moderate**	3

Table 6: Manukau Central potential social impacts (operation)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															

[13] See Appendix C for methodology
[14] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊕	Increased access to Manukau Central, including education, employment, recreation and shopping opportunities. Particularly for people without vehicles or with limited/poor access to vehicles and other transport choices.	People living and working in the area People in Local Board areas, especially Ōtara-Papatoetoe and Howick People who purchase goods and services from the area	Southern Auckland community	Permanent	G3	E2	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Permanent changes to access for properties (inc. services and businesses) along the route as a result of removing some existing right-turn facilities, particularly on Lambie Drive. It is noted there is already a physical barrier restricting vehicle movements through the Project corridor in the Manukau Central area.	People living and working in the area People who purchase goods and services from the area	locality	Permanent	G3	E3	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊕	Increased connectivity between the existing Manukau Transport Interchange and the Airport.	People in the wider Auckland Region People in Local Board areas, especially Ōtara-Papatoetoe and Howick	Southern Auckland community	Permanent	G3	E2	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on culture[15]															
⊕	Reflection of cultural values and aspirations in the project increasing people's connection to the land	Surrounding local communities	Southern Auckland community	Permanent	G2	E2	V2	R2	Major	x	_	x	Likely	**High**	1
Family and community															
⊕	Increased community cohesion through the integration of bus stops into nearby development, such as Westfield.	People living and working in the area People who purchase goods and services from the area	locality	Permanent	G3	E2	V1	R2	Moderate	x	_	x	Likely	**Moderate**	3
Quality of the environment															
⊕	Increased urban amenity, particularly on Davies Ave with urban enhancement and connectivity to Hayman Park.		Suburb	Permanent	G3	E2	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
Impacts on health and wellbeing															
⊕	Improved health and wellbeing with increased access to active transport modes leading to healthier lifestyles.	People living and working in the area People travelling through the area	People in Local Board areas, especially Ōtara-	Permanent	G2	E2	V2	R1	Major	_	x	x	Likely	**High**	1

[15] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
			Papatoetoe and Howick												
⊕	Increase in the perception of safety, especially at night for residents of the City Centre with increased activity from the operation of the RTN along roads adjacent to existing apartments.	People living and working in the area	Locality	Permanent	G3	E3	V2	R1	Moderate	_	x	x	Likely	**Moderate**	3
⊕	Reductions in Death or Serious Injuries (DSIs) as a result of adoption of the Vision Zero Philosophy.	People travelling through and within the area, including pedestrians and cyclists	Locality	Permanent	G4	E4	V2	R1	Moderate	_	x	x	Likely	**Moderate**	3
Socio-economic impacts															
⊕	Long term employment for people who have been involved in construction and participated in skills and workforce development pathways that may lead to other jobs within infrastructure and construction.	People in the wider Auckland Region People in Local Board areas, especially Ōtara-Papatoetoe and Howick	Auckland region	Ongoing	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊕	Increased access to employment, education and recreation opportunities. Particularly beneficial to those who do not have access to a private vehicle or had limited transport choice.	People in Local Board areas, especially Ōtara-Papatoetoe and Howick	People in Local Board areas	Permanent	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Equity impacts															

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊕	Increased access to employment, education and recreation opportunities for people with no, limited or poor access to transport before the project, including people with disabilities, students and those from areas with higher deprivation rates.	People in Local Board areas, especially Ōtara-Papatoetoe and Howick	People in southern Auckland	Permanent	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

2.3 Puhinui / Papatoetoe

⊕ Positive impact ⊖ Negative impact

Table 7: Puhinui/Papatoetoe potential social impacts (planning)

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊖	Loss of locally significant businesses and services including: • Mobil Puhinui Road; • Hari Superette; • Puhinui Superette; and • Pukeko Preschool Papatoetoe meaning people have to travel outside of the area or find alternative places within the community to access the same services	Leaseholders, tenants and other occupiers of potentially affected properties, people who access and use businesses and services	Individual properties and businesses		G2	E3	V1	R2	Significant	x	x	x	Almost Certain	Extreme	1
⊖	Potential for changes to some routines and convenience for some residents due to the acquisition of properties containing several local businesses.	People living and working in the area	Individual properties and businesses		G2	E2	V1	R2	Significant	_	x	x	Likely	High	1
Impacts on culture[18]															

[16] See Appendix C for methodology
[17] Based on affected groups identified in Section 5.1 of this SIA.
[18] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Potential impacts on local social ties and community relationships to place due to acquisition and loss of residential properties and local businesses in this area.	Occupiers of potentially affected properties	Individual properties and businesses		G2	E2	V1	R2	Significant	x	x	x	Almost Certain	Extreme	1
Family and community															
⊖	Loss of locally significant businesses and services including: • Mobil Puhinui Road; • Hari Superette; • Puhinui Superette; and • Pukeko Preschool Papatoetoe meaning a loss of places in the community where people meet each other, form relationships and connect as a community	Leaseholders, tenants and other occupiers of potentially affected properties	Individual properties and businesses		G2	E2	V1	R2	Significant	x	x	x	Almost Certain	Extreme	1
⊖	Changes to local community (at a localised level) associated with property acquisition, removal of buildings, and families moving out of the area.	Landowners of potentially affected properties	Individual properties and businesses		G2	E3	V1	R2	Significant	_	x	x	Likely	High	1
Quality of the environment															
⊖	Perceived reduction in the safety of the area as properties are acquired and homes vacated. Vacant buildings attract antisocial behaviour before they are removed during construction.	Landowners of potentially affected properties	Individual properties and businesses		G2	E3	V1	R1	Significant	x	_	x	Likely	High	1
Impacts on health and wellbeing															

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Stress and anxiety (Psycho-social impacts) for some more vulnerable community members resulting from a loss of social networks and social support a result of property acquisition and people having to move out of the area.	Landowners of potentially affected properties	Individual property		G1	E2	V1	R2	Significant	_	_	x	Rare	Moderate	2
⊖	Increased anxiety and uncertainty for directly affected landowners between now and when active property acquisition commences	Landowners of potentially affected properties	Individual property		G1	E4	V2	R2	Significant	_	x	x	Likely	High	1
⊖	Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences. Properties are likely to be acquired at different times meaning some businesses, services and residents are lost to the area at different times.	Leaseholders, tenants and other occupiers of potentially affected properties	Individual property		G1	E4	V1	R2	Significant	_	x	x	Likely	High	1
⊖	Increased anxiety and uncertainty for those employed in directly affected businesses between now and when active property acquisition commences	People employed in local businesses	Widespread, depending on where employees come from		G3	E1	V2	R2	Moderate	_	_	x	Rare	Low	4
Impacts on personal and property rights															
⊖	Impacts caused by the Public Works Act property acquisition process – land/property acquisition or severance within a property, potential land	Landowners of potentially affected properties	Individual property		G3	E4	V2	R2	Major	_	x	x	Likely	High	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	redistribution between different or new owners														
⊖	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Landowners of potentially affected properties	Individual property		G4	E4	V2	R2	Moderate	x	x	x	Almost Certain	High	1
⊖	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Occupiers of potentially affected properties, including Business owners and operators, leaseholders and tenants	Individual property		G4	E4	V2	R2	Moderate	x	x	x	Almost Certain	High	1
⊕	Certainty for landowners and business owners/operators about future development enabling long term planning about the future of properties/businesses	Directly affected landowners and occupiers Leaseholders, tenants and other occupiers of potentially affected properties	Individual property		G3	E4	V2	R2	Major	_	_	x	Rare	Moderate	2
⊖	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisition processes	Landowners and occupiers including business owners and operators	Individual property		G4	E4	V1	R2	Major	_	_	x	Rare	Moderate	2
Fears and aspirations															
⊖	Potential concern and anxiety about future security for residents or landowners affected by property	Directly affected landowners and occupiers	Individual property		G2	E4	V1	R1	Significant	x	x	x	Almost Certain	Extreme	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	acquisition, and associated uncertainty for business owners, employees and residents for their next steps once acquisition has been completed. This locality has a high deprivation score and the housing in this area is fairly affordable compared to other areas of Auckland, including those in proximity to the project area. Loss of private housing in this area could displace residents who may not be able to easily secure alternative housing.														
⊖	Potential negative impacts associated with fear of disruption to local community character, and perceptions about potential long-term changes to the fabric of the community as a result of property acquisition, particularly in combination with other development such as intensification of housing as a result of changes to the Auckland Unitary Plan.	Directly affected landowners and occupiers	Individual property		G4	E2	V1	R1	Moderate	x	_	x	Likely	Moderate	3
⊖	Potential concerns associated with uncertainty about urban renewal and potential concern about significant changes to the local community, particularly in association with urban intensification. This project contributes to urban renewal with a station at Puhinui Road/Lambie Drive enabling six story intensive residential development in proximity.	People living and working in the area	Southern Auckland community		G4	E3	V2	R1	Moderate	x	_	x	Likely	Moderate	3

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊕	Potential positive impacts and aspirations associated with perceived investment in Puhinui and the potential for positive transformation of the area.	All groups	Locality		G2	E2	V2	R1	Major	x	x	x	Almost Certain	High	1
Socio-economic impacts															
⊖	Loss of employment/livelihood due to acquisition of commercial properties, including: • Mobil Puhinui Road; • Hari Superette; • Puhinui Superette; and • Pukeko Preschool Papatoetoe.	Those employed by businesses in the area	Individual property		G2	E1	V1	R1	Significant	x	x	x	Almost Certain	Extreme	1

Table 8: Puhinui/Papatoetoe potential social impacts (construction)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊖	Impacts on pedestrians and cyclists – people walking along the footpath, cycling on Puhinui Road to access shops, school, work, due to construction activity,	Pedestrians and cyclists	Locality	3 - 4 years, and up to 4 - 6 years	G3	E3	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1

[19] See Appendix C for methodology
[20] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	including changed wayfinding and temporary closures. There is already conflict in nearby street between school traffic and industrial/commercial businesses during school drop off and pick up periods.			depending on location											
	Reduced amenity on alternative routes used as temporary detours during construction	All road users	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E2	V2	R1	Moderate	_	_	x	Rare	**Low**	4
	Changes to daily living routines due to changes to local access routes as a result of construction, including changed access arrangements to properties, relocation of bus stops along the route to alternative proximate sites, and access to Puhinui School for students arriving from the northern side of Puhinui Road.	People living and working in the area People who purchase goods and services from the area People who visit the area and use community facilities and open space areas	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E4	V1	R1	Major	x	x	x	Almost Certain	**High**	1
	Impacts on locally significant businesses and services as a result of construction activity including changes to access and parking, and amenity as a result of noise and vibration. • Age Concern;	People who visit the area and purchase goods and services, worship and attend school	Southern Auckland	3 - 4 years, and up to 4 - 6 years depending on location	G3	E4	V1	R2	Major	x	x	x	Almost Certain	**High**	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	• Puhinui Road shops (near Ranfurly Road); • Puhinui Medical Centre; • Te Kohanga Reo ki Puhinui; and • Kingdom Hall of Jehovah's Witnesses Puhinui School.														
⊖	Impact on people using the Puhinui Train Station with potential changes to access as a result of construction activity. It is a regionally significant business and service, including as one of the transport interchanges for connections to the Auckland Airport and for people accessing Manukau Central from the south by train.	Train station users	Region wide as can be anyone who uses the train station	2 - 3 years	G3	E1	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Delays to traffic and flow on impacts to local and regional economy and business operators	Commercial road users	Region wide	3 - 4 years, and up to 4 - 6 years depending on location	G3	E1	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3
⊖	Change in access to properties along the route, especially commercial properties adversely affecting the ability for customers to access businesses. Construction activity will result in a central 'barrier' along the corridor creating severance removing the ability to turn right from properties and cross the corridor anywhere except at formal crossing points	People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Family and community															
⊖	There is the potential for some changes to the accessibility of social infrastructure in the locality – for people travelling by train, bus or on foot – due to adjustments to transport infrastructure in the immediate vicinity of the construction site (including active transport). People using bus services in the area or accessing the Puhinui Train Station may experience some changes to access routes or minor increases in travel time.	People living and working in the area People travelling through the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E2	V1	R2	Moderate	_	x	x	Likely	**Moderate**	3
⊖	Potential changes to community character and people's sense of place and belonging associated with the possible change to the residential character of the area to the east of the Puhinui Train Station in particular due to increased construction activity, changes to the streetscape and an influx of unfamiliar construction workers into the area.	People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V2	R1	Moderate	_	x	x	Likely	**Moderate**	3
Quality of the environment															
⊖	Reduced amenity and subsequent potential impacts to people's enjoyment of everyday activities in the local area due to construction noise and vibration, including increased traffic along temporary detour routes during construction.	Near neighbours People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E2	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Construction noise and vibration may be particularly experienced by sensitive receivers surrounding the construction site which could affect local social interactions. This includes residential communities in close proximity to the construction site, students and staff of Puhinui School and Te Kohanga Reo ki Puhinui, and staff and clients of Age Concern and the Puhinui Medical Centre. Noise and vibration has the potential to negatively affect people's experience of everyday activities including physical activities and social interactions. The highest impacts would occur during noise intensive works at the construction site that use noise intensive equipment.	Near neighbours People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Temporary changes to the appearance and use of local surroundings associated with reduced amenity due to construction noise, vibration, changes to the streetscape and establishment of a construction site in a residential area. This may potentially result in reduced personal enjoyment of private homes and nearby outdoor activities for residents and users that are close to the construction site.	Near neighbours People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
⊖	Perceived and potential actual safety impacts associated with changed sightlines, establishment of hoardings, and changes to wayfinding and reduced	Near neighbours People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years	G3	E3	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	activation of certain streets at night. Some visitors to and workers at some facilities such as Age Concern, the Puhinui Medical Centre and the Will&Able facility which employs people with disabilities may be experiencing illness and disability, and / or stress and concerns which may mean they are more sensitive and could result in these changes being felt more acutely.	People who purchase goods and services from the area		depending on location											
⊖	Reduced amenity on the southern side of Puhinui Road due to the construction of the ramp across the Puhinui Train Station. The ramp will be elevated potentially creating shading on properties adjacent to the ramp along with a perception of loss of privacy and enjoyment of their homes as a result of the construction of an elevated structure and the presence of construction workers.	Near neighbours	Locality	2 - 3 years	G3	E3	V2	R1	Moderate	_	x	x	Likely	**Moderate**	3
⊕	Increased personal safety as a result of less anti-social behaviour due to the presence of construction activity	People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V2	R1	Moderate	x	_	x	Likely	**Moderate**	3
Impacts on health and wellbeing															
⊖	Distress caused by environmental change from construction activity (solastalgia), including removal of homes/businesses from properties and construction of	Project neighbours and near neighbours,	Locality	3 - 4 years, and up to 4 - 6 years	G3	E3	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	structures, particularly in the vicinity of the ramp connecting to the Puhinui Station	particularly those who will become neighbours of the ramp		depending on location											
⊖	Perceived safety impacts associated with the influx of unfamiliar construction workers in a local neighbourhood setting, adjacent to sensitive locations such as Puhinui School, Will&Able and Te Kohanga Reo ki Puhinui, which may cause anxiety and concern to local residents, employees and school parents.	People living and/or, working in, and people visiting the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V1	R2	Moderate	_	x	x	Likely	**Moderate**	3
⊖	Feelings of anxiety and stress for residents of homes immediately to the south of the raised ramp. The ramp will be elevated potentially creating shading on properties adjacent to the ramp along with a perception of loss of privacy and enjoyment of their homes as a result of the ramp.	Project neighbours and near neighbours, particularly those who will become neighbours of the ramp	Individual properties	2 - 3 years	G3	E3	V2	R1	Moderate	_	_	x	Rare	**Low**	4
⊖	Impacts to health and wellbeing associated with impacts of construction noise, dust and vibration, regardless of meeting required standards e.g. ability to sleep undisturbed in ones home, cumulative impacts of long durations of construction activity	Near neighbours	Individual properties	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
Impacts on personal and property rights															

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisitions and construction processes.	Near neighbours	Individual properties	3 - 4 years, and up to 4 - 6 years depending on location	G3	E3	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Perceived impacts to housing and businesses, e.g. potential for cracking of structures associated with vibration from nearby construction sites.	Near neighbours	Individual properties	3 - 4 years, and up to 4 - 6 years depending on location	G4	E3	V2	R2	Moderate	_	_	x	Rare	**Low**	4
Fears and aspirations															
⊖	Potential negative impacts associated with fear of disruption to local community character, and perceptions about potential long term changes to the fabric of the community, particularly in combination with other construction activity which could include intensive residential development.	People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G4	E2	V2	R1	Minor	x	_	x	Likely	**Moderate**	3
⊖	Potential concerns associated with uncertainty about urban renewal and potential concern about significant changes to the local community, particularly in association with urban intensification. This project contributes to urban renewal with a station at Puhinui Road/Lambie Drive enabling six story intensive residential development in proximity.	People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G4	E2	V2	R1	Minor	x	_	x	Likely	**Moderate**	3

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊕	Potential positive impacts and aspirations associated with perceived investment in Puhinui and potential for positive transformation of the area.	All affected groups	Auckland Region	3 - 4 years, and up to 4 - 6 years depending on location	G4	E2	V2	R1	Minor	x	x	x	Almost Certain	**Moderate**	3
Socio-economic impacts															
⊕	Employment for people from within the local community, wider southern Auckland area and beyond.	People living and working in the area People in Local Board areas, especially Ōtara-Papatoetoe and Howick People in the wider Auckland Region.	Auckland region	3 - 4 years, and up to 4 - 6 years depending on location	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Loss of employment/livelihood as a result of temporary closure of some businesses for periods of time during construction	Business owners and people employed in local businesses	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G2	E2	V2	R1	Major	x	x	x	Almost Certain	**High**	1
⊖	Reduced business activity and customers/clients as a result of disruption from construction activity, including changes to access and visibility of businesses or the need for temporary closures. This includes potential loss of	Business owners and operators	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G3	E2	V2	R2	Moderate	x	x	x	Almost Certain	**High**	1

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	some or all on-street parking for the local shopping area on Puhinui Road.														
Cumulative impacts															
⊖	Potential cumulative impacts within the broader Puhinui / Papatoetoe area associated with other developments which could include urban intensification which may disrupt community connection to place, and potentially result in 'construction fatigue'.	People living and working in the area	Locality	3 - 4 years, and up to 4 - 6 years depending on location	G4	E2	V2	R2	Minor	_	x	x	Likely	**Moderate**	3

Table 9: Puhinui/Papatoetoe potential social impacts (operation)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊕	Increased connectivity for people without vehicles or with limited access to vehicles improving access to employment, education and services.	Pedestrians and cyclists who use this path	Individual properties and businesses	Permanent	G3	E2	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

[21] See Appendix C for methodology

[22] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Permanent changes to access for properties (inc. services and businesses) along the route as a result of no right-turns.	People living and working in the area People who purchase goods and services from the area	Locality	Permanent	G3	E3	V1	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Potential increased community severance with additional lanes on Puhinui Road and fewer, but formal (and safer), pedestrian crossing points.	People living and working in the area	Locality	Permanent	G3	E2	V1	R2	Moderate	x	x	x	Almost Certain	**High**	1
Impacts on culture[23]															
⊕	Reflection of cultural values and aspirations in the project increasing people's connection to the land	Surrounding local communities	Locality	Permanent	G2	E2	V2	R2	Major	_	_	x	Rare	**Moderate**	2
Impacts on health and wellbeing															
⊕	Reductions in Death or Serious Injuries (DSIs) as a result of adoption of the Vision Zero Philosophy.	People travelling through and within the area, including pedestrians and cyclists	Locality	Permanent	G4	E4	V2	R1	Moderate	_	x	x	Likely	**Moderate**	3
⊕	Improved health and wellbeing with increased access to active transport modes leading to healthier lifestyles.	People living and working in the area	People in Local Board areas, especially Ōtara-	Permanent	G3	E2	V2	R1	Moderate	_	x	x	Likely	**Moderate**	3

23 Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
		People travelling through the area	Papatoetoe and Howick												
Socio-economic impacts															
⊕	Long term employment for people who have been involved in construction and participated in skills & workforce development pathways that may lead to other jobs within infrastructure and construction.	People in the wider Auckland Region People in Local Board areas, especially Ōtara-Papatoetoe and Howick	Auckland Region	ongoing	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊖	Reduced business activity and customers/clients as a result of loss of on-street parking for the local shopping area on Puhinui Road.	Business owners and people employed in local businesses	locality	permanent	G2	E3	V2	R1	Major	x	_	x	Likely	**High**	1
⊕	Increased access to employment, education and recreation opportunities, especially employment within the airport precinct. Particularly beneficial to those who do not have access to a private vehicle.	People in Local Board areas, especially Ōtara-Papatoetoe and Howick	People in Local Board areas	permanent	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Equity impacts															
⊕	Increased access to employment, education and recreation opportunities for people with no, limited or poor access to transport before the project, including people with disabilities, students and those from areas with higher deprivation rates.	People in Local Board areas, especially Ōtara-Papatoetoe and Howick	People in Southern Auckland	permanent	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

2.4 SH20 to Orrs Road

⊕ Positive impact ⊖ Negative impact

Table 10: SH20 to Orrs Road potential social impacts (planning)

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on health and wellbeing															
⊖	Increased anxiety and uncertainty for directly affected landowners between now and when active property acquisition commences. Some commercial landowners may not also be occupiers and may reside elsewhere in an unknown location.	Landowners of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G1	E4	V2	R2	Significant	_	x	x	Likely	**High**	1
⊖	Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences	Leaseholders, tenants and other occupiers of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G1	E4	V2	R2	Significant	_	x	x	Likely	**High**	1
⊖	Increased anxiety and uncertainty for those employed in directly affected businesses between now and when active property acquisition commences	People employed in local businesses	Widespread, depending on where employees come from	Until properties are acquired - est 10 years	G3	E4	V2	R2	Major	_	_	x	Rare	**Moderate**	2

[24] See Appendix C for methodology
[25] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on personal and property rights															
⊖	Impacts caused by the Public Works Act property acquisition process – land/property acquisition or severance within a property, potential land redistribution between different or new owners	Landowners of potentially affected properties	Individual property	During property acquisition process – est 12 months	G3	E4	V2	R2	Major	_	_	x	Rare	**Moderate**	2
⊖	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Landowners of potentially affected properties	Individual property	Until properties are acquired - est 10 years	G4	E4	V2	R2	Moderate	_	_	x	Rare	**Low**	4
⊖	Loss of autonomy of decision making about future of land/businesses for directly affected properties	Occupiers of potentially affected properties, including Business owners and operators, leaseholders and tenants	Individual property	Until properties are acquired - est 10 years	G4	E4	V2	R2	Moderate	_	_	x	Rare	**Low**	4
⊕	Certainty for landowners and business owners/operators about future development enabling long term planning about the future of properties/businesses	Directly affected landowners and occupiers Leaseholders, tenants and other occupiers of potentially affected properties	individual property	Until construction starts, i.e., the whole of the planning phase	G3	E4	V2	R2	Major	x	x	x	Almost Certain	**High**	1

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisition processes, especially for the market garden and grazing properties.	Business owners and operators	Individual property	During property acquisition process – est 12 months	G4	E4	V2	R2	Moderate	_	_	x	Rare	**Low**	4
Fears and aspirations															
⊖	Potential negative impacts associated with fear of disruption to the Manukau Memorial Gardens, and perceptions about potential long term changes to the amenity of the memorial gardens.	People who visit the area and use community facilities and open space areas	Individual property	Until construction starts, i.e. the whole of the planning phase	G3	E4	V2	R2	Major	_	_	x	Rare	**Moderate**	2
⊕	Potential positive impacts and aspirations associated with perceived investment in SH20B as the primary connection between the Airport and other areas.	Those employed in or running businesses in the area People travelling through the area Near neighbours People in the wider Auckland Region	Region wide	Until construction starts, ie the whole of the planning phase	G3	E1	V2	R2	Moderate	_	x	x	Likely	**Moderate**	3

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊕	Certainty about future development of the transport network enabling businesses in the area and landowners to plan for the future	Landowners of potentially affected properties Leaseholders, tenants and other occupiers of potentially affected properties Business owners and operators	Individual property	Until construction starts, i.e. the whole of the planning phase	G3	E4	V2	R2	Major	_	x	x	Likely	**High**	1

Table 11: SH20 to Orrs Road potential social impacts (construction)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊖	Impacts on pedestrians and cyclists – people walking along the footpath, cycling on SH20B to access the airport, Manukau Memorial Gardens, local businesses due to construction activity, including changed wayfinding and temporary closures	Pedestrians and cyclists	Individual properties	3 - 4 years	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3

[26] See Appendix C for methodology
[27] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				**Significance**				**Consequence**	**Likelihood**				**Overall Rating**	**Priority**
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	Change in access to properties along the route, especially commercial properties adversely affecting the ability for customers to access businesses.	Property owners and occupiers, including businesses	Individual properties and businesses	3 - 4 years	G3	E4	V2	R2	Major	x	x	x	Almost Certain	**High**	1
	Impact on access to Manukau Memorial Gardens as a regionally significant facility	People who visit the area and purchase goods and services	Southern Auckland community	3 - 4 years	G3	E1	V2	R2	Moderate	x	_	x	Likely	**Moderate**	3
	Delays to traffic and flow on impacts to local and regional economy and business operators	Commercial road users	Region wide	3 - 4 years	G3	E1	V2	R2	Moderate	x	_	x	Likely	**Moderate**	3
	Delays, increasing travel times	All road users	Region wide	3 - 4 years	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
Family and community															
	Changes to community character – streetscape, access, businesses, increased number of workers and visitors to the area due to construction.	People living, working and visiting the area	Individual properties	3 - 4 years	G3	E3	V2	R2	Minor	_	_	x	Rare	**Low**	4
	Changes to sense of place – e.g. changes to streetscape and urban fabric	People who live and work in the locality	Individual properties	3 - 4 years	G3	E3	V2	R2	Minor	_	_	x	Rare	**Low**	4
	Construction is located close to the Manukau Memorial Gardens as a significant regional facility. Access to this may be disrupted due to construction activity.	People who visit the area and use community facilities and open space areas	Southern Auckland community	3 - 4 years	G3	E1	V2	R2	Moderate	_	_	x	Rare	**Low**	4
Quality of the environment															

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
⊖	Reduced amenity within the Manukau Memorial Gardens as a result of construction activity impacts such as noise or vibration, temporary changes to the streetscape, and the construction of the SH20B-SH20 bridge	People who visit the area and use community facilities and open space areas	Southern Auckland community	3 - 4 years	G3	E1	V2	R1	Moderate	_	_	x	Rare	**Low**	4
⊕	Increased personal safety as a result of less anti-social behaviour due to the presence of construction activity	People living and working in the locality	Individual properties	3 - 4 years	G3	E3	V2	R2	Minor	x	_	_	Unlikely	**Low**	4
Impacts on health and wellbeing															
⊖	Impacts to health and wellbeing associated with impacts of construction noise, dust and vibration, regardless of meeting required standards e.g. ability to sleep undisturbed in ones home, cumulative impacts of long durations of construction activity	Near neighbours	Individual properties	3 - 4 years	G3	E3	V2	R2	Minor	_	x	x	Likely	**Moderate**	3
⊖	Some people accessing the Manukau Memorial Gardens may be experiencing distress (grief), and could therefore be more sensitive to changes to access in the broader area.	People who visit the area and use community facilities and open space areas	Southern Auckland community	3 - 4 years	G3	E1	V2	R1	Moderate	_	_	x	Rare	**Low**	4
Impacts on personal and property rights															
⊖	Perceived impacts to housing and businesses, e.g. potential for cracking of structures associated with vibration from nearby construction sites.	Near neighbours	Individual properties	3 - 4 years	G4	E3	V2	R2	Moderate	_	_	x	Rare	**Low**	4
⊖	Perceived impacts to personal and property rights, livelihoods and	Near neighbours	Individual properties	3 - 4 years	G3	E3	V2	R2	Minor	x	_	_	Unlikely	**Low**	4

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
	individuals' experiences of personal disadvantage may be perceived through construction processes.														
Socio-economic impacts															
⊕	Employment for people from within the local community, wider southern Auckland area and beyond.	People in the wider Auckland Region		3 - 4 years	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

Table 12: SH20 to Orrs Road Potential social impacts (operation)

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on way of life															
⊕	Increased access for pedestrians and cyclists – people walking along the footpath, cycling on SH20B to access the airport, Manukau Memorial Gardens, local businesses	Pedestrians and cyclists who use this path	Individual properties and businesses	Permanent	G3	E2	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1
⊕	Direct vehicle connection from SH20B to SH20 for south-bound traffic meaning less delays	Road users	Region wide	Permanent	G3	E1	V2	R1	Moderate	x	x	x	Almost Certain	**High**	1

[28] See Appendix C for methodology
[29] Based on affected groups identified in Section 5.1 of this SIA.

	Impact description				Significance				Consequence	Likelihood				Overall Rating	Priority
	Impact	Affected groups	Extent	Duration	G	E	V	R		S	O	E	Rating		
Impacts on culture[30]															
⊕	Reflection of cultural values and aspirations in the project increasing people's connection to the land	Surrounding local communities	Southern Auckland community	Permanent	G2	E2	V2	R2	Major	_	_	x	Almost Certain	**High**	1
Quality of the environment															
⊕	Increased amenity with pedestrian and cycling facilities on both sides of the highway.	Pedestrians and cyclists	Individual properties	Permanent	G3	E3	V2	R2	Minor	_	x	x	Almost Certain	**Moderate**	3
⊖	Reduced amenity within the Manukau Memorial Gardens as a result of the presence of the SH20B to SH20 bridge.	Users of the Manukau Memorial Gardens	Individual properties		G3	E1	V2	R2	Moderate	_	_	_	Almost Certain	**High**	1
Impacts on personal and property rights															
⊕	Reductions in Death or Serious Injuries (DSIs) as a result of adoption of the Vision Zero Philosophy.	People travelling through and within the area, including pedestrians and cyclists	Locality	Permanent	G4	E4	V2	R1	Moderate	_	x	x	Almost Certain	**High**	1

30 Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

3 Significant social impacts and mitigation

3.1 Botany to Clover Park

Table 13: Priority impacts Botany to Clover Park (planning)

Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on culture[31]				
Potential impacts on local social ties and community relationships to place due to acquisition and loss of residential properties particularly Kāinga Ora housing in the Clover Park area.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
Impacts on health and wellbeing				
Stress and anxiety (Psycho-social impacts) for some more vulnerable community members resulting from a loss of social networks and social support a result of property acquisition and people having to move out of the Cover Park area.	**High**	1	Community and Stakeholder Engagement Strategy, including ongoing collaboration with Kāinga Ora regarding project timeframes; and Community Health and Wellbeing Strategy.	2
Increased anxiety and uncertainty for directly affected landowners between now and when active property acquisition commences	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
Impacts on personal and property rights				

[31] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

Impact description		Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Impacts caused by the Public Works Act property acquisition process – land/property acquisition or severance within a property, potential land redistribution between different or new owners	**High**	1	Public Works Act; Community and Stakeholder Engagement Strategy; Community Health and Wellbeing Strategy; and Property Management Strategy.	2
	Loss of autonomy of decision making about future of land/businesses for directly affected properties	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
	Certainty for landowners and business owners/operators about future development enabling long term planning about the future of properties/businesses	**High**	1	Community and Stakeholder Engagement Strategy.	1
Fears and aspirations					
	Potential concern and anxiety about future security for residents or landowners affected by property acquisition in the Clover Park area (including those privately owned residential properties in the area), and associated uncertainty for business owners, employees and residents for their next steps once acquisition has been completed.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
Socio-economic impacts					
	Loss of employment / livelihood as a result of acquisition of businesses.	**Extreme**	1	Community and Stakeholder Engagement Strategy.	1

Table 14: Priority impacts Botany to Clover Park (construction)

Impact description		Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Impacts on pedestrians and cyclists – people walking along the footpath, cycling on Te Irirangi to access shops, school, work, etc. Changed wayfinding and temporary closures could mean people chose not to walk or cycle. Especially those accessing Sancta Maria College adjacent to the Project and nearby schools like Chapel Downs Primary and Redoubt North School from the northern side of Te Irirangi Drive (ie need to cross Te Irirangi Drive).	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
	Changes to daily living routines could be possible due to changes to local access routes as a result of construction, including temporary relocation of the Manukau Sports Bowl Bus stops near Sandrine Ave in Clover Park, and access to regional and local facilities such as the Manukau Sport Bowl and Rongomai Park.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
	Impacts on locally significant businesses and services as a result of construction activity including changes to access and parking, particularly those with direct access off Te Irirangi Drive.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
Family and community					
	Potential changes to the accessibility of social infrastructure in the locality, including schools – for people travelling by bus or on foot – due to adjustments to transport infrastructure in the immediate vicinity of the construction site (including active transport). People using bus services in the area may experience some changes to access routes or minor increases in travel time.	**High**	1	Community and Stakeholder Engagement Strategy.	2
Quality of the environment					

Impact description		Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Reduced amenity and subsequent potential impacts to people's enjoyment of everyday activities in the local area due to construction noise and vibration, particularly in open space and recreation areas such as Rongomai Park and the Manukau Sports Bowl	**High**	1	Construction Management Plan. Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
	Construction noise and vibration may be particularly experienced by sensitive receivers surrounding the construction site which could affect local social interactions. This includes the Dannemora Gardens Metlife Care, various accommodation facilities along Te Irirangi Drive, the Dannemora and Botany South Medical Centres, early childhood centres (Little Learners and Best Start) and the residential communities in close proximity to the construction. Noise and vibration has the potential to negatively affect people's experience of everyday activities including physical activities and social interactions.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; Development Response Plan; and Respite and Relocation Policy.	2
Impacts on health and wellbeing					
	Distress caused by environmental change from construction activity (solastalgia), including removal of homes/businesses from properties in the Clover Park area.	**High**	1	Community and Stakeholder Engagement Strategy; Development Response Plan; and Community Health and Wellbeing Strategy.	2
Impacts on personal and property rights					
	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through construction processes.	**High**	1	Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
Socio-economic impacts					
	Employment for people from within the local community, wider southern Auckland area and beyond.	**High**	1	Social Outcomes Strategy.	1

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Reduced business activity and customers/clients as a result of disruption from construction activity, including changes to access and visibility of businesses.	**High**	1	Development Response Plan.	2
	Increased business activity as a result of the construction workforce, such as cafés and food businesses.	**High**	1	Development Response Plan.	1

Table 15: Priority impacts Botany to Clover Park (operation)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Increased connectivity for people without vehicles or with limited access to vehicles.	**High**	1	None required.	1
Impacts on culture[32]					
	Reflection of cultural values and aspirations in the project increasing people's connection to the land	**Moderate**	2	None required.	2
Socio-economic impacts					
	Long term employment for people who have been involved in construction and participated in skills and workforce	**High**	1	Social Outcomes Strategy.	1

[32] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	development pathways that may lead to other jobs within infrastructure and construction.				
	Increased access to employment, education and recreation opportunities, especially employment within the airport precinct. Particularly beneficial to those who do not have access to a private vehicle.	**High**	1	Social Outcomes Strategy.	1
Equity impacts					
	Increased access to employment, education and recreation opportunities for people with no, limited or poor access to transport before the project, including people with disabilities, students and those from areas with higher deprivation rates.	**High**	1	Social Outcomes Strategy.	1

3.3 Manukau Central

Table 16: Priority impacts Manukau Central (planning)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on health and wellbeing					
	Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences impacting on-site parking	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
Impacts on personal and property rights					
	Impacts caused by the Public Works Act property acquisition process – partial acquisition of some areas	**High**	1	Public Works Act; Community and Stakeholder Engagement Strategy; Community Health and Wellbeing Strategy; and Property Management Strategy.	2
	Loss of autonomy of decision making about future of land/businesses for directly affected properties	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
	Loss of autonomy of decision making about future of land/businesses for directly affected properties	**High**	1	Community and Stakeholder Engagement Strategy.	2
Fears and aspirations					
	Potential concern and anxiety about future security for business owners, employees for their next steps once acquisition has been completed.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Potential concern and anxiety about future security for business owners about what the potential impacts of construction might mean and whether they should remain in the area with that uncertainty	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
	Potential positive impacts and aspirations associated with perceived investment in Manukau City Centre as a major centre and shopping destination and potential for transformation of the area.	**High**	1	Community and Stakeholder Engagement Strategy.	1
Socio-economic impacts					
	Reduced commercial activity in the area as businesses relocate/close as a result of property acquisition leaving empty buildings/tenancies. Businesses may not renew leases and seek other locations as they are uncertain about what construction impacts might be and how they might be managed. People also change their shopping habits and shop in other areas as services and businesses they used have been displaced as a result of property acquisition.	**High**	1	Community and Stakeholder Engagement Strategy.	2
	Potential loss of employment / livelihood for owners and employees of businesses that close or relocate prior to construction.	**High**	1	Public Works Act; and Community and Stakeholder Engagement Strategy.	2

Table 17: Priority impacts Manukau Central (construction)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Changes to daily living routines due to changes to access routes as a result of construction, including changed access arrangements to properties (primarily businesses), temporary relocation of bus stops along the route to alternative locations, pedestrian access, and access to significant destinations such education, employment, shopping and recreation places. These changes may impact the perceived convenience and amenity of the area.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
	Reduced access to parking in Manukau Central as the works would result in the removal of all existing on-street parking on affected sections of roads and potentially impact access to parking at Hayman Park (off Lambie Drive). This could lead to people going to other areas.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; and Development Response Plan	2
	A sense of disruption to daily activities for drivers, pedestrians and local community members from increased traffic and associated noise due to heavy vehicle movements within the Manukau Central (noting potential cumulative impacts associated with other construction projects in the vicinity by Eke Panuku and Westfield).	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
Quality of the environment					
	Construction noise and vibration may be particularly experienced by sensitive receivers surrounding the Project which could affect local social interactions. This includes residential communities in close proximity to the construction site in the apartment complexes on Ronwood Ave and Amersham Way. Noise and vibration has the potential to negatively affect people's experience of everyday activities including physical activities and social interactions.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; Development Response Plan; and Respite and Relocation Strategy.	2

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Reduced amenity and subsequent potential impacts to people's enjoyment of everyday activities in the local area due to construction activity, noise and vibration, including access to Hayman Park.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; and Development Response Plan.	2
	Perceived and potential actual safety impacts associated with changed sightlines, establishment of construction site, and changes to wayfinding and reduced accessibility of streets during construction as access is limited, particularly Amersham and Osterly Ways. May reduce perceptions of safety, particularly at night. Some visitors may be experiencing illness and disability, and / or stress and concerns which may mean they are more sensitive and could result in these changes being felt more acutely, particularly as some social infrastructure such as the Manukau Library, Work and Income and the IRD are accessed from these streets.	**High**	1	Construction Management Plan; Community and Stakeholder Engagement Strategy; Development Response Plan; and Good Neighbour Policy.	2
	Perceived safety impacts associated with changed sightlines; hoardings; reduced accessibility associated with loss of local businesses; reduced permeability of city blocks due to temporary closure of some accesses (esp to Westfield), and changes to pedestrian routes and wayfinding	**High**	1	Construction Management Plan; and Development Response Plan.	2
Impacts on health and wellbeing					
	Potential negative impacts associated with concern about disruption to, and the ongoing transformation of, Manukau City Centre, which will undergo significant changes. The scale and pace of change can impact people's sense of place and belonging. (Solastalgia)	**High**	1	Community and Stakeholder Engagement Strategy.	2
Impacts on personal and property rights					
	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisitions and construction processes.	**High**	1	Property Management Plan; and Community and Stakeholder Engagement Strategy.	2
Socio-economic impacts					

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Employment for people who have been involved in construction and/or participated in skills & workforce development pathways that may lead to jobs within infrastructure and construction	**High**	1	Social Outcomes Strategy.	1
	Reduced business activity and customers/clients as a result of disruption from construction activity, including changes to access and visibility of some businesses or the need for temporary business closures.	**High**	1	Development Response Plan.	2
	Increased business activity as a result of the construction workforce, such as cafés and food businesses.	**High**	1	Development Response Plan.	1

Table 18: Priority impacts Manukau Central (operation)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Increased access to Manukau Central, including education, employment, recreation and shopping opportunities. Particularly for people without vehicles or with limited/poor access to vehicles and other transport choices.	**High**	1	None required.	1
	Permanent changes to access for properties (inc. services and businesses) along the route as a result of removing some existing right-turn facilities, particularly on Lambie Drive. It is noted there is already a physical barrier restricting vehicle movements through the Project corridor in the Manukau Central area.	**High**	1	Community and Stakeholder Engagement Strategy – actions during construction period to inform and educated people about permanent changes.	2

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on culture[33]					
	Reflection of cultural values and aspirations in the project increasing people's connection to the land	**High**	1	None required.	1
Quality of the environment					
	Increased urban amenity, particularly on Davies Ave with urban enhancement and connectivity to Hayman Park.	**High**	1	None required.	1
Impacts on health and wellbeing					
	Improved health and wellbeing with increased access to active transport modes leading to healthier lifestyles.	**High**	1	None required.	1
Socio-economic impacts					
	Long term employment for people who have been involved in construction and participated in skills & workforce development pathways that may lead to other jobs within infrastructure and construction.	**High**	1	Social Outcomes Strategy.	1
	Increased access to employment, education and recreation opportunities. Particularly beneficial to those who do not have access to a private vehicle or had limited transport choice.	**High**	1	Social Outcomes Strategy.	1
Equity impacts					
	Increased access to employment, education and recreation opportunities for people with no, limited or poor access to transport before the project, including people with disabilities, students and those from areas with higher deprivation rates.	**High**	1	None required.	1

[33] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

3.4 Puhinui / Papatoetoe

Table 19: Priority impacts Puhinui / Papatoetoe (planning)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Loss of locally significant businesses and services including: • Mobil Puhinui Road; • Hari Superette; • Puhinui Superette; and • Pukeko Preschool Papatoetoe meaning people have to travel outside of the area or find alternative places within the community to access the same services	**Extreme**	1	Work with Auckland Council to explore opportunities for how land required for construction, but not operation might be appropriate for commercial activity.	1
	Potential for changes to some routines and convenience for some residents due to the acquisition of properties containing several local businesses.	**High**	1	Community and Stakeholder Engagement Strategy.	2
Impacts on culture[34]					
	Potential impacts on local social ties and community relationships to place due to acquisition and loss of residential properties and local businesses in this area.	**Extreme**	1	Community and Stakeholder Engagement Strategy.	1
Family and community					
	Loss of locally significant businesses and services including • Mobil Puhinui Road;	**Extreme**	1	Work with Auckland Council to explore opportunities for how land required for	1

[34] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	• Hari Superette; • Puhinui Superette; and • Pukeko Preschool Papatoeto meaning a loss of places in the community where people meet each other, form relationships and connect as a community			construction, but not operation might be appropriate for commercial activity.	
	Changes to local community (at a localised level) associated with property acquisition, removal of buildings, and families moving out of the area.	**High**	1	Community and Stakeholder Engagement Strategy; and Property Management Strategy.	2
Quality of the environment					
	Perceived reduction in the safety of the area as properties are acquired and homes vacated. Vacant buildings attract antisocial behaviour before they are removed during construction.	**High**	1	Property Management Strategy.	3
Impacts on health and wellbeing					
	Stress and anxiety (Psycho-social impacts) for some more vulnerable community members resulting from a loss of social networks and social support a result of property acquisition and people having to move out of the area.	**Moderate**	2	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
	Increased anxiety and uncertainty for directly affected landowners between now and when active property acquisition commences	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy	2
	Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences. Properties are likely to be acquired at different times meaning some businesses, services and residents are lost to the area at different times.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on personal and property rights					
	Impacts caused by the Public Works Act property acquisition process – land/property acquisition or severance within a property, potential land redistribution between different or new owners.	**High**	1	Public Works Act; Community and Stakeholder Engagement Strategy; Community Health and Wellbeing Strategy; and Property Management Strategy.	2
	Loss of autonomy of decision making about future of land/businesses for directly affected properties.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
	Loss of autonomy of decision making about future of land/businesses for directly affected properties.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
	Certainty for landowners and business owners/operators about future development enabling long term planning about the future of properties/businesses	**Moderate**	2	Community and Stakeholder Engagement Strategy.	3
	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisition processes.	**Moderate**	2	Public Works Act; Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2
Fears and aspirations					
	Potential concern and anxiety about future security for residents or landowners affected by property acquisition, and associated uncertainty for business owners, employees and residents for their next steps once acquisition has been completed. This locality has a high deprivation score and the housing in this area is fairly affordable compared to other areas of Auckland, including those in proximity to the project area. Loss	**Extreme**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy.	2

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	of private housing in this area could displace residents who may not be able to easily secure alternative housing.				
	Potential positive impacts and aspirations associated with perceived investment in Puhinui and the potential for positive transformation of the area.	**High**	1	Community and Stakeholder Engagement Strategy.	1
Socio-economic impacts					
	Loss of employment/livelihood due to acquisition of commercial properties, including: • Mobil Puhinui Road; • Hari Superette; • Puhinui Superette; and • Pukeko Preschool Papatoetoe.	**Extreme**	1	Work with Auckland Council to explore opportunities for how land required for construction, but not operation might be appropriate for commercial activity.	1

Table 20: Priority impacts Puhinui / Papatoetoe (construction)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Impacts on pedestrians and cyclists – people walking along the footpath, cycling on Puhinui Road to access shops, school, work, due to construction activity, including changed wayfinding and temporary closures. There is already conflict in nearby street between school traffic	**High**	1	Construction Management Plan; Development Response Plan; and	2

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	and industrial/commercial businesses during school drop off and pick up periods.			Community and Stakeholder Engagement Strategy	
	Changes to daily living routines due to changes to local access routes as a result of construction, including changed access arrangements to properties, relocation of bus stops along the route to alternative proximate sites, and access to Puhinui School for students arriving from the northern side of Puhinui Road.	**High**	1	Construction Management Plan; Development Response Plan; and Community and Stakeholder Engagement Strategy	2
	Impacts on locally significant businesses and services as a result of construction activity including changes to access and parking, and amenity as a result of noise and vibration. • Age Concern; • Puhinui Road shops (near Ranfurly Road); • Puhinui Medical Centre; • Te Kohanga Reo ki Puhinui; • Kingdom Hall of Jehovah's Witnesses • Puhinui School	**High**	1	Construction Management Plan; Development Response Plan; and Community and Stakeholder Engagement Strategy.	2
	Impact on people using the Puhinui Train Station with potential changes to access as a result of construction activity. It is a regionally significant business and service, including as one of the transport interchanges for connections to the Auckland Airport and for people accessing Manukau City Centre from the south by train.	**High**	1	Construction Management Plan; Development Response Plan; and Community and Stakeholder Engagement Strategy.	2
	Change in access to properties along the route, especially commercial properties adversely affecting the ability for customers to access businesses. Construction activity will result in a central 'barrier' along the corridor creating severance removing the ability to turn right from properties and cross the corridor anywhere except at formal crossing points	**High**	1	Construction Management Plan; Development Response Plan; and Community and Stakeholder Engagement Strategy.	2
Quality of the environment					

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Reduced amenity and subsequent potential impacts to people's enjoyment of everyday activities in the local area due to construction noise and vibration, including increased traffic along temporary detour routes during construction.	**High**	1	Construction Management Plan; Development Response Plan; and Community and Stakeholder Engagement Strategy.	2
	Construction noise and vibration may be particularly experienced by sensitive receivers surrounding the construction site which could affect local social interactions. This includes residential communities in close proximity to the construction site, students and staff of Puhinui School and Te Kohanga Reo ki Puhinui, and staff and clients of Age Concern and the Puhinui Medical Centre. Noise and vibration has the potential to negatively affect people's experience of everyday activities including physical activities and social interactions. The highest impacts would occur during noise intensive works at the construction site that use noise intensive equipment.	**High**	1	Construction Management Plan; Development Response Plan; and Community and Stakeholder Engagement Strategy.	2
	Perceived and potential actual safety impacts associated with changed sightlines, establishment of hoardings, and changes to wayfinding and reduced activation of certain streets at night. Some visitors to and workers at some facilities such as Age Concern, the Puhinui Medical Centre and the Will&Able facility which employs people with disabilities may be experiencing illness and disability, and / or stress and concerns which may mean they are more sensitive and could result in these changes being felt more acutely.	**High**	1	Good Neighbours Policy; Development Response Plan; Community and Stakeholder Engagement Strategy; and Construction Management Plan.	2
Impacts on health and wellbeing					
	Distress caused by environmental change from construction activity (solastalgia), including removal of homes/businesses from properties and construction of structures, particularly in the vicinity of the ramp connecting to the Puhinui Station	**High**	1	Community and Stakeholder Engagement Strategy.	2
Impacts on personal and property rights					

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Perceived impacts to personal and property rights, livelihoods and individuals' experiences of personal disadvantage may be perceived through property acquisitions and construction processes.	High	1	Community and Stakeholder Engagement Strategy; and Property Management Strategy.	2
Socio-economic impacts					
	Employment for people from within the local community, wider southern Auckland area and beyond.	High	1	Social Outcomes Strategy.	1
	Loss of employment/livelihood as a result of temporary closure of some businesses for periods of time during construction	High	1	Social Outcomes Strategy; and Community and Stakeholder Engagement Strategy.	2
	Reduced business activity and customers/clients as a result of disruption from construction activity, including changes to access and visibility of businesses or the need for temporary closures. This includes potential loss of some or all on-street parking for the local shopping area on Puhinui Road.	High	1	Development Response Plan	2

Table 21: Priority impacts Puhinui / Papatoetoe (operation)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Increased connectivity for people without vehicles or with limited access to vehicles improving access to employment, education and services	High	1	None required.	1

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Permanent changes to access for properties (inc. services and businesses) along the route as a result of no right-turns	**High**	1	Community and Stakeholder Engagement Strategy – actions during construction period to inform and educated people about permanent changes.	2
	Potential increased community severance with additional lanes on Puhinui Road and fewer, but formal (and safer), pedestrian crossing points.	**High**	1	Community and Stakeholder Engagement Strategy – actions during construction period to inform and educated people about permanent changes.	2
Impacts on culture[35]					
	Reflection of cultural values and aspirations in the project increasing people's connection to the land	**Moderate**	2	None required.	2
Socio-economic impacts					
	Long term employment for people who have been involved in construction and participated in skills & workforce development pathways that may lead to other jobs within infrastructure and construction.	**High**	1	Social Outcomes Strategy.	1
	Reduced business activity and customers/clients as a result of potential loss of on-street parking for the local shopping area on Puhinui Road.	**High**	1	Design solutions implemented during the planning and construction phases.	3
	Increased access to employment, education and recreation opportunities, especially employment within the airport precinct. Particularly beneficial to those who do not have access to a private vehicle.	**High**	1	Social Outcomes Strategy.	1
Equity impacts					
	Increased access to employment, education and recreation opportunities for people with no, limited or poor access to transport before the project,	**High**	1	Social Outcomes Strategy.	1

[35] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	including people with disabilities, students and those from areas with higher deprivation rates.				

3.5 SH20 to Orrs Road

Table 22: Priority impacts on SH20 to Orrs Road (planning)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on health and wellbeing					
	Increased anxiety and uncertainty for directly affected landowners between now and when active property acquisition commences. Some commercial landowners may not also be occupiers and may reside elsewhere in an unknown location.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy	2
	Increased anxiety and uncertainty for leaseholders, tenants and other occupiers of potentially affected properties between now and when active property acquisition commences.	**High**	1	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy	2
	Increased anxiety and uncertainty for those employed in directly affected businesses between now and when active property acquisition commences.	**Moderate**	2	Community and Stakeholder Engagement Strategy; and Community Health and Wellbeing Strategy	3
Impacts on personal and property rights					
	Impacts caused by the Public Works Act property acquisition process.	**Moderate**	2	Public Works Act;	2

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
				Community and Stakeholder Engagement Strategy; Community Health and Wellbeing Strategy; and Property Management Strategy.	
	Certainty for landowners and business owners/operators about future development enabling long term planning about the future of properties/businesses.	**High**	1	Community and Stakeholder Engagement Strategy.	1
Fears and aspirations					
	Potential negative impacts associated with fear of disruption to the Manukau Memorial Gardens, and perceptions about potential long term changes to the amenity of the memorial gardens.	**Moderate**	2	Community and Stakeholder Engagement Strategy.	2
	Certainty about future development of the transport network enabling businesses in the area and landowners to plan for the future	**High**	1	Community and Stakeholder Engagement Strategy.	1

Table 23: Priority impacts SH20 to Orrs Road (construction)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
	Change in access to properties along the route, especially commercial properties adversely affecting the ability for customers to access businesses.	**High**	1	Community and Stakeholder Engagement Strategy; Development Response Plan; and Construction Management Plan	2
	Delays, increasing travel times.	**High**	1	Community and Stakeholder Engagement Strategy; and Construction Management Plan.	2
Socio-economic impacts					
	Employment for people from within the local community, wider southern Auckland area and beyond.	**High**	1	Social Outcomes Strategy.	1

Table 24: Priority impacts SH20 to Orrs Road (operation)

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on way of life					
	Increased access for pedestrians and cyclists – people walking along the footpath, cycling on SH20B to access the airport, Manukau Memorial Gardens, local businesses.	**High**	1	None required.	1
	Direct vehicle connection from SH20B to SH20 for south-bound traffic meaning less delays.	**High**	1	None required.	1

	Impact description	Overall rating	Priority before mitigation	Mitigation	Priority after mitigation
Impacts on culture[36]					
	Reflection of cultural values and aspirations in the project increasing people's connection to the land.	**High**	1	None required.	1
Quality of the environment					
	Reduced amenity within the Manukau Memorial Gardens as a result of the presence of the SH20B to SH20 bridge.	**High**	1	Ongoing maintenance of landscape features.	2
Impacts on health and wellbeing					
	Reductions in Death or Serious Injuries (DSIs) as a result of adoption of the Vision Zero Philosophy.	**High**	1	None required.	1

[36] Manawhenua cultural values are not considered within this assessment and are addressed within the AEE.

TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

Airport to Botany Urban Design Evaluation

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

Document Status

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Revision Status

Version	Date	Reason for Issue
1.0	9 December 2022	Final for lodgement

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Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
AUP:OP	Auckland Unitary Plan: Operative in Part
BRT	Bus Rapid Transit
CVA	Cultural Values Assessments
N/A	Not Applicable
NIMT	North Island Main Trunk railway
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Airport to Botany Bus Rapid Transit (Botany Town Centre to Rongomai Park)
NoR 2	Notice of Requirement 2: Airport to Botany Bus Rapid Transit (Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue)
NoR 3	Notice of Requirement 3: Airport to Botany Bus Rapid Transit (Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange)
NoR 4a	Notice of Requirement 4a: Airport to Botany Bus Rapid Transit (SH20/20B Interchange to Orrs Road)
NoR 4b	Notice of Requirement 4b: Alteration to NZ Transport Agency Designation 6717 – State Highway 20B
NPS:UD	National Policy Statement on Urban Development 2020
Programme partners	Te Ākitai Waiohua, Auckland Airport, Auckland Transport and Waka Kotahi
RCA	Road Controlling Authority
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
SEA	Significant Ecological Area
SH1	State Highway 1
SH20	State Highway 20
SH20B	State Highway 20B
SSBC	Single Stage Business Case
SWGP	Southwest Gateway Programme
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
UDE	Urban Design Evaluation
ULDMP	Urban and Landscape Design Management Plan
Waka Kotahi	Waka Kotahi NZ Transport Agency

Executive summary

This Urban Design Evaluation (**UDE**) supports the Notices of Requirement (**NoRs**) for the Airport to Botany Bus Rapid Transit Project (the **Project**) lodged by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport (**Auckland Transport**) as requiring authorities under the Resource Management Act 1991 (**RMA**). The notices of requirement propose four new designations and one alteration to an existing designation for State Highway 20B (**SH20B**).

Table 1: Outline of NoRs

Notice	Description	Requiring Authority
NoR 1	Bus Rapid Transit corridor and high quality walking and cycling facilities from Botany Town Centre to Rongomai Park	Auckland Transport
NoR 2	Bus Rapid Transit corridor and high quality walking and cycling facilities from Rongomai Park to Puhinui Interchange, in the vicinity of Plunket Avenue	Auckland Transport
NoR 3	Bus Rapid Transit corridor and high quality walking and cycling facilities from Puhinui Interchange, in the vicinity of Plunket Avenue to SH20/SH20B Interchange	Auckland Transport
NoR 4a	Bus Rapid Transit corridor and high quality walking and cycling facilities from SH20B/20 Interchange to Orrs Road	Auckland Transport
NoR 4b	Alteration to designation 6717 to provide for the widening of SH20B, including a southbound on-ramp onto SH20, high quality walking and cycling facilities and enable a Bus Rapid Transit corridor	NZ Transport Agency

This UDE contains an evaluation section for each NoR which has been prepared based on the guidance and principles established in the Te Tupu Ngātahi Supporting Growth (**Te Tupu Ngātahi**) Programme Wide document – *Te Tupu Ngātahi Design Framework (***Design Framework or Design Framework Principles***)*. The UDE provides urban design focused commentary on the current design detail and recommends the framework for how and where any urban design opportunities should be considered in future design stages. These recommendations should form the basis of an urban design specific designation condition, and where there is an overlap of urban design outcomes with other considerations (for example ecological, landscape, visual or water quality related recommendations) they should be integrated within the relevant specialist conditions.

The recommendations are summarised as urban design outcomes sought and where additional urban design opportunities have been identified during the evaluation, they are also mapped for each NoR for consideration either by the requiring authorities or other parties at future stages of design and development of the Project. These opportunities are not however required to mitigate the anticipated urban design effects of the Project.

Summary of urban design outcomes sought

Overall, the Project has been found to be generally supportive of the Design Framework principles.

The preparation of an Urban and Landscape Design Management Plan (**ULDMP**) in future delivery stages is recommended for all NoRs to further develop the urban design outcomes recommended as summarised under each NoR evaluation.

Details of the urban design recommendations are included under each NoR and are not repeated in this summary for brevity.

1 Introduction

1.1 Purpose and scope of this evaluation

This UDE provides an overview of the urban design considerations and inputs as well as an evaluation and identification of future transport and land use integration opportunities for the Project.

This evaluation 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 within each NoR, and the typical methodologies that will be used to implement this work. These have been reviewed by the author of this evaluation and have been considered as part of this UDE. As such, they are not repeated here.

The key sections addressed for each project are outlined in Table 2.

Table 2: Report structure

Sections	Section number
The design context	2
Project description	3
Corridor form and function	3.1
Existing and likely future environment	3.2
Summary of urban design evaluation and recommendations	With each NoR section
Summary map of urban design outcomes and opportunities	With each NoR section and included in Appendix B
Evaluation against Te Tupu Ngātahi Design Framework principles	4.1, Appendix A

2 The design context

This evaluation which has been prepared for each of the NoRs is based on the guidance and principles established in the Te Tupu Ngātahi Programme Wide Design Framework / Design Framework Principles (refer to Appendix C).

As set out in the AEE, Manawhenua have been actively involved as partners in the Project (previous business case and current NoR phase). Through this partnership, project specific outcomes have been identified. These outcomes have informed this evaluation and corresponding recommendations as they relate to ongoing partnership and co-design with Manawhenua.

The Design Framework takes a systems approach as the basis on which urban areas are organised and understood and pulls these apart as a series of layers; environment, social, built form, movement and land use, with cultural and sustainability values underpinning and spanning across these. In this way transport networks are not seen in isolation rather in terms of how they can contribute to the urban system as a whole.

There are twenty design principles that have been established (as part of the Design Framework) within these layers to provide high level guidance on the attributes of responsive, resilient, sustainable, vibrant and high-quality urban environments. Each of the principles describe what 'good looks like' and what to aim for in the design of transport networks. The principles sit within an integrated system across the various layers, to be prioritised and applied according to desired outcomes articulated in the strategic policy direction and the unique needs of each context.

The Design Framework principles are relevant across the Projects within Te Tupu Ngātahi as they contribute to the understanding of the development of route options in terms of; place context, built form interfaces, movement functions and modal priorities. They also inform the design development of route options at each phase with specific urban design considerations including:

- Land use and corridor interface;
- Connectivity and access;
- Character and sense of place;
- Integration with future development; and
- Response to topography.

The Design Framework sits within the context of a range of established strategic plans, policies and design guidance that guide urban development outcomes at the:

- National level (e.g. National Policy Statement (**NPS**) on Urban Development, Government Policy Statement (**GPS**) on Land Transport, Medium Density Housing Standards (**MDRS**), NZ Transport Agency Bridging the Gap, Regional Land Transport Plan); and
- Local level (e.g. Auckland Plan 2050, Auckland Transport Alignment Project (**ATAP**), Auckland Transport Roads and Streets Framework, Transport Design Manual, Auckland Unitary Plan (**AUP:OP**), AT Sustainability Framework, AT Code of Practice).

The established strategic plans and guidance outlined above informed the development of the Design Framework content and they are referenced in general terms as they relate to the attributes that will contribute to healthy, connected and sustainable communities. Where more recent design guidance was available that did not form part of these published reports, the Design Framework included more detail, e.g. the approach to the location of rail, rapid transit and the role of active modes.

National Policy Statement on Urban Development 2020 (NPS:UD)

The 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 NPS:UD. 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 increased commercial and residential activity around:

- Centre zones;
- Areas with employment opportunities; and
- Areas that are well serviced by existing or planned public transport or where there is high demand for housing or business.

This aligns with the Design Framework principle of increasing density in and around centres to create vibrant walkable/cyclable communities that support public transport, have compact urban forms, a strong sense of place and a community focal point.

Auckland Council

At a local level, the key urban design considerations and provisions of the AUP:OP relevant to the Project include:

- Regional Policy Statement B2: Urban Growth and Form;
- Regional Policy Statement B3: Infrastructure Transport and Energy;
- Regional Policy Statement B4: Natural Heritage;
- Chapter E38: Subdivision;
- Chapter H: Zones (including structure planned zones);
- Chapter I: Precincts (Puhinui Precinct, Manukau Precinct, Florence Carter Avenue Precinct, Flat Bush Precinct); and
- Chapter M: Appendix 1 Structure plan guidelines.

The specific urban design commentary within the corridor evaluations (outlined in the sections below) broadly address the objectives and policies of the relevant sections of the Regional Policy Statement and District Plan chapters of the AUP:OP as listed above.

In addition, the Auckland Plan 2050 sets the vision and direction for Auckland and the Design Framework directly references this plan. It illustrates how the outcomes of the Auckland Plan are linked to the design principles set out in the Design Framework.

3 Project description

The overall Project is proposed to be an 18 km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations. It is part of Auckland's wider Rapid Transit Network (**RTN**) connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany.

As set out in the AEE, the UDE specifically relates to a portion of the overall Project (approximately 14.9 km) which extends from the Botany Town Centre in the vicinity of Leixlep Lane to Orrs Road in the Puhinui peninsula, off SH20B. The Project primarily involves the upgrade and widening of existing transport corridors to provide for a dedicated BRT corridor and high-quality walking and cycling facilities.

Figure 1: Overview of the Project and NoR extents

To integrate with the surrounding, predominantly urban environment that the Project passes through, the Project has been split into four sections for urban design evaluation purposes:

- Botany Town Centre to Rongomai Park (NoR 1);
- Rongomai Park to Puhinui Station (NoR 2);
- Puhinui Station to SH20/20B Interchange (NoR 3); and
- SH20/20B Interchange to Orrs Road (NoRs 4a and 4b).

3.1 Corridor form and function

Section 3 of the AEE outlines the key physical elements of the Project across each of the NoR sections and how the different elements of the Project will operate once the Project is implemented.

The design of the Project is commensurate with the 'route protection' phase of the Project, as such, only a concept level of design has been undertaken. The design will be further refined through subsequent phases of the Project and will be undertaken within the scope of the designation conditions and future resource consent conditions. The detailed design of the Project will be undertaken prior to construction and reflected in the Outline Plan(s) which will be submitted to Council as set out in s176A of the RMA.

Nine BRT stations are proposed as part of the Project, these stations will facilitate off-board ticketing, level boarding and all-door boarding. These are situated in the following locations:

- Smales Road;
- Accent Drive;
- Ormiston Road – Botany Junction Shopping Centre;
- Dawson Road;
- Diorella Drive;
- Ronwood Avenue (Manukau Central);
- Manukau Station;
- Puhinui Road/Lambie Drive; and
- Puhinui Station.

Each NoR section is described in the AEE under the key feature headings:

- Bus Rapid Transit Corridor;
- Stations;
- Walking and Cycling Facilities;
- General Traffic;
- Access;
- Speed Environment;
- Signalised intersections; and
- Stormwater infrastructure.

3.2 Existing and likely future environment

Section 9 of the AEE outlines the key attributes of the existing and likely future environment of the Project across each of the NoR sections. Each section is described in the AEE under key features of:

- Current land use;
- Community and recreation facilities;
- Watercourses;
- Vegetation and recreational facilities;
- Historic heritage and archaeological values;
- Existing designations;
- Current zoning;

- Precincts;
- Other non-statutory features; and
- Likely future zoning.

3.3 Preparation for this evaluation

Work undertaken for this evaluation commenced in August 2022. In summary, the preparation for this work has included:

- Review of the Airport to Botany specialist briefing package, the Single Stage Business Case (**SSBC**) design drawings and the Te Tupu Ngātahi GIS viewer;
- A review of the statutory setting of the project and surrounding context;
- A review of the base map data such as contours and aerial photography;
- A detailed site visit including taking representative photographs along the route was undertaken on 7 September 2022 by Stuart Bowden and Nigel Parker to understand the nature of the receiving environment and its physical and visual relationship to the surrounding environment, as well as the context, character and urban setting from the wider area; and
- A site visit with Auckland Council representatives was undertaken on 11th September 2022 by Elaine Chen as part of the verification process.

4 All Airport to Botany Bus Rapid Transit NoRs

This section evaluates common or general urban design matters across the entire Project against the relevant Design Framework Principles. It provides urban design focused commentary on the current design detail and recommends the framework for how and where common urban design outcomes should be considered in future design stages. These recommendations could form the basis of an urban design specific designation condition, and where there is an overlap of urban design outcomes with other considerations (for example ecological, landscape, visual or water quality related recommendations) these could be integrated with other relevant designation conditions.

4.1 Urban design matters common to all NoRs

Table 3: Common urban design matters

Principle	Explanation	Application common to all NoRs
ENVIRONMENT		
1.1 **Support and enhance ecological corridors and biodiversity**	Mitigate the effects on or enhance existing ecological corridors through the placement and design of movement corridors	• It is noted that detailed water quality and detention / retention requirements for the corridor will be decided in the future consenting stage of the Project. • The proposed corridor and associated designation boundary provide spatial provisions (within the cross section and wider boundary) that have the potential to support ecological connectivity and biodiversity in the local environment by providing contiguous space for diverse planting responses. • Opportunities within the immediate landscape of the corridor to support and enhance indigenous biodiversity are detailed in the *Airport to Botany: Assessment of Ecological Effects*. • There are multiple water courses that cross the corridor. Impacts on ecological features such as the stream alignment and indigenous vegetation are avoided or reduced where possible. • There are two water course bridge crossings proposed along the corridor. Both crossings incorporate bridging structures to reinforce broader connectivity outcomes for ecology and water quality by minimising stream interruptions and ensuring a connected natural system. • Stream crossings where existing culverts are to be upgraded or lengthened will be improved so that fish passage is provided.
1.2 **Support water conservation and enhance water quality in a watershed**	Take into account and work with the existing watershed as part of a whole system.	• As set out in the AEE, a stormwater philosophy has been developed for the Project that identifies preferred treatment approaches along the Project corridor. This identifies a preference for the use of green infrastructure for new treatment devices across the corridor such as ponds, raingardens, linear treatment as well as the use

		and / or enhancement of existing public stormwater treatment ponds. • The proposed typical corridor cross section and designation boundary allows spatial provisions where adjacent to existing service lanes and other selected locations to provide natural drainage to stormwater raingardens to address water quality and reduce hard engineering solutions. • Further refinement of the raingarden configuration and arrangements during the detailed design stage is recommended to define the raingarden's final form and interface with the surrounding land uses. For example, raingarden edges may be configured in a naturally shaped manner and fully integrated with existing natural drainage features and vegetation. • Future development and definition of the proposed stormwater treatment devices, swales and ponds is recommended to provide an appropriate interface with the surrounding context and amenity for the corridor.
1.3 **Minimise land disturbance, conserve resources and materials**	Respect the existing topography, landforms and urban structure in the placement of strategic corridors. Minimise the quantity of hard engineering materials required. Minimise, mitigate any adverse effects of activities on the environment.	• The proposed corridor demonstrates a generally efficient alignment in relation to existing property boundaries along the corridor minimising land impacts and inefficient residual land portions. • The proposed corridor generally follows the vertical geometry of the existing corridor, minimising land disturbance. Further vertical integration adjacent to stream crossings and bridging structures should be developed in the future, at detailed design to allow an appropriate transition and interface to adjacent built form. • If practicable, opportunities should be explored at future detailed design stages to redefine and integrate residual land (following the construction of the Project) along the corridor frontage with the expected future land use function. • The proposed corridor cross section has the potential to impact tree and vegetation cover within the designation. An assessment of the potential losses and mitigation recommendations are outlined in the *Airport to Botany Assessment of Arboricultural Effects*, however further definition and design of the corridor landscape should be developed in future design stages and should address how the proposed corridor landscape: – Responds to pedestrian amenity outcomes; – Provides replacement and augmented canopy shading to the corridor; – Mitigates urban heat island effects within the environment of the corridor; – Contributes to biodiversity values within the corridor; and

		– Responds to and improves landscape character and values within the corridor.
1.4 **Adapt to a changing climate and respond to the microclimatic factors of each area**	Design for predicted future regional climatic impacts in the corridor location. Consider the positive contribution that the orientation of transport corridors can make to the local climate of future places and streets.	• The *Airport to Botany: Assessment of Flooding Effects* for the Project sets out how flooding effects can be appropriately managed through the future detailed design stage. The assessment has considered the sensitivity of the Project to increased rainfall as a result of climate change based on two scenarios. The designation boundaries allow for retention/detention devices which include some flood storage. However, the final geometric design of the Project which will be confirmed through future detailed design will consider a series of outcomes to not exacerbate existing flood effects. • The proposed corridor provides space for street tree planting that, when delivered, will contribute to the amenity of the area by providing shade and microclimatic cooling qualities. Further definition and design of the corridor landscape should be developed in future design stages. • The proposed corridor provides for active modes and prioritises public transport options to support modal shift and reduce transport related climate change contributions.
SOCIAL		
2.1 **Identity and place**	The identity or spirit of place is generally acknowledged as the unique amalgam of the inherent built, natural and cultural qualities of a place. Responding to identity in the location and type of new corridors can provide a sense of continuity and contribute to our collective memory. **Local Identity** Locate the station facilities to maximise the placemaking potential and enhance local identity.	• The proposed corridor passes through a highly varied urban environment that is planned to change to mixed and denser residential land uses, the proposed cross section has spatial flexibility that is capable of responding to a range of characteristics (identity drivers) that may arise from this change. For example, the existing lower density Residential – Mixed Housing Suburban Zone land is subject to change under the requirements of Policy 3 of the NPS:UD to enable higher density development of at least 6 storeys (particularly around proposed BRT stations) – in these areas the cross section can provide support for active edges (where there is visual engagement between the built form and the street), permeable access for pedestrians, and vegetation appropriately scaled to built form. • In order to create a sense of identity and place, the future architectural design response of the stations and associated facilities will need to consider the underlying identity drivers of the surrounding context such as: – Cultural values and narratives of Manawhenua; – Any identified landscape character drivers of each station location; and – Urban space qualities of the surrounding high to medium density land uses. • There is opportunity to improve connectivity and interface with watercourse crossings to enhance their distinctive

		landscape qualities (character drivers) for their local communities. • Consideration of street tree selection and placement provides the opportunity to reflect and enhance the unique local character inherent in the built, natural and cultural qualities of the location. Manawhenua will be invited to provide input as Partners into relevant cultural landscape and design matters including how Project outcomes reflect their identity and values.
2.2 **Respect culturally significant sites and landscapes**	Acknowledge significant sites and features in the layout of movement corridors including ridgelines or horizons.	• Under the AUP:OP, there are no scheduled sites of significance to Manawhenua that have been identified along or in close proximity to the proposed corridor. • Through the NoR phase, Manawhenua have been involved in regular hui and site visits with the Project Team to share sites/areas that are of significance to Manawhenua and identify opportunities within and adjacent to the Project to acknowledge, respond, protect and incorporate their cultural landscape and values into the Project design. • As set out above, in future design stages, Manawhenua will be invited as Partners to provide input on the cultural landscape and design matters including how Manawhenua values and cultural narrative are incorporated through the Project outcomes. This could include but is not limited to: – Incorporating Manawhenua values and narrative through the form of the Project and associated structures; – Identifying opportunities to recognise the historic and cultural significance of the Puhinui Historic Gateway to the Airport; – Providing pou, art, sculpture, mahi toi or other public amenity features located on land within or adjoining the Project; and – Providing any other feature that represents the Māori history of the area and promotes a distinctiveness or sense of place appropriate for the wider heritage area.
2.3 **Adaptive corridors**	Corridors should demonstrate flexibility to respond to changes in their function and physical interfaces. Consider an adaptive approach in the way strategic corridors are designed to be able to respond to changes in land use, the way we move around and utilise technology over time. **Future Growth**	• The proposed typical corridor cross section has the spatial provisions to be re-configurable and adaptable for changing transport needs. For example, modal changes, future bus priority measures at intersections, bus stations and future expansion of any walking and cycling networks can be accommodated within the corridor. • The proposed cross section provides space for all modes, with spatial provisions at the corridor edges that accommodate active frontages, provide permeability for access to adjacent land use types and movement corridors.

	Consider the existing and future movement and place context that will be supported by the Project and the ability of the design to accommodate change over time.	
2.4 **Social cohesion**	Provide clear, effective and legible connectivity between community and social functions.	• The proposed typical corridor cross sections supports the creation of spaces where seamless corridor access can be provided through a permeable interface at the corridor boundary. • The proposed corridor alignment and function can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres and open spaces. Refer to individual NoR sections for specific focus areas. • To enable equitable local connectivity and cross corridor access to commercial centres and areas of high density, further development at the detailed design stage should be undertaken of crossing points for multi-lane intersections and potential midblock crossings.
2.5 **Safety**	Provide a safe and convenient network of routes accessible to people of all ages and abilities. **Universal Access** Focus on the needs of the customer by placing importance on the spatial requirements that provide for universally inclusive and safe facilities with good physical and visual links.	• The proposed corridor will deliver a greater level of access and movement to future local communities, with the provision of fully segregated active travel solutions. • The proposed corridor accommodates the universal design approach and accessibility to all parts of user journeys. • The proposed functionality and configuration of the interchange provides for pedestrian access through the BRT station which supports a greater level of access and movement for future local communities, promoting a sense of personal safety for pedestrians and cyclists. • The future design and functional layout of the BRT stations as well as future corridor design stages should respond to and incorporate CPTED principles, including clear sightlines, good levels of lighting, passive surveillance, and avoidance of entrapment zones. • There is opportunity for future adjacent development to provide additional passive surveillance and activation improving CPTED outcomes for the project. • A CPTED audit of each NoR project should be carried out against the proposed design and should address, at a minimum, the current identified CPTED risks outlined in each NoR evaluation. • Future development and detailed design of the final crossing points of the station accessways is required to confirm and reinforce a sense of personal safety and provide for equitable local connectivity and access. • Further design detail of safe prioritised active modes crossings across the corridor and intersections should be addressed at subsequent detail design stages.

BUILT FORM		
3.1 **Align corridors with density**	Locate stations/stops and corridors within walking distance of higher density development to facilitate modal shift, support commercial and mixed-use centres and contribute to vibrant, active urban environments. **Active Mode Catchments** Locate stations and interchange facilities in places that align with areas of greater density and is centered on the active mode catchment.	• The proposed BRT station locations will provide the core transport function of a new multi modal transport network that will support the requirements of Policies 1 and 3 of the NPS:UD for enabling increased development capacity adjacent to rapid transit networks. • The corridor prioritises public transport and active modes to provide direct access to both housing and employment areas at Botany, East Tamaki, Clover Park, Manukau City Centre, Papatoetoe, Wiri and ultimately Auckland Airport. The combination of the core corridor functions and alignment to key destinations will maximise the benefits of modal shift and provide a positive contribution to the vibrancy and activation of the varied urban environments along the corridor.
3.2 **Corridor scaled to the surrounding context and urban structure**	Align the speed, type and scale of transport corridors and infrastructure with the environment that it moves through (appropriate scale to the context). **Respond to Land Use** The size, design and location of the facilities should respond to the adjacent land use and respect natural features. This minimises any 'left over' spaces and disconnected pockets of land that need integration.	• Approximately 7.5 km length of the existing corridor land uses (Mixed Housing Suburban and Mixed Housing Urban) are subject to change as a result of the increased development capacity requirements of the NPS:UD. The remainder of the corridor will remain as Light Industry, Local, Neighbourhood or Metropolitan Centre zoning. • The ongoing regional freight function of sections of the corridor including those in NoRs 1, 3 and 4, poses a potential conflict between placemaking aspirations within local communities and the scale and speed of the proposed movement function. Place specific responses to integrating these functions should be identified and addressed in future design states of the project. • Localised urban design commentary on corridor scaling is contained in each NoR section. • Overall, the proposed corridor configuration and scale provides an appropriate response to the potential needs of the adjacent area functions (access to and from adjacent built form and general spatial layout). Examples include efficient localised movement, alignment with known higher density housing land uses and the provision of mixed mode travel.
3.3 **Facilitate an appropriate interface between place and movement**	Facilitate the opportunity for place as well as movement in corridors (people-oriented streets)	• The proposed corridor cross sections provide a flexible platform to address the opportunity for place as well as movement function with clear allocation of street space, for example separated pedestrian and cycle facilities and potential road berm spaces that provide safe waiting zones for pedestrians. • In the absence of medians, signalised or legal crossings, spaced appropriately for the adjacent land-uses and pedestrian desire routes involved, should be considered.

		• Direct private vehicular access is generally not accommodated onto the corridor, however a pedestrian permeable interface or active frontage interface is supported at all locations along the corridor.
MOVEMENT		
4.1 **Connect nodes**	Provide tangible connectivity between identified activity nodes. **Cross Corridor Connectivity** Balance the functional access requirements across the Project corridor with the optimal location to provide connections into the surrounding area.	• The proposed corridor provides tangible and direct connectivity between existing industrial / employment areas, local communities and mixed-use centres. • There are opportunities in the future development of the Project to provide further clear and direct connections across the corridor; – Between local, neighbourhood and town centre functions and the communities they serve. – Between open spaces and reserves along the wider blue-green network. • Refer to individual NoR sections for specific focus areas.
4.2 **Connect modes**	Provide for choice in travel and the ability to connect at interchanges between modes. **Permeability** Provide a level of permeability for stations that supports access into the surrounding streets/corridors.	• The proposed corridor provides simple but complete future connectivity for all modes (walking, cycling, public transport and private vehicles). • The corridor provides a direct and prioritised active mode and public transport connection to the proposed Manukau Central and existing bus and train stations at Puhinui and Manukau. • Connectivity to the surrounding street network and access to the wider area is generally identified and accommodated, however it is recommended that further consideration in future design stages is given to the detailed connections to any future active mode network design.
4.3 **Support access to employment and industry**	Align the corridor location and typology to provide direct and efficient access to areas of employment and industry.	• The corridor prioritises public transport and active modes to provide direct access to and support for existing and planned commercial, industrial and employment areas including: – South of Puhinui Road within NoRs 3 and 4a/4b; – Along Lambie Drive in NoR 3; – Manukau Central in NoR 2; and – West of Te Irirangi Drive between East Tamaki Road and Rongomai Park in NoR 1.
4.4 **Prioritise active modes and public transport**	Provision of quality active mode corridors and dedicated public transport corridors to enable a modal shift away from private vehicle use.	• The corridor design and designation boundary provides access for active modes, and public transport through the provision of: – High quality walking and cycling facilities, space for cycle parking close to station locations. There is an opportunity to provide additional cycle parking in future design stages.

	Walkability Locate the station and interchange facility within or in close proximity and walking distance of local activity hubs/town centres. **Modal Priority** Consider efficient connectivity between transport modes by: • Providing access that is aligned with the desired modal hierarchy; 1) pedestrians, 2) cyclists/micro-mobility, 3) public transport, 4) drop off/pick up/taxis, and 5) private vehicles / parking. • Minimising the interchange time and distance between transport modes by designing direct, safe and self –explaining linkages. • Minimising the conflicts between modes.	– BRT stations adjacent to both housing, commercial and employment land and destinations along the corridor. • Further development of safe and prioritised active mode connections at intersections and the provision of mid-block crossings at the future detailed design stage will provide a higher level of service to active and micro modes and further encourage modal shift. • Potential priority conflicts between active modes / public transport and the ongoing freight function of sections of the corridor including those in NoRs 1, 3 and 4a/4b, should be further identified and addressed in the future design of the Project.
4.5 **Support inter-regional connections and strategic infrastructure**	Consider the location and alignment of significant movement corridors and placement of infrastructure (power, wastewater, water) to the network.	• The corridor includes some of Auckland's main industrial, warehousing and distribution areas. Multiple freight-related operations are located in the area due to the many competitive advantages that proximity affords, including shorter transit times to end destinations and improving overall supply chain efficiency. • NoR specific urban design commentary on the place / movement balance, modal priority aspirations and urban interfaces is included in the individual NoR evaluations.
4.6 **Support legible corridor function**	Consider how the corridor can be clearly navigated and understood by users moving from place to place. **Legible Connections** To achieve a positive and engaging street presence	• The typical corridor cross section accommodates a range of modes with clear allocation of street spaces that inherently supports future community connectivity, mobility and travel choice. • Further development of active mode midblock crossings and along the corridor at the detailed design stage will provide clear and legible cross corridor access and

	provide clear physical and visual connection between station and interchange facilities and surrounding corridors.	connectivity between areas of high density, centres and community amenities.
LANDUSE		
5.1 Public transport directed and integrated into centres	Locate rapid transit interchanges within centres (local, town and metro) to support a mix of uses and provide modal choice to a larger number of users.	• The corridor provides a direct and prioritised public transport connection as part of the BRT network that connects Botany and Manukau Town Centres as well as multiple local and neighbourhood centres along the corridor.
5.2 Strategic corridors as urban edges	Strategic corridors as potential definers of a land use edge.	• This principle is not directly relevant to the Project as the corridor follows existing road corridors that are integrated with the urban environment.

5 NoR 1 – Botany Town Centre to Rongomai Park

This section considers the proposed NoR 1 – Botany Town Centre to Rongomai Park section against the relevant Design Framework Principles. It provides urban design focused commentary on the current design detail and recommends the framework for how and where any urban design outcomes should be considered in future design stages.

Table 4 in **Appendix A** only outlines urban design commentary specific to NoR 1. For commentary common to all NoRs refer to Table 3.

5.1 Summary of urban design evaluation and recommendations for NoR 1

Overall, the proposed NoR 1 corridor design and configuration is generally supportive of the Design Framework principles. A summary of the recommended urban design outcomes and opportunities for NoR 1 are outlined below and illustrated in Figure 2, Figure 3, Figure 4 and **Appendix B**. These are recommended to form a part of the ULDMP in future delivery stages. This is to ensure the detailed design of the corridor responds appropriately to the principles and the project specific urban design outcomes sought.

The ULDMP should address the following Project specific outcomes for NoR 1:

ENVIRONMENT

- A landscape plan that considers recommendations from the landscape and visual, arboriculture, flooding and ecological assessments including street tree and stormwater raingarden and wetland planting, construction compound and private property reinstatement and treatment of batter slopes. The landscape plan should also demonstrate integration of Otara Creek, Puhinui Creek and their tributaries where the corridor intersects with the existing Blue-Green Network. The landscape outcomes should support the principles of Auckland's Urban Ngahere Strategy and reinforce the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider walking and cycling network.
- Integration of the stormwater raingardens and wetlands to ensure an appropriate interface with adjacent land uses, specifically where wetlands are proposed in areas zoned high density.
- Measures to demonstrate that the project has adapted to the changing climate such as reducing urban heat island effects in future urbanised areas, supporting modal shift and accounting for flood hazard risks.

SOCIAL

- In future design stages, Manawhenua shall be invited as Partners to provide input on the cultural, landscape and design matters including how Project outcomes reflect their identity and values.
- The identification, development and integration of key local community and identity drivers within NoR 1 should be demonstrated. Key NoR 1 local identity community functions to be addressed include:
  - Business – The General Business Zone, Business – Neighbourhood Centre Zone and Business – Light Industry Zone at Bishop Dunn Place;
  - Sancta Maria Catholic Primary School and College;

  - Links to the adjacent Ormiston Town Centre (Business – Town Centre Zone) on Ormiston Road; and
  - Botany Junction shopping centre (Business – Local Centre Zone) at 277 Te Irirangi Drive;

- Key NoR 1 distinctive landscape character qualities of open spaces, stream and conservation zones include;

  - Open space linkages along Otara Creek Reserve and Tributaries to Barry Curtis Park;
  - Kellaway Drive Reserve,
  - Savonna Park; and
  - Rongomai Park / Recreation Reserve.

- The proposed corridor alignment and function can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres, schools, community functions and open spaces. Key school, community and business functions within NoR 1 to be addressed include:

  - Sancta Maria Catholic Primary School and College;
  - Rongomai Park / recreational reserve; and
  - Barry Curtis Park.

- A CPTED review of the NoR 1 project should address, at a minimum, the current identified CPTED risks including:

  - The existing underpass environment at Kellaway Drive / Brinlack Drive;
  - Pedestrian overpasses at East Tamaki Drive and Whetstone Road; and
  - Under bridge environments at the Otara Creek tributary overbridge and culverts.

BUILT FORM

- Known or planned changes of land use and residential density that have the potential to alter the perceived scale and impact of the proposed corridor functions should be identified and addressed.
- Resolution of any potential conflict between placemaking aspirations within local communities and the scale and operating speed of the proposed movement functions of the corridor should be addressed.
- An urban interface approach within the corridor that:

  - Provides an appropriate interface to the existing local, neighbourhood and town centres and enables buildings and spaces to positively address and integrate with the NoR 1 corridor;
  - Responds to the spatial character of proposed centre environments and supports quality public realm infrastructure, ample pedestrian footpath width, frequent pedestrian crossing points and street trees for shade and amenity;
  - Demonstrates the proposed modal connections, modal hierarchy, built form interfaces and arrangements at the proposed NoR 1 BRT station locations at Smales Road, Accent Drive and Ormiston Road that support the requirements of Policies 1 and 3 of the NPS:UD for enabling increased development capacity adjacent to rapid transit networks;
  - Recognises the transition of densities from Residential – Terrace Housing and Apartment Building to Residential to Mixed Housing Suburban Zone and provides a corridor interface that supports permeable pedestrian access and responds to the changing built form interface and spatial character of adjacent future development; and

- Supports the integration of the proposed BRT stations and surrounding land uses.

MOVEMENT

- Permeability of the corridor for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities. Demonstration of place specific active mode cross corridor solutions should include:
  - Kellaway Drive / Brinlack Drive (upgraded existing);
  - East Tamaki Road pedestrian crossing location (upgraded existing);
  - Vidiri Court pedestrian crossing (New); and
  - Whetstone Road pedestrian crossing (upgraded existing).
- Legibility, connectivity demands, safety and modal priority for active modes should be addressed for intersections within NoR 1. Demonstration of specific intersection responses to ensure connectivity between the proposed BRT facilities, local centres and other community facilities should include the intersections of Te Irirangi Drive and:
  - Brinlack Drive;
  - Smales Road;
  - Redcastle Drive;
  - Accent Drive;
  - Banville Road;
  - Bishop Dunn Place / Sancta Maria Way;
  - Ormiston Road;
  - Florence Carter Avenue; and
  - Whetstone Road.
- A modal integration strategy that addresses the potential conflict between the continued freight function of the corridor and placemaking opportunities arising from the introduction of the BRT stations along Te Irirangi Drive.

LANDUSE

- Demonstration of how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function, in particular areas immediately adjacent to the station locations.

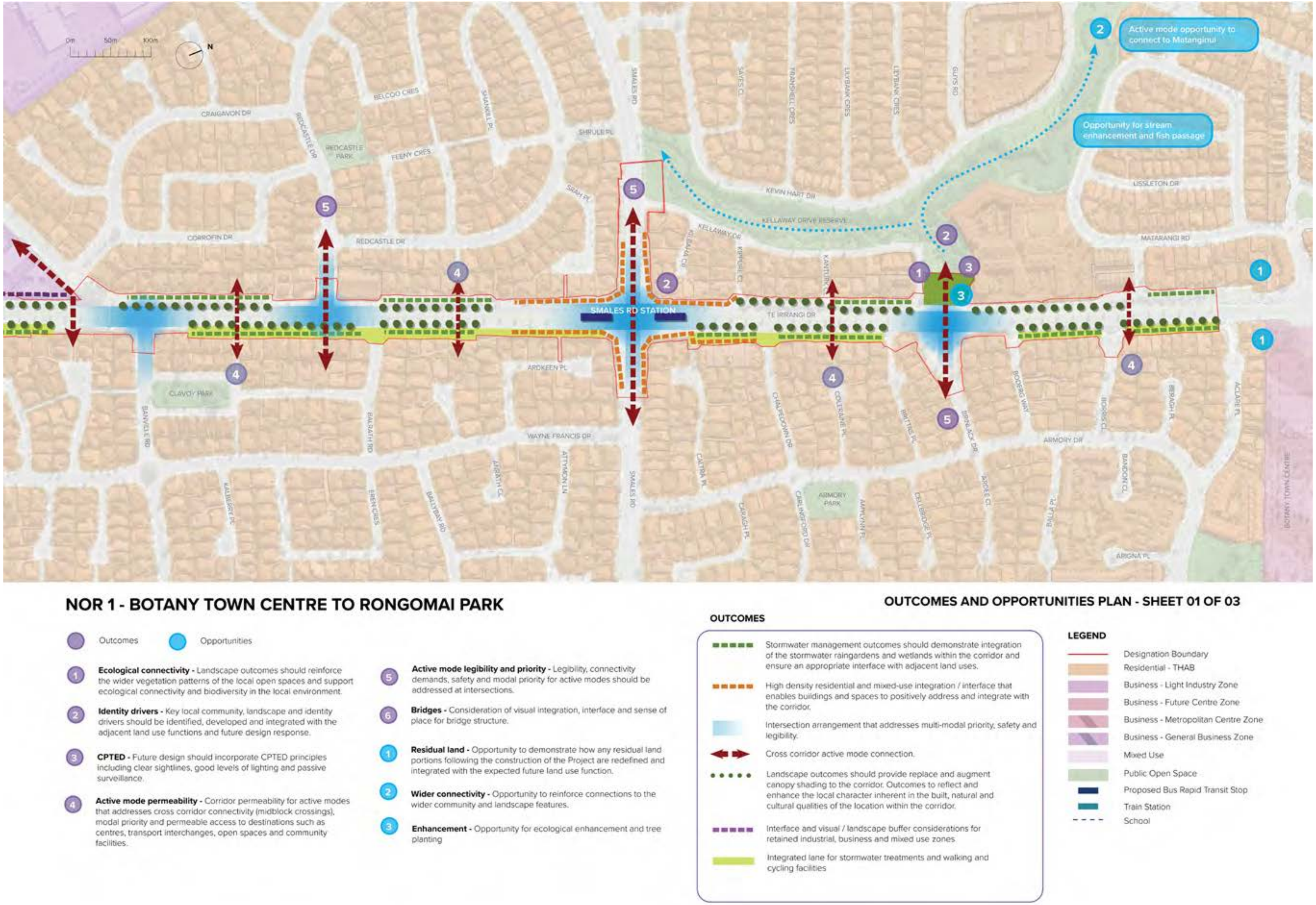


Figure 2: NoR 1 urban design outcomes and opportunities Sheet 01 of 03

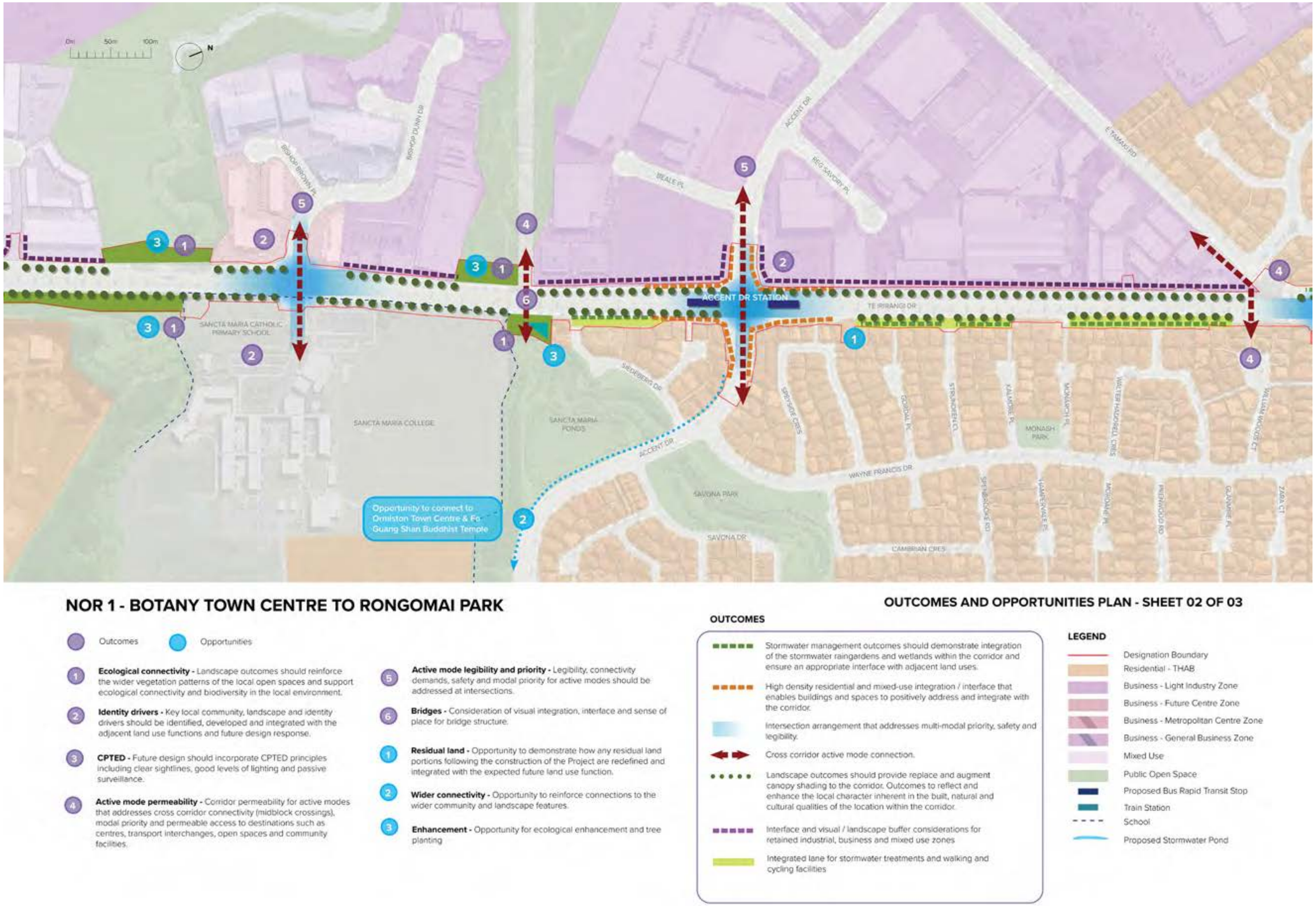


Figure 3: NoR 1 urban design outcomes and opportunities Sheet 02 of 03

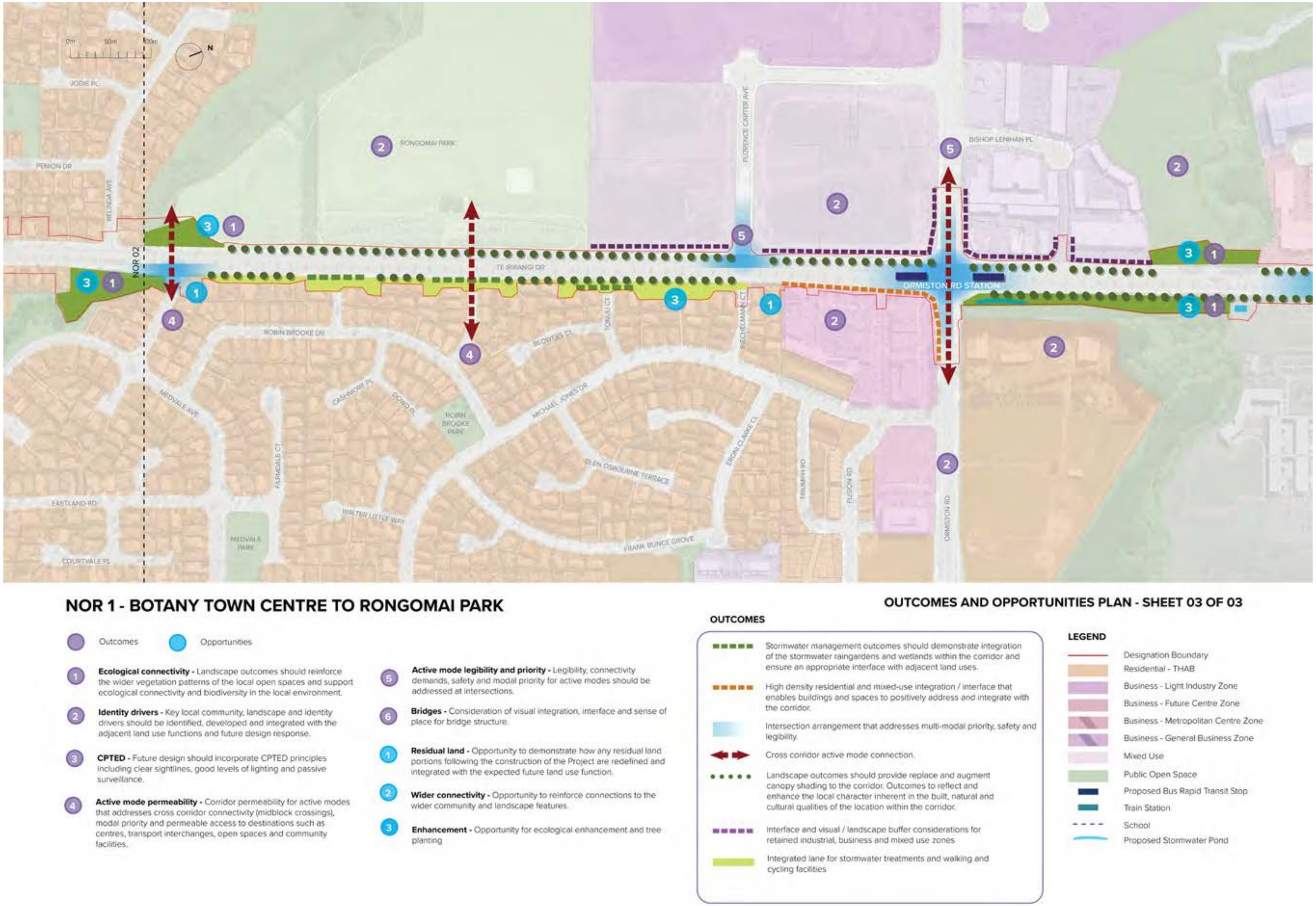


Figure 4: NoR 1 urban design outcomes and opportunities Sheet 03 of 03

6 NoR 2 – Rongomai Park to Puhinui Station

This section considers the proposed NoR 2 – Rongomai Park to Puhinui Station section against the relevant Design Framework Principles. It provides urban design focused commentary on the current design detail and recommends the framework for how and where any urban design outcomes should be considered in future design stages.

Table 5 in **Appendix A** outlines urban design commentary specific to NoR 2. For commentary common to all NoRs, refer to Table 3.

6.1 Summary of urban design evaluation and recommendations for NoR 2

Overall, the proposed NoR 2 corridor design and configuration is generally supportive of the Design Framework principles. A summary of the recommended urban design outcomes and opportunities for NoR 2 are outlined below and illustrated in Figure 5, Figure 6, Figure 7, Figure 8 and **Appendix B**. These are recommended to form a part of the ULDMP in future delivery stages. This is to ensure the detailed design of the corridor responds appropriately to the principles and the project specific urban design outcomes sought.

The ULDMP should address the following Project specific outcomes for NoR 2:

ENVIRONMENT

- A landscape plan that considers recommendations from the landscape and visual, arboriculture, flooding and ecological assessments including street tree and stormwater raingarden and wetland planting, construction compound and private property reinstatement and treatment of batter slopes. The landscape plan should also demonstrate integration of Otara Creek, Puhinui Creek and their tributaries where the corridor intersects with the existing Blue-Green Network. The landscape outcomes should support the principles of Auckland's Urban Ngahere Strategy and reinforce the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider walking and cycling network.
- Integration of the stormwater raingardens and wetlands to ensure an appropriate interface with adjacent land uses, specifically where wetlands are proposed in areas zoned high density.
- Measures to demonstrate that the project has adapted to the changing climate such as reducing urban heat island effects in future urbanised areas, supporting modal shift and accounting for flood hazard risks.

SOCIAL

- In future design stages, Manawhenua shall be invited as Partners to provide input on the cultural, landscape and design matters including how the Project outcomes reflect their identity and values.
- The identification, development and integration of key local community and identity drivers within NoR 2 should be demonstrated. Key NoR 2 local identity landscape, open space and community functions to be addressed include:
  - The Business – Local Centre Zone at Dawson Road;
  - Manukau Sports Bowl and Velodrome;
  - AUT South Campus (including addressing the objectives of the Manukau 2 Precinct);
  - Manukau Central (including addressing the objectives of the Manukau Precinct);

  - Manukau Station;
  - Manukau Institute of Technology; and
  - Hayman Park.

- The proposed corridor alignment and function can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres, schools, community functions and open spaces. Key school, community and business functions within NoR 2 to be addressed include:

  - The Manukau Sports Bowl;
  - Redoubt North School (potential for direct access to the BRT station);
  - Puhinui School;
  - AUT South Campus (including addressing the objectives of the Manukau 2 Precinct);
  - Manukau Central (including addressing the objectives of the Manukau Precinct);
  - Manukau Rail Station and Bus Interchange;
  - Manukau Institute of Technology; and
  - Hayman Park.

- A CPTED review of the NoR 2 project should address, at a minimum, the current identified CPTED risks including:

  - Under bridge environments at the Otara Creek tributary overbridge and culverts;
  - The Orlando Park frontage;
  - The public access walkway from Te Irirangi Drive to Townley Place;
  - The corridor interfaces (both east and west) on Te Irirangi Drive adjacent to the SH1 over bridge;
  - Hayman Park and it's interface with the Project corridor;
  - The public access walkway from Lambie Drive to Leith Court; and
  - The public access walkway from Puhinui Road to Fitzroy Street.

BUILT FORM

- Known or planned changes of land use and residential density have the potential to alter the perceived scale and impact of the proposed corridor functions should be identified and addressed.
- Resolution of any potential conflict between placemaking aspirations within local communities and the scale and operating speed of the proposed movement functions of the corridor should be addressed.
- An urban interface approach within the corridor that:

  - Provides an appropriate interface to the existing local, neighbourhood and town centres and enables buildings and spaces to positively address and integrate with the NoR 2 corridor;
  - Responds to the spatial character of proposed centre environments and supports quality public realm infrastructure, ample pedestrian footpath width, frequent pedestrian crossing points and street trees for shade and amenity;
  - Demonstrates the proposed modal connections, modal hierarchy, built form interfaces and arrangements at the proposed NoR 2 BRT station locations at:

    - Dawson Road;
    - Diorella Drive;
    - Ronwood Avenue (Manukau Central);

    - Manukau Station; and
    - Puhinui Road/Lambie Drive,

  - Support the requirements of Policies 1 and 3 of the NPS:UD for enabling increased development capacity adjacent to rapid transit networks;
  - Recognises the transition of densities from Residential Terrace Housing and Apartment Building Zone to Residential Mixed Housing Suburban Zone and provides a corridor interface that supports permeable pedestrian access and responds to the changing built form interface and spatial character of adjacent future development; and
  - Supports the integration of the proposed BRT stations and surrounding land uses; and
  - Supports vertical integration of bridging structures along the SH1 crossing to allow an appropriate transition and interface to adjacent built form.

MOVEMENT

- Permeability of the corridor for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities. Demonstration of place specific active mode cross corridor solutions should include:

  - A potential mid-block crossing of Te Irirangi Drive between Titchmarsh Crescent and Penion Drive;
  - A potential mid-block crossing of Te Irirangi Drive at Leila Place;
  - Two mid-block crossings (one an upgrade to existing) on Ronwood Avenue at the Westfield shopping centre;
  - Upgrade of the existing mid-block crossing on Davies Avenue;

- Legibility, connectivity demands, safety and modal priority for active modes should be addressed for intersections within NoR 2. Demonstration of specific intersection responses to ensure connectivity between the proposed BRT facilities, local centres and other community facilities should include the intersections at:

  - Dawson Road;
  - Hollyford Road;
  - Diorella Drive;
  - Te Irirangi Drive and Great South Road;
  - Great South Road at the entry to Southpoint Shopping centre;
  - Great South Road and Ronwood Avenue;
  - Ronwood Avenue at Sharkey Way;
  - Ronwood Avenue and Davies Avenue;
  - Davies Avenue and Putney Way;
  - Davies Avenue and Manukau Station Road;
  - Manukau Station Road and Lambie Drive;
  - Lambie Drive and Ron wood Avenue;
  - Lambie Drive and Cavendish Drive;
  - Puhinui Road and Norman Spencer Drive;
  - Puhinui Road at Puhinui School; and
  - Puhinui Road and York Road / Grayson Avenue.

- A modal integration strategy that addresses the potential conflict between the continued freight function of the corridor and placemaking opportunities arising from the introduction of the BRT stations along the NoR 2 corridor.
- A modal integration strategy that addresses the functional layout of the Manukau station area to provide for legibility and clear wayfinding for active modes through and around the station area and between the rail, bus interchange and BRT station.

LANDUSE

- Demonstration of how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

NOR 2 - RONGOMAI PARK TO PUHINUI STATION

Outcomes   Opportunities

Outcomes

1. **Ecological connectivity** - Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.
2. **Identity drivers** - Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.
3. **CPTED** - Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.
4. **Active mode permeability** - Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.
5. **Active mode legibility and priority** - Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.
6. **Bridges** - Consideration of visual integration, interface and sense of place for bridge structure.

Opportunities

1. **Residual land** - Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.
2. **Wider connectivity** - Opportunity to reinforce connections to the wider community and landscape features.
3. **Enhancement** - Opportunity for ecological enhancement and tree planting

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 01 OF 04

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones.
- Integrated lane for stormwater treatments and walking and cycling facilities

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School
- Proposed Stormwater Pond

Figure 5: NoR 2 urban design outcomes and opportunities Sheet 01 of 04

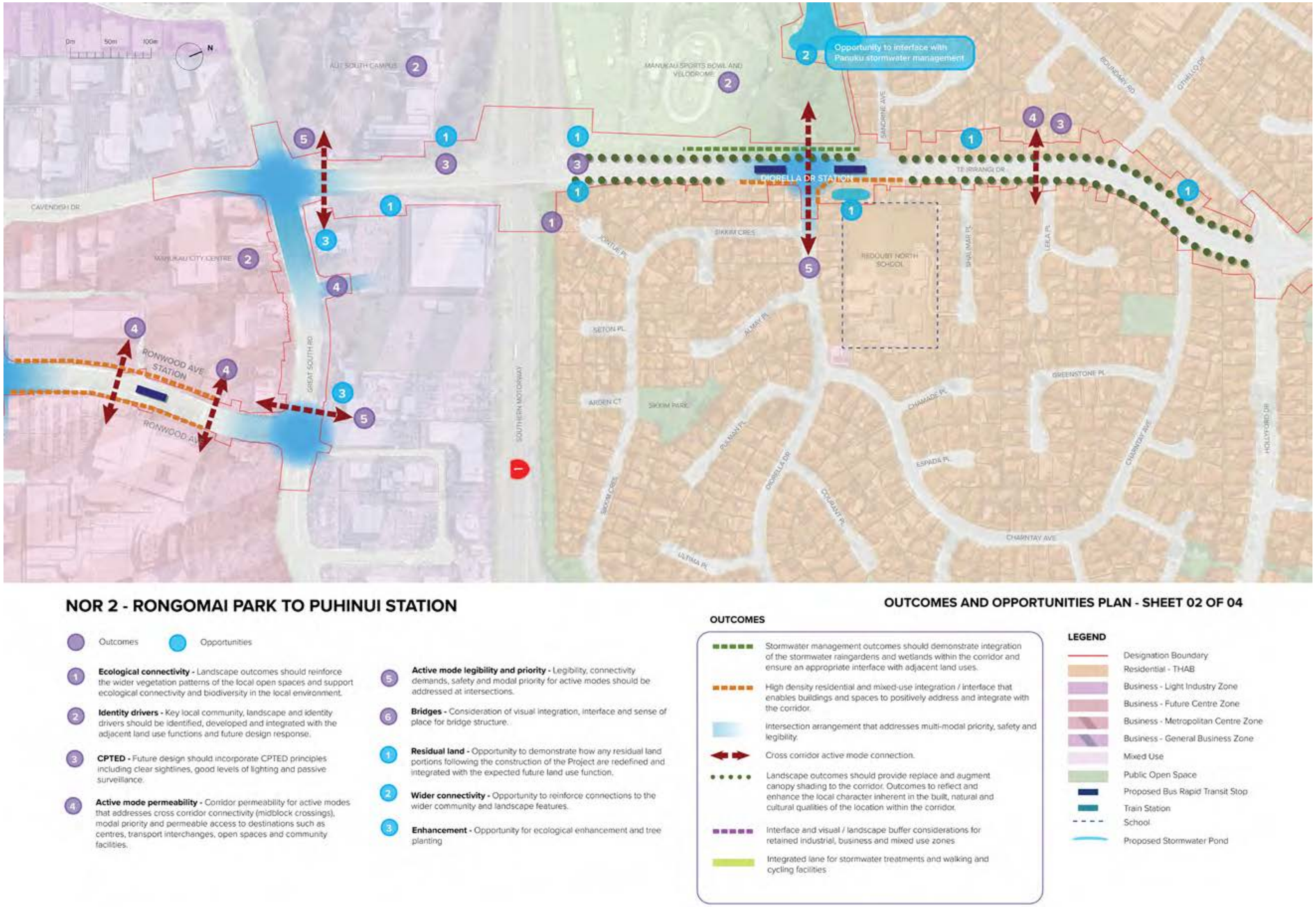


Figure 6: NoR 2 urban design outcomes and opportunities Sheet 02 of 04

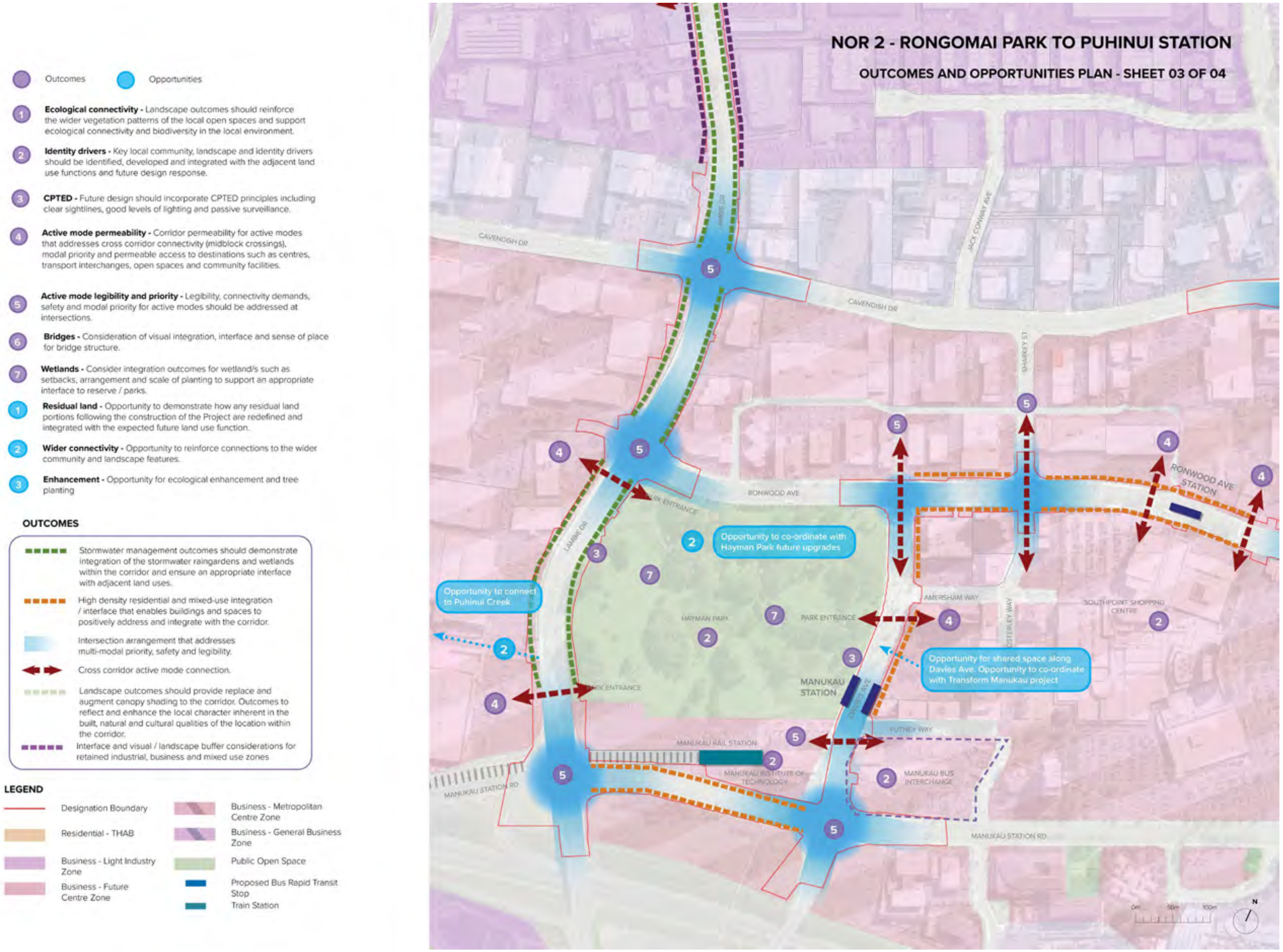


Figure 7: NoR 2 urban design outcomes and opportunities Sheet 03 of 04

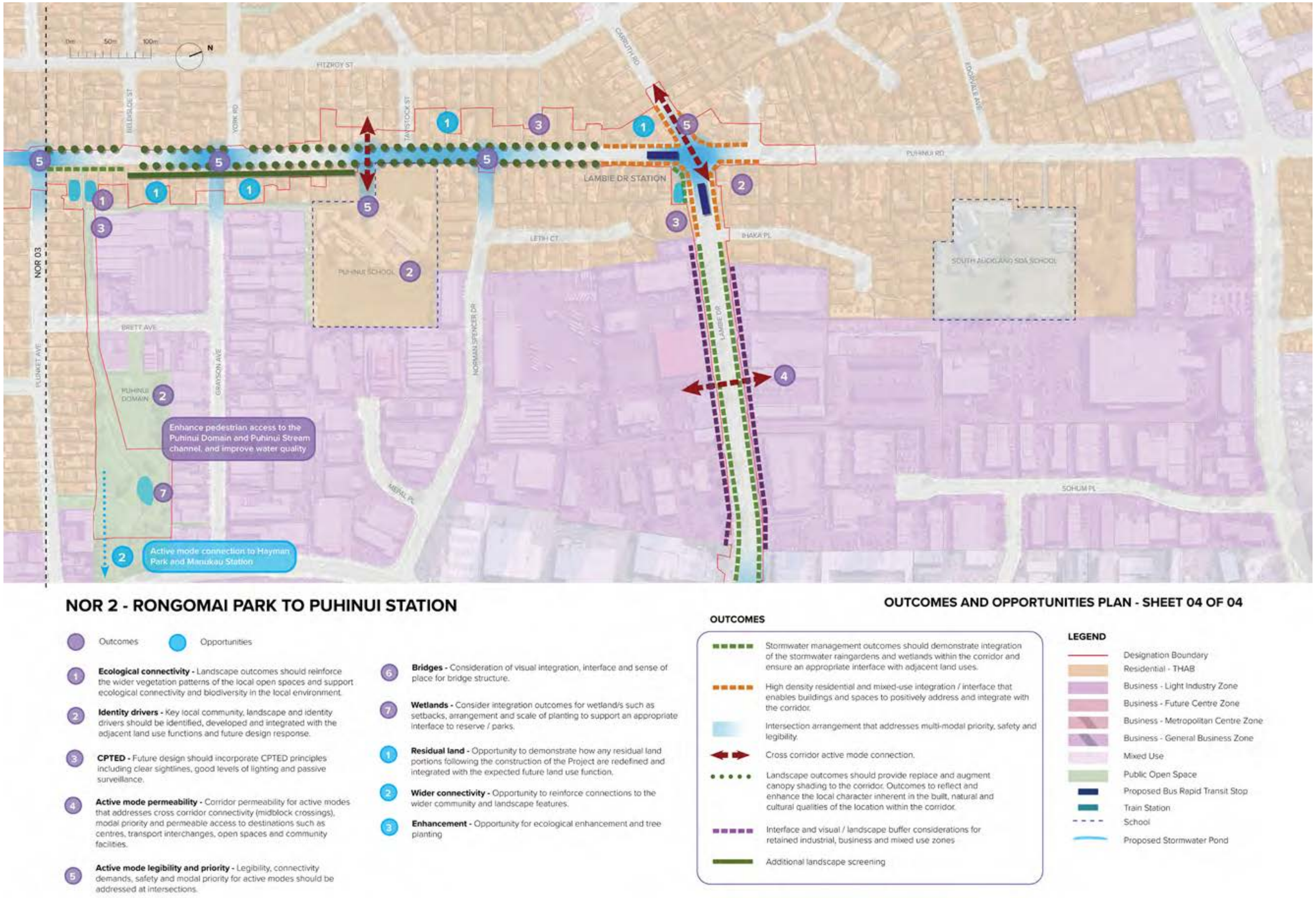


Figure 8: NoR 2 urban design outcomes and opportunities Sheet 04 of 04

7 NoR 3 – Puhinui Station to SH20/20B Interchange

This evaluation considers the proposed NoR 3 – Puhinui Station to SH20/20B Interchange section against the relevant Design Framework Principles. It provides urban design focused commentary on the current design detail and recommends the framework for how and where any urban design outcomes should be considered in future design stages.

Table 6 in **Appendix A** only outlines urban design commentary specific to NoR 1. For commentary common to all NoRs, refer to Table 3.

7.1 Summary of urban design evaluation and recommendations for NoR 3

Overall, the proposed NoR 3 corridor design and configuration is generally supportive of the Design Framework principles. A summary of the recommended urban design outcomes and opportunities for NoR 3 are outlined below and illustrated in Figure 9 and **Appendix B**. These are recommended to form a part of the ULDMP in future delivery stages. This is to ensure the detailed design of the corridor responds appropriately to the principles and the project specific urban design outcomes sought.

The ULDMP should address the following Project specific outcomes for NoR 3:

ENVIRONMENT

- A landscape plan that considers recommendations from the landscape and visual, arboriculture, flooding and ecological assessments including street tree and stormwater raingarden and wetland planting, construction compound and private property reinstatement and treatment of batter slopes. The landscape outcomes should support the principles of Auckland’s Urban Ngahere Strategy and reinforce the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider walking and cycling network.
- Integration of the stormwater raingardens and wetlands to ensure an appropriate interface with adjacent land uses, specifically where wetlands are proposed in areas zoned high density.
- Measures to demonstrate that the project has adapted to the changing climate such as reducing urban heat island effects in future urbanised areas, supporting modal shift and accounting for flood hazard risks.

SOCIAL

- In future design stages, Manawhenua shall be invited as Partners to provide input on the cultural, landscape and design matters including how Project outcomes reflect their identity and values.
- The identification, development and integration of key local community and identity drivers within NoR 3 should be demonstrated. Key NoR 3 local identity landscape, open space and community functions to be addressed include:
  - The Business – Neighbourhood Centre Zone at Wyllie Road and Noel Burnside Road;
  - The Puhinui Station precinct that includes Te Kohanga Reo ki Puhinui; and
  - The Business – Neighbourhood Centre Zone at Ranfurly Road.
- The identification, development and integration of historically significant identity drivers within NoR 3 should be demonstrated, these include:

- The Category B Scheduled historic heritage place (250 Puhinui Road - Cambria House and Gardeners Cottage); and
- The memorial plaque identified at the intersection of Kenderdine Road and Puhinui Road.

- The proposed corridor alignment and function can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres, schools, community functions and open spaces. Key school, community and business functions within NoR 2 to be addressed include:
  - Puhinui School;
  - Greyson Avenue Reserve;
  - Puhinui Station area;
  - Te Kohanga Reo ki Puhinui;
  - Papatoetoe South School; and
  - Murdoch Park.
- A CPTED review of the NoR 3 project should address, at a minimum, the current identified CPTED risks including:
  - The Business – Neighbourhood Centre Zone at Wyllie Road and Noel Burnside Road;
  - The Puhinui Station area that includes Te Kohanga Reo ki Puhinui; and
  - The Business – Neighbourhood Centre Zone at Ranfurly Road.

BUILT FORM

- Known or planned changes of land use and residential density have the potential to alter the perceived scale and impact of the proposed corridor functions should be identified and addressed.
- Resolution of any potential conflict between placemaking aspirations within local communities and the scale and operating speed of the proposed movement functions of the corridor should be addressed.
- An urban interface approach within the corridor that:
  - Provides an appropriate interface to the existing local, neighbourhood and town centres and enables buildings and spaces to positively address and integrate with the NoR 3 corridor;
  - Responds to the spatial character of proposed centre environments and supports quality public realm infrastructure, ample pedestrian footpath width, frequent pedestrian crossing points and street trees for shade and amenity;
  - Demonstrates the proposed modal connections, modal hierarchy, built form interfaces and arrangements at the proposed NoR 3 BRT station at Puhinui Rail Station and interchange that supports the requirements of Policies 1 and 3 of the NPS:UD for enabling increased development capacity adjacent to rapid transit networks;
  - Recognises the transition of densities from Residential Terrace Housing and Apartment Building Zone to Residential Mixed Housing Suburban Zone and provides a corridor interface that supports permeable pedestrian access and responds to the changing built form interface and spatial character of adjacent future development;
  - Responds to any built form interface, visual or landscape buffers and development controls proposed for retained Business – Light Industry Zone and Business – Mixed Use Zone land to the south of Puhinui Road; and

- Considers the scale, visual integration, interface and sense of place qualities of the BRT bridge structure at Puhinui station to the rail station building and other adjacent developments.

- Demonstration of how the Project supports the purpose and objectives of the Puhinui Precinct (and relevant sub precincts) in terms of the response to the place function including the built form interface, any visual or landscape buffers and development controls proposed for adjoining lands.

MOVEMENT

- Permeability of the corridor for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities. Demonstration of place specific active mode cross corridor solutions should include:

  - The Puhinui Station precinct including intersections at Kenderdine Road, Cambridge Terrace and Clendon Avenue;
  - An integrated crossing at the intersections of Wyllie Road and Noel Burnside Road.

- Legibility, connectivity demands, safety and modal priority for active modes should be addressed for intersections within NoR 3. Demonstration of specific intersection responses to ensure connectivity between the proposed BRT facilities, local centres and other community facilities should include the intersections on Puhinui Road at:

  - Plunket Avenue;
  - Wallace Road;
  - Clendon Avenue;
  - Raymond Road;
  - Noel Burnside Road;
  - Wyllie Road; and
  - Vision Place.

- A modal integration strategy that addresses the potential conflict between the continued freight function of the corridor and placemaking opportunities arising from the introduction of the BRT stations along the NoR 3 corridor.
- A modal integration strategy that addresses the functional layout of the Puhinui station area to provide for legibility and clear wayfinding for active modes through and around the station area and between the rail and BRT station.

LANDUSE

Demonstration of how any residual land portions resulting from the Project are redefined and integrated with the expected future land use function.

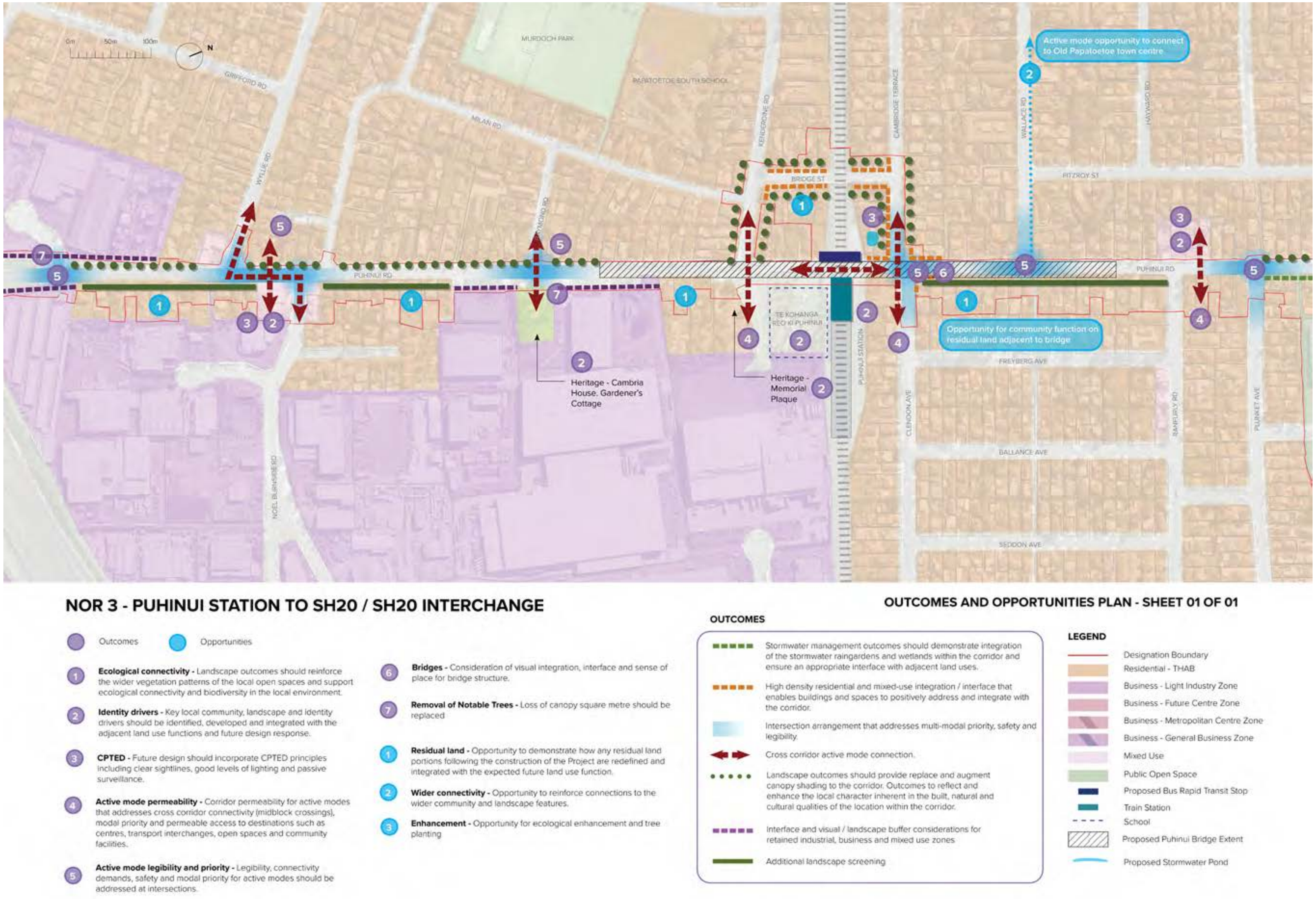


Figure 9: NoR 3 urban design outcomes and opportunities Sheet 01 of 01

8 NoRs 4a and 4b – SH20/20B Interchange to Orrs Road

This evaluation considers the proposed NoR 4a and 4b – SH20/SH20B Interchange to Orrs Road section (combined for this evaluation) against the relevant Design Framework Principles. It provides urban design focused commentary on the current design detail and recommends the framework for how and where any urban design outcomes should be considered in future design stages.

Table 7 in **Appendix A** only outlines urban design commentary specific to NoR 1. For commentary common to all NoRs, refer to Table 3.

8.1 Summary of urban design evaluation and recommendations for NoRs 4a and 4b

Overall, the proposed corridor design and configuration for NoRs 4a and 4b is generally supportive of the Design Framework principles. A summary of the recommended urban design outcomes and opportunities for NoR 4a and 4b are outlined below and illustrated in Figure 10, Figure 11 and Appendix B. These are recommended to form a part of the ULDMP in future delivery stages. This is to ensure the detailed design of the corridor responds appropriately to the principles and the Project specific urban design outcomes sought.

The ULDMP should address the following Project specific outcomes for NoR 4a and 4b:

ENVIRONMENT

- A landscape plan that considers recommendations from the landscape and visual, arboriculture, flooding and ecological assessments including street tree and stormwater raingarden and wetland planting, construction compound and private property reinstatement and treatment of batter slopes. The landscape outcomes should support the principles of Auckland's Urban Ngahere Strategy and reinforce the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider walking and cycling network.
- Integration of stormwater raingardens and wetlands to ensure an appropriate interface with adjacent land uses, specifically where wetlands are proposed in areas zoned high density.
- Measures to demonstrate that the project has adapted to the changing climate such as reducing urban heat island effects in future urbanised areas, supporting modal shift and accounting for flood hazard risks.

SOCIAL

- As set out in the AEE, this section of the Project traverses the Puhinui peninsula, which is of significant cultural value to Manawhenua, in particular Te Ākitai Waiohua. In future design stages, Manawhenua will be invited to provide input on the cultural, landscape and design matters including how Project outcomes reflect their identity and values.
- The identification, development and integration of key local community and identity drivers within NoRs 4a and 4b should be demonstrated. Key local identity landscape, open space and community functions within NoR 4a and 4b to be addressed include the Manukau Memorial Gardens frontage and entry and Waokauri Creek.
- A CPTED review of NoRs 4a and 4b should address, at a minimum, the current identified CPTED risks including:

- The walking and cycling facilities where there are limited passive surveillance opportunities; and
- The underbridge environment at the Waokauri Creek overbridge.

BUILT FORM

- Known or planned changes of land use and the ultimate delivery of the Future Urban Zone land to the north west of the corridor have the potential to alter the perceived scale and impact of the proposed corridor functions should be identified and addressed.
- Resolution of any potential conflict between placemaking aspirations within local communities and the scale and operating speed of the proposed movement functions of the corridor should be addressed.
- An urban interface approach for the proposed ramp structure from SH20B to SH20 that considers the scale, visual integration and interface response to adjacent land use functions.

MOVEMENT

- Legibility, connectivity demands, safety and modal priority for active modes should be addressed for intersections within NoRs 4a and 4b. Demonstration of specific intersection responses to ensure connectivity between the proposed BRT facilities or other community facilities should include the intersections on Puhinui Road at:
  - The SH20 access ramps / interchange;
  - The vehicular entry to Manukau Memorial Gardens;
  - Princes Road;
  - Campana Road; and
  - Orrs Road.
- A modal integration strategy that addresses the potential conflict between the continued freight function of the corridor and any placemaking opportunities along NoRs 4a and 4b corridor.

LANDUSE

No NoR specific recommendations.

NOR 4A AND 4B - SH20 / SH20B INTERCHANGE TO ORRS ROAD

Outcomes — Opportunities

Outcomes

1. **Ecological connectivity** - Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.
2. **Identity drivers** - Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.
3. **CPTED** - Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.
4. **Active mode permeability** - Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.
5. **Active mode legibility and priority** - Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.
6. **Bridges** - Consideration of visual integration, interface and sense of place for bridge structure.
7. **Removal of Notable Trees** - Loss of canopy square metre must be replaced

Opportunities

1. **Residual land** - Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.
2. **Wider connectivity** - Opportunity to reinforce connections to the wider community and landscape features.
3. **Enhancement** - Opportunity for ecological enhancement and tree planting
4. **Walking and Cycling** - Opportunity for stopping point with walking and cycling facilities to obeserve the cultural landscape

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 01 OF 02

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Proposed SH20 ramp

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School

Figure 10: NoR 4a and 4b urban design outcomes and opportunities Sheet 01 of 02

NOR 4A AND 4B - SH20 / SH20B INTERCHANGE TO ORRS ROAD

Outcomes | Opportunities

Outcomes

1. **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.
2. **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.
3. **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.
4. **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.
5. **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.
6. **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.
7. **Removal of Notable Trees -** Loss of canopy square metre must be replaced

Opportunities

1. **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.
2. **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.
3. **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 02 OF 02

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School

Figure 11: NoR 4a and 4b urban design outcomes and opportunities Sheet 02 of 02

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix A

Urban Design Evaluation Principles

For urban design commentary common to all NoRs, refer to Table 3

1.1 NoR 1 Urban Design matters

Table 4: Urban design evaluation for NoR 1 – Botany Town Centre to Rongomai Park

Principle	Explanation	Application to NoR 1
ENVIRONMENT		
1.1 Support and enhance ecological corridors and biodiversity	Mitigate the effects on or enhance existing ecological corridors through the placement and design of movement corridors	• Opportunities within the immediate environment of NoR 1 to support ecological connectivity and biodiversity are identified in the Airport to Botany: *Assessment of Ecological Effects* and include: – Artificial wetlands and swales within the corridor; – Rongomai Park; and – where the corridor crosses tributaries of Otara Creek and Taraire Creek. • Refer to the *Airport to Botany: Assessment of Ecological Effects* for details of these opportunities. • There is one watercourse bridge crossing in NoR 1 at an unnamed stream crossing near Rongomai Park that presents an opportunity to reinforce broader connectivity outcomes for ecology and water quality by minimising the stream interruption and ensuring a connected natural system. • There is also opportunity to consider future stream enhancement and fish passage particularly at Kellaway Drive Reserve
1.2 **Support water conservation and enhance water quality in a watershed**	Take into account and work with the existing watershed as part of a whole system.	The proposed typical corridor cross section and designation boundary allows spatial provisions where adjacent to existing service lanes and other selected locations to provide natural drainage to stormwater raingardens to address water quality and reduce hard engineering solutions. These locations exist on both the eastern and western edges of Te Irirangi Drive from Ch2600 to Ch6850.
1.3 **Minimise land disturbance, conserve resources and materials**		Refer to Table 3 in relation to this design principle.
1.4 **Adapt to a changing climate and respond to the microclimatic factors of each area**		Refer to Table 3 in relation to this design principle.
SOCIAL		

2.1 **Identity and place**	The identity or spirit of place is generally acknowledged as the unique amalgam of the inherent built, natural and cultural qualities of a place. Responding to identity in the location and type of new corridors can provide a sense of continuity and contribute to our collective memory. **Local Identity** Locate the station facilities to maximise the placemaking potential and enhance local identity.	• The further identification, development and integration of key local community and identity drivers within NoR 1 should be addressed in future design stages. Key NoR 1 local identity locations and functions include: – The Business – General Business Zone, Business – Neighbourhood Centre Zone and Business – Light Industrial Zone at Bishop Dunn Place; – Sancta Maria Primary School and College at 317 Te Irirangi Drive, Clover Park; – Open space linkages along Otara Creek Reserve and Tributaries to Barry Curtis Park; – Links to the adjacent Ormiston Town Centre (Business – Town Centre Zone) on Ormiston Road; – Botany Junction shopping centre (Business – Local Centre Zone) at 277 Te Irirangi Drive; – Rongomai Park / Recreation Reserve; – a built form and corridor interface response to station locations and built form; and – The response to distinctive landscape character qualities of open spaces, stream and conservation zones.
2.2 **Respect culturally significant sites and landscapes**		Refer to Table 3**Error! Reference source not found.** in relation to this design principle.
2.3 **Adaptive corridors**	Corridors should demonstrate flexibility to respond to changes in their function and physical interfaces. Consider an adaptive approach in the way strategic corridors are designed to be able to respond to changes in land use, the way we move around or utilise technology over time. **Future Growth** Consider the existing and future movement and place context in the location of bus stations and transport interchange and the ability of the design to accommodate change over time.	If practicable, future land integration post construction should be considered to support any proposed development / redevelopment adjacent to the NoR 1 corridor.

2.4 **Social cohesion**	Provide clear, effective and legible connectivity between community and social functions.	• The proposed corridor alignment and function can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres, schools, community functions and open spaces. Examples of school, community and business functions that will benefit from improved connectivity delivered by the project within NoR 1 include: – Sancta Maria Primary School and College; – Rongomai Park / recreational reserve; and – Barry Curtis Park. • To enable equitable local connectivity and cross corridor access to commercial centres and areas of high density, further development at the detailed design stage should be undertaken of crossing points for multi-lane intersections and potential midblock crossings including: – Kellaway Drive / Brinlack Drive (upgraded existing); – Redcastle Drive intersection; – Smales Road intersection; – East Tamaki Road pedestrian crossing location (upgraded existing); – Accent Drive intersection; – Bishop Dunn Place / Sancta Maria Way intersection; – Ormiston Road intersection; – Vidiri Court pedestrian crossing (New); – Whetstone Road pedestrian crossing (upgraded existing); and – Belinda Avenue intersection.
2.5 **Safety**	Provide a safe and convenient network of routes accessible to people of all ages and abilities. **Universal Access** Focus on the needs of the customer by placing importance on the spatial requirements that provide for universally inclusive and safe facilities with good physical and visual links.	• Refer to Table 3 in relation to Safety recommendations. In addition to these recommendations, a CPTED audit of the NoR 1 project should address, at a minimum, the current identified CPTED risks including: – The existing underpass environment at Kellaway Drive / Brinlack Drive; – Pedestrian overpasses at East Tamaki Drive and Whetstone Road; and – Under bridge environments at the Otara Creek tributary overbridge and culverts.
BUILT FORM		
3.1	Locate stations/stops and corridors within walking distance of higher density	The proposed NoR 1 station locations at Smales Road, Accent Drive and Ormiston Road directly support the requirements of Policies 1 and 3 of the NPS:UD for

Align corridors with density	development to facilitate modal shift, support commercial and mixed-use centres and contribute to vibrant, active urban environments. **Active Mode Catchments** Locate stations and interchange facilities in places that align with areas of greater density and is centred on the active mode catchment.	enabling increased development capacity adjacent to rapid transit networks. It is recommended that future design stages demonstrate the proposed modal connections, hierarchy, built form interfaces and arrangements that support the creation of vibrant, active urban environments
3.2 **Corridor scaled to the surrounding context and urban structure**	Align the speed, type and scale of transport corridors and infrastructure with the environment that it moves through (appropriate scale to the context). **Respond to Land Use** The size, design and location of the facilities should respond to the adjacent land use and respect natural features. This minimises any 'left over' spaces and disconnected pockets of land that need integration.	• Approximately 2.1 km length of the NoR 1 existing corridor land uses that are currently Mixed Housing Suburban and Mixed Housing Urban are subject to change as a result of the increased development capacity requirements of the NPS:UD. This potential change of land use and residential density has the potential to alter the perceived scale and impact of the proposed corridor functions. Any potential conflict between placemaking aspirations within local communities and the scale and speed of the proposed movement functions of the corridor should be addressed in future design stages. • Key focus areas within NoR 1 that require further resolution in future design stages to demonstrate the potential scale and urban structure response include: – The walk-up catchments of the proposed stations at Smales Road, Accent Drive and Ormiston Road; – The corridor edges and interfaces with Business – Local Centre Zone, Business – Neighbourhood Centre Zone and Business – Town Centre Zone land; and – The built form interface, any visual or landscape buffers and development controls proposed for retained Business – Light Industry and Business – Mixed Use Zone land to the West of Te Irirangi Drive.
3.3 **Facilitate an appropriate interface between place and movement**	Facilitate the opportunity for place as well as movement in corridors (people-oriented streets)	• Key focus areas within NoR 1 that require further resolution in future design stages to demonstrate the place function include: – The service road environments that exist on both sides of full NoR 1 corridor (refer to Engineering drawings for locations); – The key intersections and mid-block crossings outlined under principle 2.4 – Social Cohesion;

		– The built form interface, any visual or landscape buffers and development controls proposed for retained Business – Light Industry Zone and Business – Mixed Use Zone land to the west of Te Irirangi Drive.
MOVEMENT		
4.1 **Connect nodes**	Provide tangible connectivity between identified activity nodes. **Cross Corridor Connectivity** Balance the functional access requirements across the Project corridor with the optimal location to provide connections into the surrounding area.	• There are opportunities in the future development of the Project to provide further clear and direct connections across the corridor between local, neighbourhood and town centre functions and the communities they serve. For example: – Kellaway Drive / Brinlack Drive (upgrade existing underpass); – East Tamaki Road pedestrian crossing location (upgrade existing overpass); – Vidiri Court pedestrian crossing (Potential new crossing); – Whetstone Road pedestrian crossing (upgrade existing) overpass. • There are opportunities in the future development of the Project to consider wider active mode network connections to: – Greenmount Park via Kellaway Drive Reserve; – Ormiston Town Centre via Accent Drive; and – Fo Guang Shan Buddhist Temple via Accent Drive.
4.2 **Connect modes**		Refer to Table 3**Error! Reference source not found.** in relation to this design principle.
4.3 **Support access to employment and industry**		Refer to Table 3 in relation to this design principle.
4.4 **Prioritise active modes and public transport**		Refer to Table 3 in relation to this design principle.
4.5 **Support inter-regional connections and strategic infrastructure**	Consider the location and alignment of significant movement corridors and placement of infrastructure (power, wastewater, water) to the network.	• Te Irirangi Drive within NoR 1 is a key arterial corridor that connects existing industrial/commercial land use activities with the State Highway network. This corridor is currently classified as Level 1B in the Auckland Transport Freight Plan, which is described as roads of the highest strategic value to freight movement where efficient freight movements must be actively supported to maintain levels of service, where

		competing modes and land uses require active management. • The potential conflict between the continued freight function of the corridor and placemaking opportunities arising from the introduction of the BRT stations along Te Irirangi Drive will require careful and deliberate consideration in future design stages of the project. Further urban design commentary on this issue is included under Principles 2.1, 2.4, 2.5, 3.1, 3.2, 3.3, 4.1 and 4.4.
4.6 **Support legible corridor function**		Refer to Table 3 in relation to this design principle.
LANDUSE		
5.1 **Public transport directed and integrated into centres**		Refer to Table 3 in relation to this design principle.
5.2 **Strategic corridors as urban edges**		This principle is not directly relevant to the Project corridor.

1.2 NoR 2 Urban Design matters

Table 5: Urban design evaluation for NoR 2 – Rongomai Park to Puhinui Station

Principle	Explanation	Application to NoR 2
ENVIRONMENT		
1.1 Support and enhance ecological corridors and biodiversity	Mitigate the effects on or enhance existing ecological corridors through the placement and design of movement corridors	• Opportunities within the immediate environment of NoR 2 to support ecological connectivity and biodiversity are identified in the *Airport to Botany: Assessment of Ecological Effects* and include: – Artificial wetlands and swales within the corridor; – Rongomai Park / Medvale Avenue Reserve; and – Where the corridor crosses tributaries of the Puhinui, Otara Creek and Flat Bush catchments.
1.2 **Support water conservation and enhance water**	Take into account and work with the existing watershed as part of a whole system.	• The proposed typical corridor cross section and designation boundary allows spatial provisions where required to provide natural drainage to constructed stormwater ponds and raingardens to

quality in a watershed		address water quality and reduce hard engineering solutions. These locations are proposed at: – The eastern side of Te Irirangi Drive opposite Belinda Avenue; – The western side of Te Irirangi Drive Near Zelda Avenue; – The Manukau Sports Bowl site; – Hayman Park; – The corner of Lambie Drive and Puhinui Road; – The southern side of Puhinui Road near Plunket Avenue; and – Puhinui Creek.
1.3 **Minimise land disturbance, conserve resources and materials**		Refer to Table 3 in relation to this design principle.
1.4 **Adapt to a changing climate and respond to the microclimatic factors of each area**		Refer to Table 3 in relation to this design principle.
SOCIAL		
2.1 **Identity and place**	The identity or spirit of place is generally acknowledged as the unique amalgam of the inherent built, natural and cultural qualities of a place. Responding to identity in the location and type of new corridors can provide a sense of continuity and contribute to our collective memory. **Local Identity** Locate the station facilities to maximise the placemaking potential and enhance local identity.	• The further identification, development and integration of key local community and identity drivers within NoR 2 should be addressed in future design stages. Key NoR 2 local identity locations and functions include: – The Business – Local Centre Zone at Dawson Road; – Manukau Sports Bowl and Velodrome; – AUT South Campus (including addressing the objectives of the Manukau 2 Precinct); – Manukau Central (including addressing the objectives of the Manukau Precinct); – Manukau Station; – Manukau Institute of Technology; and – Hayman Park. • Future design stages should demonstrate the project response to both the locational drivers outlined above and placemaking drivers including: – Improved pedestrian and cyclist connectivity to the local and town centres outlined above; – Interface, modal priority and access arrangements at Hayman Park; and

		– Interface, modal priority and access arrangements at the Manukau Sports Bowl and Velodrome.
2.2 **Respect culturally significant sites and landscapes**		Refer to Table 3**Error! Reference source not found.** in relation to this design principle.
2.3 **Adaptive corridors**	Corridors should demonstrate flexibility to respond to changes in their function and physical interfaces. Consider an adaptive approach in the way strategic corridors are designed to be able to respond to changes in land use, the way we move around or utilise technology over time. **Future Growth** Consider the existing and future movement and place context in the location of bus stations and transport interchange and the ability of the design to accommodate change over time.	• If practicable, future land integration post construction should be considered in the following areas to support any proposed development / redevelopment adjacent to the NoR 2 corridor: – On both sides of Te Irirangi Drive between Otara Creek and SH1 crossing; – To the Business – Metropolitan Centre Zone land adjacent to the corridor on Ronwood Avenue, Davies Avenue, Manukau Station Road and Lambie Drive in Manukau City Centre; – To the Business – General Business Zone land adjacent to the corridor on Te Irirangi Drive and Great South Road; and – On both sides of Puhinui Road within NoR 2.
2.4 **Social cohesion**	Provide clear, effective and legible connectivity between community and social functions.	• The proposed corridor alignment and function can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres, schools, community functions and open spaces. Examples of school, community and business functions that will benefit from improved connectivity delivered by the Project within NoR 2 include: – The Manukau Sports Bowl and Velodrome; – Redoubt North School (potential for direct access to the BRT station); – Puhinui School; – AUT South Campus (including addressing the objectives of the Manukau 2 Precinct); – Manukau Central (including addressing the objectives of the Manukau Precinct); – Manukau Station; – Manukau Institute of Technology; and – Hayman Park.

		• To enable equitable local connectivity and cross corridor access to commercial centres and areas of current and future high density residential development, further development at the detailed design stage should be undertaken of crossing points for multi-lane intersections and potential midblock crossings including: – A potential mid-block crossing of Te Irirangi Drive between Titchmarsh Crescent and Penion Drive; – Dawson Road; – Hollyford Road; – A potential mid-block crossing of Te Irirangi Drive at Leila Place; – Diorella Drive; – Te Irirangi Drive and Great South Road; – Great South Road at the entry to Southpoint Shopping centre; – Great South Road and Ronwood Avenue; – Two mid-block crossings (one an upgrade to existing) on Ronwood Avenue at the Westfield shopping centre; – Ronwood Avenue at Sharkey Way; – Ronwood Avenue and Davies Avenue; – Upgrade of the existing mid-block crossing on Davies Avenue; – Davies Avenue and Putney Way; – Davies Avenue and Manukau Station Road; – Manukau Station Road and Lambie Drive; – Lambie Drive and Ron wood Avenue; – Lambie Drive and Cavendish Drive; – Puhinui Road and Norman Spencer Drive; – Puhinui Road at Puhinui School; and – Puhinui Road and York Road / Grayson Avenue.
2.5 **Safety**	Provide a safe and convenient network of routes accessible to people of all ages and abilities. **Universal Access** Focus on the needs of the customer by placing importance on the spatial requirements that provide for universally inclusive and safe facilities with good physical and visual links.	• Refer to Table 3**Error! Reference source not found.** in relation to Safety recommendations. In addition to these recommendations, a CPTED audit of the NoR 2 project should address, at a minimum, the current identified CPTED risks including: – Under bridge environments at the Otara Creek tributary overbridge and culverts; – The Orlando Park frontage; – The public access walkway from Te Irirangi Drive to Townley Place; – The corridor interfaces (both east and west) on Te Irirangi Drive adjacent to the SH1 over bridge;

		– Hayman Park and it's interface with the Project corridor; – The public access walkway from Lambie Drive to Leith Court; and – The public access walkway from Puhinui Road to Fitzroy Street.
BUILT FORM		
3.1 **Align corridors with density**	Locate stations/stops and corridors within walking distance of higher density development to facilitate modal shift, support commercial and mixed-use centres and contribute to vibrant, active urban environments. **Active Mode Catchments** Locate stations and interchange facilities in places that align with areas of greater density and is centred on the active mode catchment.	• The proposed NoR 2 station locations at: – Dawson Road; – Diorella Drive; – Ronwood Avenue (Manukau Central); – Manukau Station; and – Puhinui Road/Lambie Drive; • Directly support the requirements of Policies 1 and 3 of the NPS:UD for enabling increased development capacity adjacent to rapid transit networks. It is recommended that future design stages demonstrate the proposed modal connections, hierarchy, built form interfaces and arrangements that support the creation of vibrant, active urban environments.
3.2 **Corridor scaled to the surrounding context and urban structure**	Align the speed, type and scale of transport corridors and infrastructure with the environment that it moves through (appropriate scale to the context). **Respond to Land Use** The size, design and location of the facilities should respond to the adjacent land use and respect natural features. This minimises any 'left over' spaces and disconnected pockets of land that need integration.	• Approximately 2.7 km length of the NoR 2 existing corridor land uses that are currently Residential – Single House Zone, Residential – Mixed Housing Suburban and Mixed Housing Urban are subject to change as a result of the increased development capacity requirements of the NPS:UD. This possible land use and residential density change has the potential to alter the perceived scale and impact of the proposed corridor functions. Any potential conflict between placemaking aspirations within local communities and the scale and speed of the proposed movement functions of the corridor should be addressed in future design stages. • Key focus areas within NoR 2 that require further resolution in future design stages to demonstrate the potential scale and urban structure response include: – The walk-up catchments of the proposed stations within NoR 2; – The corridor edges and interfaces with Business – Local Centre Zone, Business Neighbourhood Centre Zone and Business – Town Centre Zone land; – The built form interface, any visual or landscape buffers and development controls proposed for retained Business – Light

		Industry Zone and Business – Mixed Use Zone land to Lambie Drive. – Further vertical integration adjacent to bridging structures along the SH1 crossing should be developed at a detailed design stage to allow an appropriate transition and interface to adjacent built form.
3.3 **Facilitate an appropriate interface between place and movement**	Facilitate the opportunity for place as well as movement in corridors (people-oriented streets)	• Key focus areas within NoR 2 that require further resolution in future design stages to demonstrate the place interface / response to the proposed movement functions include: – The key community and business functions outlined for NoR 2 under Principle 2.4 Social Cohesion; – The key intersections and mid-block crossings outlined for NoR 2 under principle 2.4 – Social Cohesion; – Where Te Irirangi Drive approaches SH1 and retaining walls are potentially required; and – The built form interface, any visual or landscape buffers and development controls proposed for retained Business – Light Industry Zone, Business – General Business Zone and Business – Mixed Use Zone along Lambie Drive.
MOVEMENT		
4.1 **Connect nodes**	Provide tangible connectivity between identified activity nodes. **Cross Corridor Connectivity** Balance the functional access requirements across the Project corridor with the optimal location to provide connections into the surrounding area.	• There are opportunities in the future development of the Project to provide further clear and direct connections across the corridor between local, neighbourhood and town centre functions and the communities they serve. Examples of cross corridor connectivity that would benefit from further development in future design stages within NoR 2 include: – Dawson Road local centre; – Diorella Drive at Redoubt North School and Manukau Sports Bowl and Velodrome; – Great South Road and Ronwood Avenue; – Two mid-block crossings (one an upgrade to existing) across Ronwood Avenue at the Westfield shopping centre; – Upgrade of the existing mid-block crossing on Davies Avenue to Hayward Park; – Davies Avenue and Putney Way (upgrade to existing); – Puhinui Road and Norman Spencer Drive; – Puhinui Road at Puhinui School; and

		– Puhinui Road and York Road / Grayson Avenue. • There are opportunities in the future development of the Project to consider wider active mode network connections to; – Puhinui Creek via Lambie Drive; and – Hayman Park and Manukau Station via Puhinui Creek.
4.2 **Connect modes**		The station location and layout within the Manukau precinct should consider legibility and clear wayfinding for all modes between the BRT station, rail station and bus interchange. Further development of the functional layout of the precinct is recommended.
4.3 **Support access to employment and industry**		Refer to Table 3 in relation to this design principle.
4.4 **Prioritise active modes and public transport**		Refer to Table 3 in relation to this design principle.
4.5 **Support inter-regional connections and strategic infrastructure**	Consider the location and alignment of significant movement corridors and placement of infrastructure (power, wastewater, water) to the network.	• Te Irirangi Drive within NoR 2 is a key arterial corridor that connects existing industrial/commercial land use activities with the State Highway network. This corridor is currently classified as Level 1B in the Auckland Transport Freight Plan, which is described as roads of the highest strategic value to freight movement where efficient freight movements must be actively supported to maintain levels of service, where competing modes and land uses require active management. Future downgrade of the freight classification is envisaged for this corridor. • Any other potential conflict between the continued freight function of the corridor and placemaking opportunities arising from the introduction of the BRT function along Te Irirangi Drive will require careful and deliberate consideration in future design stages of the project. Further urban design commentary on this issue is included under Principles 2.1, 2.4, 2.5, 3.1, 3.2, 3.3, 4.1 and 4.4.
4.6 **Support legible corridor function**		Refer to Table 3 in relation to this design principle.
LANDUSE		
5.1		Refer to Table 3 in relation to this design principle.

Public transport directed and integrated into centres		
5.2 **Strategic corridors as urban edges**		This principle is not directly relevant to the Project corridor.

1.3 NoR 3 Urban Design matters

Table 6: Urban design evaluation for NoR 3 – Puhinui Station to SH20/20B Interchange

Principle	Explanation	Application to NoR 3
ENVIRONMENT		
1.1 Support and enhance ecological corridors and biodiversity	Mitigate the effects on or enhance existing ecological corridors through the placement and design of movement corridors	The existing environment within NoR 3 presents limited opportunities to support ecological connectivity and biodiversity. The corridor passes through a highly urbanised area which is predominantly residential comprising amenity planting and gardens.
1.2 **Support water conservation and enhance water quality in a watershed**		Refer to Table 3 in relation to this design principle.
1.3 **Minimise land disturbance, conserve resources and materials**		Refer to Table 3 in relation to this design principle.
1.4 **Adapt to a changing climate and respond to the microclimatic factors of each area**		Refer to Table 3 in relation to this design principle.
SOCIAL		
2.1 **Identity and place**	The identity or spirit of place is generally acknowledged as the unique amalgam of the inherent built, natural and cultural qualities of a place. Responding to identity in the location and type of new corridors can provide a sense of continuity and	• The further identification, development and integration of key local community and identity drivers within NoR 3 should be addressed in future design stages. Key NoR 3 local identity locations and functions include: – The Business – Neighbourhood Centre Zone at Wyllie Road and Noel Burnside Road; – The Puhinui Station area that includes Te Kohanga Reo ki Puhinui; and

	contribute to our collective memory. **Local Identity** Locate the station facilities to maximise the placemaking potential and enhance local identity.	– The Business – Neighbourhood Centre Zone at Ranfurly Road. • Future design stages should demonstrate the project response to local identity drivers including: – The built form, corridor interface, modal priority and access response to the proposed BRT and rail station interchange and the area adjacent to Puhinui Station; and – Improved pedestrian and cyclist connectivity to the local and neighbourhood centres outlined above.
2.2 **Respect culturally significant sites and landscapes**	Acknowledge significant sites and features in the layout of movement corridors including ridgelines or horizons.	• There is one Category B Scheduled historic heritage place (250 Puhinui Road Cambria House and Gardeners Cottage) recorded in close proximity to the proposed NoR 3 corridor – this site provides an opportunity for future development to explore and celebrate the inherent heritage character drivers of the area. • There is also a memorial plaque identified at the intersection of Kenderdine Road and Puhinui Road with some historical value that should be recognised and considered in future placemaking opportunities. • Further details of these are referenced in the *Airport to Botany: Assessment of Historic Heritage Effects.*
2.3 **Adaptive corridors**	Corridors should demonstrate flexibility to respond to changes in their function and physical interfaces. Consider an adaptive approach in the way strategic corridors are designed to be able to respond to changes in land use, the way we move around or utilise technology over time. **Future Growth** Consider the existing and future movement and place context in the location of a rail station and transport interchange and the ability of the design to accommodate change over time.	• If practicable, future land integration post construction should be considered in the following areas to support any proposed development / redevelopment adjacent to the NoR 3 corridor: – On both sides of Puhinui Road within NoR 3; and – The Puhinui Station area.

2.4 **Social cohesion**	Provide clear, effective and legible connectivity between community and social functions.	• To enable equitable local connectivity and cross corridor access to commercial centres and areas of high density, further development at the detailed design stage should be undertaken of crossing points for multi-lane intersections and potential midblock crossings including: – Plunket Avenue; – The Puhinui Station area including intersections at Kenderdine Road, Cambridge Terrace and Clendon Avenue; – An integrated crossing at the intersections of Wyllie Road and Noel Burnside Road. • The proposed corridor alignment and function can deliver a positive contribution to the sense of belonging and participation, as well as community resilience by supporting direct access to existing local, neighbourhood and town centres, schools, community functions and open spaces. Examples of school, community and business functions that will benefit from improved connectivity delivered by the Project within NoR 2 include: – Puhinui School; – Greyson Avenue Reserve; – Puhinui Rail Station precinct; – Te Kohanga Reo ki Puhinui; – Papatoetoe South School; and – Murdoch Park.
2.5 **Safety**	Provide a safe and convenient network of routes accessible to people of all ages and abilities. **Universal Access** Focus on the needs of the customer by placing importance on the spatial requirements that provide for universally inclusive and safe facilities with good physical and visual links.	• Refer to Table 3 in relation to Safety recommendations. In addition to these recommendations, a CPTED audit of the NoR 3 project should address, at a minimum, the current identified CPTED risks including: – The Business – Neighbourhood Centre Zone at Wyllie Road and Noel Burnside Road; – The Puhinui Station precinct that includes Te Kohanga Reo ki Puhinui; and – The Neighbourhood Centre Zone at Ranfurly Road.
BUILT FORM		
3.1 **Align corridors with density**	Locate stations/stops and corridors within walking distance of higher density development to facilitate modal shift, support commercial and mixed-use centres and contribute to	• The proposed NoR 3 station location at the existing Puhinui Station directly supports the requirements of Policies 1 and 3 of the NPS:UD for enabling increased development capacity adjacent to rapid transit networks. It is recommended that future design stages demonstrate the proposed modal connections, hierarchy, built form interfaces and

	vibrant, active urban environments. **Active Mode Catchments** Locate stations and interchange facilities in places that align with areas of greater density and is centred on the active mode catchment.	arrangements that support the creation of vibrant, active urban environments.
3.2 **Corridor scaled to the surrounding context and urban structure**	Align the speed, type and scale of transport corridors and infrastructure with the environment that it moves through (appropriate scale to the context). **Respond to Land Use** The size, design and location of the facilities should respond to the adjacent land use and respect natural features. This minimises any 'left over' spaces and disconnected pockets of land that need integration.	• The full length of the NoR 3 existing corridor land uses that are currently Residential – Mixed Housing Suburban Zone and Residential – Mixed Housing Urban Zone are subject to change as a result of the increased development capacity requirements of the NPS:UD. This potential change of land use and residential density has the potential to alter the perceived scale and impact of the proposed corridor functions. Any potential conflict between placemaking aspirations within local communities and the scale and speed of the proposed movement functions of the corridor should be addressed in future design stages. • Key focus areas within NoR 3 that require further resolution in future design stages to demonstrate the potential scale and urban structure response include: – The walk-up catchment of the proposed BRT station at the existing Puhinui Station; – The corridor edges and interfaces with the Business – Neighbourhood Zone land; – The built form interface, any visual or landscape buffers and development controls proposed for retained Business – Light Industry Zone and Business – Mixed Use Zone land to the south of Puhinui Road. • Future design detail of the proposed BRT bridge structure at Puhinui station should consider scale, visual integration, interface and sense of place qualities to the rail station building and other adjacent developments. • Further vertical integration adjacent to the BRT bridge structure should be developed at a detailed design stage to allow an appropriate transition and interface to adjacent built form.
3.3 **Facilitate an appropriate interface between place and movement**	Facilitate the opportunity for place as well as movement in corridors (people-oriented streets)	• Key focus areas within NoR 3 that require further resolution in future design stages to demonstrate the place function include:

		– The key intersections and mid-block crossings outlined under principle 2.4 – Social Cohesion; – The built form interface, any visual or landscape buffers and development controls proposed for retained Business – Light Industry Zone and Business – Mixed Use Zone land to the south of Puhinui Road.
MOVEMENT		
4.1 **Connect nodes**	Provide tangible connectivity between identified activity nodes. **Cross Corridor Connectivity** Balance the functional access requirements across the Project corridor with the optimal location to provide connections into the surrounding area.	• There are opportunities in the future development of the Project to provide further clear and direct connections across the corridor between neighbourhood centre functions and the communities they serve. For example: – The Business – Neighbourhood Centre Zone at Wyllie Road and Noel Burnside Road; – The Puhinui Station area that includes Te Kohanga Reo ki Puhinui; and – The Business – Neighbourhood Centre Zone at Ranfurly Road. • Future active mode opportunities to connect to Old Papatoetoe town centre.
4.2 **Connect modes**		• Further development of the functional layout of the Puhinui station area is recommended to provide for legibility and clear wayfinding for active modes through and around the station area and between the rail and BRT station.
4.3 **Support access to employment and industry**		Refer to Table 3 in relation to this design principle.
4.4 **Prioritise active modes and public transport**	Provision of quality active mode corridors and dedicated public transport corridors to enable a modal shift away from private vehicle use. **Walkability** Locate the station and interchange facility within or in close proximity and walking distance of local activity hubs/town centres. **Modal Priority**	Potential priority conflicts between active modes / public transport and the ongoing freight function of Puhinui Road should be further identified and addressed in future design states of the project.

	Consider efficient connectivity between transport modes by: • Providing access that is aligned with the desired modal hierarchy; 1) pedestrians, 2) cyclists/micro-mobility, 3) public transport, 4) drop off/pick up/taxis, and 5) private vehicles / parking. • Minimising the interchange time and distance between transport modes by designing direct, safe and self –explaining linkages. • Minimising the conflicts between modes.	
4.5 **Support inter-regional connections and strategic infrastructure**		Refer to Table 3 in relation to this design principle.
4.6 **Support legible corridor function**		Refer to Table 3 in relation to this design principle.
LANDUSE		
5.1 **Public transport directed and integrated into centres**	Locate rapid transit interchanges within centres (local, town and metro) to support a mix of uses and provide modal choice to a larger number of users.	Refer to Table 3 in relation to this design principle.
5.2 **Strategic corridors as urban edges**		This principle is not directly relevant to the Project corridor.

1.4 NoRs 4a and 4b Urban Design matters

Table 7: Urban design evaluation for NoRs 4a and 4b – SH20/20B Interchange to Orrs Road

Principle	**Explanation**	**Application to NoRs 4a and 4b**
ENVIRONMENT		

1.1 Support and enhance ecological corridors and biodiversity	Mitigate the effects on or enhance existing ecological corridors through the placement and design of movement corridors	• Opportunities within the immediate environment of NoR 4a and 4b to support ecological connectivity and biodiversity are identified in the *Airport to Botany: Assessment of Ecological Effects* and include: – Artificial vegetated swales within the corridor; and – where the corridor crosses tributaries of Waokauri Creek and its tributaries. • The is one water course bridge crossing in NoR 4a at Waokauri Creek (ch2050) that presents an opportunity to reinforce broader connectivity outcomes for ecology and water quality by minimising the stream interruption and ensuring a connected natural system.
1.2 **Support water conservation and enhance water quality in a watershed**	Take into account and work with the existing watershed as part of a whole system.	The proposed typical corridor cross section and designation boundary allows spatial provisions to provide natural drainage to vegetated swales to address water quality and reduce hard engineering solutions.
1.3 **Minimise land disturbance, conserve resources and materials**		Refer to Table 3 in relation to this design principle.
1.4 **Adapt to a changing climate and respond to the microclimatic factors of each area**		Refer to Table 3 in relation to this design principle.
SOCIAL		
2.1 **Identity and place**	The identity or spirit of place is generally acknowledged as the unique amalgam of the inherent built, natural and cultural qualities of a place. Responding to identity in the location and type of new corridors can provide a sense of continuity and contribute to our collective memory. **Local Identity** Locate the station facilities to maximise the placemaking potential and enhance local identity.	• The further identification, development and integration of key identity drivers within NoRs 4a and 4b should be addressed in future design stages and are generally limited to the Manukau Memorial Gardens frontage and entry. • With the exception of the Manukau Memorial Gardens, the existing setting of the corridor is expected to change significantly with the realisation of the Business – Light Industry Zone land to the south of the corridor and the Future Urban Zone around Campana Road.

2.2 **Respect culturally significant sites and landscapes**	Acknowledge significant sites and features in the layout of movement corridors including ridgelines or horizons.	• As set in the Puhinui Precinct of the AUP:OP and summarised in the AEE, the Puhinui peninsula is of significant cultural value to Manawhenua, in particular Te Ākitai Waiohua. • Key areas of interest for Te Ākitai Waiohua which were identified in the Cultural Values Assessment prepared for the previous business case phase of the Project include: Pūkaki and Waokauri Creeks, the Pūkaki marae on the northern bank of the Waokauri Creek; several recorded archaeological sites and evidence of widespread occupation in the area by Manawhenua during pre-European times, volcanic cones and other significant sites relating to historic settlements and the Manukau Harbour. • To recognise the connection Te Ākitai Waiohua and other Manawhenua have to the Project area, it is recommended that Manawhenua are invited as partners in all phases of the Project to provide input on the cultural, landscape and design matters including how Project outcomes reflect their identity and values. • Refer to Table 3**Error! Reference source not found.** in relation to this design principle.
2.3 **Adaptive corridors**		Refer to Table 3 in relation to this design principle.
2.4 **Social cohesion**		Refer to Table 3 in relation to this design principle.
2.5 **Safety**	Provide a safe and convenient network of routes accessible to people of all ages and abilities. **Universal Access** Focus on the needs of the customer by placing importance on the spatial requirements that provide for universally inclusive and safe facilities with good physical and visual links.	• Refer to Table 3 in relation to Safety recommendations. In addition to these recommendations, a CPTED audit of the corridor within NoRs 4a and 4b should address, at a minimum, the current identified CPTED risks including: – The walking and cycling facilities where there are limited passive surveillance opportunities; and – The underbridge environment at the Waokauri Creek overbridge.
BUILT FORM		
3.1 **Align corridors with density**		• This principle is not directly relevant to the NoR 4 corridor as the area is predominantly zoned Business – Light Industry Zone and Future Urban Zone.
3.2 **Corridor scaled to the surrounding**		• Future design detail of the proposed ramp structure from SH20B to SH20 should consider scale, visual integration and interface response to adjacent land use functions.

context and urban structure		• Further vertical integration adjacent to the proposed ramp structure should be developed at a detailed design stage to allow an appropriate transition and interface to adjacent built form.
3.3 **Facilitate an appropriate interface between place and movement**	Facilitate the opportunity for place as well as movement in corridors (people-oriented streets)	• Key focus areas within NoRs 4a and 4b that require further resolution in future design stages to demonstrate the place function include the built form interface, any visual or landscape buffers and development controls proposed for retained Business – Light Industry Zone lands to the south of Puhinui Road.
MOVEMENT		
4.1 **Connect nodes**		• There are opportunities in the future development of the Project to provide clear and direct connections across the corridor to the Manukau Memorial Gardens.
4.2 **Connect modes**		Refer to Table 3 in relation to this design principle.
4.3 **Support access to employment and industry**		Refer to Table 3 in relation to this design principle.
4.4 **Prioritise active modes and public transport**	Provision of quality active mode corridors and dedicated public transport corridors to enable a modal shift away from private vehicle use. **Walkability** Locate the station and interchange facility within or in close proximity and walking distance of local activity hubs/town centres. **Modal Priority** Consider efficient connectivity between transport modes by: • Providing access that is aligned with the desired modal hierarchy; 1) pedestrians, 2) cyclists/micro-mobility, 3) public transport, 4) drop off/pick up/taxis, and 5) private vehicles / parking.	Refer to Table 3 in relation to this design principle.

	• Minimising the interchange time and distance between transport modes by designing direct, safe and self –explaining linkages. • Minimising the conflicts between modes.	
4.5 **Support inter-regional connections and strategic infrastructure**	Consider the location and alignment of significant movement corridors and placement of infrastructure (power, wastewater, water) to the network.	• SH20A and SH20B, alongside SH20 between Manukau and the SH20A intersection, are areas of high heavy commercial vehicle (**HCV**) use. Auckland Airport, Wiri / Manukau and their surrounds are international gateways and major freight generators and attractors. Airport access for freight is heavily reliant on the SH20A/B triangle. • The proposed ramp structure from SH20B to SH20 will provide a direct and strategic connection to SH20 which is an important link for HCVs that travel from the industrial area in Onehunga/Penrose to Wiri/Manukau (and vice versa). • Puhinui Road within NoRs 4a and 4b is a key arterial corridor that connects existing industrial/commercial land use activities with the State Highway network. This corridor is currently classified as Level 1A in the Auckland Transport Freight Plan, which is described as roads of the highest strategic value to freight movement, including the motorways and most of the state highways (typically the Waka Kotahi road network), being arterials where efficient freight movements must be actively supported to maintain Levels of Service through active planning and design • The potential conflict between the continued freight function of the corridor and placemaking opportunities arising from the introduction of the BRT function along Puhinui Road will require careful and deliberate consideration in future design stages of the project. Further urban design commentary on this issue is included under Principles 2.1, 2.4, 2.5, 3.1, 3.2, 3.3, 4.1 and 4.4.
4.6 **Support legible corridor function**		Refer to Table 3 in relation to this design principle.
LANDUSE		
5.1 **Public transport directed and**		Refer to Table 3 in relation to this design principle.

integrated into centres		
5.2 **Strategic corridors as urban edges**		This principle is not directly relevant to the Project corridor.

TE TUPU NGĀTAHI
SUPPORTING GROWTH

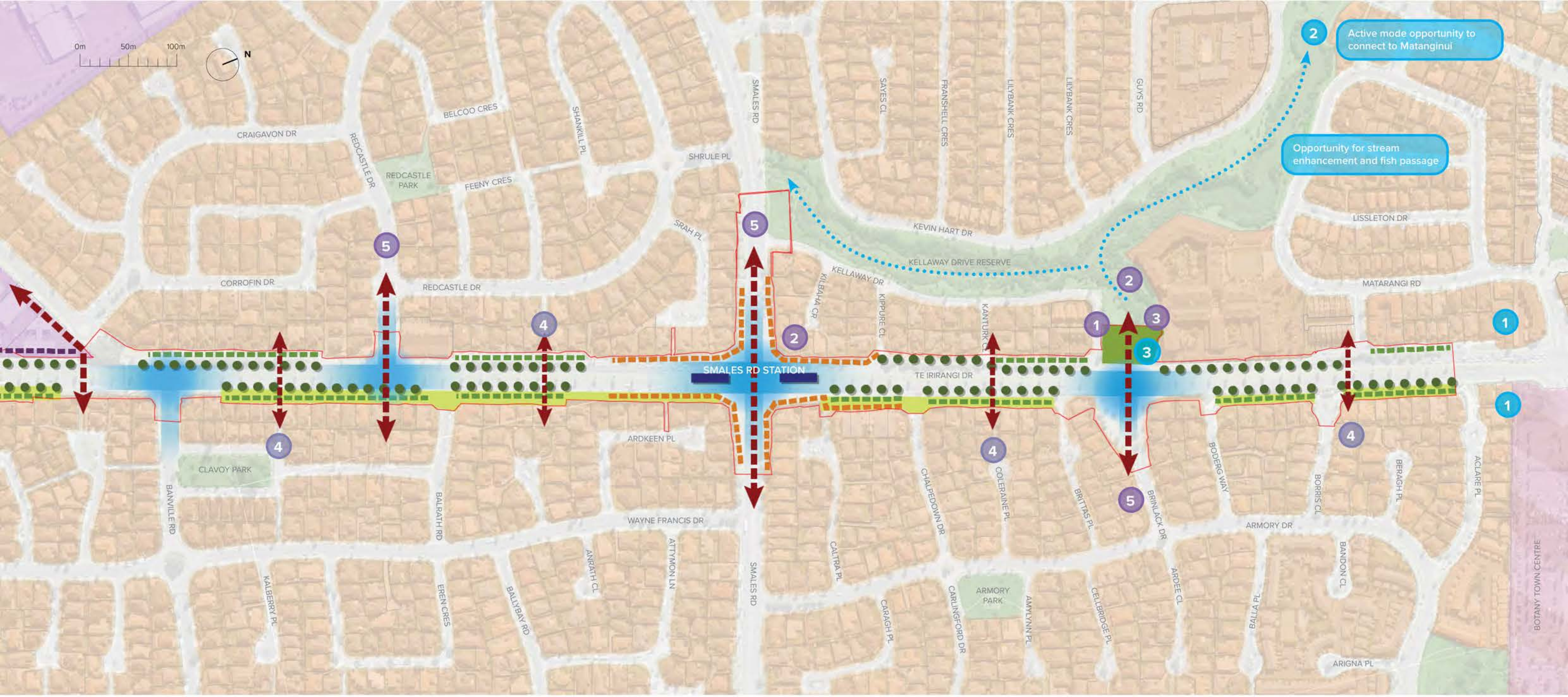
Appendix B

Urban design outcomes and opportunities for the Project

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government



NOR 1 - BOTANY TOWN CENTRE TO RONGOMAI PARK

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 01 OF 03

Outcomes

Opportunities

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

5 **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.

6 **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.

1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Integrated lane for stormwater treatments and walking and cycling facilities

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School

NOR 1 - BOTANY TOWN CENTRE TO RONGOMAI PARK

Outcomes
Opportunities

Outcomes

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

5 **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.

6 **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.

Opportunities

1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

3 **Enhancement -** Opportunity for ecological enhancement and tree planting

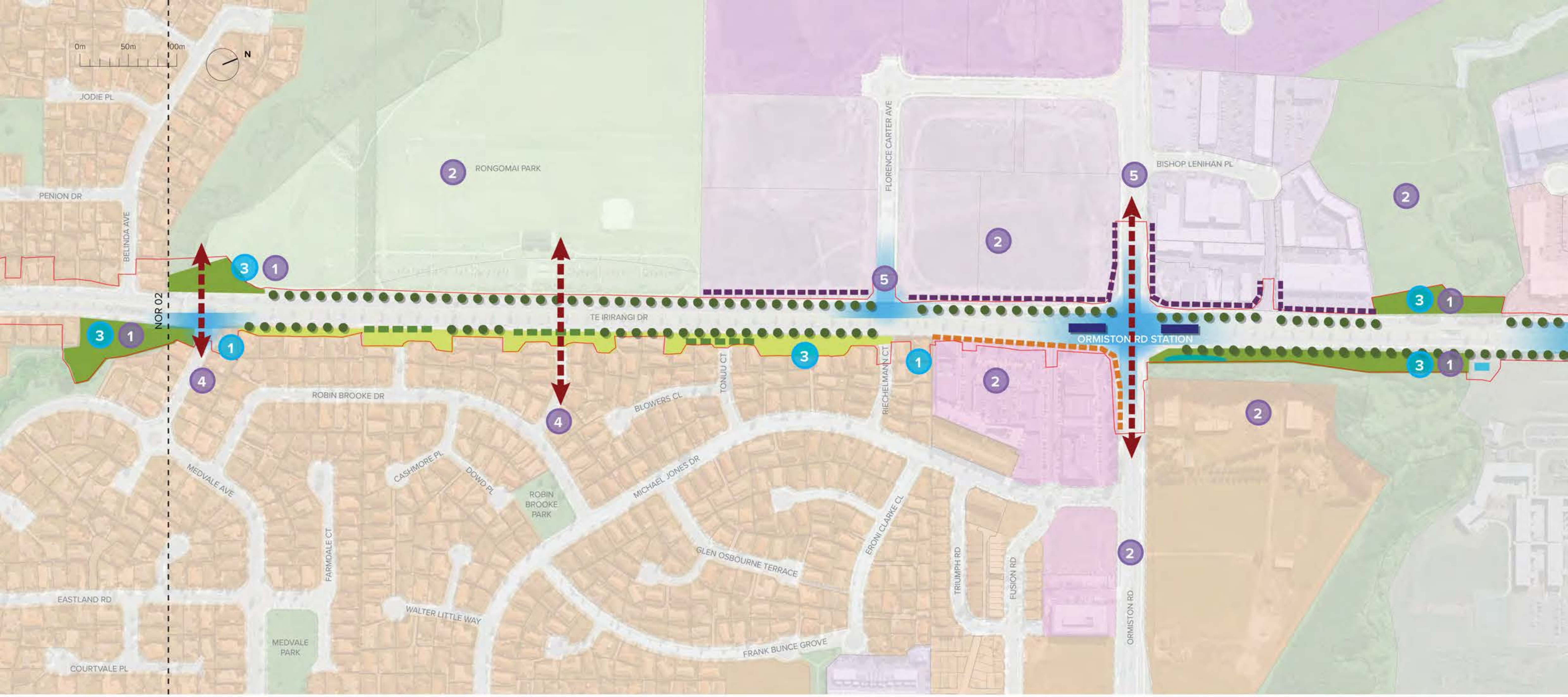
OUTCOMES AND OPPORTUNITIES PLAN - SHEET 02 OF 03

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Integrated lane for stormwater treatments and walking and cycling facilities

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School
- Proposed Stormwater Pond



NOR 1 - BOTANY TOWN CENTRE TO RONGOMAI PARK

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 03 OF 03

Outcomes — Opportunities

Outcomes

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

5 **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.

6 **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.

Opportunities

1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Integrated lane for stormwater treatments and walking and cycling facilities

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School
- Proposed Stormwater Pond

NOR 2 - RONGOMAI PARK TO PUHINUI STATION

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 01 OF 04

Outcomes
Opportunities

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

5 **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.

6 **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.

1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

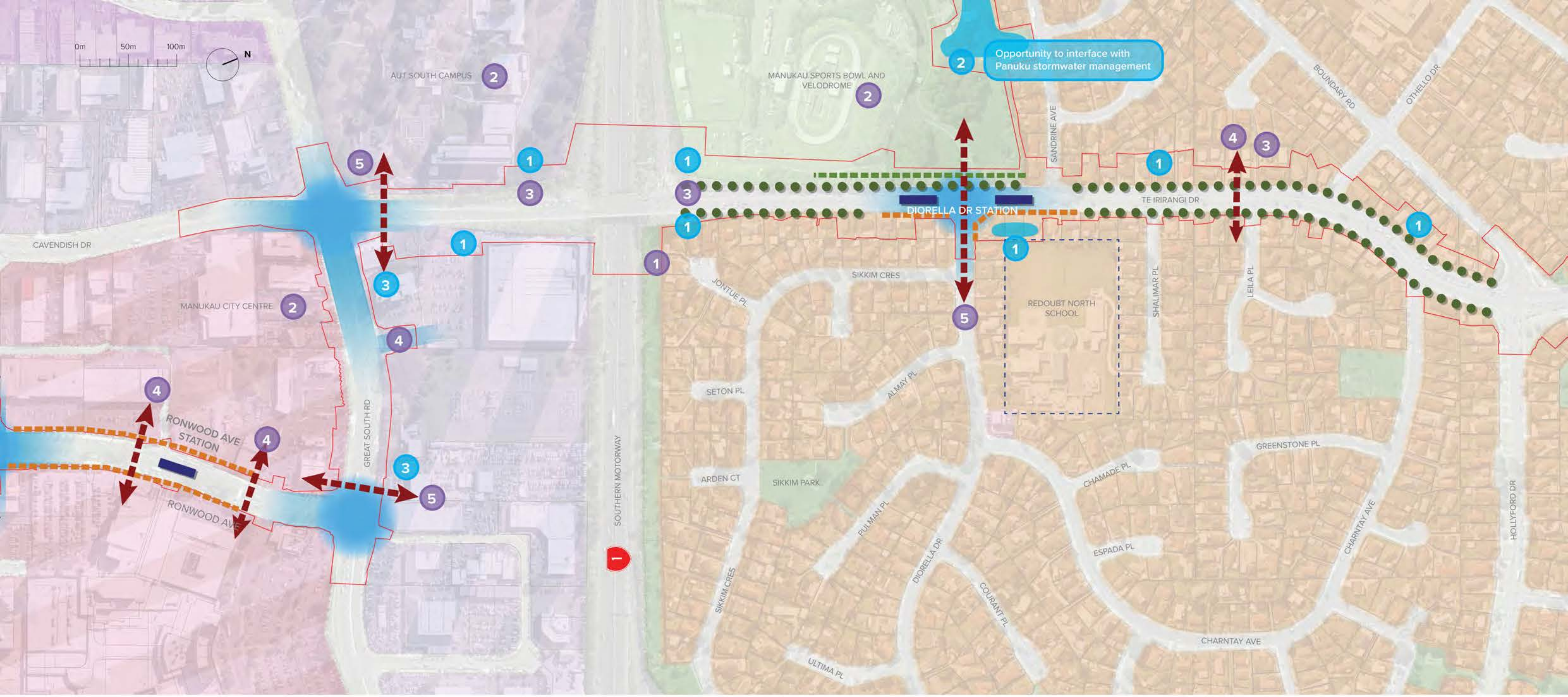
3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Integrated lane for stormwater treatments and walking and cycling facilities

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School
- Proposed Stormwater Pond



NOR 2 - RONGOMAI PARK TO PUHINUI STATION

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 02 OF 04

Outcomes   Opportunities

Outcomes

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

5 **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.

6 **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.

Opportunities

1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Integrated lane for stormwater treatments and walking and cycling facilities

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School
- Proposed Stormwater Pond

NOR 2 - RONGOMAI PARK TO PUHINUI STATION

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 03 OF 04

Outcomes   Opportunities

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

5 **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.

6 **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.

7 **Wetlands -** Consider integration outcomes for wetland/s such as setbacks, arrangement and scale of planting to support an appropriate interface to reserve / parks.

1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
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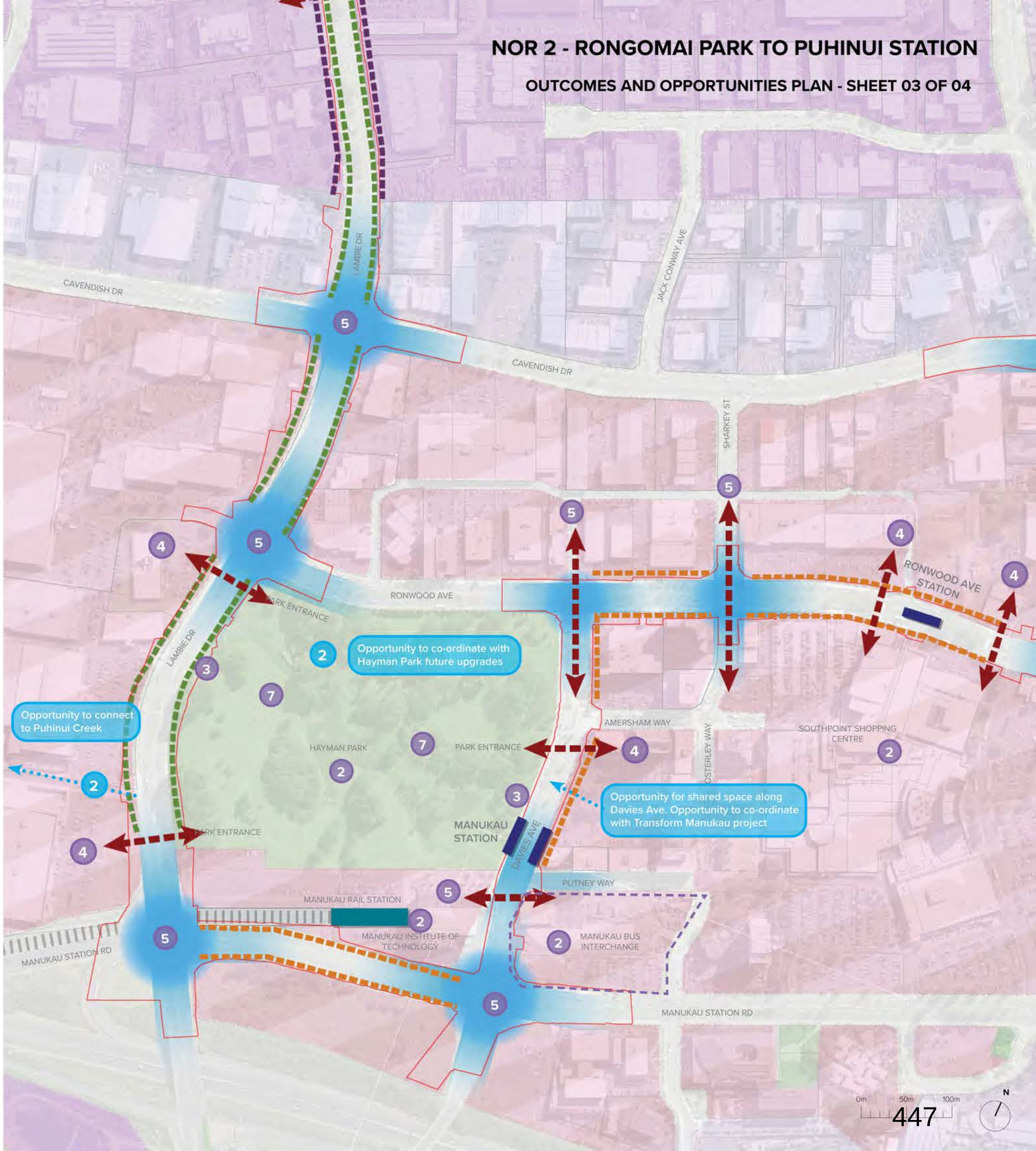
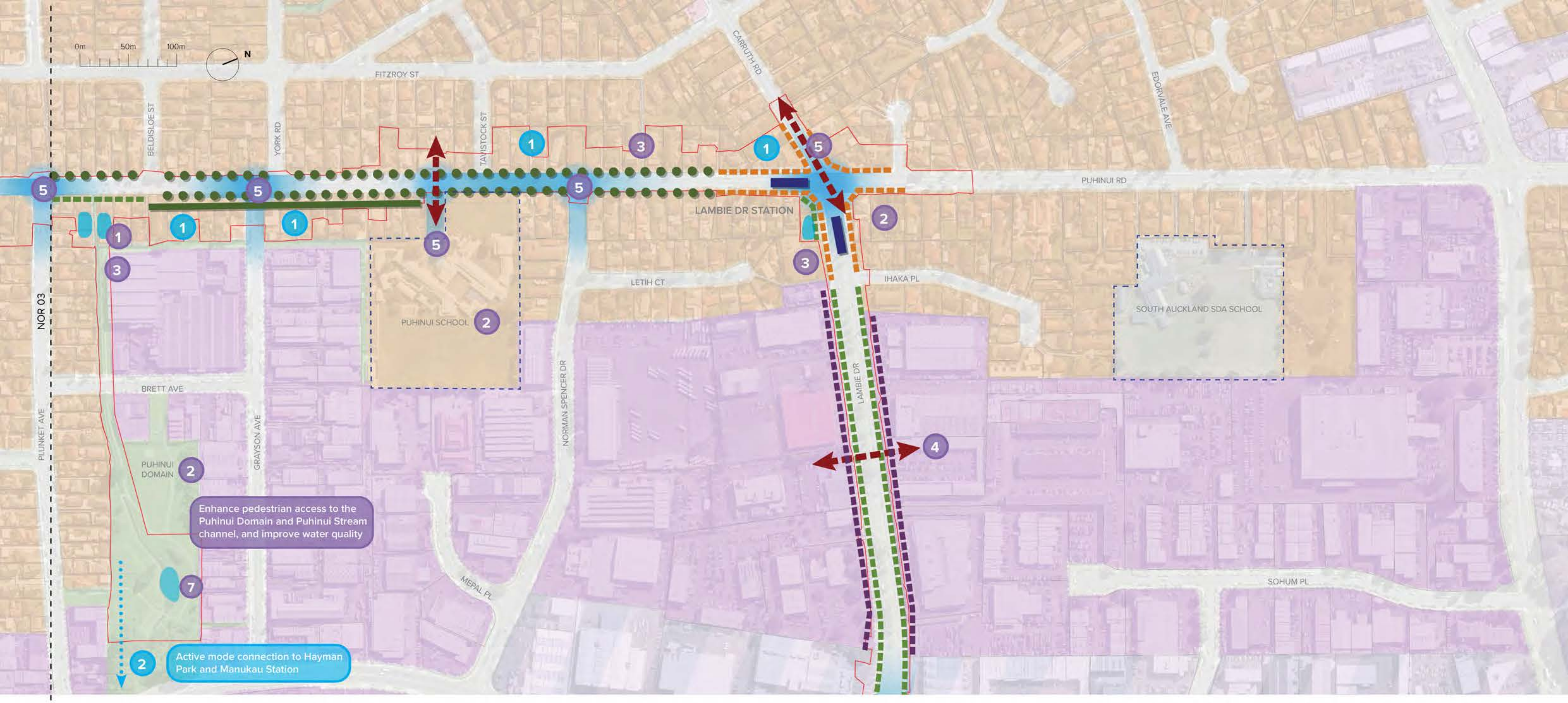
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station





NOR 2 - RONGOMAI PARK TO PUHINUI STATION

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 04 OF 04

Outcomes

Opportunities

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

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1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

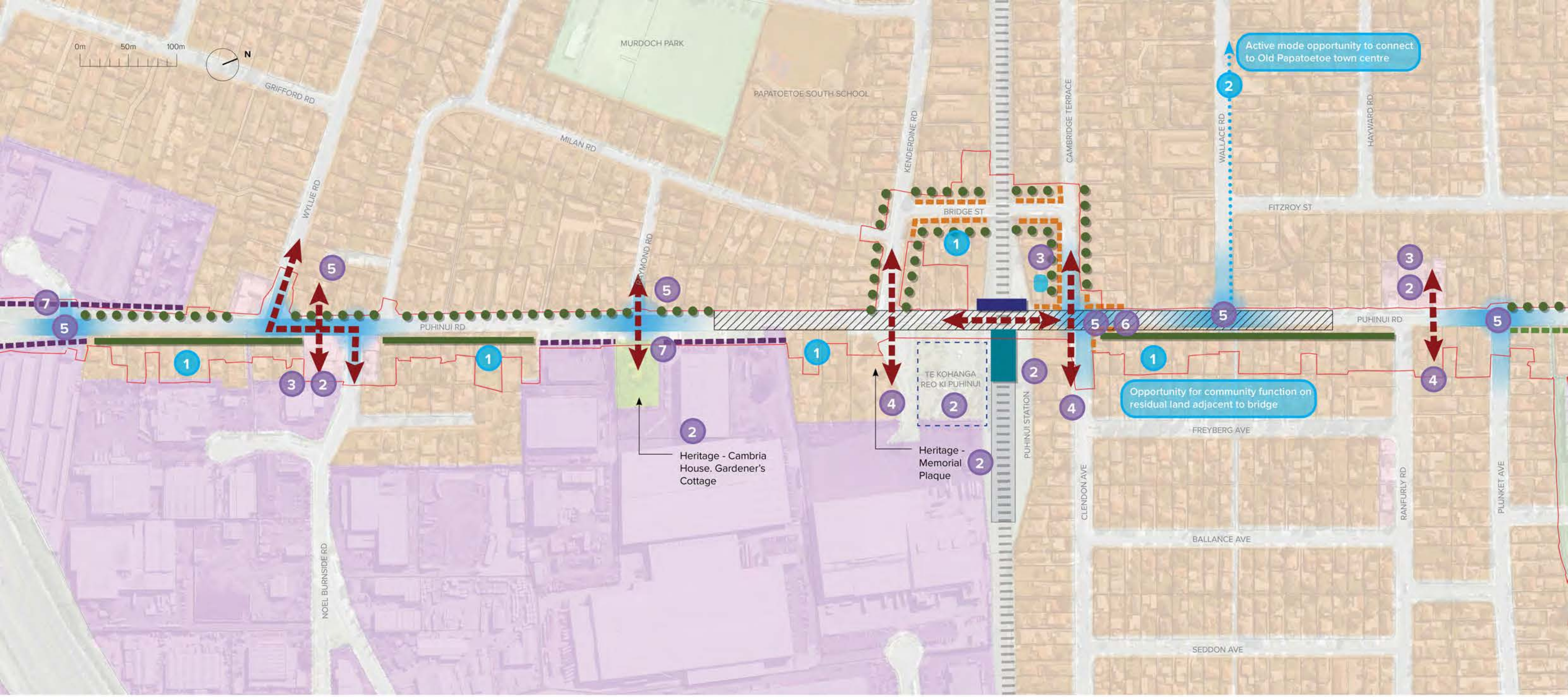
3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Additional landscape screening

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School
- Proposed Stormwater Pond



NOR 3 - PUHINUI STATION TO SH20 / SH20 INTERCHANGE

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 01 OF 01

Outcomes

Opportunities

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

5 **Active mode legibility and priority -** Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.

6 **Bridges -** Consideration of visual integration, interface and sense of place for bridge structure.

7 **Removal of Notable Trees -** Loss of canopy square metre should be replaced

1 **Residual land -** Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.

2 **Wider connectivity -** Opportunity to reinforce connections to the wider community and landscape features.

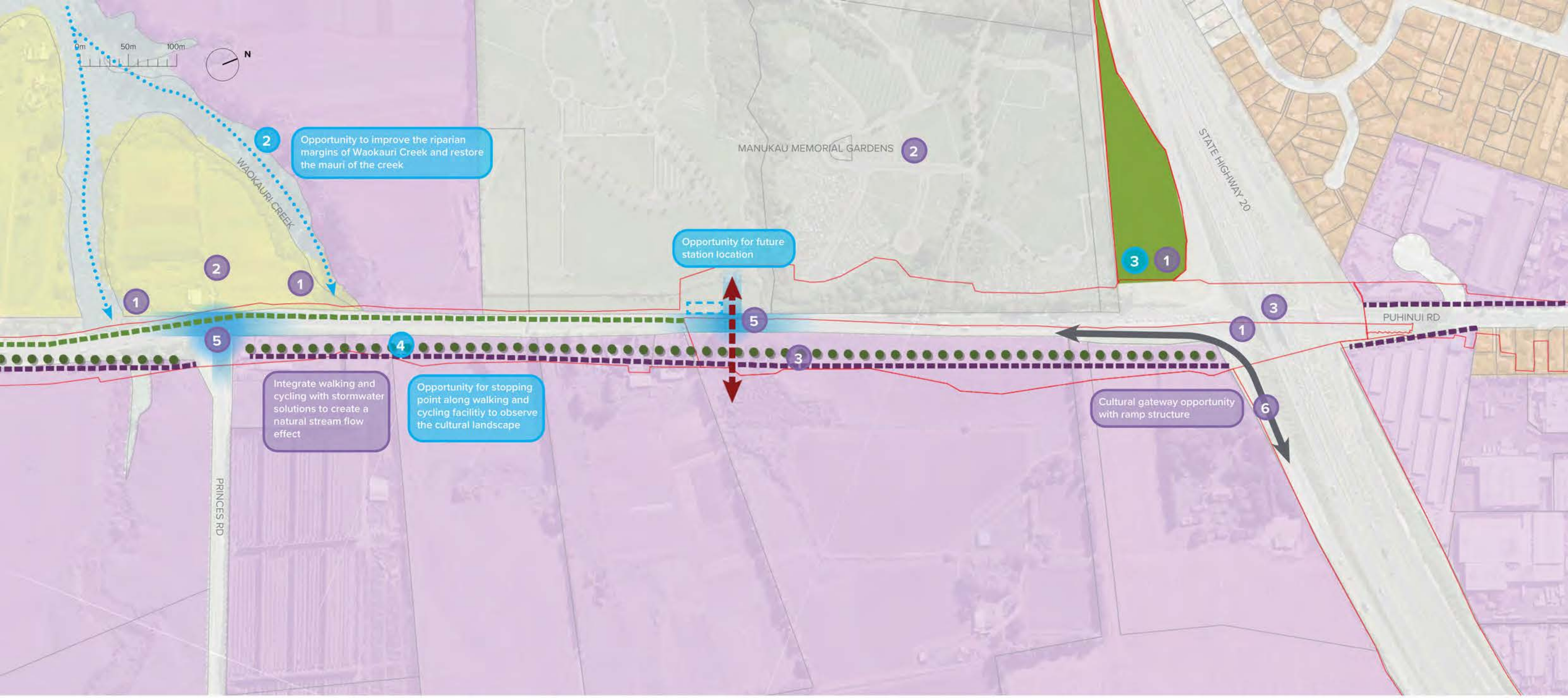
3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Additional landscape screening

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School
- Proposed Puhinui Bridge Extent
- Proposed Stormwater Pond



NOR 4A AND 4B - SH20 / SH20B INTERCHANGE TO ORRS ROAD

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 01 OF 02

Outcomes   Opportunities

Outcomes

1. **Ecological connectivity** - Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.
2. **Identity drivers** - Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.
3. **CPTED** - Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.
4. **Active mode permeability** - Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.
5. **Active mode legibility and priority** - Legibility, connectivity demands, safety and modal priority for active modes should be addressed at intersections.
6. **Bridges** - Consideration of visual integration, interface and sense of place for bridge structure.
7. **Removal of Notable Trees** - Loss of canopy square metre must be replaced

Opportunities

1. **Residual land** - Opportunity to demonstrate how any residual land portions following the construction of the Project are redefined and integrated with the expected future land use function.
2. **Wider connectivity** - Opportunity to reinforce connections to the wider community and landscape features.
3. **Enhancement** - Opportunity for ecological enhancement and tree planting
4. **Walking and Cycling** - Opportunity for stopping point with walking and cycling facilities to obeserve the cultural landscape

OUTCOMES

- Stormwater management outcomes should demonstrate integration of the stormwater raingardens and wetlands within the corridor and ensure an appropriate interface with adjacent land uses.
- High density residential and mixed-use integration / interface that enables buildings and spaces to positively address and integrate with the corridor.
- Intersection arrangement that addresses multi-modal priority, safety and legibility.
- Cross corridor active mode connection.
- Landscape outcomes should provide replace and augment canopy shading to the corridor. Outcomes to reflect and enhance the local character inherent in the built, natural and cultural qualities of the location within the corridor.
- Interface and visual / landscape buffer considerations for retained industrial, business and mixed use zones
- Proposed SH20 ramp

LEGEND

- Designation Boundary
- Residential - THAB
- Business - Light Industry Zone
- Business - Future Centre Zone
- Business - Metropolitan Centre Zone
- Business - General Business Zone
- Mixed Use
- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School

NOR 4A AND 4B - SH20 / SH20B INTERCHANGE TO ORRS ROAD

OUTCOMES AND OPPORTUNITIES PLAN - SHEET 02 OF 02

Outcomes

Opportunities

1 **Ecological connectivity -** Landscape outcomes should reinforce the wider vegetation patterns of the local open spaces and support ecological connectivity and biodiversity in the local environment.

2 **Identity drivers -** Key local community, landscape and identity drivers should be identified, developed and integrated with the adjacent land use functions and future design response.

3 **CPTED -** Future design should incorporate CPTED principles including clear sightlines, good levels of lighting and passive surveillance.

4 **Active mode permeability -** Corridor permeability for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities.

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3 **Enhancement -** Opportunity for ecological enhancement and tree planting

OUTCOMES

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LEGEND

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- Business - Light Industry Zone
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- Public Open Space
- Proposed Bus Rapid Transit Stop
- Train Station
- School

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix C

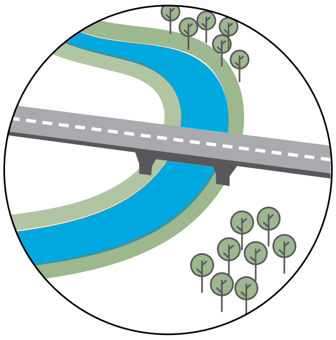
Design Framework Principles

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

ENVIRONMENT



1.1 Support and enhance ecological corridors and biodiversity

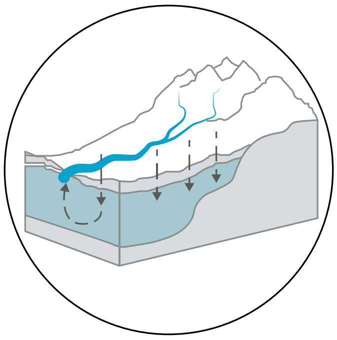
In the placement and design of movement corridors mitigate the effects on or enhance existing ecological corridors.

Outcome:

- The preservation of the biosphere, continuity of natural systems (at a range of scales) and contribution to climate change mitigation through emissions uptake.
- Contribution to the legibility of an area, open space corridors for movement and community use and increased community connection to natural habitats.
- Supports and rehabilitates the natural landscape.

Measure:

- Continuity/ severance of ecological corridors and enhanced biodiversity.
- Protection and enhancement of significant ecological areas (SEA's).



1.2 Support water conservation and enhance water quality in a watershed

Take into account and work with the existing watershed and aquifers as part of a whole system.

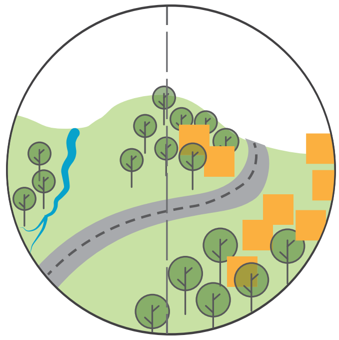
It is important that the mauri of waterways is restored, maintained and preserved for future generations. Connection to the Māori world view is described in the Te Aranga Principles - Mauri Tū: Environmental Health

Outcome:

- Use of natural systems to support design outcomes, reduces hard engineering solutions and thereby carbon emissions.
- Supports natural water cycles that the biosphere and communities depend on.
- Reduces the cost of water quality treatment.
- Supports and restores the coastal landscape.

Measure:

- Continuity/ severance of watershed.
- Allocation of land area for water quality treatment.
- Water quality treatment systems - swales, rain gardens, bioswales and wetlands are to be located within the corridor and not reliant on out of corridor treatment



1.3 Minimise land disturbance, conserve resources and materials

Respect the existing topography, landforms and urban structure in the placement of strategic corridors. Minimise the quantity of hard engineering materials required. Minimise, mitigate any adverse effects of activities on the environment.

Landforms and built heritage including movement networks can embody a history and create a distinctive sense of place. They help to provide an understanding and connection to the former natural and cultural history.

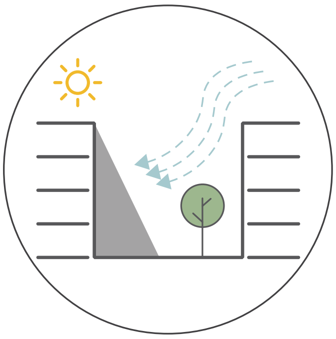
Connection to the Māori world view is described in the Te Aranga Principles - Tohu: The wider cultural landscape

Outcome:

- Reduces carbon emissions, waste of resources and impact on the biosphere.
- Protection of elite soils that support food production.

Measure:

- Works with/ against land, topography or urban structure.
- Utilisation of existing corridors to minimise land disturbance.



1.4 Adapt to a changing climate and respond to the microclimatic factors of each area

Design for predicted future regional climatic impacts in the corridor location. Consider the positive contribution that the orientation of transport corridors can make to the local climatic environment of future places and streets.

Outcome:

- Long term planning in regard to climate change such as sustainable management of resources and development and adoption of renewable energy.
- Maintains key corridors and infrastructure resilience.
- Creates a streetscape environment that considers the quality of the experience for people. Supports and encourages foot traffic to local destinations.

Measure:

- Corridor provides for active modes and public transport options to support modal shift and reduce climate change impacts.
- Consideration of future flood levels.
- Responds to the microclimatic conditions and characteristics of the area.
- Accommodates amenity measures such as space for shade, trees, wind protection, orientation of connections.

2.1 Identity and place

The identity or spirit of place is generally acknowledged as the unique amalgram of the inherent built, natural and cultural qualities of a place.

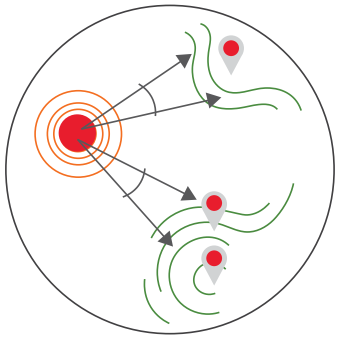
Responding to identity in the location and type of new corridors can provide a sense of continuity and contribute to our collective memory.

Outcome:

- Supports social cohesion, sense of belonging and pride in an area through clear connection to history and identity of a place.
- Supports outstanding natural landscapes and features.

Measure:

- Considers, respects and/ or enhances the established identity/ form/ layout of a place.
- Preserves the amenity values and quality of a place.
- Responds to the underlying topography and natural characteristics of a place.
- Contributes to the placemaking drivers of its context.



2.2 Respect culturally significant sites and landscapes

Acknowledge significant sites and features in the layout of movement corridors including ridgelines or horizons.

Protecting or featuring these vistas or landmarks acknowledges the wider cultural or natural landscape and provides context and orientation for people who are either moving through or living within an area.

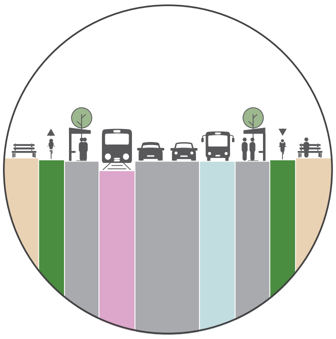
Connection to the Māori world view is described in the Te Aranga Principles - Tohu: The wider cultural landscape.

Outcome:

- Supports the cultural context of places.

Measure:

- Location of strategic corridor considers, respects and/or enhances significant sites and features.
- Establishes or acknowledges viewshafts and terminating vistas.



2.3 Adaptive corridors

Corridors should demonstrate flexibility to respond to changes in their function and physical interfaces.

Consider an adaptive approach in the way strategic corridors are designed to be able to respond to changes in land use, the way we move around or utilise technology over time.

Outcome:

- Look to preserve, repurpose existing corridors over time to support long term whole of life beneficial use.
- Reduce the need to update and replace corridors, saving emissions and materials
- Minimise social disruption.
- Minimise significant and permanent engineering interventions/solutions.

Measure:

- Utilisation and adoption of existing corridors.
- Corridor configuration that does not preclude active modes or public transport.
- Accommodate variations and future changes in noise levels generated by corridor function.
- Provision of space function for non transport functions such as ecological diversity, water management and recreation.

2.4 Social cohesion

Provide clear, effective and legible connectivity between community and social functions.

Outcome:

- Deliver a positive contribution to the sense of belonging and participation, as well as community resilience.
- Establish and support a positive spatial relationship to the grain of future development.
- Supports the creation of spaces where people can seamlessly connect.
- Support modal shift to allow a diversity of choices to more of the population.

Measure:

- Address potential severance issues between areas through the network layout and providing universal access.
- Avoid isolated or fragmented areas of Future Urban Zones.
- Provision of modal choices.
- Provides connectivity and equitable access to community facilities and open spaces.

2.5 Safe corridors

Provide a safe and convenient network of routes accessible to people of all ages and abilities.

Outcome:

- Supporting a greater level of movement that promotes a sense of personal safety.
- Provide safe crossings for people crossing roads and railways.
- Illustrates the universal design approach and accessbility in to all parts of user journeys.
- Reduce deaths and injuries on the road network.

Measure:

- Support personal safety in the environment (CPTED) in the layout or colocation of different modes/ land uses.
- Clear and legible mixed modal zones.
- Grade separated crossings for pedestrians and cyclists.
- Corridor configuration that supports safe pedestrian enironments.

BUILT FORM

3.1 Align corridors with density

Locate stations/stops and corridors within walking distance of higher density development to facilitate modal shift, support commercial and mixed use centres and contribute to vibrant, active urban environments.

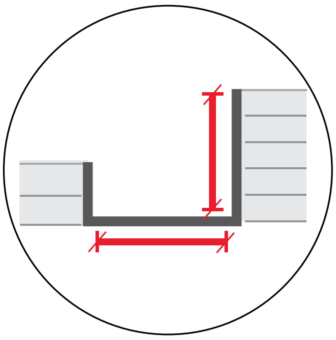
Density (and a diversity of housing choices) gives people the opportunity to live in neighbourhoods that meet their lifestyle preferences and economic means. Residents should be provided with the choice to live in amenity-rich neighbourhoods where they are a short walk or bike ride away from shopping, parks, schools and cafés and are encouraged to take public transport to work and regional destinations.

Outcome:

- Provides opportunity for greater housing diversity and choice.
- Reduces car dependency and emissions, linear servicing infrastructure and climate change impacts.
- Align appropriate corridor typologies with public private interfaces that support density.

Measure:

- Corridors aligned/ not aligned to areas of higher density.
- Corridors located near/through interchanges and centres.



3.2 Corridor scaled to the surrounding context and urban structure

Align the speed, type and scale of transport corridors and infrastructure with the environment that it moves through (appropriate scale to the context).

Corridor configuration should respond to contextual drivers and support different functional requirements at a regional, sub-regional and neighbourhood scale. Corridor functions should support efficient movement, higher density living, mixed mode travel and placemaking.

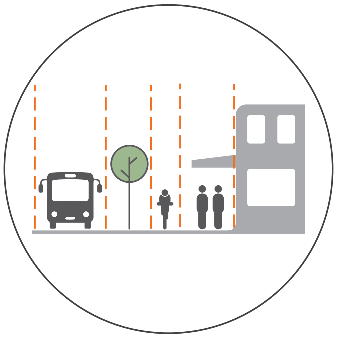
Refer to Locational Principles in Appendix E.

Outcome:

- Corridors should demonstrate support for economic outcomes through efficient regional movement.
- Corridors should enable mass rapid transit and multi modal options that contribute to climate change mitigation.
- Maintain or improve amenity of the environment through which the corridor passes.
- Corridor should minimise impacts of widening in relation to existing land use patterns.

Measure:

- Scale is/ isn't appropriate to the surrounding context.
- Corridor arrangement supports adjacent land use and provides an appropriate interface.



3.3 Facilitate an appropriate interface between place and movement

Facilitate the opportunity for place as well as movement in corridors (people oriented streets)

Corridors should deliver street typologies scaled to the adjoining land use that provide a clear movement function as well as an appropriate interface to built form.

Refer to Locational Principles Appendix E.

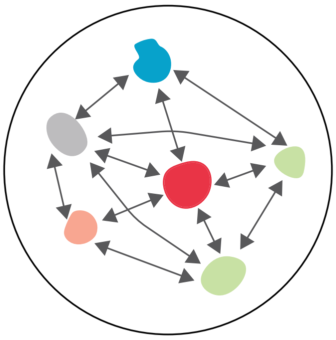
Outcome:

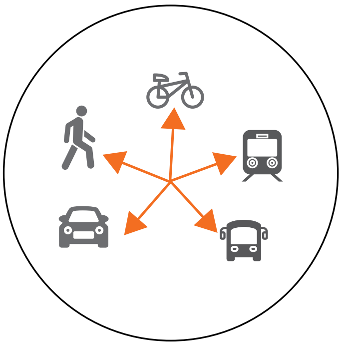
- Social cohesion and economic benefit for local businesses.
- Opportunity for people oriented streets, potential for streets as public spaces.
- Supports connectivity and interface to open spaces and public spaces.

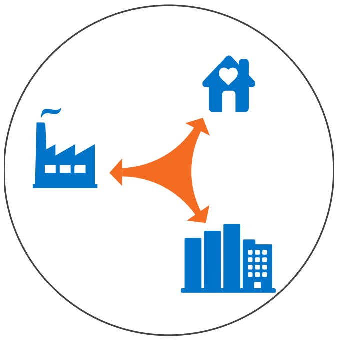
Measure:

- Supports appropriate public private interfaces.
- Appropriate allocation of street space between competing uses.
- Provides connectivity at a fine grain (pedestrian) level
- Appropriate and positive influence on future urban form.

MOVEMENT







4.1 Connect nodes

Provide tangible connectivity between identified activity nodes.

Corridors should provide direct and legible connections between key destinations.

Corridors should consider connectivity for all modes (walking, cycling, public transport, freight transport and private vehicle). Connect between areas as well as through central corridors.

Corridors should accommodate any identified cross connections between nodes outside of strategic corridors.

Outcome:

- Provides community connectivity, mobility and choice.
- Reduces car dependency and emissions as well as climate change impacts.
- Reduces travel times. between destinations.

Measure:

- Provides clear and tangible connectivity between complementary destinations.

4.2 Connect modes

Provide for choice in travel and the ability to connect at interchanges between modes.

Provide access to multiple travel modes. Corridors can contribute to outcomes for a wider cross section of the community (including elderly, children and mobility-impaired users) when they support safe, comfortable and attractive multi-modal transport for all users.

Outcome:

- Provides community connectivity, mobility and choice.
- Provides economic benefit at interchanges.
- Reduces car dependency and emissions as well as climate change impacts.

Measure:

- Modal connections and interchange is/ isn't accommodated.
- Transition between modes is easy, convenient, safe and smooth,
- Clear and legible interchanges.

4.3 Support access to employment and industry

Align the corridor location and typology to provide direct and efficient access to areas of employment and industry.

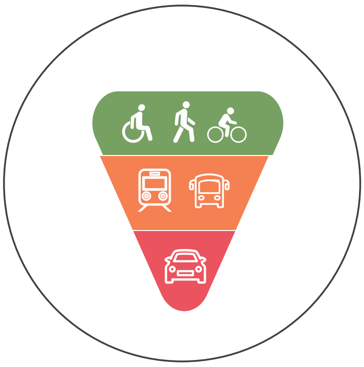
Outcome:

- Supports the efficient movement of resources.
- Provision of modal choices to enable equitable access to areas of employment and industry.

Refer to Locational Principles in Appendix E.

Measure:

- Provides tangible connectivity to areas of employment and industry.



4.4 Prioritise active modes and public transport

Provision of quality active mode corridors and dedicated public transport corridors to enable a modal shift away from private vehicle use.

Dedicated and connected active mode networks provide choices for people walking and cycling, reduces land consumption, and improves overall network efficiency.

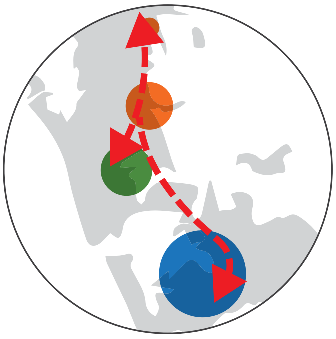
Dedicated and efficient public transport corridors provide modal choice to a larger number of users and reduces the impact on the environment.

Outcome:

- Supports community connectivity, mobility and choice.
- Reduction of car dependency and emissions, reduces climate change impacts.
- Supporting healthy lifestyles of the community by replacing short motor vehicle trips by alternative modes.
- Reduce environmental impact of travel.

Measure:

- Connectivity and quality of active paths.
- Prioritised network for public transport.



4.5 Support inter-regional connections and strategic infrastructure

Consider the location and alignment of significant movement corridors and placement of infrastructure (power, waste water, water) to the network.

Locate significant infrastructure in appropriate locations and away from primarily residential areas.

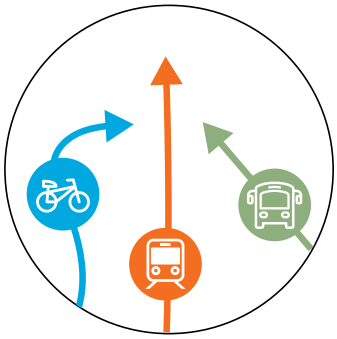
Identify corridor heirarchies and functions to allow for differentiation between inter-regional trips and local trips.

Outcome:

- Supports strategic infrastructure planning.
- Considers a coordinated approach between freight and passenger rail services.

Measure:

- Alignment of significant infrastructure along strategic corridors.
- Provide direct connections to rail, port and airport.
- Minimise the number of local trip movements from inter-regional routes.



4.6 Support legible corridor function

Consider how areas can be clearly navigated and understood by users moving from place to place.

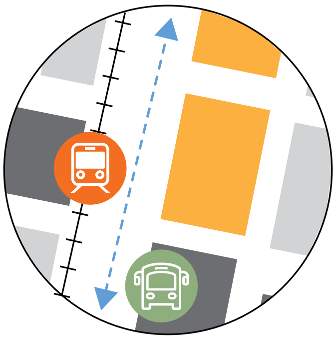
Outcome:

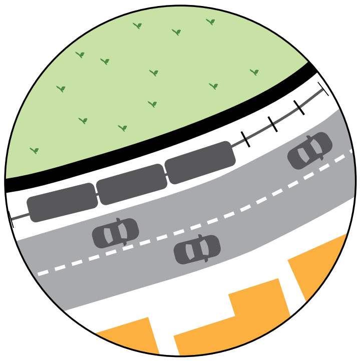
- Corridors designed and developed to suit the corridor function.
- Supports community connectivity, mobility and choice.

Measure:

- Provides clear gateways into areas.
- Provides direct connections between destinations.
- Corridor configuration provides clear modal interactions and priorities.

LAND USE





5.1 Public transport directed and integrated into centres

Locate rapid transit interchanges within centres (local, town and metro) to support a mix of uses and provide modal choice to a larger number of users.

Bringing public transport into a centre that has a higher level of density will cater for a greater number of users as well as providing accessible and viable alternatives to private vehicles.

Refer to Locational Principles in Appendix E.

Outcome:

- Supports community connectivity, mobility and choice.
- Supports higher densities in and around interchanges and centres.
- Reduction of car dependency and emissions, reduces climate change impacts.

Measure:

- Public transport is/ isn't directed and integrated into centres.
- Interchanges are located in centres.
- Clear modal interactions at interchanges.

5.2 Strategic corridors as urban edges

Strategic corridors as potential definers of a land use edge.

Providing an edge that supports the containment of land use and restricts unwanted development outside of the identified urban areas.

Outcome:

- Supports connectivity but restricts unwanted development.
- Minimises land take, disturbance and biodiversity impacts.

Measure:

- Enables/ does not enable a land use edge.
- Provides appropriate corridor configuration with limited access.

TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

Airport to Botany - Assessment of Flooding Effects

December 2022

Version 1

Document Status

Responsibility	Name
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Reviewer	Roger Seyb
Approver	Adam Jellie

Revision Status

Version	Date	Reason for Issue
1.0	9 December 2022	Final for lodgement

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Glossary of defined terms and acronyms

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
ARI	Average Recurrence Interval
AUP:OP	Auckland Unitary Plan: Operative in Part
BRT	Bus Rapid Transit
CEMP	Construction Environmental Management Plan
CVA	Cultural Values Assessments
MPD	Maximum Probable Development
N/A	Not Applicable
NIMT	North Island Main Trunk railway track
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Airport to Botany Bus Rapid Transit (Botany Town Centre to Rongomai Park)
NoR 2	Notice of Requirement 2: Airport to Botany Bus Rapid Transit (Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue)
NoR 3	Notice of Requirement 3: Airport to Botany Bus Rapid Transit (Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange)
NoR 4a	Notice of Requirement 4a: Airport to Botany Bus Rapid Transit (SH20/20B Interchange to Orrs Road)
NoR 4b	Notice of Requirement 4b: Alteration to NZ Transport Agency Designation 6717 – State Highway 20B
NPS:UD	National Policy Statement on Urban Development
Programme partners	Te Ākitai Waiohua, Auckland Airport, Auckland Transport and Waka Kotahi
RCA	Road Controlling Authority
RLTP	Auckland Regional Land Transport Plan
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
SEA	Significant Ecological Area
SH1	State Highway 1
SH20	State Highway 20
SH20B	State Highway 20B

SMAF	Stormwater Management Area Control – Flow
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
Waka Kotahi	Waka Kotahi NZ Transport Agency

Executive summary

This report provides an assessment of flood hazard risks associated with the construction, operation and maintenance of the Airport to Botany Bus Rapid Transit project (the **Project**).

Flooding is a natural hazard and has therefore been considered as part of the Notices of Requirement (**NoRs**) for the Project. The works required for the Project have the potential to lead to flooding effects and an assessment is provided to demonstrate that these effects can be appropriately avoided, remedied or mitigated in the future, closer to the construction of the Project. 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; and
- The level of flooding to roads, cycleways and footpaths;

The assessment of flooding effects for the Project has involved the following steps:

- Desktop assessment to identify potential flooding location;
- Modelling of the pre-development terrain with Maximum Probable Development (**MPD**) and future 100 year Average Recurrence Interval (**ARI**) plus climate change rainfall;
- Modelling of two climate scenarios, one allowing for 2.1 degrees of temperature increase and one for 3.8 degrees of temperature increase. The higher climate change scenario has been used to undertake a sensitivity analysis; and
- Inspection and review of flood depths at key locations such as crossings and where there is more vulnerable development e.g. dwellings.

While stormwater effects apart from flooding are not assessed (as these are part of future consenting processes), provision is made for the future mitigation of potential stormwater effects (stormwater quality and retention/detention) by identifying the space required for stormwater management devices (for example drainage channels and ponds) and incorporating sufficient land for that purpose into the proposed designation boundaries. The assessment considers that flooding effects will be subject to further assessment at a future detailed design stage.

The Project will lead to an increase to impervious area within the future corridor between 5% and 15% adjacent to urban areas. However, as a contribution to catchment wide flooding problems, the Project is expected to cause limited flooding effects. Design refinements or matters to be addressed at detailed design have been identified and there is sufficient space within the proposed designations for stormwater and flood mitigation. There are a number of existing flood areas identified along the route – these have been assessed to identify the level of hazard and potential effects outside the corridor. It will be important to make sure that the vertical alignment of the corridor crest does not change at these locations.

Summary of assessment of effects and recommendations

A flood risk rating was determined using flood depth from the model outputs compared to the proposed road levels and existing ground levels in the terrain model to identify where there was an existing flood risk (and hence where the Project works could exacerbate flooding). The flood risk was assessed according to the criteria set out in Table 4.

The outcomes of the flood assessment are set out in the table below.

Table 1: Summary of flooding assessment

NoR	Location	Flood Risk Rating	Recommendation
NoR 1	Te Irirangi Drive near Bishop Dunn Place	Negligible	N/A
	Te Irirangi Drive south of Smales Road	High	• Lower the intersection to allow flood water to move from trapped low point • Investigate additional pipe capacity and inlets • No flood flow attenuation for increased impervious area as the existing road corridor is in the lower half of the catchment
	Te Irirangi Drive north of Smales Road	Moderate	• Provide additional or upsized piped drainage and/or greater inlet capacity • No flood flow attenuation for increased impervious area as the existing road corridor is in the lower half of the catchment
NoR 2	Te Irirangi Drive near Diorella Drive / Boundary Road	Low to negligible	• No flood flow attenuation for increased impervious area for sub-catchment to the existing Rongomai attenuation pond • Flood flow attenuation for increased impervious areas within the proposed raingardens (if required) for sub-catchment to Ōtara Creek
	Lambie Drive / Cavendish Drive	High	• Keep the current vertical alignment • Flood flow attenuation for increased impervious areas

			within proposed linear treatment
	Davies Avenue / Ronwood Avenue	Moderate - High	• Reduce the level of Davies Avenue to allow overland flow to discharge into Hayman Park • Provide additional pipe capacity or diversion drains parallel to the road • Flood flow attenuation for increased impervious areas within the proposed wetland at Hayman Park
	Puhinui Road near Cavendish Drive	High	• Keep the current vertical alignment • Flood flow attenuation for increased impervious areas within the proposed designation boundary (if required)
NoR 3	Puhinui Road near Noel Burnside Road	High	• Keep the current vertical alignment • Flood flow attenuation for increased impervious areas within the proposed designation boundary (if required)
NoRs 4a and 4b	Puhinui Road between Vision Place and SH20/20B Interchange	Moderate	• No flood flow attenuation for increased impervious area • Increase culvert capacity if required

1 Introduction

1.1 Purpose and scope of this Report

This assessment of flood hazard effects has been prepared to inform the Assessment of Effects on the Environment (**AEE**) for five NoRs being sought by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport (**AT**) for the Project under the Resource Management Act 1991 (**RMA**). Specifically, this Report considers the actual and potential effects associated with the construction and operation of the Project on the existing and likely future environment as it relates to flood hazard effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

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 stormwater quantity effects (such as flooding, erosion and changes to hydrology – which may cause effects onstream habitat, baseflow and sediment movement in streams), stormwater discharge 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 section 13, 14 and 15 of the RMA and are administered through regional consents by Auckland Council.

A designation is a land use or district planning mechanism. Accordingly, when assessing the actual or potential stormwater effects on the environment of allowing the requirement in terms of section 171 of the RMA, the assessment of effects has been limited to flood hazard matters being the specific matters that would trigger a District Plan consent requirement under the Auckland Unitary Plan (Operative in Part) (**AUP:OP**). Where Regional Plan consenting requirements are triggered, these will not be authorised by the designation, and will require further regional consents to be obtained prior to construction of the Project.

In presenting information on flood hazard effects, it is therefore acknowledged that there will be a subsequent process for seeking regional council consents. The NoRs also acknowledge that the works required for the Project could lead to risks associated with flooding as a natural hazard and provide an assessment of effects to demonstrate that these risks can be appropriately managed in the future.

In the context of this assessment, flood hazard effects include:

- Increasing flood levels on adjoining property; and
- Increasing the flood hazard.

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 within each NoR, and the typical construction methodology 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 flood hazard effects. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this Report for clarity.

1.2 Report structure

In order to provide a clear assessment of each NoR, this Report follows the structure set out in the AEE. That is, each notice has been separated out into its own section, and each section contains an assessment of the actual and potential effects for the specific NoR. Where appropriate, measures to avoid, remedy or mitigate effects are recommended.

Each section is arranged in geographical order, starting from the northernmost point of the proposed NoR, to the southernmost point. Table 2 below describes the extent of each section, and where the description of effects can be found in this Report.

Table 2: Report structure

Sections	Section number
Description of the Project	2
Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines	3
Assessment of general flooding and stormwater matters for all Airport to Botany Bus Rapid Transit NoRs	4
Assessment of specific flooding and stormwater matters for Airport to Botany Bus Rapid Transit NoR 1	5
Assessment of specific flooding and stormwater matters for Airport to Botany Bus Rapid Transit NoR 2	6
Assessment of specific flooding and stormwater matters for Airport to Botany Bus Rapid Transit NoR 3	7
Assessment of specific flooding and stormwater matters for Airport to Botany Bus Rapid Transit NoR 4a and 4b	8
Overall conclusion of the level of potential adverse flood effects of the Airport to Botany Bus Rapid Transit Project	10

2 Project description

The overall Project is proposed to be an 18km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations. It is part of Auckland's wider Rapid Transit Network (**RTN**) connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany.

As set out in the AEE, this Report specifically relates to a portion of the broader Project (approximately 14.9km) which extends from the Botany Town Centre in the vicinity of Leixlep Lane to Orrs Road in the Puhinui peninsula, off SH20B. The Project primarily involves the upgrade and widening of existing transport corridors to provide for a separated bus rapid transit corridor and high-quality walking and cycling facilities.

Nine BRT stations are proposed as part of the Project. These stations will facilitate off-board ticketing and level boarding and are situated in the following locations:

- Smales Road;
- Accent Drive;
- Ormiston Road – Botany Junction Shopping Centre;
- Dawson Road;
- Diorella Drive;
- Ronwood Avenue (Manukau Central);
- Manukau Station;
- Puhinui Road/Lambie Drive; and
- Puhinui Station.

As part of the Project, two new structures are proposed:

- A BRT bridge crossing the North Island Main Trunk (NIMT) and connecting to the concourse level of the Puhinui Station; and
- A southbound ramp from SH20B to SH20.

Upgrades to existing structures are proposed at the:

- Bridge over Otara Creek (NoR 1);
- Bridge over SH1 (NoR 2);
- Bridge over NIMT (NoR 3); and
- Bridge over Waokauri Creek (NoR 4a).

Figure 1: Overview of Project and NoR extents

Table 3: Overview of NoRs

Notice of Requirement	Description	Requiring Authority
NoR 1	Bus Rapid Transit corridor and high quality walking and cycling facilities from Botany Town Centre to Rongomai Park	Auckland Transport
NoR 2	Bus Rapid Transit corridor and high quality walking and cycling facilities from Rongomai Park to Puhinui Interchange, in the vicinity of Plunket Avenue	Auckland Transport
NoR 3	Bus Rapid Transit corridor and high quality walking and cycling facilities from Puhinui Interchange, in the vicinity of Plunket Avenue to SH20/SH20B Interchange	Auckland Transport
NoR 4a	Bus Rapid Transit corridor and high quality walking and cycling facilities from SH20B/20 Interchange to Orrs Road	Auckland Transport
NoR 4b	Alteration to designation 6717 to provide for the widening of SH20B, including a southbound on-ramp onto SH20, high quality walking and cycling facilities and enable a Bus Rapid Transit corridor	NZ Transport Agency

3 Assessment methodology

3.1 Preparation for this Report

Several resources were used to support the assessment. These included site visits, technical specialist inputs, previous reports developed for the business case and the stormwater discharge consent application for SH20B, 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 flood models for Pūkaki Creek, Puhinui Creek, Ōtara Creek (including Flat Bush) and Pakuranga Creek catchments were used to assess the flood water levels and extents of the flooding on existing (pre-development) terrain.

3.2 Summary

The assessment of flooding effects for the Project has involved the following steps:

- Desktop assessment to identify potential flooding locations, namely:
  - Existing buildings appear to be near/within the existing flood plains; and
  - Where the Project involves work near stream crossings and major overland flow paths.
- Flood modelling of the pre-development terrain:
  - Flood modelling of the existing terrain using MPD development with 100 year ARI plus climate change rainfall (2.1 and 3.8 degree increase); and
  - Model results were used to identify flood water levels ≥ 0.05m for the future 100 year flood event.
- Inspection of the flood extent 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; and
  - 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 impact of climate change on the results.

3.3 Outcomes based approach

The stormwater and flooding considerations are based on a concept design and proposed designation boundary which includes sufficient space to respond to the future environment. The effects assessment is based on the Project being able to meet the outcomes set out below and provide any required mitigation within the designation boundary.

The Project does not propose substantial changes to the vertical alignment of existing roads within the urban areas. Therefore, the Project geometry is expected to cause limited additional flooding effects, such as loss of flood plain storage or raising the overtopping level. Notwithstanding this, there are a number of locations where there is existing flood hazard. As such, future detailed design for the Project will need to assess and manage potential flooding effects. In some areas, the corridor passes through existing flood plains and detailed design geometry will need to match the existing levels so as to not exacerbate effects.

There will also be some increase in impervious area within the urban parts of the Project corridor – in the order of 10%. As the retention and detention volumes will be sized for the impervious area of the whole Project corridor and increases in runoff relate to the change in impervious area, the storage will reduce the peak flow increases. The changes in impervious areas are small in the context of the overall catchments and are not expected to cause considerable effects. If future detailed modelling for the Project identifies the need for further flood attenuation, beyond what is currently provided for, the designation boundary provides sufficient space for this to be incorporated into proposed treatment devices or located adjacent to the corridor.

In any case, during the future detailed design stage of the Project, measures should be implemented 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); and
- No more than a 10% average increase of flood hazard (defined as flow depth times velocity) for the main access to authorised habitable dwellings.

Where the above outcomes can be achieved through alternative measures outside of the proposed designations 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 existing flood effects occur and may require mitigation. The designation boundary allows for treatment and retention/detention devices which include some storage. However, the final geometric design will be more important in not exacerbating existing flood effects.

Compliance with these flooding outcomes should 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 MPD and climate change) at the future resource consent stage of the Project.

3.4 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 work near the stream crossings / major overland flow paths; and
- 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:

- AUP:OP;
- Auckland Council GIS resources (Auckland GeoMaps);
- Design Drawings;
- Flood maps created by the SG modelling team;
- SGA Flood Resilience Technical Note;
- Indicative Construction Methodologies;
- NZTA Stormwater Specification P46;
- New Zealand Bridge Manual (SP/M/022) for freeboard allowance;
- Puhinui Catchment Management Plan;
- The Auckland Code of Practice for Land Development and Subdivision Chapter 4: Stormwater, Version 3.0, January 2022;
- Auckland Transport Hīkina te Wero: Environment Action Plan, December 2021; and
- Waka Kotahi Toitū Te Taiao Sustainability Action Plan, April 2020.

3.5 Flood modelling

3.5.1 Purpose

The purpose of the flood modelling is to identify the extent and scale of existing flooding effects. We have used this to consider how the proposed Project corridor may exacerbate existing flooding and potential methods to manage these effects.

3.5.2 Stormwater catchment overview

As set out in the figure below, the Project traverses four major stormwater catchments: Pakuranga Creek, Ōtara Creek/Flat Bush, Puhinui Creek and Pūkaki Waokauri Creek.

The Pakuranga Creek catchment covers approximately 2,918 ha, but the Project covers only a small area in the southern portion of this catchment. Runoff from the Pakuranga Creek catchment drains to the Pakuranga Creek before discharging to the Tāmaki River and further the Waitematā Harbour. The Pakuranga Creek catchment is highly developed. The downstream environment includes significant existing flood hazards.

The Ōtara Creek/Flat Bush catchment covers approximately 3,477 ha. Ōtara Creek catchment is heavily modified with both industrial and residential development. Runoff from the Ōtara Creek/Flat Bush catchment drains to open watercourses before discharging to the Tāmaki River via the Ōtara Creek. Stormwater runoff from the Project area to the north of Ormiston Road will discharge to the Flat Bush Dam before discharge to Ōtara Creek. The downstream environment includes significant existing flood hazards.

The Puhinui Creek Catchment covers approximately is 2,964 ha. The majority of the catchment is highly developed and includes a large area of commercial and industrial development. Large sections of both the upper and lower catchment are open space. The main channel of the Puhinui Stream flows north-west towards the Manukau Town Centre and then east to the coast near the Papakura Channel of the Manukau Harbour. Puhinui Creek Catchment discharges by means of two streams namely, Puhinui Creek and Homai Stream and into Manukau Harbour. The Puhinui Creek Catchment includes a number of areas with high flood hazard including Lambie Drive and Cavendish Drive where works will be undertaken.

The Pūkaki Waokauri catchment is approximately 1,727 ha in size. Stormwater runoff from the Project within the Pūkaki Waokauri catchment discharges to the Waokauri Creek, which discharges to the Pūkaki Creek and then into Manukau Harbour. The Pukaki-Waokauri catchment that SH20B passes through has been identified in the Stormwater Management Area Control – Flow 1 (**SMAF 1**) area under the AUP:OP.

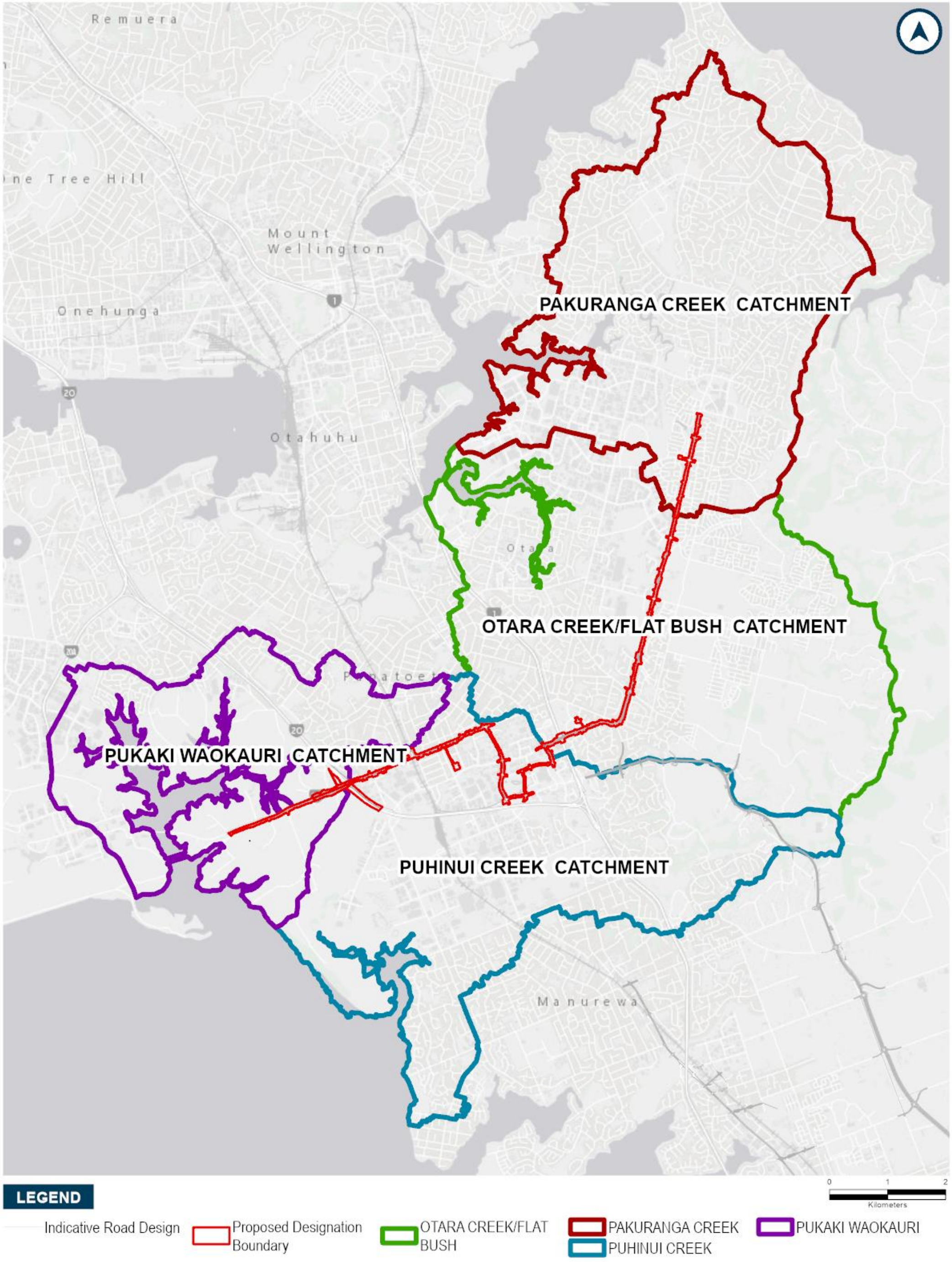


Figure 2: Stormwater catchments for the Project

3.5.3 Modelling parameters

Auckland Council have produced catchment models for Pūkaki Waokauri, Puhinui Creek, Flat Bush, Ōtara Creek and Pakuranga Creek which were adapted for this assessment (**the models**).

To assess the flooding effects of the Project on the receiving environment, the base case scenario was reviewed and areas with the potential for increase in flood risk were identified. To date, only the pre-development scenario has been modelled, this is based on:

- Future 100 year ARI rainfall event + climate change event with future land-use without the Project in place.

The proposed imperviousness for the MPD land use was applied i.e. the model assumes the maximum impervious surface limits of the current zone or, if the land is zoned Future Urban in the AUP:OP, the probable level of development arising from zone changes.

The models include the existing roads and existing culverts where the culverts are 600 mm or greater. In the models existing culverts < 600 mm diameter are considered to be fully blocked (according to the Auckland Council Code of Practice) although larger culverts are considered to be fully working.

The post-development flood models for the Project were not developed or assessed in this Report. It is anticipated that these models will be developed during detailed design when a final Project alignment is developed. Future modelling will be used to confirm that flood effects associated with the Project will be adequately mitigated.

3.5.4 Modelling outputs

The flood depth from the model outputs was compared to the proposed road levels and existing ground levels in the terrain model to identify where there was a potential flood risk. The existing ground level or road level was taken from the terrain model which is broadly based on 2016 LiDAR information. This was confirmed using contour information available from Auckland Council Geomaps.

The existing flood risk was assessed according to the criteria set out in Table 4. For those areas identified as having a potential risk of flooding effects, the key mitigation will be to maintain existing road crest levels.

Table 4: Flooding effects risk assessment criteria

Flood depth / land use	Negligible (flood depth < 0.05 m)	Low (flood depth 0.05 m to 0.15 m)	Moderate (flood depth 0.15 m to 0.5 m)	High (flood depth > 0.5m)
Less Vulnerable e.g. open space, agricultural land				
Moderately Vulnerable e.g. commercial and industrial, road corridors				
Highly Vulnerable e.g. dwellings, educational facilities				

Overall Flood Risk	**Negligible**		**Low**		**Moderate**		**High**

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. Surveyed floor levels of the existing habitable buildings are not available and should be reviewed in the future detailed design stage of the Project.

The required freeboard for bridges and culverts used to assess the suitability of the indicative design is set out in Table 5. Positive effects have been identified where the proposed vertical alignment of the road would increase freeboard to meet the allowance in Table 5.

Table 5: 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
Culvert	All situations	From the predicted flood water level to the road surface	0.5

3.5.5 Stormwater devices

As set out in the Section 1, this assessment is limited to flooding effects. Notwithstanding this, the concept design and proposed designation boundary provides for the future management of other stormwater effects (stormwater quantity and quality). The area required for stormwater devices within the proposed designation boundaries is based on a high-level indicative sizing of the device and area required for construction.

As set out in the AEE, a stormwater philosophy has been developed for the Project in partnership with Manawhenua. This sets out the stormwater management approach to inform future design and implementation. In summary, the approach identifies preferred treatment approaches along the Project corridor and includes linear treatment, use and/or enhancement of existing public stormwater treatment ponds, raingardens and new treatment devices.

The stormwater infrastructure has been conceptually designed in accordance with:

- Auckland Council's Stormwater Management Devices in the Auckland Region, Guideline Document 2017/001 (December 2017);
- Auckland Transport's Stormwater Guidelines (February 2014);
- The Waka Kotahi Stormwater Design Philosophy Statement (May 2010); and
- AUP:OP Stormwater Management Requirements.

In general, the approach has been to avoid locating stormwater devices in floodplains where possible. However, there are extensive flood plains covering and adjacent to the Project and this has not been possible in a number of locations. Where applicable, this is discussed in the NoR specific sections to follow.

3.5.6 Limitations

NoRs 4a and 4b have downstream catchments which contain Future Urban Zoned land. The modelled scenarios use imperviousness assumptions associated with the future land use(s) shown in the Future Urban Land Supply Strategy.

Given the area of Future Urban Zoned land in NoRs 4a and 4b and the likely increase in density that is anticipated following the National Policy Statement on Urban Development (**NPS:UD**) along the rest of the NoRs, 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 detailed design phase of the Project to take account of catchment characteristics at that time and to confirm proposed mitigation.

Similarly, 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.

3.5.7 Sensitivity analysis

Sensitivity is the degree to which a system is affected, adversely or beneficially, by a given exposure[1]. In this instance the sensitivity of the proposed designations to increased rainfall as a result of climate change has been considered.

The flood models have assessed 2.1 degrees of warming and a 16% increase on rainfall based on guidance from Auckland Council and the Ministry for the Environment. However, given the uncertainty of climate change effects in the future, the assessment has also considered a more severe climate change scenario based on the Representative Concentration Pathway (**RCP**) 8.5 which allows for 3.8 degrees of warming and a 32.7% increase on rainfall.

The results for 3.8 degrees of warming have been compared to those reported in the flood assessment for RCP 4.5 and areas where higher rainfall may increase flooding have been identified.

In the future it is possible that there may be different requirements for assessing climate change, however, at this time, the sensitivity analysis has been prepared to understand the risk of climate change associated with the proposed designations and enable decision makers to appropriately respond to this with the level of information available at the time of writing this assessment.

[1] Intergovernmental Panel on Climate Change. (2007). Climate Change 2007: Contribution of Working Group II to the Fourth Assessment Report. Cambridge, UK: Cambridge University Press.

4 All Airport to Botany Bus Rapid Transit NoRs

This section assesses common or general flood matters across the entire Project corridor (i.e. all five NoRs). This section also recommends measures to avoid, remedy, or mitigate actual or potential adverse effects.

4.1 Positive effects

The positive effects associated with the Project include the potential to:

- Raise the existing road levels to preventing flood flows across the road and reducing flood hazard (where this is not limited by existing flooding effects upstream) for road users;
- Improve existing culvert capacities and/or provide new stormwater infrastructure which improve ponding and stream flow in the area; and
- Provide stormwater quality treatment and retention/detention for existing and proposed impervious areas.

4.2 Assessment of construction effects

The following construction effects apply to the entire Project. Based on the location of works in terms of overland flows or known flood extents in the vicinity, the proposed construction works which could result in flooding effects include:

- Construction of new culvert crossings or upgrading of existing culvert or bridge crossings;
- Realignment of existing overland flow paths;
- Works, such as regrading and raising levels, within existing floodplains; and
- Storage of materials and use of lay down areas within floodplains.

4.3 Recommended measures to avoid, remedy or mitigate construction effects

The proposed management and mitigation measures for construction effects across the Project are set out below.

General:

Flood hazard effects for the construction phase in existing high hazard areas should be addressed in a Construction Environmental Management Plan (**CEMP**). In preparing the CEMP, key matters to include are (but not limited to):

- Siting construction yards, laydown areas and stockpiles outside the predicted flood plains;
- Maintaining overland flow paths around / through areas of work;
- Minimising 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;
- Carrying out earthworks during the summer / dry months to reduce the risk of flooding; and
- Managing the overland flow paths to make sure flows are not diverted toward existing buildings or properties.

Construction of new and existing bridges, culvert crossings and stormwater devices:

There may be some temporary flooding risk associated with the works required for the construction of new and existing bridges, culverts and stormwater devices. However, the details of the construction methodology will be confirmed in the future during detailed design. It is expected that that the works can be carried out in a manner that appropriately manages these risks and this can be defined through the flood risk mitigation measures in the CEMP.

4.4 Assessment of operational effects

The assessment of operational effects for the Project is based on the 100 year flood model results for the pre-development (existing) terrain and considers the flooding extents at existing culvert crossings and along existing roads. The following matters have been considered as part of this assessment:

- Existing flooding and freeboard at key points identified from modelling the existing terrain;
- The potential of flooding on existing properties due to the new Project corridor geometry;
- Incremental changes to the corridor impervious area; and
- The mitigation measures set out in Section 4.5 have been designed so that flood effects are adequately addressed during the future detailed design stage of the Project and that adverse flood effects are avoided, remedied or mitigated.

4.5 Recommended measures to avoid, remedy or mitigate operational effects

It is recommended that during detailed design, additional flood modelling is carried out and mitigation measures are implemented (as required) 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); and
- No more than a 10% average increase of flood hazard (defined as flow depth times velocity) for the main access to authorised habitable dwellings.

In addition to the above, further mitigation measures that could be implemented include:

- Maintaining existing road levels within the corridor at overland flow paths and floodplains;
- 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 Project corridor and do not cross under the road;
- Increasing culvert sizes or pipe systems to manage changes to flood levels;
- Using storage within linear treatment devices, raingardens, wetlands or separate attenuation devices to reduce the peak flow increase due to changes in impervious area within the corridor; and
- Integrating development stormwater design requirements with adjacent development or wider upgrades to public infrastructure upstream and downstream of the proposed corridor.

5 Airport to Botany Bus Rapid Transit NoR 1

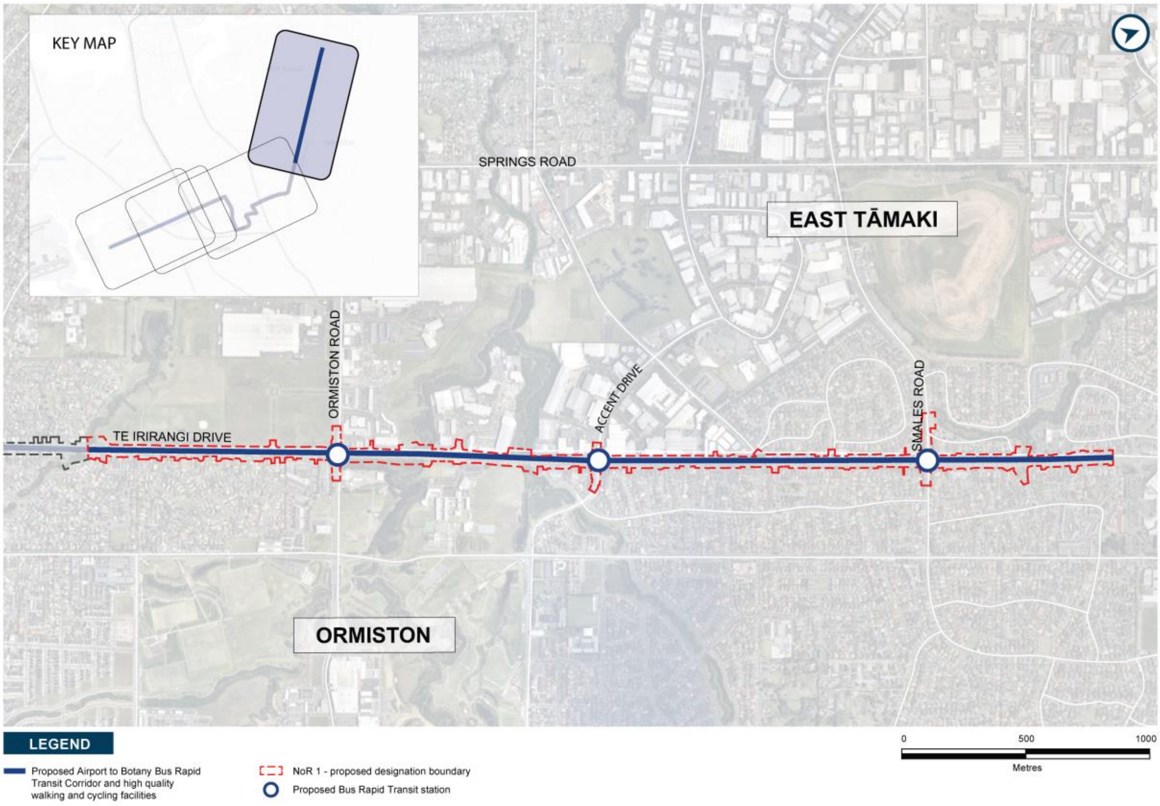
This section assesses specific flood matters relating to the NoR 1 corridor between Botany Town Centre, in the vicinity of Leixlep Lane and Rongomai Park.

5.1 Project features and proposed works

As set out in Table 6 below, the proposed works in NoR 1 include the widening of existing Te Irirangi Drive to accommodate a centre-running BRT corridor, two vehicle lanes in each direction and high quality walking and cycling facilities.

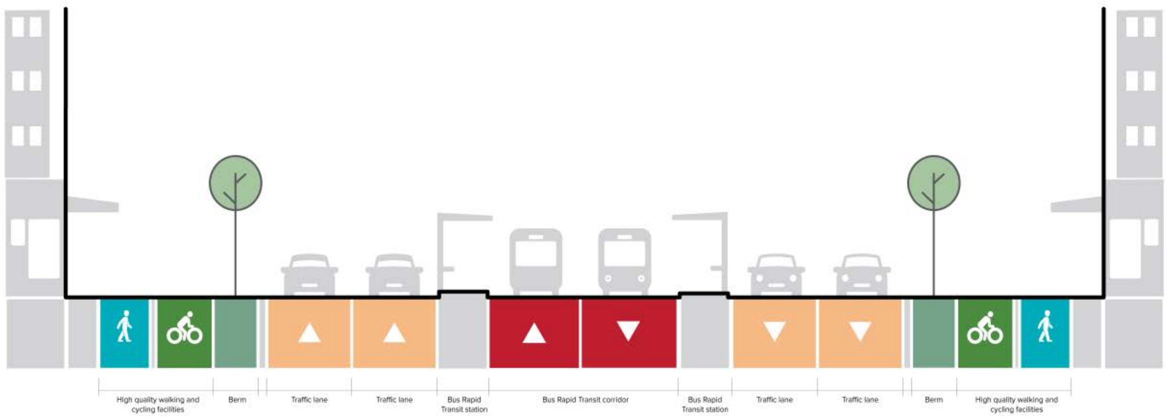
Table 6: Overview of NoR 1

NoR 1 – Botany Town Centre to Rongomai Park



Key features	
BRT Corridor	Centre-running along Te Irirangi Drive
BRT Stations	• Smales Road Station; • Accent Drive Station; and • Ormiston Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	Two lanes in each direction (existing)

Access	There is an existing central median along the majority of Te Irirangi Drive which restricts right-turn access
Speed environment	50km/h
Signalised intersections	• Te Irirangi Drive and Smales Road; • Te Irirangi Drive and Accent Drive; • Te Irirangi Drive and Bishop Dunn Avenue; and • Te Irirangi Drive and Ormiston Road.
Stormwater infrastructure	• Swales; and • Wetlands
NoR 1 typical cross section	



NoR 1 is generally limited to the existing road corridor width, therefore the proposed stormwater treatment devices are mainly linear treatment.

Proposed stormwater treatment devices include:

- **For Pakuranga Catchment:** Swales on Te Irirangi Drive near Wando Lane, near Shingleton Lane, near Gransa Lane and near Shedding Lane;
- **For Ōtara Creek/Flat Bush Catchment:** Rain Gardens on Te Irirangi Drive, Bishop Dunn Place; and
- New stormwater drains will be required on both sides of the road to direct the stormwater to the proposed treatment devices.

5.1.1 Stormwater catchment overview

NoR 1 lies within the Ōtara Creek / Flat Bush and Pakuranga Creek catchment models (see Section 3.5.2 for more detail). Along NoR 1 the corridor crosses three streams and two overland flow paths that drain by means of a bridge, culverts and an underground pipe network (see Figure 8).

5.1.2 Catchment characteristics

NoR 1 is predominantly zoned under the AUP:OP as Residential – Mixed Housing Suburban Zone, Residential – Mixed Housing Urban Zone, Open Space – Sport and Active Recreation Zone, Business – Light Industry Zone and Business – Mixed Use Zone. In terms of land use, the upstream area along this section of the Project is mainly residential development characterised by single homes, while the downstream areas are more open consisting of open space and large format commercial and industrial development.

Pakuranga Creek has a number of tributaries which are heavily modified.

Figure 3: NoR 1 in the context of the Pakuranga Creek catchment

For the Ōtara Creek / Flat Bush Catchment the main watercourses include Ōtara Creek, Stancombe Stream, Ormiston Stream, Murphy's Stream, Flat Bush School Road Stream and Killarney Stream. Streams within the catchment are generally characterised by poorly consolidated stream banks with a mixture of native and exotic vegetation.

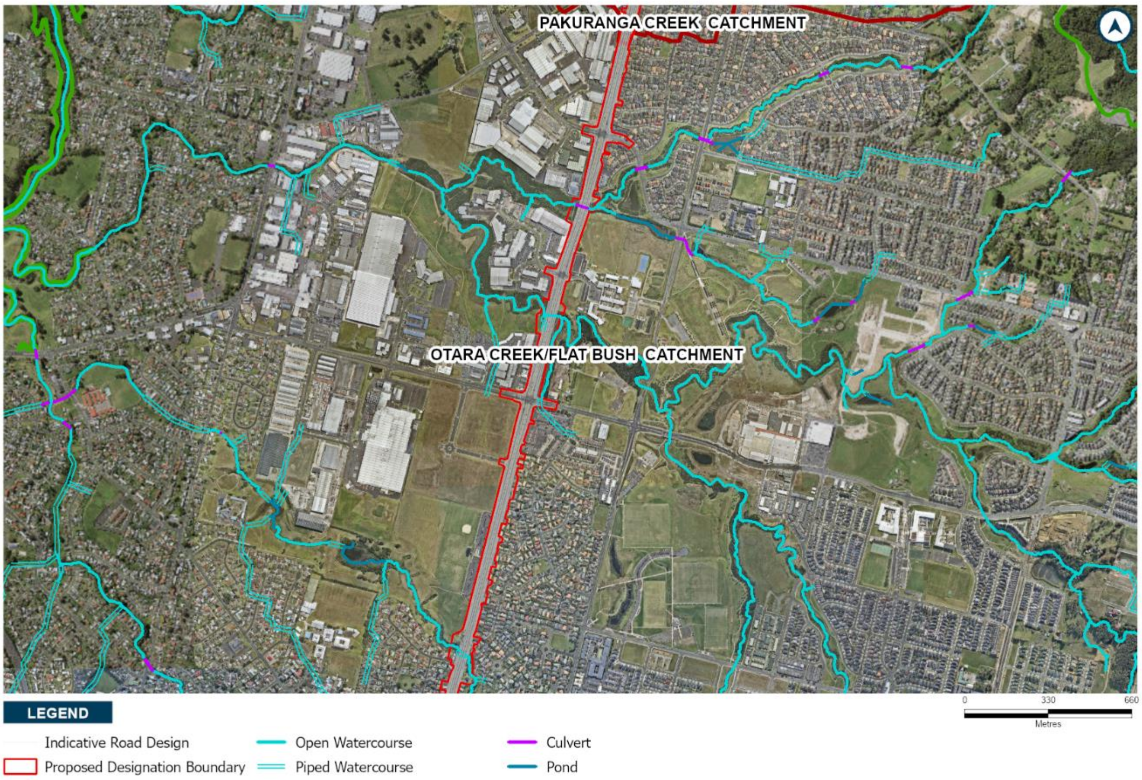


Figure 4: NoR 1 corridor in the context of the Ōtara Creek / Flat Bush catchment

Key existing stormwater management assets in this section of the corridor in Ōtara Creek / Flat Bush Catchment include:

- Rongomai Park Wet Pond and Rongomai Park Dam;
- Preston Road Reserve Wet Pond and Preston Road Reserve Dam;
- Flat Bush Dam; and
- Sancta Maria Wet Pond.

The Stormwater Management Report prepared for Flat Bush identifies Flat Bush Dam as a significant quantity control structure attenuating water during extreme rainfall events to mitigate downstream flooding and forms part of a wider stormwater and flood management strategy for the catchment.

5.2 Assessment of construction effects and recommended measures to manage effects

Potential flooding effects during construction across the Project have been described in Section 4.2 above. Stream crossings are key sites for potential flooding effects during construction. NoR 1 includes the following stream crossings:

- 2500 dia culvert south of Treneary Lane;
- Bridge duplication south of Sancta Maria; and
- Box culverts south of Whetstone Road.

As set out in Section 4.3, the potential flooding effects during construction will be managed through flood risk mitigation measures set out in the CEMP for existing high flood hazard areas which is recommended to be a condition on the proposed designation.

5.3 Assessment of operational effects

This assessment of effects refers to the 100 year flood model results for the pre-development (existing) terrain and considers the flooding extents at the existing culvert crossing and significant areas alongside the existing road. The flood effects identified in NoR 1 already exist. As there are no significant changes proposed to the vertical alignment, these effects are generally unchanged.

Within NoR 1, the increase in impervious area is expected to be approximately 10%, which is due to the removal of the central grassed island being replaced with the BRT lanes. The higher peak runoff during the 100 year event can be reduced by the provision of storage within the linear treatment devices if required. Within the Pakuranga Creek catchment and the Flat Bush catchment, the corridor is in the lower half of both catchments, indicating that flood attenuation is not required.

The existing flood model has been reviewed and specific locations of interest have been assessed below.

5.3.1 Pakuranga Creek catchment

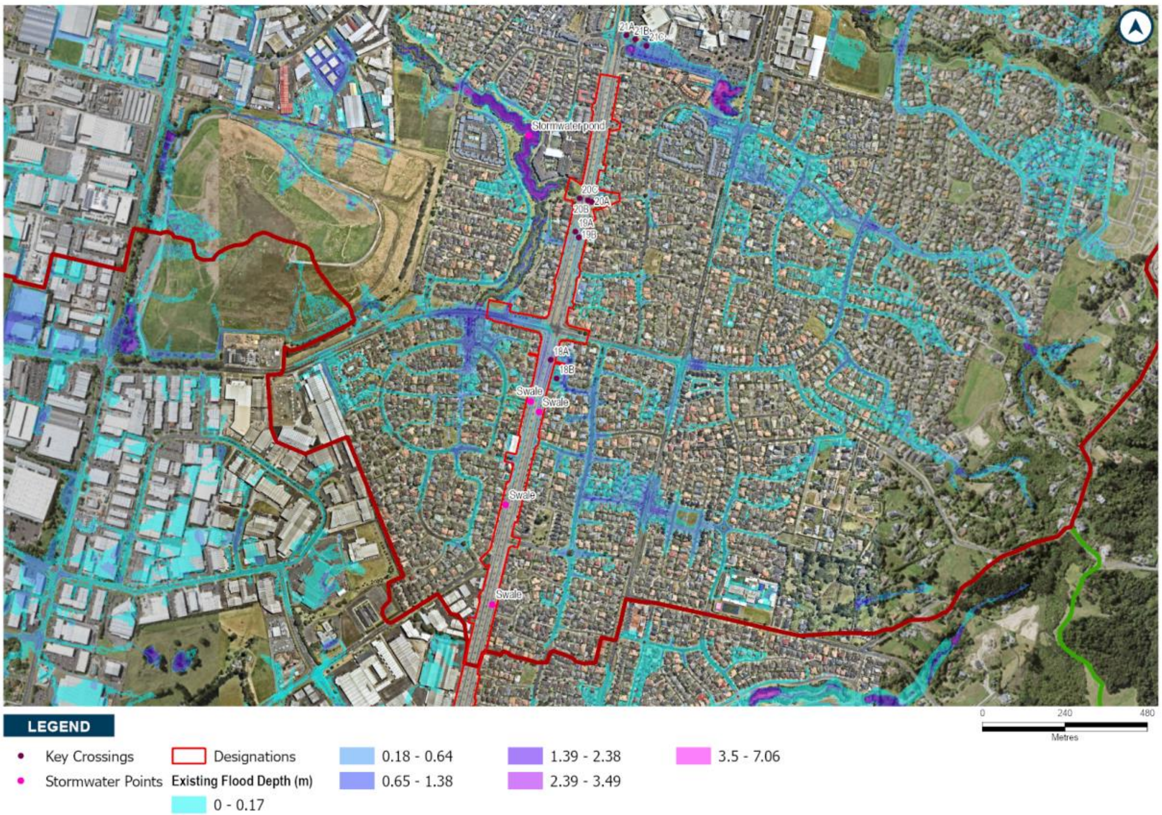


Figure 5: 100 year event for the proposed NoR 1 corridor (Pakuranga catchment)

At Point 20 the flood risk rating is negligible (see Table 7) and no further assessment of this location has been undertaken. Locations where the existing flood risk is moderate or high are discussed in more detail below.

Table 7: Rongomai Park to Botany Town Centre, in the vicinity of Leixlep Lane (NoR 1) existing flood levels at key locations

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	100 Year flood level (RL) pre-development	Existing flood risk rating
Te Irirangi Drive near Smales Road (Point 18A)	2050 mm dia. pipe network Road lvl RL 20.89 m	Road corridor	21.88 m	High risk Flood depth 0.98 m
18 Ardkeen Place (Point 18B)	Site lvl RL 22.09	House / building	22.18 m	Low risk Flood depth 0.09 m
Te Irirangi Drive near Kellaway Drive (Point 19A)	1350 mm dia. pipe network Road lvl RL 18.98	Road corridor	19.19 m	Moderate risk Flood depth 0.21 m
Te Irirangi Drive near Aaronville Way (Point 19B)	Road lvl RL 18.96	Road corridor	19.44 m	Moderate risk Flood depth 0.48 m
Te Irirangi Drive near Brinlack Drive (Point 20B)	Road lvl RL 20.16 m	Road corridor	18.12 m Upstream 17.61 m Downstream	Negligible risk Adequate freeboard Flood depth 0.00 m

5.3.1.1 Te Irirangi Drive and Smales Road intersection

The existing flood risk at the Te Irirangi Drive and Smales Road intersection (Location 18A) is high. The flood level is up to 0.98m deep with a 100 year flood level of 21.88 m. The flood enters the existing road corridor from the east and builds up in depth on the west side of the road until it can overflow through residential property to the west (see Point 18B) and along Te Irirangi Drive to the north to the intersection with Smales Road (where the lowest road level is about RL 21.5 m). The intersection levels prevent overland flow from this location which is the low point.

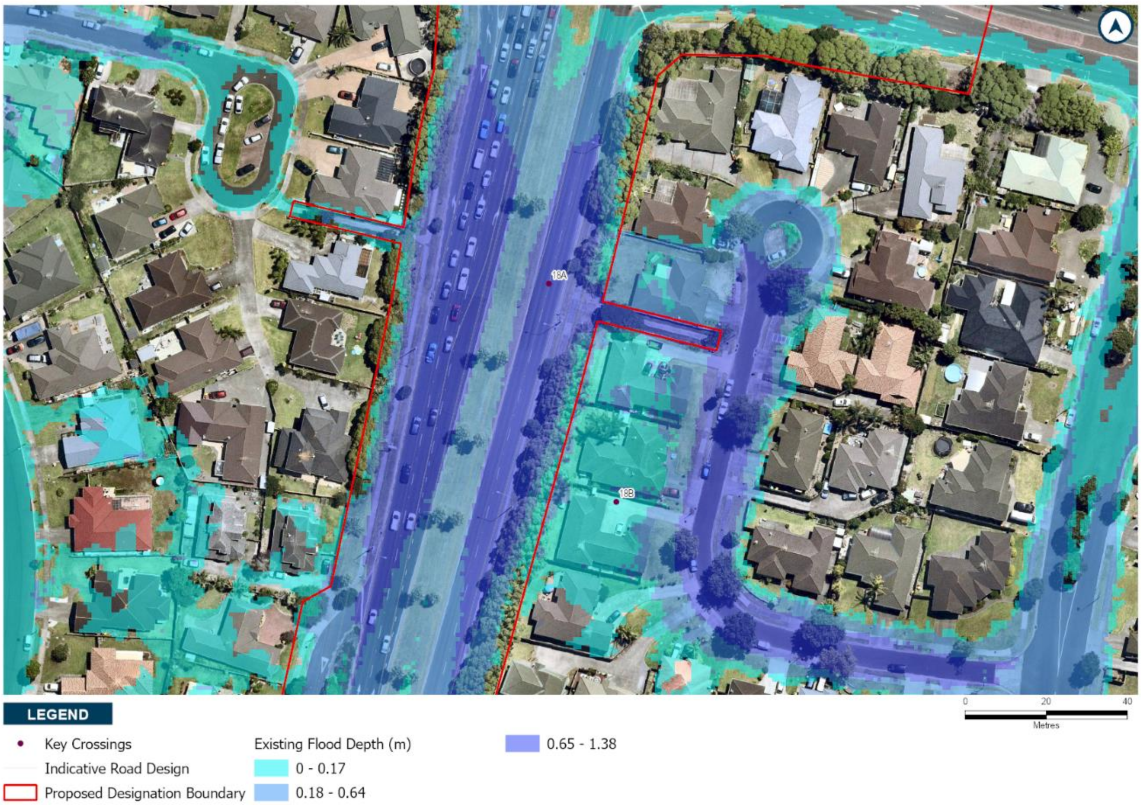


Figure 6: 100 year ARI event for the proposed NoR 1 corridor at Location 18A

In addition to the levels there is potentially a lack of network capacity. The network east of the existing road corridor consists of several branches of pipes up to 2100 mm diameter all drained by one 2050 mm diameter pipe to Kellaway Reserve. There are no details of the pipe network to the west side of the existing corridor and further investigation is required at the future detailed design stage of the Project. It is recommended that the levels of the final design for the Project should not increase unless an overland flow path or significant additional pipe capacity is provided.

5.3.1.2 Te Irirangi Drive near Kellaway Drive

At Te Irirangi Drive near Kellaway Drive (Location 19), a moderate flood risk exists with flood depths up to 0.48 m predicted on the eastern side of the existing road including the footpath and cycleway (Point 19B) and up to 0.21 m are on the western side of the road (Point 19A). Water moves across the road and pools before flowing to the unnamed stream on the western side of Kellaway Drive.

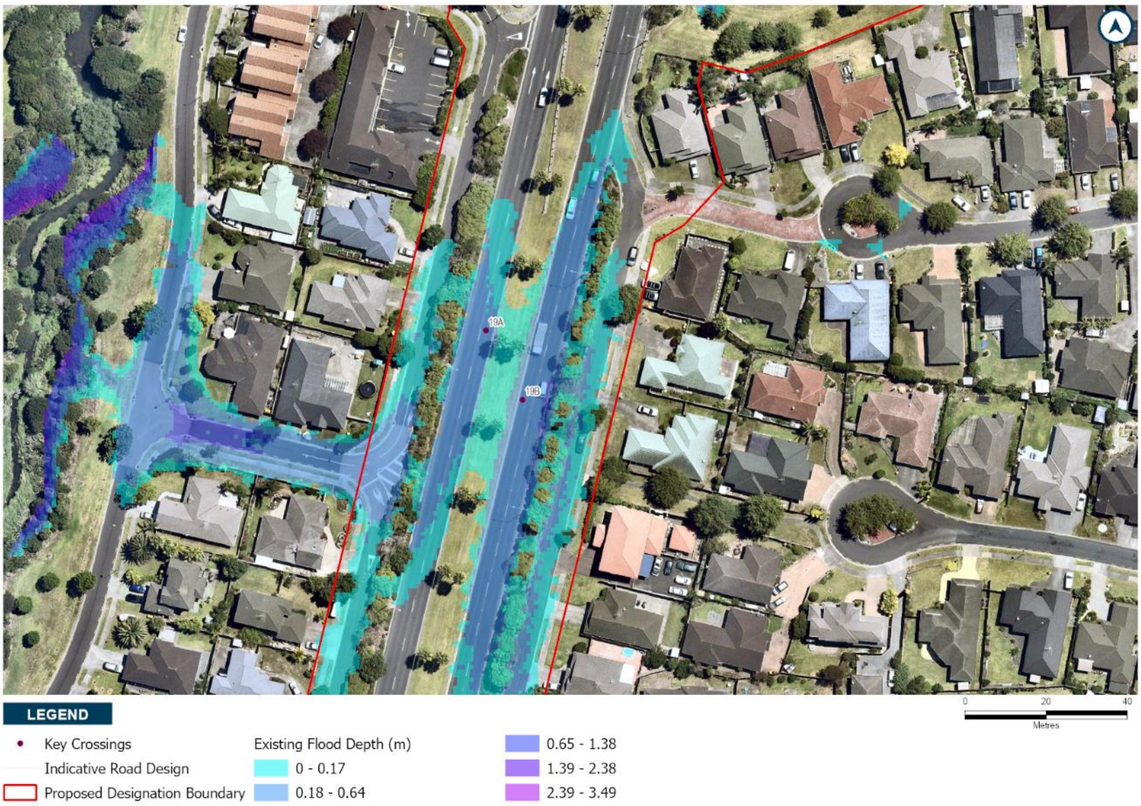


Figure 7: 100 year ARI event for the proposed NoR 1 corridor at Location 19A and 19B

It is recommended that the levels of the final design for the Project should not increase unless an enlarged or new overland flow path or significant additional pipe capacity is provided. Further checking of the pipe capacity will need to be carried out at the detailed design stage to refine this estimate and determine the extent of the hazard. Methods to mitigate the risk can be assessed further at the detailed design stage and it is considered that the proposed designation has sufficient space for a number of mitigation options to be applied.

5.3.2 Ōtara Creek / Flat Bush catchment

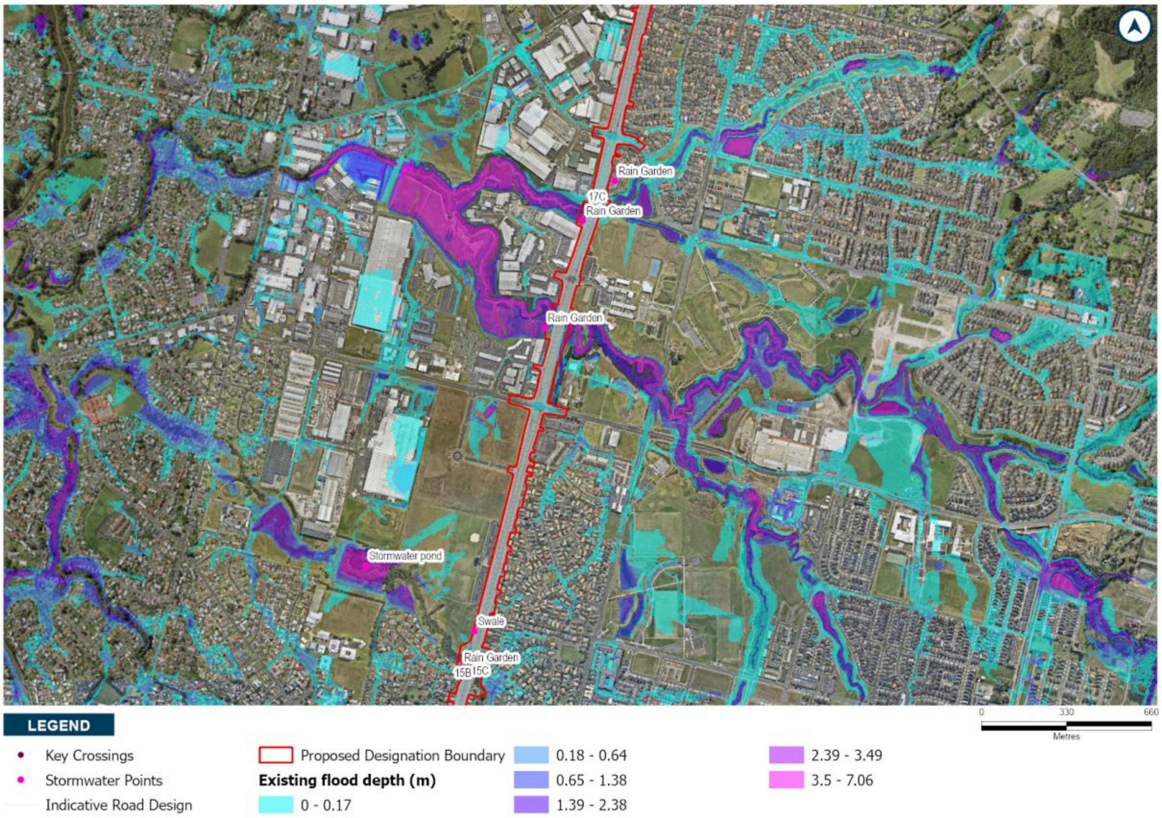


Figure 8: 100 year event for the proposed NoR 1 corridor (Ōtara Creek/Flat Bush catchment)

At Locations 16 and 17 the flood risk rating is negligible (see Table 8) and no further assessment of these locations has been undertaken. Location 15, where the flood risk high, has been discussed in more detail below.

Table 8: Rongomai Park to Botany Town Centre, in the vicinity of Leixlep Lane (NoR 1) existing flood levels at key locations

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	100 Year flood level (RL) pre-development	Existing flood risk rating
Unnamed Stream Crossing near Rongomai park (Point 15B)	Road/bridge lvl RL 18.43 m 450 mm dia pipe network	Road corridor	18.65 m	Moderate risk Flood depth 0.33 m
Whetstone Road near Te Irirangi Road (Point 15A)	Site lvl RL 18.10 m	Road corridor	18.66 m	High risk Flood depth 0.65 m
Ōtara Stream Bridge (Points 16A to 16C)	Ōtara Stream Bridge lvl RL 17.66 m	Road corridor	16.27 m Upstream 16.15 m Downstream	Negligible risk Adequate freeboard Flood depth 0.00 m

Unnamed Stream Crossing near Treneary Lane (Points 17A to 17C)	2500 mm arched pipe culvert Road lvl RL 18.87 m	Road corridor	18.41 m Upstream 15.96 m Downstream	Negligible risk Adequate freeboard Flood depth 0.00 m

5.3.2.1 Unnamed Stream Crossing near Rongomai Park

At Te Irirangi Drive unnamed stream crossing (Point 15B) the existing flood risk is considered moderate with a flood depth of 0.33 m during the 100 year event. Buses would be able to continue to utilise the BRT corridor at depths of up to 0.3 m and would therefore only be impacted in extreme weather events.

The adjacent land use at Whetstone Road near Te Irirangi Road (Point 15A) are residential with no direct access to Te Irirangi Road. There is an opportunity to raise to road at the culvert or place additional culverts to reduce the flooding risk. The proposed designation boundary is considered sufficiently wide at this point to enable localised raising of the carriageway or culvert duplication, and therefore the need to improve flood resilience can be considered during the future detailed design phase.

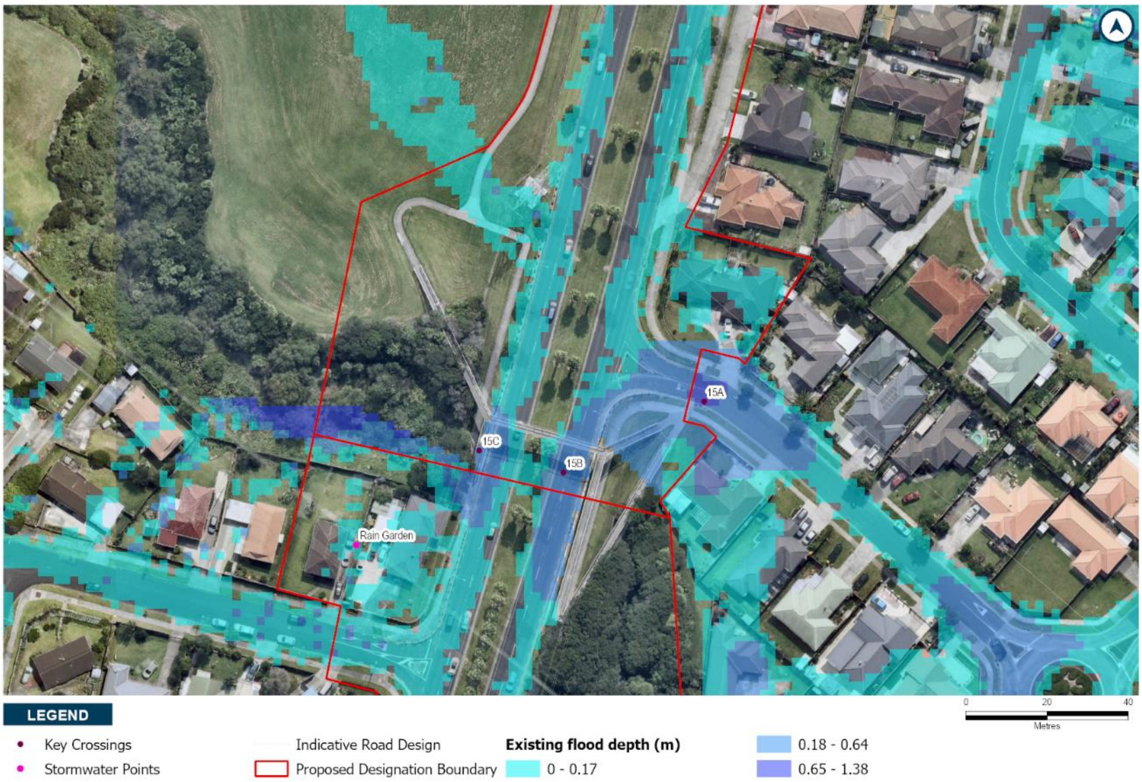


Figure 9: 100 year ARI event for the proposed NoR 1 corridor at Location 15

5.4 Recommended measures to avoid, remedy or mitigate operational effects

There is a high existing flood risk identified at the intersection of Te Irirangi Drive and Smales Road (Point 18A). Potential mitigation options at this location include:

- Lowering the intersection to allow flood water to move more easily from the trapped low point onto Smales Road and reduce flood levels;
- Temporary road diversions or safe alternative routes during a flood event; and
- Additional pipe capacity and inlets, particularly on the western side of the road.

At Te Irirangi Drive near Kellaway Drive (Point 19A and 19B) there is a moderate flood risk rating due to existing flood effects. Potential mitigation at this location is to:

- Provide additional or upsized piped drainage and/or greater inlet capacity to reduce the risk of flooding.

At the Te Irirangi Drive unnamed stream crossing near Rongomai Park (Point 15B), investigations into raising the road or adding additional culvert capacity should be undertaken during the future detailed design stage.

It is recommended that the outcomes identified in Section 4.5 apply as a proposed condition on this NoR.

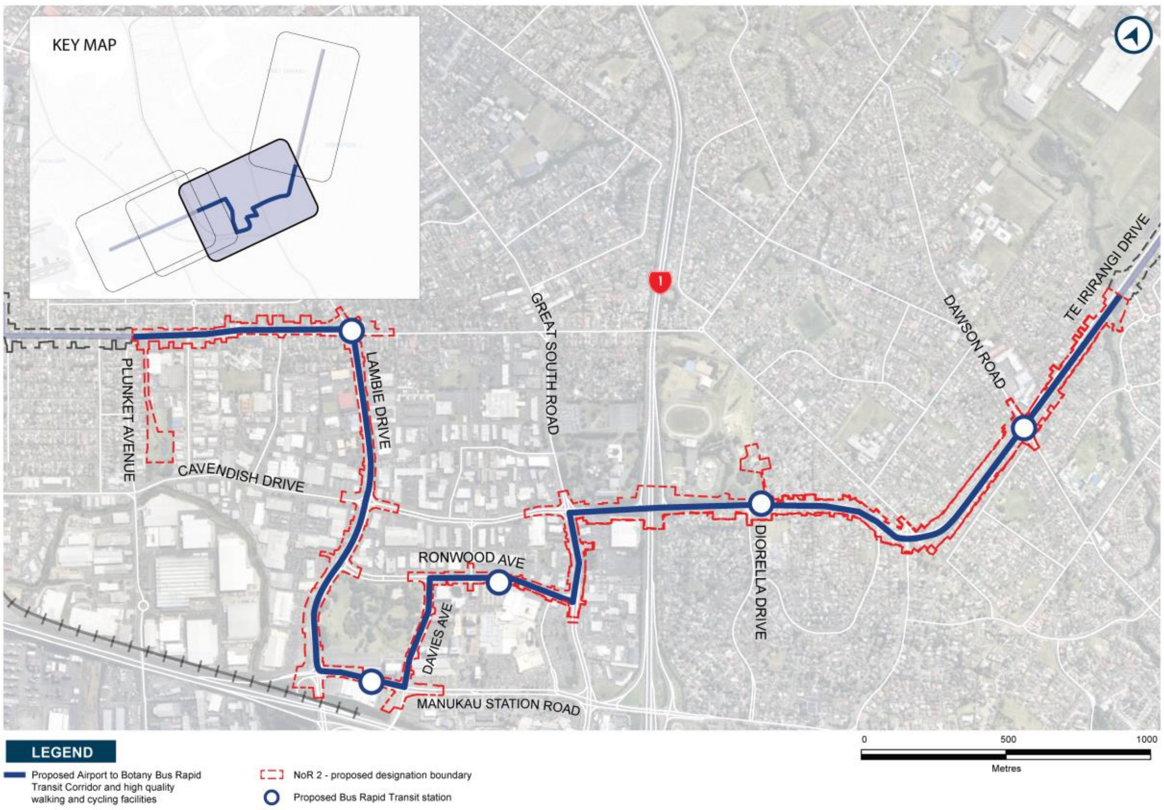
6 Airport to Botany Bus Rapid Transit – NoR 2

This section assesses specific flood matters relating to NoR 2, the Project corridor between Rongomai Park and Puhinui Station, in the vicinity of Plunket Avenue.

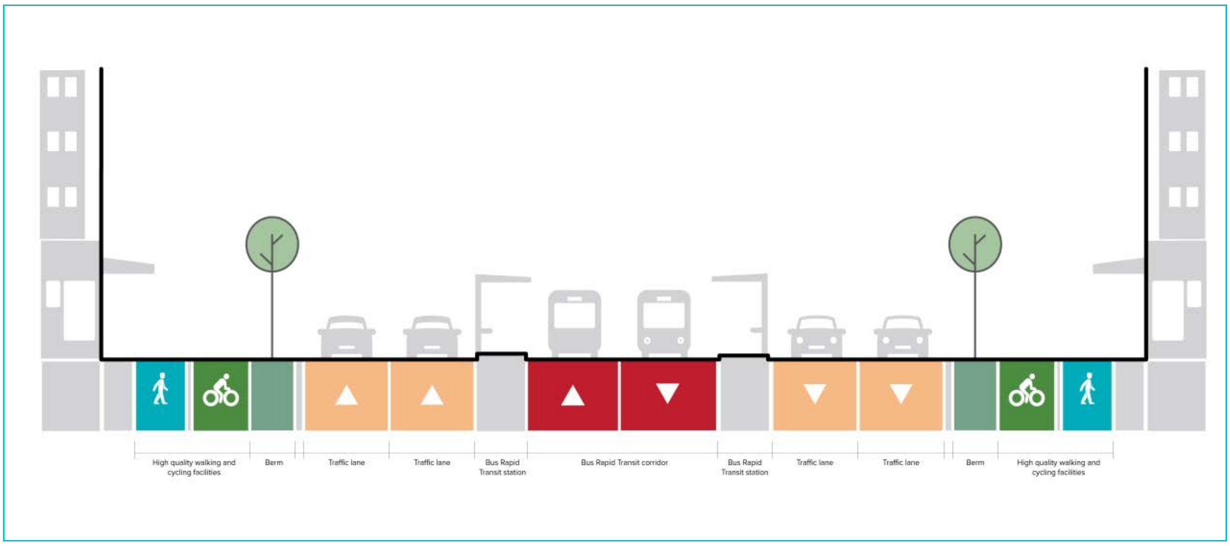
6.1 Project features and proposed works

As set out in Table 9 below, the proposed works in NoR 2 include the widening of several existing roads to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities.

Table 9: Overview of NoR 2

NoR 2 – Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue	
	
Key features	
BRT Corridor	Centre-running for the majority of the corridor along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, Lambie Drive, and Puhinui Road West-running on Davies Avenue along the edge of Hayman Park
BRT Stations	• Dawson Road Station; • Diorella Drive Station; • Ronwood Avenue Station; • Manukau Station; and

	• Corner of Lambie Drive and Puhinui Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the road
General traffic	• Two lanes in each direction along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, and Lambie Drive • One-way single lane along Davies Avenue • One lane in each direction along Puhinui Road
Access	Existing central medians limit right turn access on Te Irirangi Drive, Great South Road, Ronwood Avenue, and Lambie Drive. New signalised intersection at Mitre 10 and Bunnings Warehouse on Lambie Drive. Priority access for fire engine movements across the BRT corridor at Papatoetoe Fire Station.
Speed environment	• 30 km/h on Ronwood Avenue and Davies Avenue; and • 50 km/h on Te Irirangi Drive, Great South Road, Manukau Station Road, Lambie Drive and Puhinui Road.
Signalised intersections **(new intersections in bold)**	• Te Irirangi Drive and Dawson Road; • Te Irirangi Drive, Boundary Road and Hollyford Drive; • Te Irirangi Drive and Diorella Drive; • Te Irirangi Drive, Great South Road and Cavendish Drive; • Great South Road and Ronwood Avenue; • Ronwood Avenue and Davies Avenue; • Davies Avenue, Wiri Station Road and Manukau Station Road; • Manukau Station Road and Lambie Drive; • **Mitre 10 and Bunnings Warehouse;** • **Lambie Drive and Ronwood Avenue;** • Lambie Drive and Cavendish Drive; • Lambie Drive and Puhinui Road; and • **Puhinui Road and Plunket Avenue.**
Stormwater infrastructure	• Swales; and • Wetlands
NoR 2 typical cross section	



A summary of the proposed stormwater treatment in NoR 2 includes:

- Rain gardens on Te Irirangi Drive and near the Manukau Sports Bowl for the Ōtara Creek / Flat Bush catchment;
- Stormwater pond enhancement at Puhinui Doman and Hayman Park for the Puhinui Catchment; and
- New stormwater drains will be required on both sides of the road to direct the stormwater to the proposed treatment devices.

6.1.1 Stormwater catchment overview

NoR 2 lies within the Ōtara Creek / Flat Bush and Puhinui catchments (see Section 3.5.2 for more detail). Along NoR 2 the corridor crosses four overland flow paths that drain by means of an underground pipe network (see Table 11).

6.1.2 Catchment characteristics

The land is zoned as per AUP:OP as Business – Light Industry Zone, Business – Metropolitan Centre Zone, Business – General Business Zone, Residential – Mixed Housing Suburban Zone, Open Space – Informal Recreation Zone and Open Space – Sport and Active Recreation Zone. The majority of land adjacent to the corridor is highly developed. There are existing established residential developments to the north of the proposed corridor along Puhinui Road. Areas to the south of the proposed corridor through Lambie Drive, Ronwood Avenue and Great South Road include existing commercial and industrial development.

Figure 10: NoR 2 in the context of the Ōtara Creek / Flat Bush catchment

Key existing stormwater management assets in this section of the corridor in the Puhinui Catchment include:

- Wet Ponds at Puhinui Domain, Lambie Drive On-Ramp and Off-Ramp and Hayman Park; and
- AT owned stormwater device at 154 Puhinui Road (StormFilter).

Figure 11: NoR 2 in the context of the Puhinui catchment

6.2 Assessment of construction effects and recommended measures to manage effects

Potential flooding effects during construction across the Project have been described in Section 4.2 above. In NoR 2, the proposed upgrade of the stormwater pond at Hayman Park is located within flood plain and overland flow path.

As set out in Section 4.3 above, the potential flooding effects during construction, including where works are within a flood plain will be managed through flood risk mitigation measures captured in the CEMP for existing high flood hazard areas.

6.3 Assessment of operational effects

This assessment of effects refers to the 100 year flood model results for the pre-development (existing) terrain and considers the flooding extents at the existing culvert crossing and significant areas alongside the existing road. The flood effects identified in NoR 2 already exist. As there are no significant changes to the vertical alignment, these effects are generally unchanged.

Within NoR 2 the increase in impervious area is expected to be:

- Approximately 10% - 15% within the Ōtara Creek / Flat Bush catchment; and
- Approximately 5% - 10% within the commercial area of the Puhinui catchment.

Within the Ōtara Creek catchment and the Puhinui catchment, the corridor is in the upper third of both catchments, indicating that flood attenuation for increased impervious area may be required.

The higher post development peak runoff during the 100 year event can be reduced by the provision of storage within the proposed raingardens near the Manukau Sports Bowl and the proposed new wetland within Hayman Park. Linear treatment is proposed within the Puhinui catchment along Lambie Drive. The small effect from increased impervious area and peak flow in the existing commercial area can be mitigated by providing flood attenuation controls at the regularly spaced tree pits.

6.3.1 Ōtara Creek / Flat Bush catchment

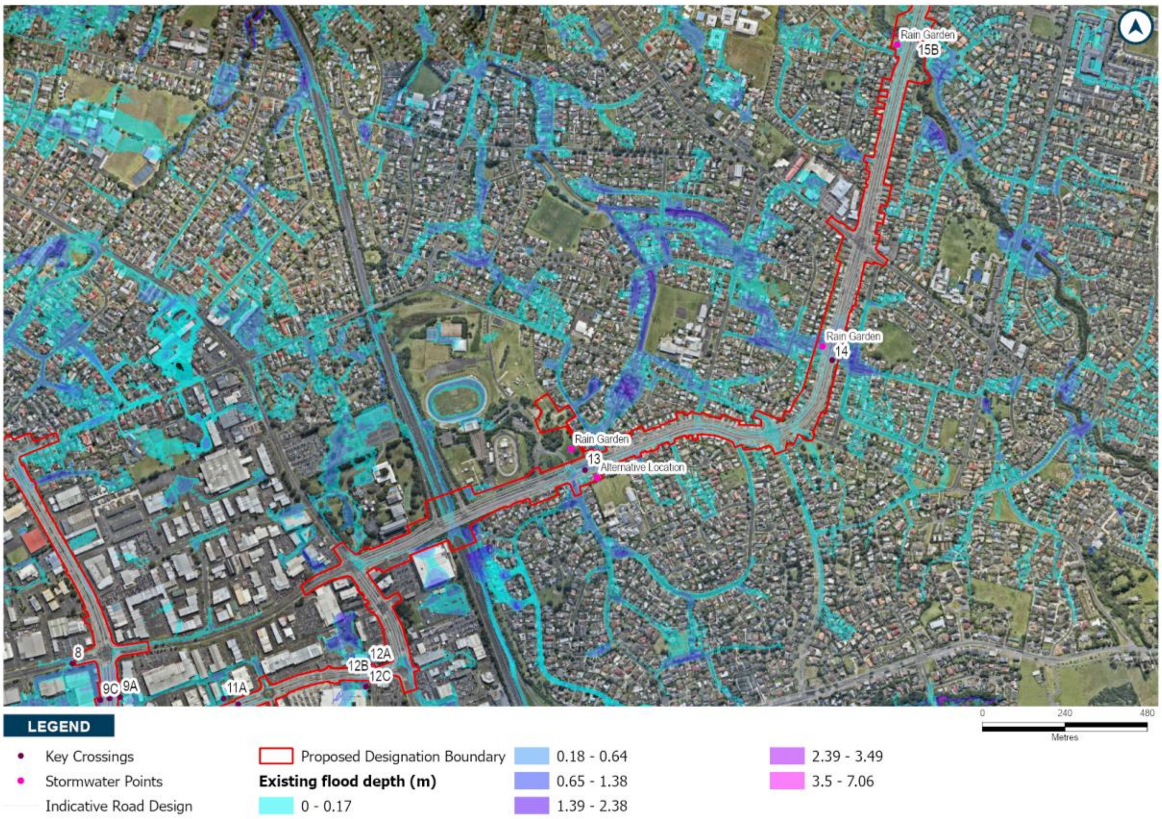


Figure 12: 100 year event for the proposed NoR 2 corridor (Ōtara Creek / Flat Bush catchment)

The existing flood model has been reviewed and specific locations of interest have been assessed below.

At Locations 13 and 14 the flood risk rating is low or negligible (see Table 10) and no further assessment of these locations has been undertaken. Locations where the flood risk is moderate or high are discussed in more detail below.

Table 10: NoR 2 (Ōtara Creek / Flat Bush Catchment) existing flood levels at key locations

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	100 Year flood level (RL) pre-development	Existing flood risk rating
1 Ronwood Avenue (Point 12A)	Site lvl RL 26.64 m	Commercial building / driveway	27.30 m	High risk Flood depth 0.65 m

Ronwood Avenue near Great South Road (Point 12B)	Road lvl RL 26.79 m	Road corridor	27.30 m	High risk Flood depth 0.51 m
Manukau Westfield near Ronwood Avenue (Point 12C)	Site lvl RL 27.04 m	Carpark	27.30 m	Moderate risk Flood depth 0.26 m
Te Irirangi Drive near Diorella Drive Road (Point 13)	Road lvl RL 28.44 m	Road corridor	28.46 m	Low risk Flood depth 0.11 m
Te Irirangi Drive near Boundary Road (Point 14)	Road lvl RL 17.58 m	Road corridor	29.93 m	Negligible risk Flood depth 0.03 m

At Location 12 the existing flood risk rating has identified a high flood risk. The flood depth is up to 0.65 m to the north of Ronwood Avenue where flooding is confined to the carpark area and up to 0.51 m on the road centreline. It is recommended that further investigation into the effects on adjacent buildings to the south at 655 Great South Road is required.

It is also recommended that a new overland flow path parallel to Ronwood Avenue running down to Hayman Park is considered at the detailed design stage. This overland flow path could be combined with the berm or walking and cycling facility on the south side of the corridor. If this is not feasible, it is recommended that the vertical alignment on Ronwood Avenue near Leyton Way is not raised to avoid exacerbating flooding upstream.

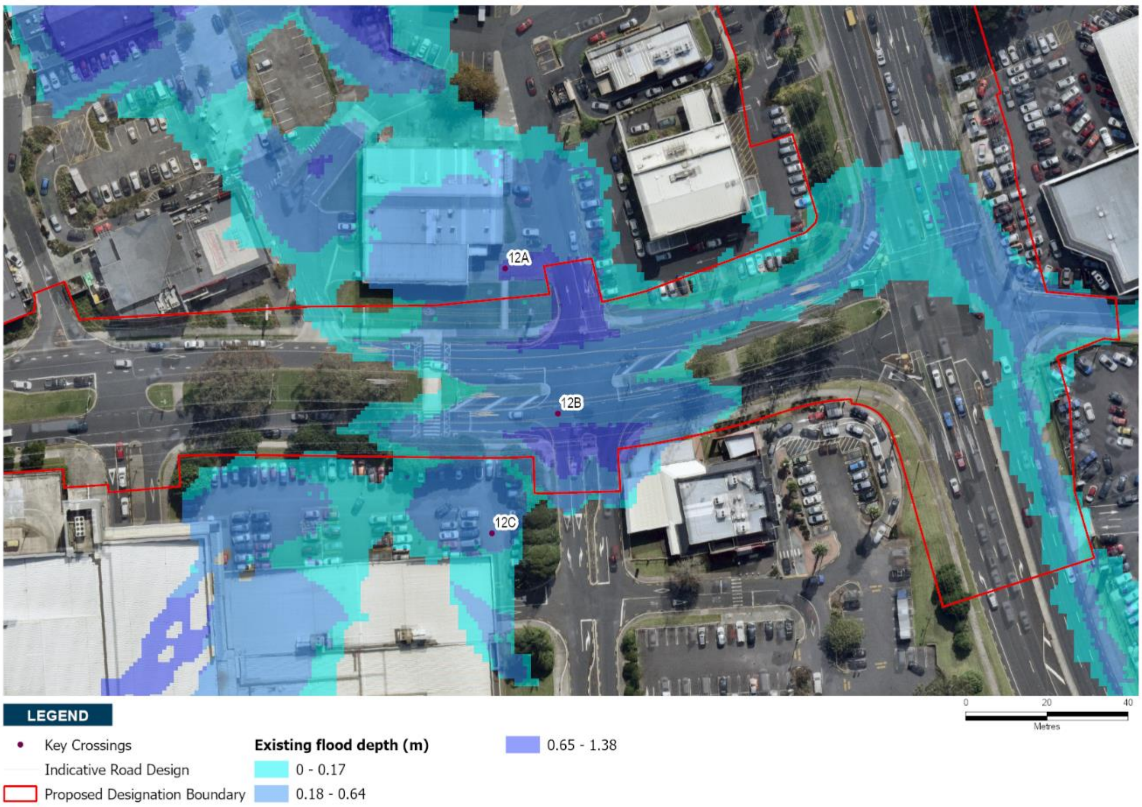


Figure 13: 100 year ARI event for the proposed NoR 2 corridor at Location 12

6.3.2 Puhinui catchment

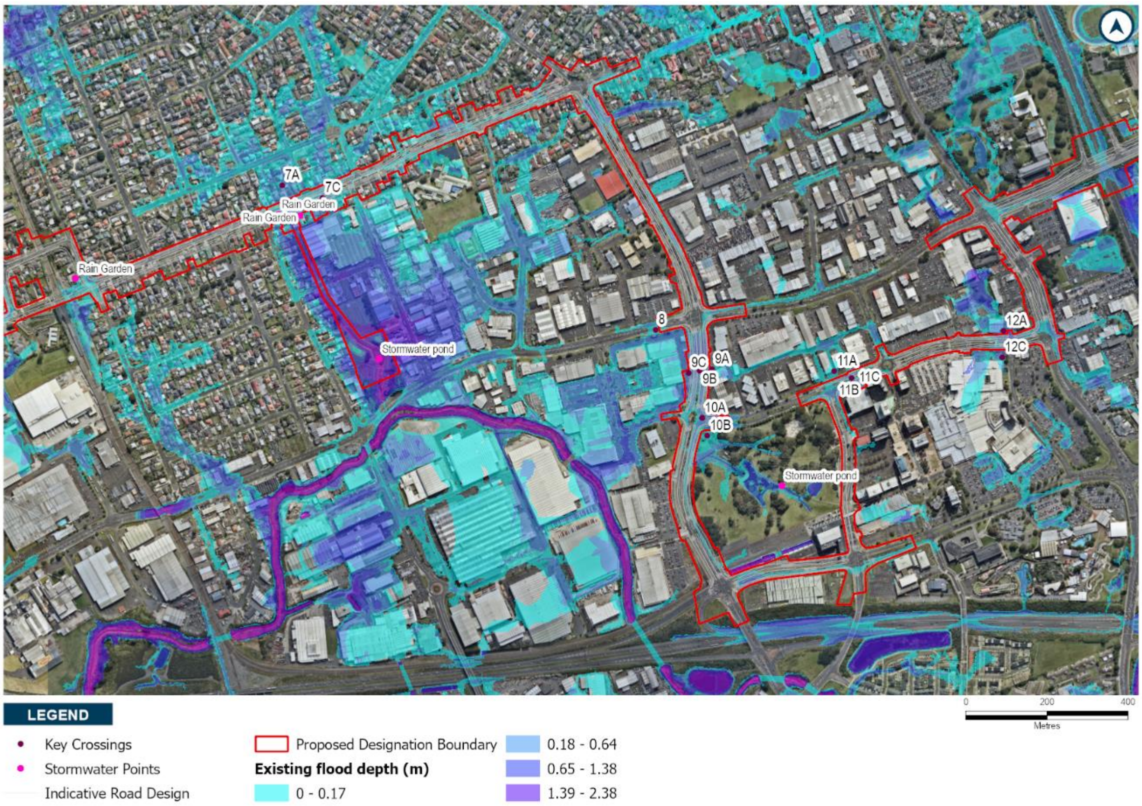


Figure 14: 100 year event for the proposed NoR 2 corridor (Puhinui catchment)

At Point 8 the maximum flood depth is 0.09 m and the risk rating is considered low (see Table 11) this location has not been considered further. For those locations where the flood risk is moderate or high are discussed in more detail below.

Table 11: NoR 2 (Puhinui Catchment) existing flood levels at key locations

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	100 Year flood level (RL) pre-development	Existing flood risk rating
135A Puhinui Road (Point 7A)	Site lvl RL 17.69 m	Building / house driveway	17.76 m	Low risk Flood depth 0.07 m
Puhinui Road near Bledisloe Street (Point 7B)	600 mm dia. pipe network Road lvl RL 17.58 m	Road corridor	17.68 m	Low risk Flood depth 0.11 m
142 Puhinui Road (Point 7C)	Site lvl RL 17.44 m	Building / house driveway	17.64 m	High risk Flood depth 0.20 m
Cavendish Drive near Lambie Drive (Point 8)	Site lvl RL 19.68 m	Road corridor	19.77 m	Low risk Flood depth 0.09 m
42 Lambie Drive (Point 9A)	Site lvl RL 19.56 m	Carpark	19.58 m	Negligible risk Flood depth 0.02 m

Lambie Drive near Cavendish Drive (Point 9B)	Road lvl RL 18.68 m	Road corridor	19.01 m	Moderate risk Flood depth 0.33 m
Cnr Lambie Drive and Cavendish Drive (Point 9C)	Cnr Lambie Drive and Cavendish Drive Road lvl RL 18.04 m	Carpark	18.69 m	High risk Flood depth 0.65 m
Lambie Drive Ronwood Avenue Intersection (Point 10A)	Road RL 19.17 m	Road corridor	19.57 m	Moderate risk Flood depth 0.40 m
Hayman Park Near Lambie Drive carpark (Point 10B)	Site lvl RL 19.76 m	Open space / park	19.84 m	Low risk Flood depth 0.09 m
11 Ronwood Avenue (Point 11A)	Site lvl RL 24.06 m	Commercial building / carpark	24.08 m	Negligible risk Flood depth 0.02 m
Ronwood Avenue near Davie Avenue (Point 11B)	Road lvl RL 24.36 m	Road corridor	24.37 m	Negligible risk Flood depth 0.00 m
2 Davies Avenue (Point 11C)	Site lvl RL 24.24 m	Carpark	24.45 m	Moderate risk Flood depth 0.21 m

6.3.2.1 Puhinui Road

At Location 7 the residential development downstream (Point 7C) has a flood depth between 0.15 m to 0.5 m and therefore is considered to have a high-risk rating with respect to flood effects. At Location 7 the catchment drains by means of an underground pipe network into the Puhinui domain and discharges under Cavendish Drive into Puhinui Creek. The drainage network has 600 to 1500 mm diameter pipes which has been duplicated with 900 mm diameter pipes beneath the upstream extent of flooding.

Raising the vertical alignment of the existing road would affect a significant number of houses (approximately 200 houses) upstream and therefore the current road crest level should not be raised. The downstream flooding covers a wide area with a relatively flat hydraulic gradient. Further mitigation could entail temporary flood management options (such as temporary road diversions) during large flood events.

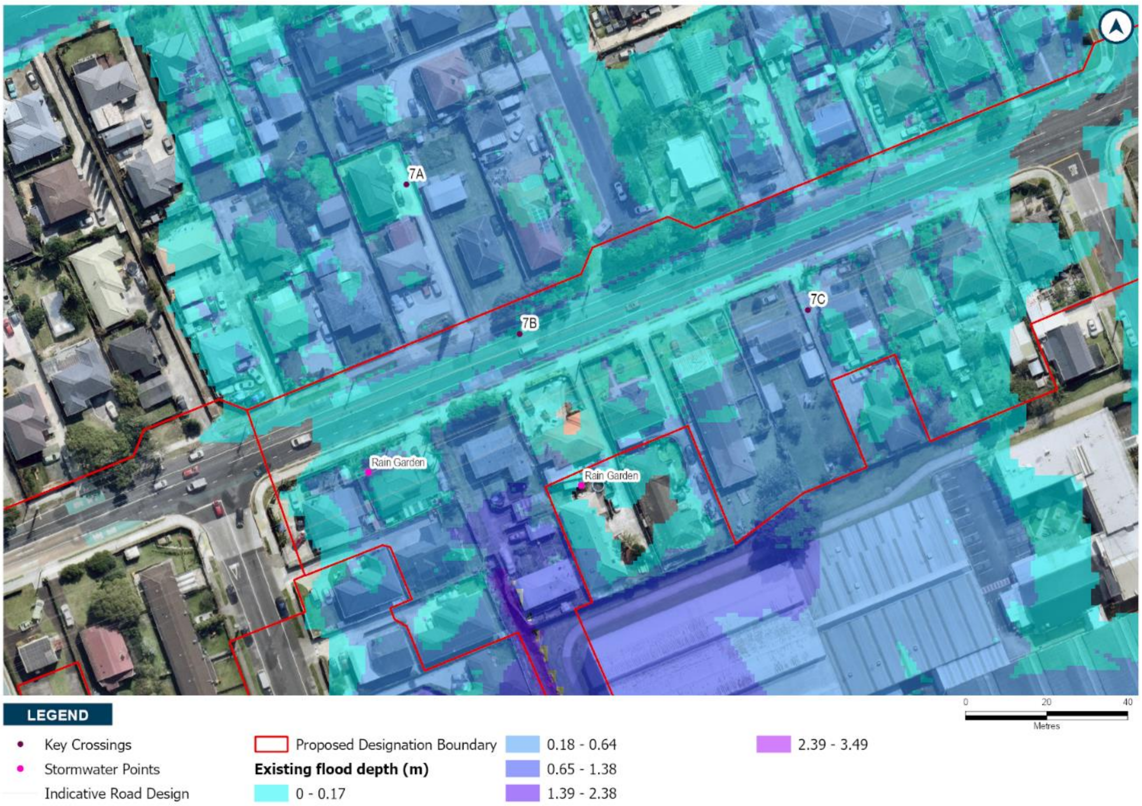


Figure 15: 100 year ARI event for the proposed NoR 2 corridor at Location 7

6.3.2.2 Lambie Drive

The road overtops at Point 9B with flood levels 0.33 m above existing road level for the 100 year ARI event. Upstream of this crossing the flood risk is negligible (Point 9A) at 0.02 m flood depth. However downstream of this crossing (Point 9C), flooding is controlled by downstream constrictions and a large area of deeper flooding forms on the west side of Lambie Drive. The flood depth is considered a high flood risk with flood depths up to 0.65 m predicted in the 100 year ARI.

Operational management options (such as warning signage or temporary closures) could be considered to reduce the exposure of pedestrians and cyclists along the proposed walking and cycling facilities.

At Points 10A and 10B water enters the road from Hayman Park. Raising the intersection so that water is contained within the park could reduce the hazard.

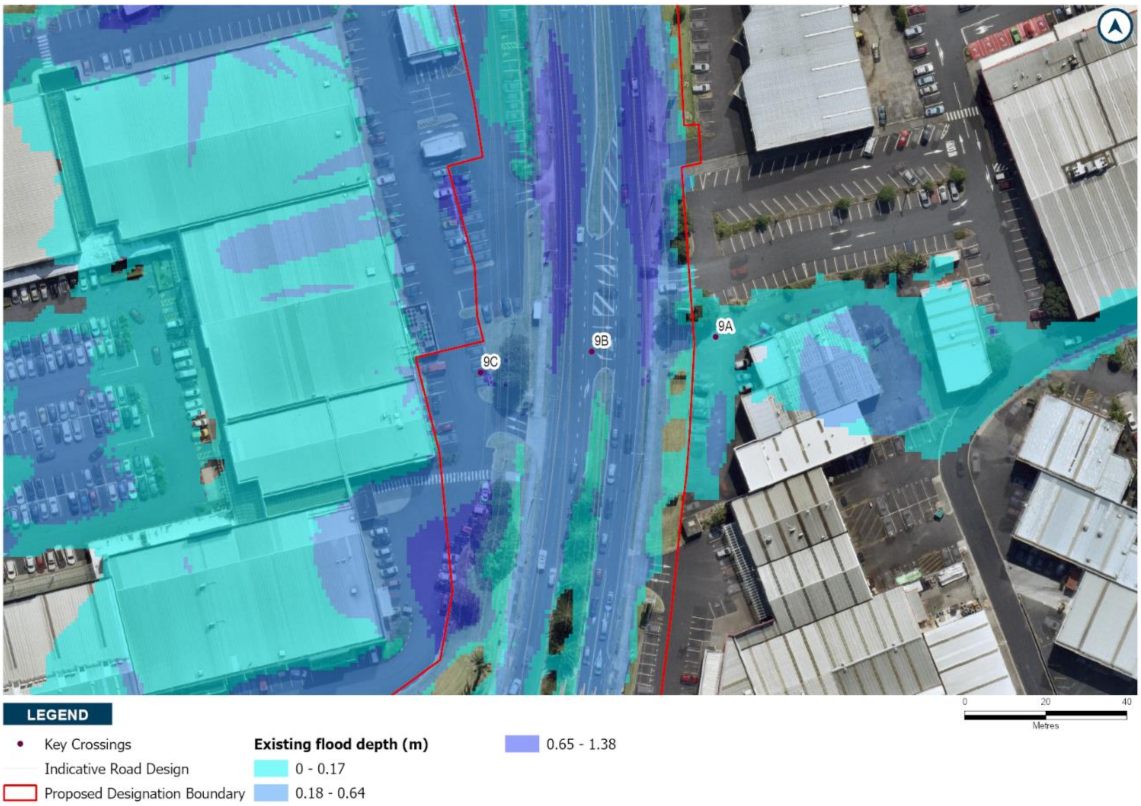


Figure 16 100 year ARI event for the proposed NoR 2 corridor at Location 9

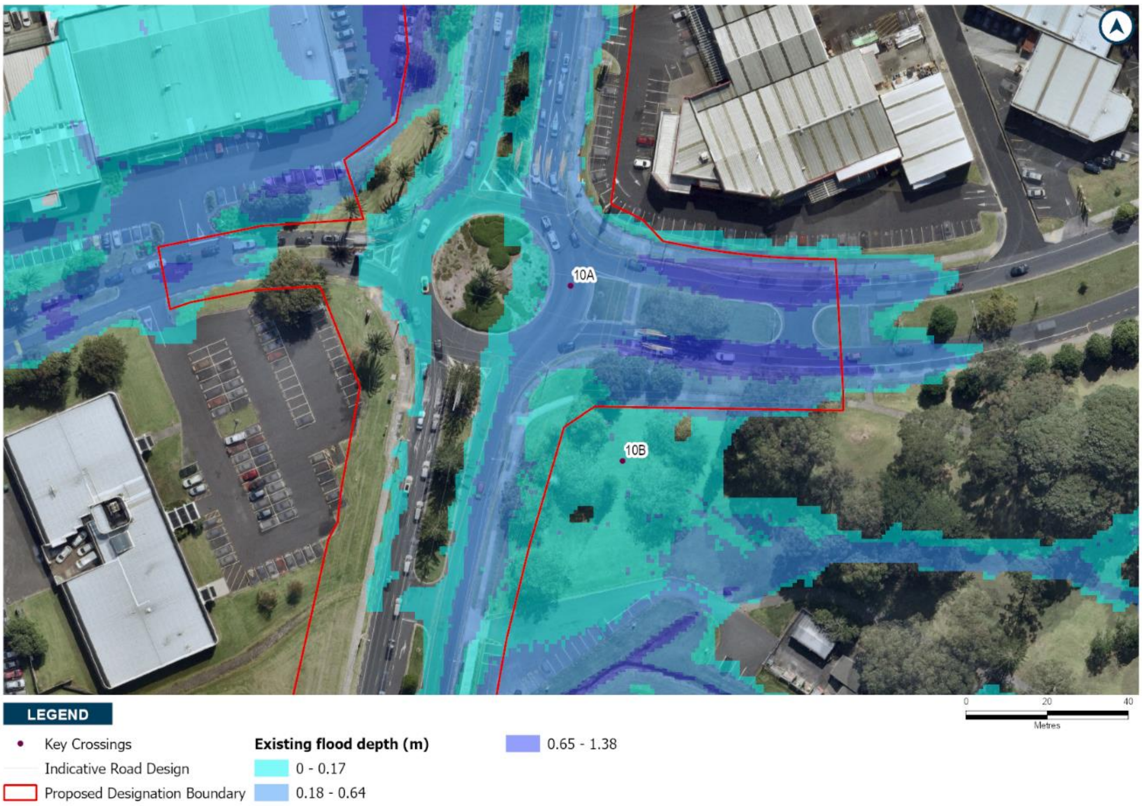


Figure 17: 100 year ARI event for the proposed NoR 2 corridor at Location 10

6.3.2.3 Ronwood Avenue

At Location 11, the vertical alignment of the Davies Avenue / Ronwood Avenue intersection cause water to pond on the south-east side of the road. Recommended mitigation includes reducing the level of Davies Avenue to allow overland flow to discharge into Hayman Park and minimise ponding.

Figure 18: 100 year ARI event for the proposed NoR 2 corridor at Location 11

6.4 Recommended measures to avoid, remedy or mitigate operational effects

There is an existing high flood risk at Ronwood Avenue near Great South Road (Point 12B). Potential mitigation options at this location include:

- A new overland flow path parallel to Ronwood Avenue running down to Hayman Park is investigated at detailed design;
- Not raising the road crest of the new alignment on Ronwood Avenue near Leyton Way; and
- Using a berm or walking and cycling facilities on the south side of the corridor as an overland flow path to reduce flood risk.

There is a high flood risk identified at the corner of Lambie Drive and Cavendish Drive (Point 9C), where there is flood plain and flood prone land. Potential mitigation options at this location include:

- Increasing the vertical alignment at the corner of Lambie Drive and Cavendish Drive provided that upstream flood risk is not increased; and
- Investigating temporary road diversions or safe alternative routes during a flood event.

At the Lambie Drive / Ronwood Avenue Intersection (Point 10A) there is a moderate existing flood risk rating. Potential mitigation options at this location include:

- Raising the intersection to contain flood water in Hayman Park.

There is also an existing high flood risk identified at Davies Avenue / Ronwood Avenue intersection (Point 11C). Potential mitigation options at this location include:

- Reducing the level of Davies Avenue to direct overland flow to Hayman Park.

At Ronwood Avenue near Leyton Way, potential mitigation for an existing high flood risk affecting the road corridor and some commercial development includes:

- Keeping the current vertical alignment; and
- Providing additional piped drainage, greater inlet capacity or creating an overland flow path parallel to the road.

There is an existing high flood risk identified at Puhinui Road, where there is flood plain and flood prone land. At this location mitigation options are limited due to development either side of the proposed designation. Potential mitigation options at this location includes:

- Keeping the current vertical alignment along Puhinui Road; and
- Investigating temporary road diversions or safe alternative routes during a flood event.

It is recommended that the outcomes identified in Section 4.5 apply as a proposed condition on this NoR.

7 Airport to Botany Bus Rapid Transit – NoR 3

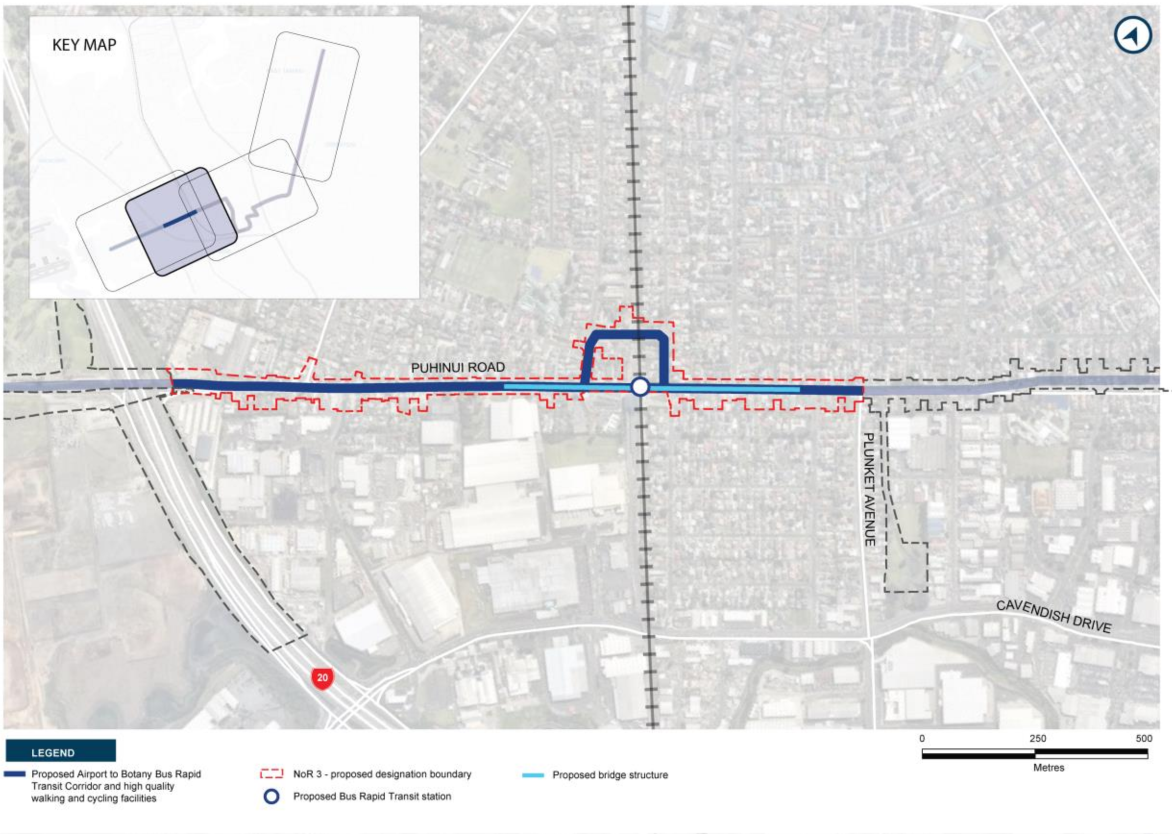
This section assesses specific flood matters relating to NoR 3, the Project corridor between Puhinui Station, in the vicinity of Plunket Avenue and the SH20/20B Interchange.

7.1 Project features and proposed works

As set out in Table 12 below, the proposed works in NoR 3 include the widening of the existing Puhinui Road to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities.

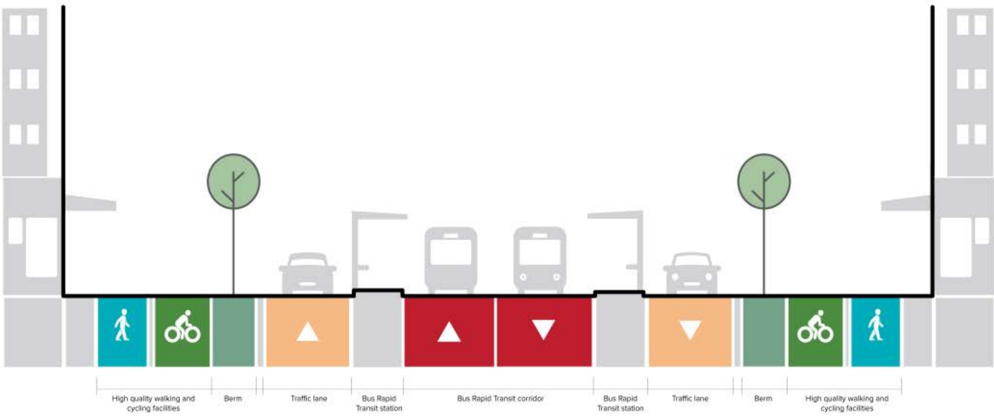
Table 12: Overview of NoR 3

NoR 3 – Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange



Key features	
BRT Corridor	Centre-running along Puhinui Road connecting to the Puhinui Station concourse via a new BRT bridge structure
BRT Stations	Puhinui Station
Walking and cycling facilities	• Walking and cycling facilities on both sides of the corridor; and • Walking and cycling facilities will be provided along Cambridge Terrace, Bridge Street and Kenderdine Road.

General traffic	One lane in each direction on Puhinui Road
Access	Limited right turn access
Speed environment	50km/h
Signalised intersections	• Puhinui Road and Noel Burnside Road; and • Puhinui Road and Wyllie Road.
Stormwater infrastructure	Wetland
NoR 3 typical cross section	



The widening of the proposed Project corridor is predominantly to the south of Puhinui Road. Proposed stormwater treatment devices in NoR 3 include:

- Rain gardens on Puhinui Road, Cambridge Street, Noel Burnside Road (East), Noel Burnside Road (West).

In addition to installing the rain garden, works will be required to isolate the Project corridor catchment from the existing stormwater network catchment to this point.

7.1.1 Stormwater catchment overview

NoR 3 is within the Puhinui Creek catchment (see Section 3.5.2 for more detail). Along NoR 3 the corridor crosses three major overland flow paths by means of an underground pipe network. Existing flood plain and flood prone areas are present on both sides of the road.

7.1.2 Catchment characteristics

NoR 3 is predominantly zoned under the AUP:OP as Business - Light Industry Zone, Residential – Mixed Housing Suburban Zone, Open Space – Sport and Recreation Zone and Open Space – Community Zone. In terms of land use the area contains a mixture of open space and established residential development dominated by single dwellings alongside industrial land use to the east of SH1. Adjacent to NoR 3, the urban form is mainly residential development described above.

Puhinui Stream is a heavily modified stream in places. The stream generally flows west towards Manukau Harbour.

An existing stormwater management asset is located in this section of the corridor in the Puhinui Creek catchment which is a stormwater pond located in Aerovista Place Reserve.

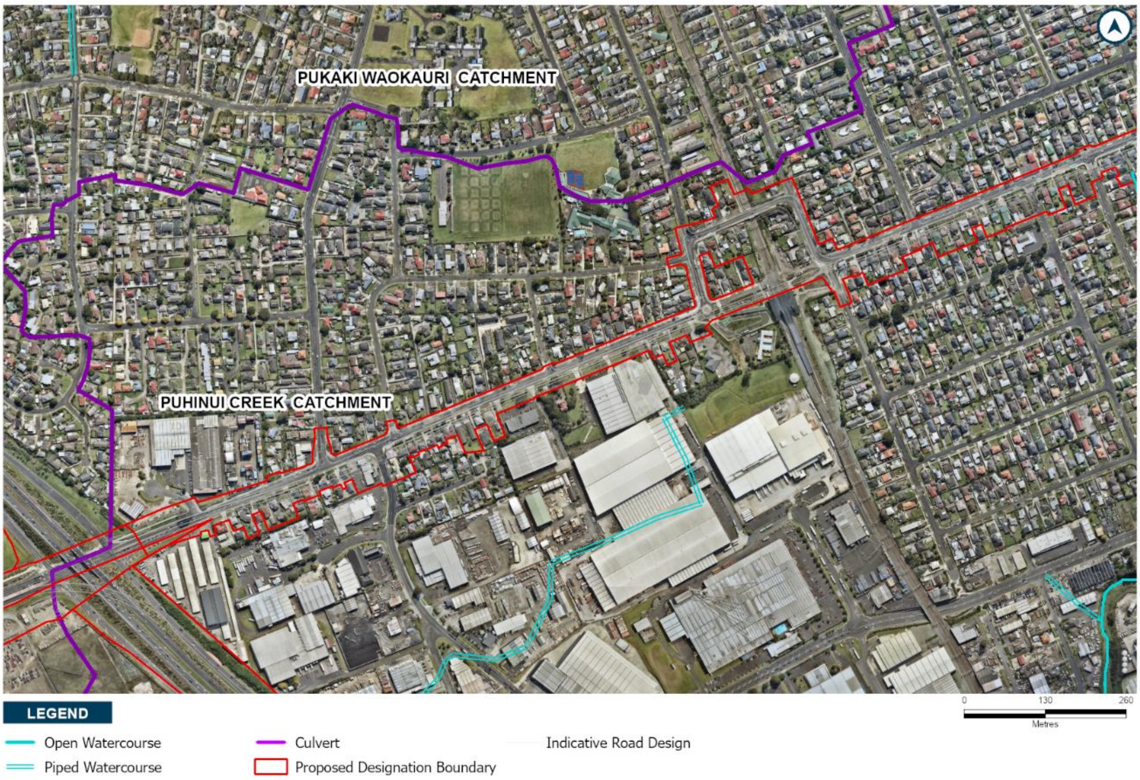


Figure 19: NoR 3 corridor in the context of Puhinui Creek catchment

7.2 Assessment of construction effects and recommended measures to manage effects

Potential flooding effects during construction across the Project have been described in Section 4.2 above. Stream crossings are key sites for potential flooding effects during construction, NoR 3 includes the following stream crossing:

- 1500 mm diameter culvert at 152 Puhinui Road.

A 300 m stretch of Puhinui Road and the proposed upgraded stormwater pond at Puhinui Domain are located within flood plain and overland flow path.

As set out in Section 4.3, the potential flooding effects during construction, including where works are within the floodplain it will be managed through flood risk mitigation measures set out in the CEMP for existing high flood hazard areas.

7.3 Assessment of operational effects

This assessment of effects refers to the 100 year flood model results for the pre-development (existing) terrain and considers the flooding extents at the existing culvert crossing and significant areas alongside the existing road. The flood effects identified in NoR 3 already exist. As there are no significant changes to the vertical alignment, these effects are generally unchanged.

Within NoR 3 the increase in impervious area is expected to be:

- Approximately 10% to 15% within the residential areas of the Puhinui catchment.

The corridor is in the upper third of the catchment, indicating that flood attenuation may be required. The corridor runoff will be treated by a combination of existing ponds and proposed raingardens.

Between Lambie Drive and the Puhinui Station the corridor is 1.4 km long, with 0.5 km of this below the existing 100 year flood level. Raingardens are proposed in selected locations for treatment to enhance the downstream channel into, and the area around the Puhinui Domain pond. The Puhinui Domain pond is already designed to provide some attenuation in smaller events. As additional storage cannot take up existing storage within the floodplain, if further attenuation is required, the proposed designation boundary provides sufficient space to accommodate this alongside the corridor adjacent to the flood plain (likely at 166 to 176 Puhinui Road).

Between the Puhinui Station and SH20 the corridor is 1.0 km long, with existing 100 year flooding at the intersection with Noel Burnside Place. There is an existing treatment device downstream which is proposed to be used for treatment. The network carrying the flow to the existing pond will be affected by the flooding. If required, there is sufficient space within the designation boundary for flow attenuation adjacent to the corridor at 266 Puhinui Road and 302 to 306 Puhinui Road.

Figure 20: 100 year event for the proposed NoR 3 Corridor

The existing flood model has been reviewed and specific locations of interest have been addressed below.

At Location 6 the flood risk rating is low (see Table 13) which is likely a result of undersized drainage system size (currently 450 mm diameter maximum). Recommended mitigation includes increasing the pipe sizes to reduce the risk of flooding.

Locations where the flood risk is moderate has been discussed in more detail below.

Table 13: Puhinui Section (NoR 3) existing flood levels at key locations

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	100 Year flood level (RL) pre-development	Existing flood risk rating
North of Puhinui Road near Noel Burnside Road (Point 5A)	277 Puhinui Road Site lvl RL 15.34 m	Building / house driveway	15.92 m	High risk Flood depth 0.58 m
Puhinui Road near Noel Burnside Road (Point 5B)	Puhinui Road 600 mm dia. pipe network Road lvl RL 15.54 m	Road corridor	15.92 m	High risk Flood depth 0.38 m
South of Puhinui Road near Noel Burnside Road (Point 5C)	Noel Burnside Road Road lvl RL 15.38 m	Road corridor	15.90 m	High risk Flood depth 0.52 m
Puhinui Road near Kenderdine Road (Point 6)	Puhinui Road Road lvl RL 17.79 m	Road corridor	17.95 m	Low risk Flood depth 0.15 m

7.3.1 Puhinui Road

At Puhinui Road near Noel Burnside Road (Location 5) the flow overtops the road at Point 5B with 0.38 m above existing road level for the 100 year ARI flood event. This results in a high flood risk rating.

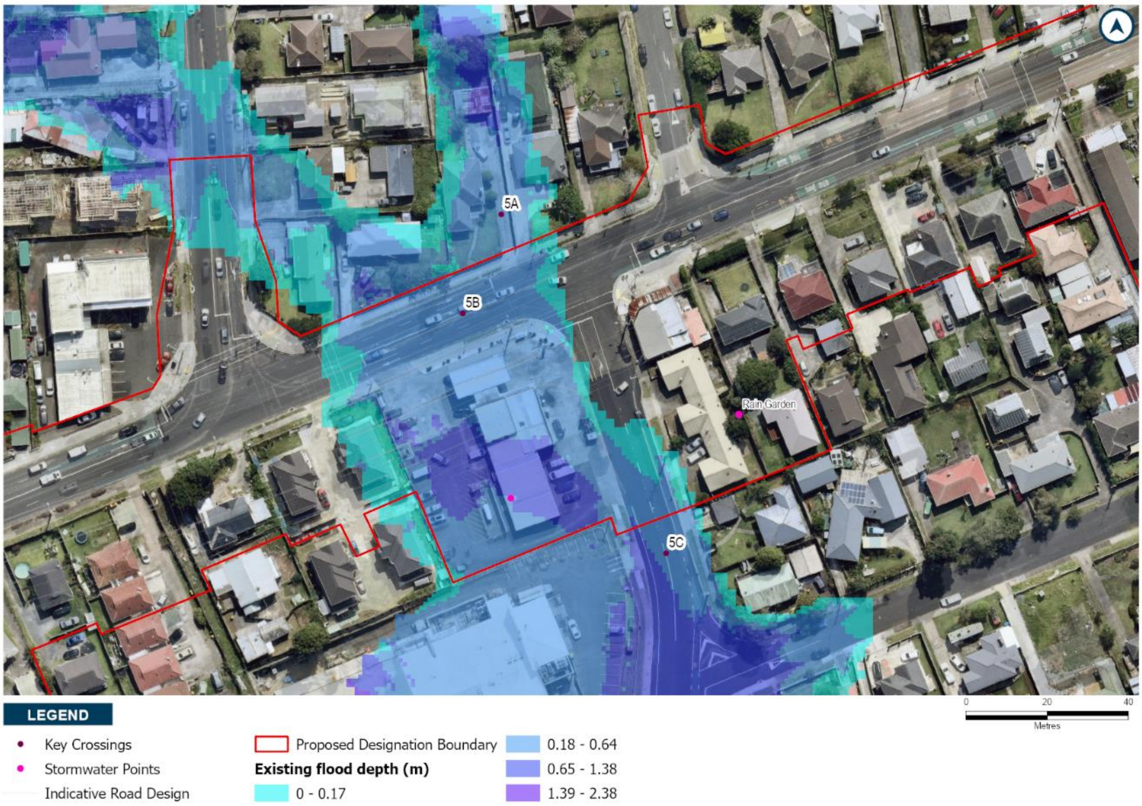


Figure 21: 100 year ARI event for the proposed NoR 3 corridor at Location 5

The existing flood issue at Location 5 includes residential and commercial development located within the flood plain. The flood modelling has found that at Point 5A there is predicted to be flood depths of up to 0.58 m in the 100 year ARI event which results in a high flood risk rating. At Point 5C there is predicted flood depths of 0.52 m on Noel Burnside Road in the 100 year ARI event which results in a high flood risk rating. Mitigation at this location is constrained by development either side of the proposed designation (see Section 7.4).

An initial desktop review has identified that floor levels appear to be approximately 0.6 – 0.7 m above ground level which indicates that insufficient freeboard is available. Raising the road would likely exacerbate the flood effects and it is recommended that the vertical alignment of the existing road is not changed. However, given the depth of the existing flooding, the road would also be impassable to most vehicles during a flood. As such, it is recommended that further investigation into temporary road diversions during a flood event should be undertaken.

7.4 Recommended measures to avoid, remedy or mitigate operational effects

A high existing flood risk is identified at Puhinui Road near Noel Burnside Road (Point 5C). Mitigation options at this location are limited due to development on either side of the proposed designation. Potential mitigation options at this location include:

- Keeping the current vertical alignment along Puhinui Road; and
- Investigating temporary road diversions or safe alternative routes during a flood event.

At Puhinui Road near Kenderdine Road (Point 6), the flood risk should not be exacerbated, potential mitigation at this location is to:

- Provide additional or upsized piped drainage and/or greater inlet capacity to reduce the risk of flooding.

It is recommended that the outcomes identified in Section 4.5 apply as a proposed condition on this NoR.

8 Airport to Botany Bus Rapid Transit – NoRs 4a and 4b

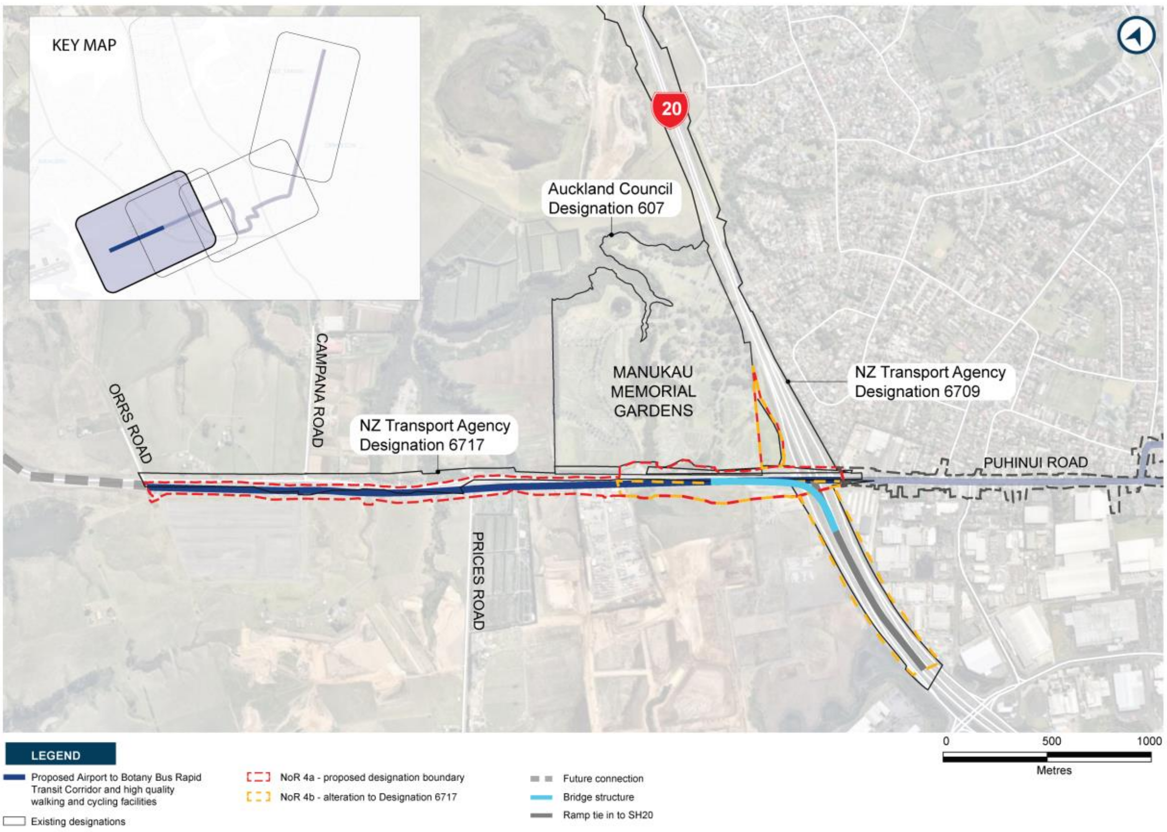
This section assesses specific flood matters relating to NoRs 4a and NoR 4b, the Project corridor between the SH20/20B Interchange and Orrs Road.

8.1 Project features and proposed works

As set out in Table 14 below, the proposed works in NoRs 4a and 4b include the widening of SH20B to accommodate a centre-running BRT corridor until the Manukau Memorial Gardens. From this point, the BRT corridor shifts south of SH20B until Orrs Road. Proposed works also include high quality walking and cycling facilities, eastbound lanes to Auckland Airport and a ramp from SH20B onto SH20 for southbound traffic.

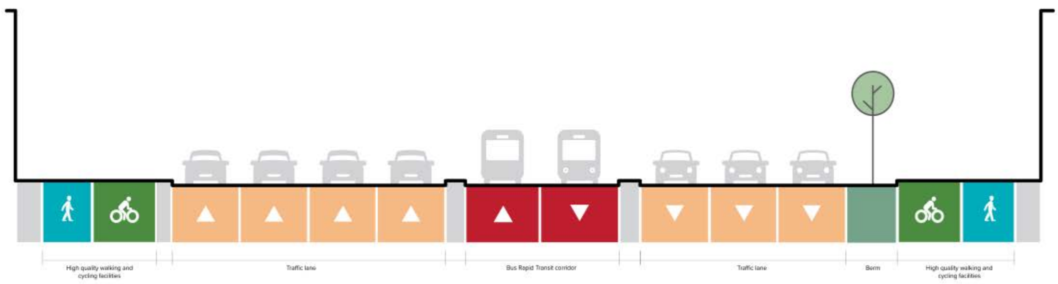
There is an existing swale between the existing SH20B traffic lanes and the proposed BRT corridor and walking and cycling facilities. Linear treatment is proposed near the SH20/20B Interchange (in the NoR 3 area) and a piped connection would need to be provided.

Table 14: Overview of NoR 4a and 4b

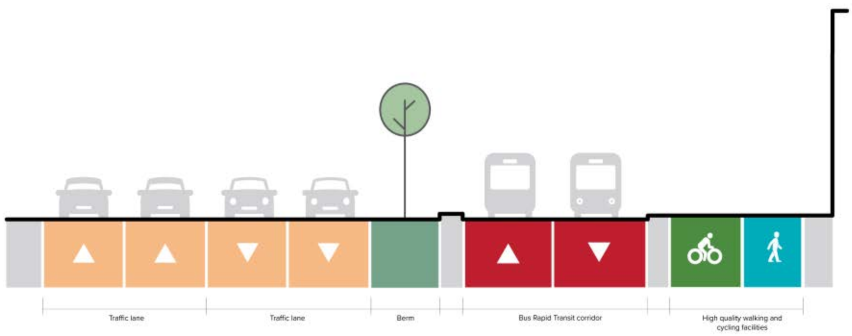
NoRs 4a and 4b – SH20/20B Interchange to Orrs Road

Key features

BRT Corridor	• Centre-running on Puhinui Road through to the Manukau Memorial Gardens intersection (approx. 600 m west of SH20/20B Interchange); and • South running to Orrs Road.
Walking and cycling facilities	Walking and cycling facilities on southern side of the corridor
General traffic	• Two lanes in each direction; and • New southbound ramp from SH20B onto SH20.
Access	• Limited access; and • Access maintained via signals at Manukau Memorial Gardens and Campana Road.
Speed environment	60km/h
Signalised intersections	• SH20/SH20B Interchange; • Puhinui Road and Manukau Memorial Gardens; and • Puhinui Road and Campana Road.
Stormwater infrastructure	Swales

NoR 4b typical cross section



NoR 4a typical cross section



8.1.1 Stormwater catchment overview

NoRs 4a and 4b are within the Pūkaki Waokauri Creek catchment (see Section 3.5.2 for more detail). This section crosses three unnamed permanent streams by means of a bridge and two major culverts (see Table 15 for details).

8.1.2 Catchment characteristics

NoRs 4a and 4b are zoned under the AUP:OP as Future Urban Zone, Business – Light Industry Zone and Special Purpose – Cemetery Zone. The Manukau Memorial Gardens is within the NoRs 4a and 4b areas as well as some areas of residential and commercial land use on the eastern and western sides.

Currently stormwater runoff from SH20B is collected by either swales or catchpits and conveyed to outfalls via stormwater management devices. The swales and stormwater devices are within the existing NZ Transport Agency Designation 6717. All stormwater runoff from the existing carriageway is treated prior to discharging to the receiving environment.

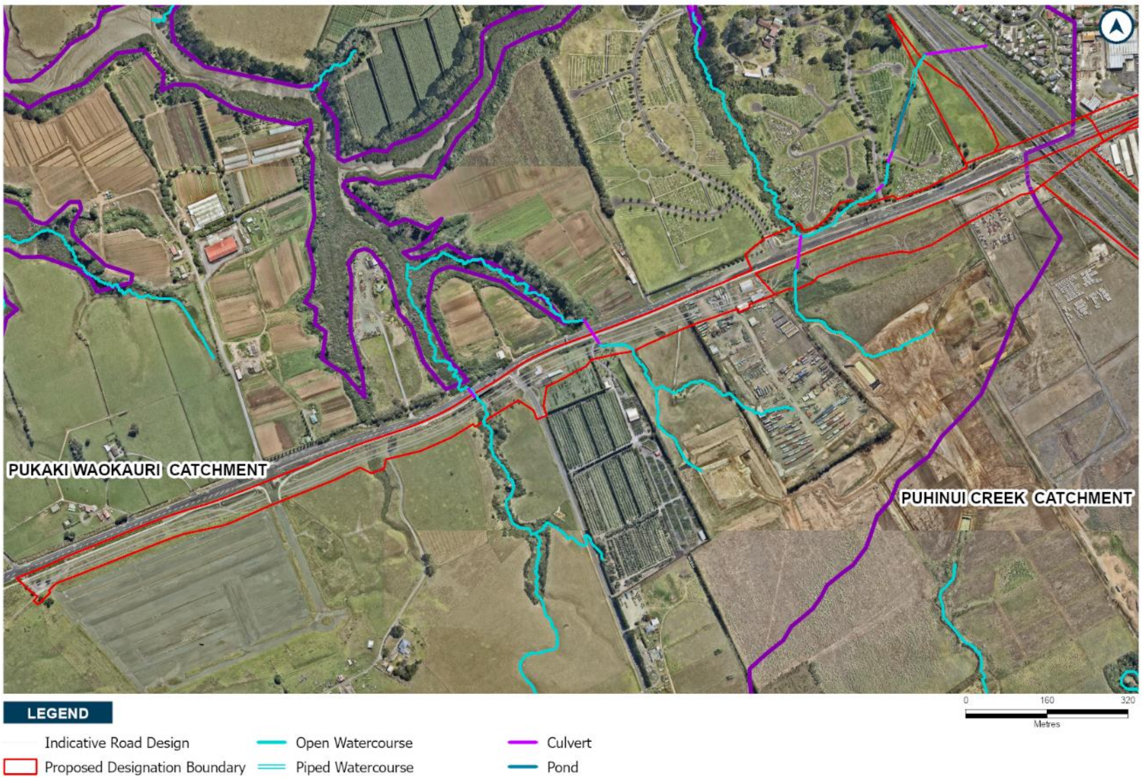


Figure 22: NoRs 4a and 4b in the context of the Pūkaki Waokauri Creek catchment

8.2 Assessment of construction effects and recommended measures to manage effects

Potential flooding effects during construction across the Project have been described in Section 4.2 above. Stream crossings are key sites for potential flooding effects during construction, NoRs 4a and 4b include the following stream crossings:

- Culvert crossing Puhinui Road near Manukau Memorial Gardens;
- Culvert crossing at 436 Puhinui Road; and

- Bridge duplication near Prices Road.

As set out in Section 4.3, the potential flooding effects during construction, including those associated with stream crossings will be managed through flood risk mitigation measures captured in the CEMP for existing high flood hazard areas.

8.3 Assessment of operational effects

This assessment of effects refers to the 100 year flood model results for the pre-development (existing) terrain and considers the flooding extents at the existing culvert / stream crossings. The flood effects identified in NoRs 4a and 4b are existing. This section of the corridor includes proposed widening to the south of SH20B which includes extending existing culverts and a bridge duplicated. While there may be changes to the vertical alignment, there is significant freeboard as existing flood levels downstream are several metres below the road levels. There may be an increase in culvert headwaters, however this can be managed by upsizing or duplicating culverts. No changes to existing flood levels are therefore expected.

The increase in impervious area is expected to be approximately 15% to 20%.

The corridor is close to the coast with no known habitable floors close to the stream crossings, indicating that flood attenuation is not required.

The corridor runoff is proposed to be treated by vegetated swales.

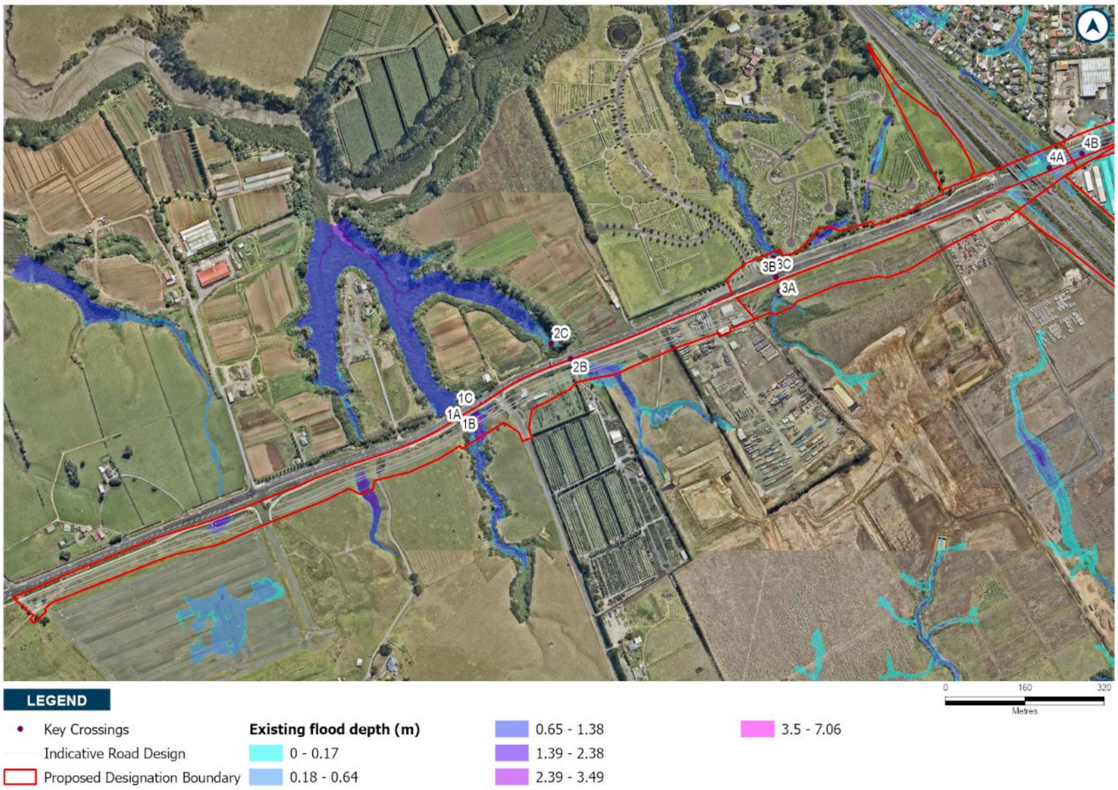


Figure 23: 100 year ARI event for the proposed NoR 4a and b corridor (Pūkaki Waokauri Creek Catchment)

The flood levels at the three major crossings identified above are below the road level and the road does not overtop. There is considered to be a negligible risk of flooding. At key crossings (bridge and culverts) adequate freeboard allowance is provided in accordance with NZTA Bridge Manual requirements.

At Locations 1, 2 and 3 the flood risk rating is negligible (see Table 15) and no further assessment has been undertaken. Locations where the flood risk is moderate has been discussed in more detail below.

Table 15: SH20B (NoRs 4a and 4b) existing flood levels at key locations

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	100 Year flood level (RL) pre-development	Existing flood risk rating
Waokauri Creek tributary crossing 1 (Points 1A and 1C) 2	Waokauri Creek Bridge Road lvl RL 9.28 m	Road corridor	2.76 m Upstream 2.54 m Downstream	Negligible risk Road does not overtop Adequate freeboard
Waokauri Creek tributary crossing 2 (Points 2A and 2C)	Culvert size unknown Road lvl RL 10.78 m	Road corridor	9.32 m Upstream 2.71 m Downstream	Negligible risk Road does not overtop Adequate freeboard
Waokauri Creek tributary crossing 3 (Points 3A and 3C)	Culvert size unknown Road lvl RL 16.06 m	Road corridor	Flood level: 12.17 m Upstream 9.55 m Downstream	Negligible risk Road does not overtop Adequate freeboard
SH20B/20 intersection 4A	Road lvl RL 19.71 m	Road corridor	19.86 m	Moderate risk Flood depth 0.16 m
East of SH20B/20 intersection 4B	Road lvl RL 19.61 m	Road corridor	19.85 m	Moderate risk Flood depth 0.24 m

8.3.1 SH20/20B Interchange

Near the SH20/20B Interchange (Points 4A and 4B) there is an existing moderate flood risk identified. The flood effect is likely to be related to the grading of the intersection and it is recommended that further consideration is given to identify the most appropriate way to effectively drain the road and prevent ponding at the detailed design stage.

[2] A to C: A is upstream water level, B is the existing road level, C is downstream water level

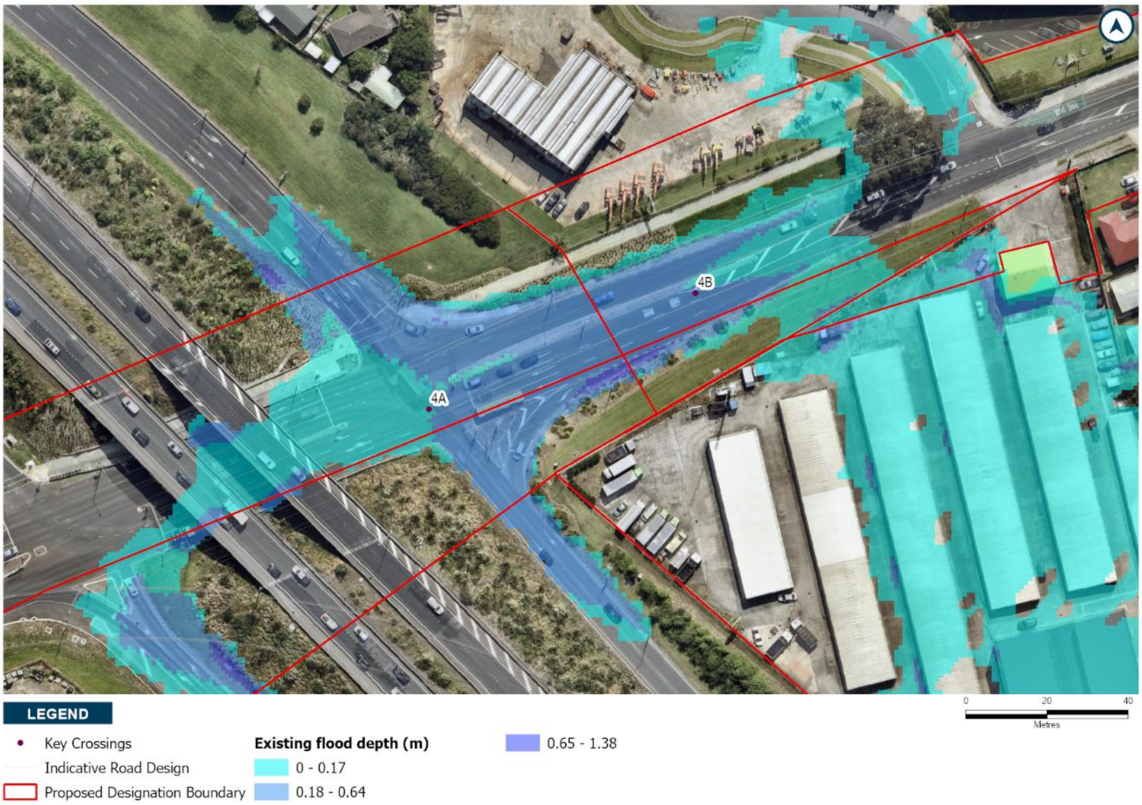


Figure 24: 100 year ARI event for the proposed NoRs 4a and 4b corridor at Location 4

8.4 Recommended measures to avoid, remedy or mitigate operational effects

Between Vision Place and the SH20/20B Interchange there is an existing moderate flood risk, proposed mitigation at this location includes:

- Keeping the current vertical alignment; and
- Providing additional piped drainage, greater inlet capacity or creating an overland flow path along the south side of the road.

It is recommended that the outcomes identified in Section 4.5 apply as a proposed condition on this NoR.

9 Sensitivity analysis

Sensitivity is the degree to which a system is affected, adversely or beneficially, by a given variance in a parameter. In this instance the sensitivity of road infrastructure to increased rainfall as a result of climate change has been considered.

As set out in Section 3.5 the flood model has allowed for two scenarios which involves two different climate change requirements. Results for a more severe climate change based on 3.8 degrees of warming have been compared to the result for 2.1 degrees of warming under the current Auckland Council Code of Practice.

In the future it is possible that there may be different requirements or additional RCPs which would need to be considered. However, at the time of writing this assessment, the sensitivity analysis has been prepared to understand the risk of climate change at the respective major crossings across the Project corridor.

9.1 NoR 1: Te Irirangi Drive section

The sensitivity analysis at the locations where a flood risk has been identified are shown in Table 16. The sensitivity analysis found that at point 18A there was >0.15 m increase in flood height under a more severe climate change scenario. This location is considered sensitive to climate change and additional consideration should be given to effects during higher rainfall events during the detailed design stage.

At point 20 there was also an increase in flood height, however there is sufficient freeboard at this location, and it is not considered sensitive to climate change.

Table 16: Consideration of flooding at major crossing identified for the Te Irirangi Drive Section (NoR 1)

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	2.1 degrees of warming 100 Year flood level (RL) pre-development	3.8 degrees of warming 100 Year flood level (RL) pre-development	Flood difference (m)	Revised freeboard (m)
Te Irirangi Drive near Smales Road (Point 18A)	2050 mm dia. pipe network Road lvl RL 20.89 m	Road corridor	21.88 m	22.05 m	+0.18 m	-1.16 m
18 Arkdeen Place (Point 18B)	Site lvl RL 22.09	House / building	22.18 m	22.31 m	+0.13 m	-0.22 m
Te Irirangi Drive near Kellaway Drive (Point 19A)	1350 mm dia. pipe network Road lvl RL 18.98	Road corridor	19.19 m	19.26 m	+0.08 m	-0.29 m
Te Irirangi Drive near Aaronville	Road lvl RL 18.96	Road corridor	19.44 m	19.48 m	+0.04 m	-0.52m

Way (Point 19B)						
Te Irirangi Drive near Brinlack Drive (Point 20B)	Road lvl RL 20.16 m	Road corridor	18.12 m Upstream 17.61 m Downstream	18.32 m 17.94 m	+0.19 m +0.33 m	+1.26 m +1.30 m

9.2 NoR 2: Manukau Central section

The sensitivity analysis at the locations where a flood risk has been identified are shown in Table 17. The sensitivity analysis found that there was there was a maximum increase of 0.14 m to the identified flood risk at locations within the NoR under a more severe climate change scenario (3.8 degrees of warming). Several locations are already experiencing flood effects and particularly points 7C, 9B, 9C and 10A are considered to be sensitive to climate change. Potential mitigation to address these effects is set out in Section 6. As the modelled flood level increase is minor no additional mitigation beyond that described in Section 6 is proposed. Mitigation for the existing flooding effect should consider sensitivity to climate change at the future detailed design stage.

Table 17: Consideration of flooding at major crossing identified for the Manukau Central Section (NoR 2)

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	2.1 degrees of warming 100 Year flood level (RL) pre-development	3.8 degrees of warming 100 Year flood level (RL) pre-development	Flood difference (m)	Revised freeboard (m)
135A Puhinui Road (Point 7A)	Site lvl RL 17.69 m	Building / house driveway	17.76 m	17.81 m	+0.05 m	-0.12
Puhinui Road near Bledisloe Street (Point 7B)	600 mm dia. pipe network Road lvl RL 17.58 m	Road corridor	17.68 m	17.78 m	+0.10 m	-0.21 m
142 Puhinui Road (Point 7C)	Site lvl RL 17.44 m	Building / house driveway	17.64 m	17.78 m	+0.14 m	-0.34 m
Cavendish Drive near Lambie Drive (Point 8)	Site lvl RL 19.68 m	Road corridor	19.77 m	19.77 m	0.00 m	-0.10 m
42 Lambie Drive (Point 9A)	Site lvl RL 17.58 m	Carpark	19.60 m	19.63 m	+0.03 m	-0.03 m
Lambie Drive near Cavendish	Road lvl RL 17.44 m	Road corridor	19.35 m	19.43 m	+0.09 m	-0.42 m

Drive (Point 9B)						
Cnr Lambie Drive and Cavendish Drive (Point 9C)	Cnr Lambie Drive and Cavendish Drive Road lvl RL 17.44 m	Carpark	19.34 m	19.43 m	+0.09 m	-0.74 m
Lambie Drive Ronwood Avenue Intersection (Point 10A)	Road RL 19.17 m	Road corridor	19.57 m	19.62 m	+0.05 m	-0.45 m
Hayman Park Near Lambie Drive carpark (Point 10B)	Site lvl RL 19.76 m	Open space / park	19.84 m	19.86 m	+0.01 m	-0.10 m
11 Ronwood Avenue (Point 11A)	Site lvl RL 24.06 m	Commercial building / carpark	24.08 m	24.10 m	+0.02 m	-0.04 m
2 Davies Avenue (Point 11C)	Site lvl RL 24.24 m	Carpark	24.45 m	24.48 m	+0.03 m	-0.24 m

9.3 NoR 3: Puhinui section

The sensitivity analysis at the locations where a flood risk has been identified are shown in Table 18. The sensitivity analysis found that there was a maximum increase of 0.11 m to the identified flood risk at locations within the NoR under a more severe climate change scenario (3.8 degrees of warming). However, at these locations there is no freeboard and hence they can be considered sensitive to flood effects. Potential mitigation to address these effects is set out in Section 7. As the modelled flood level increase is minor no additional mitigation beyond that described in Section 7 is proposed. Mitigation for the existing flooding effect should consider sensitivity to climate change at the future detailed design stage.

Table 18: Consideration of flooding at major crossing identified for the Puhinui Section (NoR 3)

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	2.1 degrees of warming 100 Year flood level (RL) pre-development	3.8 degrees of warming 100 Year flood level (RL) pre-development	Flood difference (m)	Revised freeboard (m)
North of Puhinui Road near Noel Burnside	277 Puhinui Road Site lvl RL 15.34 m	Building / house driveway	15.92 m	16.03 m	+0.11 m	-0.69 m

Road (Point 5A)						
Puhinui Road near Noel Burnside Road (Point 5B)	Puhinui Road 600 mm dia. pipe network Road lvl RL 15.54 m	Road corridor	15.92 m	16.03 m	+0.11 m	-0.49 m
South of Puhinui Road near Noel Burnside Road (Point 5C)	Noel Burnside Road Road lvl RL 15.38 m	Road corridor	15.90 m	16.01 m	+0.11 m	-0.62 m
Puhinui Road near Kenderdine Road (Point 6)	Puhinui Road Road lvl RL 17.79 m	Road corridor	17.95 m	17.97 m	+0.02 m	-0.17 m

9.4 NoRs 4a and 4b: SH20B section

The sensitivity analysis at the locations where a flood risk has been identified are shown in Table 19. The sensitivity analysis found that at Locations 2 and 3 there was >0.4 m increase in flood depth under a more severe climate change scenario. However, there is sufficient freeboard even under a more severe climate change scenario and these locations are not considered sensitive to climate change. Future culvert upgrades to prevent upstream ponding should consider sensitivity to climate change.

Table 19: Consideration of flooding at major crossing identified for the SH20B Section (NoRs 4a and 4b)

Point	Existing Cross Drainage / Property address	Affected area/ vulnerability	2.1 degrees of warming 100 Year flood level (RL) pre-development	3.8 degrees of warming 100 Year flood level (RL) pre-development	Flood difference (m)	Revised freeboard (m)
Waokauri Creek tributary crossing 1 (Points 1A and 1C) [3]	Waokauri Creek Bridge Road lvl RL 9.28 m	Road corridor	2.76 m Upstream 2.54 m Downstream	2.90 m 2.58 m	+0.14 m +0.05 m	+6.38 m
Waokauri Creek tributary crossing 2 (Points 2A and 2C)	Culvert size unknown Road lvl RL 10.78 m	Road corridor	9.32 m Upstream 2.71 m Downstream	9.78 m 2.73 m	+0.46 m +0.02 m	+1.46 m

[3] A to C: A is upstream water level, B is the existing road level, C is downstream water level

Waokauri Creek tributary crossing 3 (Points 3A and 3C)	Culvert size unknown Road lvl RL 16.06 m	Road corridor	Flood level: 12.17 m Upstream 9.55 m Downstream	12.59 m 9.62 m	+0.43 m +0.06 m	+3.47 m
SH20B/20 intersection 4A	Road lvl RL 19.71 m	Road corridor	19.86 m	19.89 m	+0.03 m	+0.18 m
East of SH20B/20 intersection 4B	Road lvl RL 19.61 m	Road corridor	19.85 m	19.88 m	+0.03 m	+0.12 m

10 Conclusions

This assessment has considered the potential flood effects of the Project. The assessment uses a flood risk rating to identify those areas where existing flood effects are likely and makes recommendations to mitigate any effects during the future detailed design stage of the Project.

The assessment found that there is unlikely to be significant additional risk of flood effects during construction. Proposed works will be located outside of flood plains and overland flow paths as far as practicable. Where this is not possible, potential flooding effects will be managed through the flood risk mitigation measures set out in the CEMP for existing high flood hazard areas. For those areas where there is an increased flood risk, mitigation measures such as carrying out construction works during dry weather and using diversion drains will be adequate to manage this risk and will be identified through the CEMP.

There are potential operational effects risks of increased flood levels upstream and downstream of crossings and where the vertical alignment of the road is elevated. Some of the effects were assessed as moderate based on a flood depth of greater than 0.15 m for more vulnerable uses (e.g. habitable buildings) and 0.5 m for less vulnerable uses (e.g. open space).

A number of potential management and mitigation measures have been provided to manage operational effects at the future detailed design stage. However, this corridor is heavily constrained by existing residential and commercial development within flood plains and flood prone areas. In some locations the recommendation is to maintain the current vertical alignment, this means the road will overtop however flood effects will not increase.

A series of outcomes are identified to be included as conditions on the NoRs and maintain effects at a level that is no more than minor.

The increase in corridor impervious area associated with urban areas is between 5 and 15%. In the Pakuranga Creek catchment no attenuation is expected, and flows would be passed forward. In other catchments, attenuation can be incorporated into treatment devices or included into storage areas adjacent to the corridor. Alternatively, network improvements could reduce flooding in some places if an integrated flood management approach with other organisations is adopted.

The potential mitigation measures of the flood assessment are set out in the table below. These are provided as potential mitigation measures to be considered by the future designer of how existing and potential effects could be mitigated.

NoR	Location	Flood Risk Rating	Recommendation
NoR 1	Te Irirangi Drive near Bishop Dunn Place	Negligible	• n/a
	Te Irirangi Drive south of Smales Road	High	• Lower the intersection to allow flood water to move from trapped low point • Investigate additional pipe capacity and inlets • No flood flow attenuation for increased impervious area as the existing road corridor is in

			the lower half of the catchment
	Te Irirangi Drive north of Smales Road	Moderate	• Provide additional or upsized piped drainage and/or greater inlet capacity • No flood flow attenuation for increased impervious area as the existing road corridor is in the lower half of the catchment
NoR 2	Te Irirangi Drive near Diorella Drive / Boundary Road	Low to negligible	• No flood flow attenuation for increased impervious area for sub-catchment to the existing Rongomai attenuation pond • Flood flow attenuation for increased impervious areas within the proposed raingardens (if required) for sub-catchment to Ōtara Creek
	Lambie Drive / Cavendish Drive	High	• Keep the current vertical alignment • Flood flow attenuation for increased impervious areas within proposed linear treatment
	Davies Avenue / Ronwood Avenue	Moderate - High	• Reduce the level of Davies Avenue to allow overland flow to discharge into Hayman Park • Provide additional pipe capacity or diversion drains parallel to the road • Flood flow attenuation for increased impervious areas within the proposed wetland at Hayman Park
	Puhinui Road near Cavendish Drive	High	• Keep the current vertical alignment • Flood flow attenuation for increased impervious areas within the proposed designation boundary (if required)
NoR 3	Puhinui Road near Noel Burnside Road	High	• Keep the current vertical alignment • Flood flow attenuation for increased impervious areas within the proposed

			designation boundary (if required)
NoRs 4a and 4b	Puhinui Road between Vision Place and the SH20/20B Interchange	Moderate	• No flood flow attenuation for increased impervious area • Increase culvert capacity if required

A sensitivity analysis has been undertaken to consider the effects of additional rainfall under a more severe climate change scenario. The sensitivity analysis identified an increased risk of flooding at some locations. However, this increased risk can be addressed through the proposed mitigation that are described in the report.

TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

Airport to Botany – 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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Revision Status

Version	Date	Reason for Issue
1.0	9 December 2022	Final for lodgement

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Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
AUP:OP	Auckland Unitary Plan: Operative in Part
BPO	Best Practicable Option
BRT	Bus Rapid Transit
CNVMP	Construction Noise and Vibration Management Plan
CVA	Cultural Values Assessments
HANA	High Aircraft Noise Area
MANA	Moderate Aircraft Noise Area
N/A	Not Applicable
NIMT	North Island Main Trunk railway
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Airport to Botany Bus Rapid Transit (Botany Town Centre to Rongomai Park)
NoR 2	Notice of Requirement 2: Airport to Botany Bus Rapid Transit (Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue)
NoR 3	Notice of Requirement 3: Airport to Botany Bus Rapid Transit (Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange)
NoR 4a	Notice of Requirement 4a: Airport to Botany Bus Rapid Transit (SH20/20B Interchange to Orrs Road)
NoR 4b	Notice of Requirement 4b: Alteration to NZ Transport Agency Designation 6717 – State Highway 20B
NPS:UD	National Policy Statement on Urban Development 2020
PPFs	Protected Premises and Facilities
Programme partners	Te Ākitai Waiohua, Auckland Airport, Auckland Transport and Waka Kotahi
RCA	Road Controlling Authority
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
SEA	Significant Ecological Area
Schedules	Site Specific Noise and/or Vibration Management Schedules
SH1	State Highway 1
SH20	State Highway 20
SH20B	State Highway 20B
SWGP	Southwest Gateway Programme
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
Waka Kotahi	Waka Kotahi NZ Transport Agency

Executive summary

This report provides an assessment of the construction noise and vibration effects for the Airport to Botany Bus Rapid Transit project (**the Project**) to inform the Assessment of Effects on the Environment (**AEE**) for five Notices of Requirement (**NoR**) being sought by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport.

Methodology

The following methodology has been used for the construction noise and vibration assessment for all NoRs:

- We reviewed relevant Standards and guidelines appropriate for the assessment of construction noise and vibration and recommended which standards to use as follows:

– **Construction noise:** NZS 6803:1999 Acoustics – Construction Noise. This standard is referenced both in the Auckland Unitary Plan (Operative in Part) (**AUP:OP**) and relevant Waka Kotahi guidance. The criteria are generally 70 dB LAeq and 85 dB LAFmax during daytime; and

– **Construction vibration:** a two-tiered approach has been adopted of Category A (generally to protect amenity) and Category B (to protect buildings from any, including cosmetic, damage. The criteria are generally based on those of DIN4150-3 (1999) Structural vibration – Part 3 Effects of vibration on structures and British Standard (BS) 5228-2: 2009 “Code of practice for noise and vibration control on construction and open sites”. The above criteria are referenced in AUP:OP E25.6.30 and the Waka Kotahi “State Highway Construction and Maintenance Noise and Vibration Guide” (**Guide**), V1.1, August 2019. The criteria range from 1 to 2 mm/s PPV for Category A, to 5 mm/s PPV for occupied buildings for Category B, and higher for unoccupied buildings.

- We reviewed noise and vibration emission data for each construction task / process based on equipment data previously measured by Marshall Day Acoustics for similar activities. Data from appropriate noise and vibration standards (e.g. BS5228-1:2009) has also been considered, where relevant.
- We predicted noise and vibration levels from construction based on relevant standards and guidelines and determined setback distances where compliance with the relevant standards can be achieved. These setback distances have been plotted on the Project drawings and are shown in **Appendix A** for noise and **Appendix B** for vibration.
- Where construction is predicted to exceed the noise or vibration standards, we recommend management and mitigation through a framework of a Construction Noise and Vibration Management Plan (**CNVMP**) and schedules.

Effects analysis

Construction noise and vibration is generally higher than that of ongoing continuous activities. Therefore, while effects are based on how people are likely to react to equivalent internal noise levels, one needs to keep in mind that construction is a temporary activity with a finite duration. Most people are more likely to accept increased noise or vibration levels if durations and magnitudes are well communicated prior to works occurring.

Overall, predicted noise levels for the majority of works will be able to comply with the relevant daytime limits, which means that effects are generally acceptable inside neighbouring buildings. Where high noise activities are likely (e.g. demolition of close by buildings, piling of bridges or retaining walls, and earthworks), these activities would occur for short periods only close to any one building, extending over a few days at most, before moving along the alignment or being completed.

Effects can be managed through the application of management and mitigation measures through a CNVMP and schedules as discussed below. Overall, we consider the effects will generally be reasonable for the majority of activities.

Management and mitigation recommendations

Management and mitigation measures should be implemented as a matter of good practice and are considered the baseline mitigation for most circumstances, irrespective of compliance with the limits.

Where an exceedance of the construction noise or vibration standards is likely due to a specific activity or in a specific area, and the general mitigation measures as discussed below are not sufficient to achieve full compliance, further mitigation and management should be investigated and implemented where practicable. Such information would be contained in the Schedule as an attachment to the CNVMP. Depending on the final construction methodology and receivers in the vicinity, mitigation and management measures may also include the offer of temporary relocation. The appropriate mitigation measures will be determined on a case-by-case basis throughout construction using the CNVMP and/or site specific schedules as the implementation tool.

Table 1: Summary of construction noise and vibration effects and recommendations

Effect	Assessment	Recommendation
Construction noise – all NoRs	NoRs 1, 2 and 3 traverse well established residential and commercial areas, with buildings in close proximity to construction works. NoR 4a and 4b traverses currently generally greenfield sites (some zoned FUZ). Largest effects anticipated from: • Demolition of first row houses in NoR 2 and 3, and some of NoR 1 – limited duration and localised, but very close to houses; • Earthworks to prepare alignment, service relocations – longer duration but moving along the alignment; • Bridge piling and installation in NoR 4b, 2/3 – limited duration and localised effects only, but night/weekend works likely required; and • Final surfacing – likely to be done at night-time. Limited duration.	Management and mitigation through the CNVMP Schedules for any specifically noisy activities or where receivers are particularly affected, e.g.: • Any night-time works in all NoRs in the vicinity of residential areas; and • Any specifically high noise works where they affect sensitive receivers. Communication and consultation prior to high noise works
Construction vibration – all NoRs	NoRs 1, 2 and 3 traverse well established residential and commercial areas, with buildings in close proximity to construction works. There are no close buildings in NoR 4a and 4b. Largest effects anticipated from:	Management and mitigation through the CNVMP Schedules for any specific vibration inducing activities or where

Effect	Assessment	Recommendation
	• Demolition of first row houses in NoR 2 and 3, and some of NoR 1 – limited duration and localised, but very close to houses; • Road preparation: use of vibratory rollers – along entire alignment, therefore limited duration but affecting all immediately fronting houses; and • Construction of bridge piles and retaining walls.	receivers are particularly affected, e.g.: • Piling; • Demolition of existing driveways and structures close to other houses; and • Vibratory rolling (if to be undertaken at night-time). Choice of piling methodology to be bored rather than impact or vibrated Use of non-vibratory compaction close to buildings Building condition surveys
Night-time construction noise – NoR 2	Bridge construction across SH1 will likely require night-time works as SH1 may need to be closed	Consider offer of temporary relocation to most affected residents to manage sleep disturbance, depending on duration and noise level
Construction noise – NoR 2	Works close to educational facilities (MIT and AUT South Campus)	Consult with the educational facilities and schedule works to avoid exams or other sensitive times.
Construction noise – NoR 3	Works close to Puhinui School	Consult with school and schedule works to avoid exams or other sensitive times. Potentially offer noise barrier (to be retained following construction) to mitigate traffic noise to the sports fields.
Night-time/long weekend construction noise – NoR 3	Bridge construction across the rail line and Puhinui Station will likely require night-time works or works over a long weekend, as a block of line may be required	Consider offer of temporary relocation to most affected residents to manage sleep disturbance, depending on duration and noise level
Construction noise – NoR 4a and 4b	Works close to Manukau Memorial Gardens	Consult with operator and schedule works to avoid services or other sensitive times.

1 Introduction

1.1 Purpose and scope of this Report

This Assessment of Construction Noise and Vibration report (**Report**) has been prepared to inform the AEE or five Notices of Requirement (**NoR**) being sought by Waka Kotahi and Auckland Transport for the Project under the Resource Management Act 1991 (**RMA**). Specifically, this report considers the actual and potential effects associated with the construction of the project on the existing and likely future environment as it relates to construction noise and vibration effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

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 within each NoR, 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 construction noise and vibration effects. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this report for clarity.

1.2 Report structure

In order to provide a clear assessment of each NoR, this Report follows the structure set out in the AEE. That is, each notice has been separated out into its own section, and each section contains an assessment of the actual and potential effects for the specific NoR. Where appropriate, measures to avoid, remedy or mitigate effects are recommended in a subsequent section.

Each section is arranged in geographical order, starting from the westernmost point of the proposed NoR, to the easternmost point. Table 2 below describes the extent of each section, and where the description of effects can be found in this report.

Table 2: Report structure

Sections	Section number
Description of the Project	2
Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines	4
Identification and description of the existing and likely receiving noise environment;	6.1,7.1,8.1,9.1
Assessment of general construction noise and vibration matters for all Airport to Botany Bus Rapid Transit NoRs	5
Assessment of specific construction noise and vibration matters for Airport to Botany Bus Rapid Transit NoR 1	6
Assessment of specific construction noise and vibration matters for Airport to Botany Bus Rapid Transit NoR 2	7
Assessment of specific construction noise and vibration matters for Airport to Botany Bus Rapid Transit NoR 3	8

Sections	Section number
Assessment of specific construction noise and vibration matters for Airport to Botany Bus Rapid Transit NoR 4a and 4b	9
Determination of construction noise and vibration management and mitigation measures	10
Overall conclusion of the level of potential adverse construction noise and vibration effects of the Airport to Botany Bus Rapid Transit Project	12

1.3 Preparation for this Report

Work undertaken for this Report commenced in January 2022. In summary, the preparation for this Report has included:

- Information from other technical specialists, namely traffic, construction, design and planning amongst others;
- A site visit of all NoRs on 2 March 2022;
- Review of equipment data for similar projects;
- Computer noise modelling and vibration predictions; and
- A review of findings from a workshop with the Project technical specialists on 8 March 2022.

Where we rely on information provided by other experts, this is noted in the Report.

2 Project description

The overall Project is proposed to be an 18 km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations. It is part of Auckland's wider Rapid Transit Network (**RTN**) connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany.

As set out in the AEE, this Report specifically relates to a portion of the overall Project (approximately 14.9 km) which extends from the Botany Town Centre in the vicinity of Leixlep Lane to Orrs Road in the Puhinui peninsula, off SH20B. The Project primarily involves the upgrade and widening of existing transport corridors to provide for a dedicated BRT corridor and high-quality walking and cycling facilities.

Nine BRT stations are proposed as part of the Project. These stations are generally located at signalised intersections and will be staggered on either side of the intersection.

These stations are situated in the following locations:

- Smales Road;
- Accent Drive;
- Ormiston Road – Botany Junction Shopping Centre;
- Dawson Road;
- Diorella Drive;
- Ronwood Avenue (Manukau Central);
- Manukau Station;
- Puhinui Road/Lambie Drive; and
- Puhinui Station.

As part of the Project, two new structures are proposed:

- A BRT bridge crossing the North Island Main Trunk (NIMT) and connecting to the concourse level of the Puhinui Station; and
- A southbound ramp from SH20B to SH20.

Upgrades to existing structures are proposed at the:

- Bridge over Otara Creek (NoR 1);
- Bridge over SH1 (NoR 2);
- Bridge over NIMT (NoR 3); and
- Bridge over Waokauri Creek (NoR 4a).

Figure 1: Overview of the Project and NoR extents

Table 3: Overview of NoRs

Notice	Description	Requiring Authority
NoR 1	Bus Rapid Transit corridor and high quality walking and cycling facilities from Botany Town Centre to Rongomai Park	Auckland Transport
NoR 2	Bus Rapid Transit corridor and high quality walking and cycling facilities from Rongomai Park to Puhinui Interchange, in the vicinity of Plunket Avenue	Auckland Transport
NoR 3	Bus Rapid Transit corridor and high quality walking and cycling facilities from Puhinui Interchange, in the vicinity of Plunket Avenue to SH20/SH20B Interchange	Auckland Transport
NoR 4a	Bus Rapid Transit corridor and high quality walking and cycling facilities from SH20B/20 Interchange to Orrs Road	Auckland Transport
NoR 4b	Alteration to designation 6717 to provide for the widening of SH20B, including a southbound on-ramp onto SH20, high quality walking and cycling facilities and enable a Bus Rapid Transit corridor	NZ Transport Agency

2.1 Overview and description of each NoR

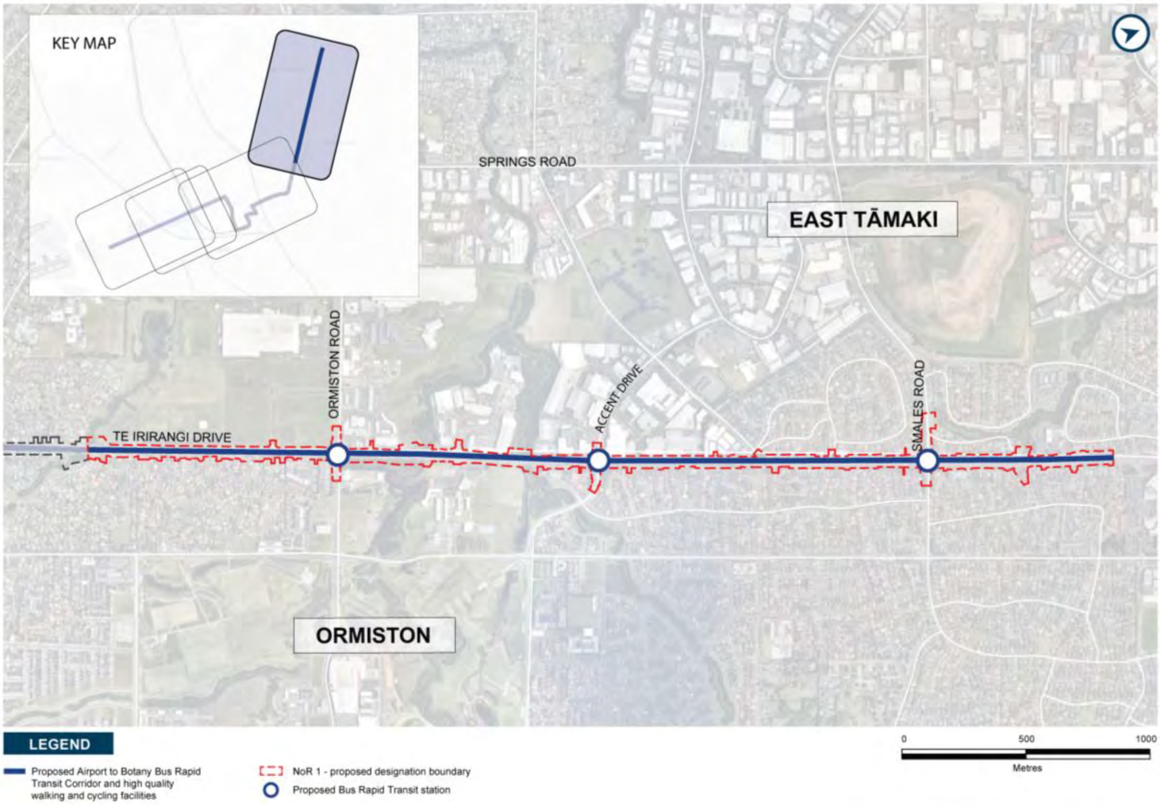
The following sections provide an overview of the NoRs that make up the Project. For more detail, refer to the AEE.

2.1.1 NoR 1

As set out in Table 4 below, the proposed works in NoR 1 include the widening of existing Te Irirangi Drive to accommodate a centre-running BRT corridor, two vehicle lanes in each direction and high quality walking and cycling facilities.

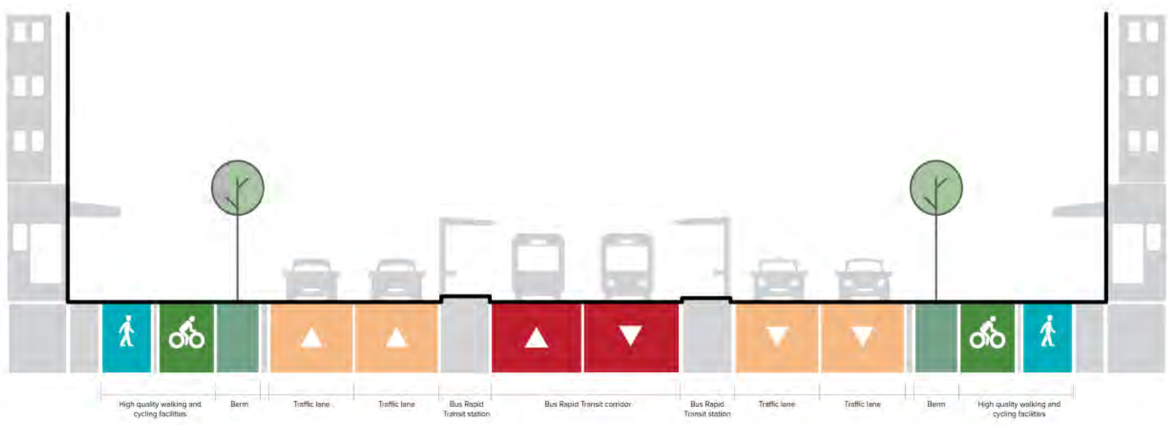
Table 4: Overview of NoR 1

NoR 1 – Botany Town Centre to Rongomai Park



Key features	
BRT Corridor	Centre-running along Te Irirangi Drive
BRT Stations	• Smales Road Station; • Accent Drive Station; and • Ormiston Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	Two lanes in each direction (existing)
Access	There is an existing central median along the majority of Te Irirangi Drive which restricts right-turn access
Speed environment	50km/h

Signalised intersections	• Te Irirangi Drive and Smales Road; • Te Irirangi Drive and Accent Drive; • Te Irirangi Drive and Bishop Dunn Avenue; and • Te Irirangi Drive and Ormiston Road.
NoR 1 typical cross section	

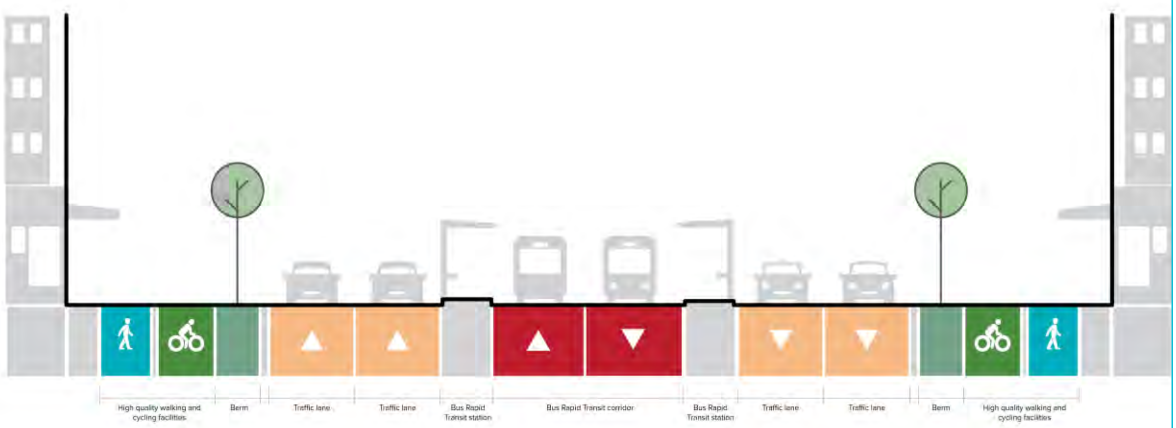


2.1.2 NoR 2

As set out in Table 5 below, the proposed works in NoR 2 include the widening of several existing roads to accommodate a centre-running bus rapid transit corridor, vehicle lanes and high quality walking and cycling facilities.

Table 5: Overview of NoR 2

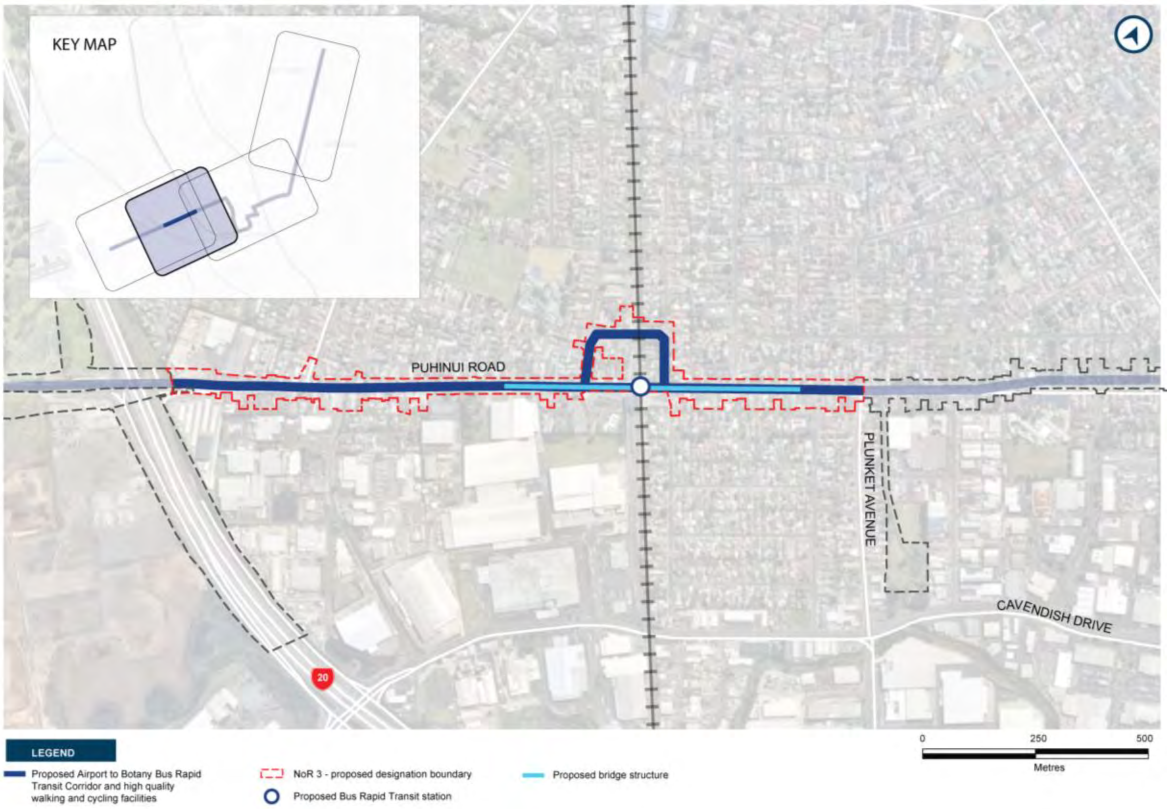
NoR 2 – Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue	
	
Key features	
BRT Corridor	Centre-running for the majority of the corridor along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, Lambie Drive, and Puhinui Road West-running on Davies Avenue along the edge of Hayman Park
BRT stations	• Dawson Road Station; • Diorella Drive Station; • Ronwood Avenue Station; • Manukau Station; and • Corner of Lambie Drive and Puhinui Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	• Two lanes in each direction along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, and Lambie Drive; • One-way single lane along Davies Avenue; and

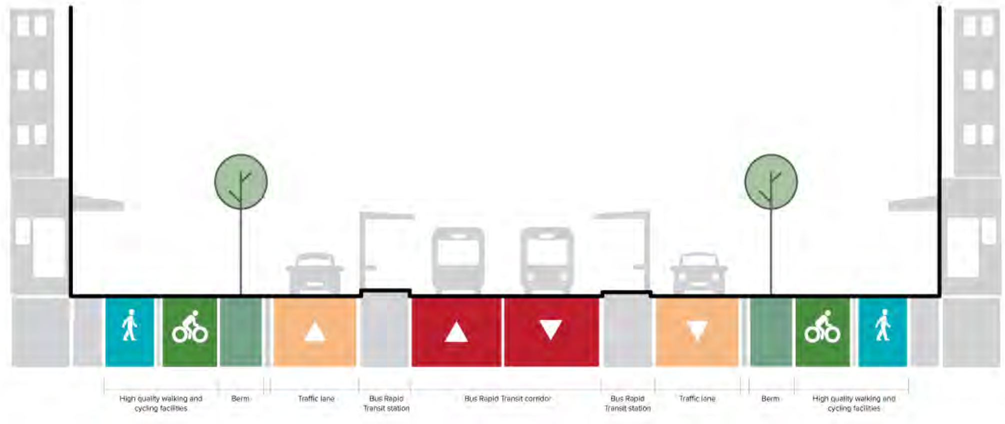
	• One lane in each direction along Puhinui Road.
Access	Existing central medians limit right turn access on Te Irirangi Drive, Great South Road, Ronwood Avenue, and Lambie Drive. New signalised intersection at Mitre 10 and Bunnings Warehouse on Lambie Drive. Priority access for fire engine movements across the BRT corridor at Papatoetoe Fire Station.
Speed environment	• 30 km/h on Ronwood Avenue and Davies Avenue; and • 50 km/h on Te Irirangi Drive, Great South Road, Manukau Station Road, Lambie Drive and Puhinui Road.
Signalised intersections (**new intersections in bold**)	• Te Irirangi Drive and Dawson Road; • Te Irirangi Drive, Boundary Road and Hollyford Drive; • Te Irirangi Drive and Diorella Drive; • Te Irirangi Drive, Great South Road and Cavendish Drive; • Great South Road and Ronwood Avenue; • Ronwood Avenue and Davies Avenue; • Davies Avenue, Wiri Station Road and Manukau Station Road; • Manukau Station Road and Lambie Drive; • **Mitre 10 and Bunnings Warehouse;** • **Lambie Drive and Ronwood Avenue;** • Lambie Drive and Cavendish Drive; • Lambie Drive and Puhinui Road; and • **Puhinui Road and Plunket Avenue.**
NoR 2 typical cross section	
	

2.1.3 NoR 3

As set out in Table 6 below, the proposed works in NoR 3 include the widening of the existing Puhinui Road to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities. As part of the proposed works, a BRT bridge over the NIMT is proposed to connect to the Puhinui Station.

Table 6: Overview of NoR 3

NoR 3 – Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange	
	
Key features	
BRT Corridor	Centre-running along Puhinui Road connecting to the Puhinui Station concourse via a new BRT bridge structure
BRT Stations	Puhinui Station
Walking and cycling facilities	• Walking and cycling facilities on both sides of the corridor; and • Walking and cycling facilities will be provided along Cambridge Terrace, Bridge Street and Kenderdine Road.
General traffic	One lane in each direction on Puhinui Road
Access	Limited right turn access
Speed environment	50 km/h
Signalised intersections	• Puhinui Road and Noel Burnside Road; and • Puhinui Road and Wyllie Road.
NoR 3 typical cross section	

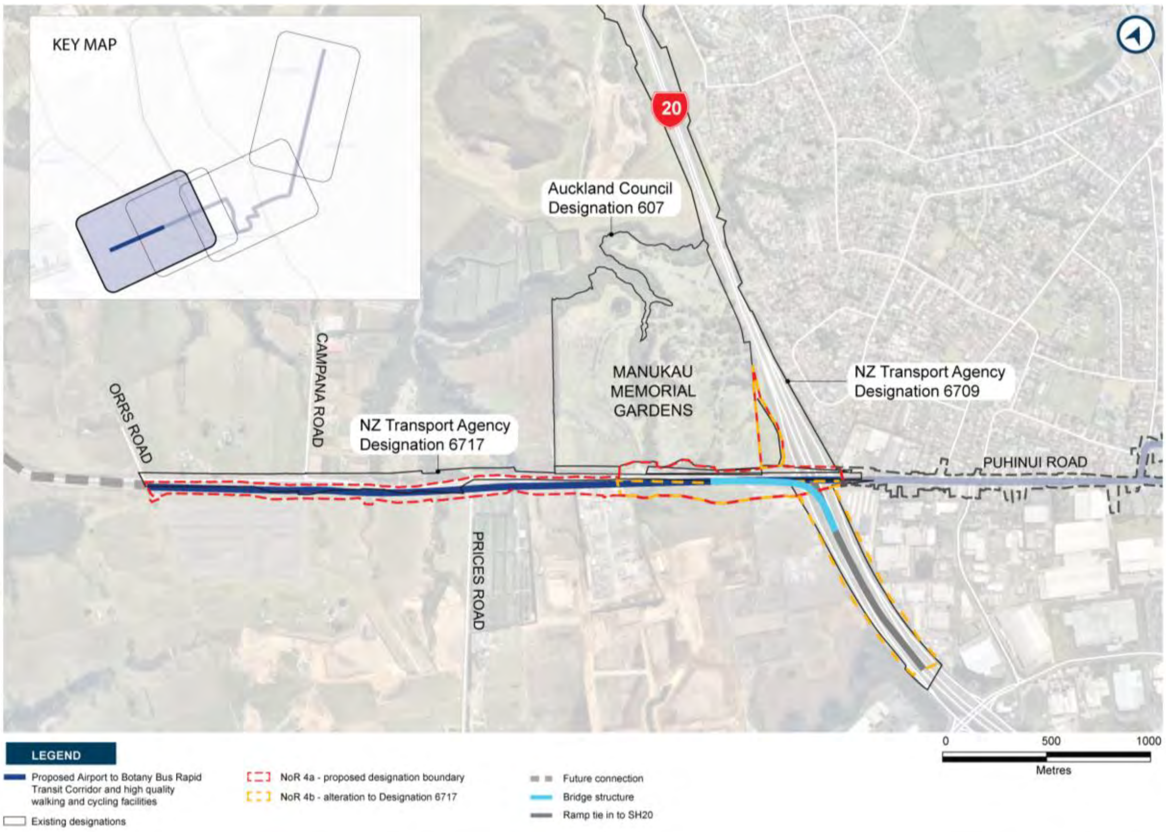

High quality walking and cycling facilities
Berm
Traffic lane
Bus Rapid Transit station
Bus Rapid Transit corridor
Bus Rapid Transit station
Traffic lane
Berm
High quality walking and cycling facilities

2.1.4 NoRs 4a and 4b

As set out in Table 7 below, the proposed works in NoRs 4a and 4b include the widening of SH20B to accommodate a centre-running BRT corridor until the Manukau Memorial Gardens. From this point, the BRT corridor shifts south of SH20B until Orrs Road. Proposed works also include high quality walking and cycling facilities, eastbound lanes to Auckland Airport and a ramp from SH20B onto SH20 for southbound traffic.

Table 7: Overview of NoRs 4a and 4b

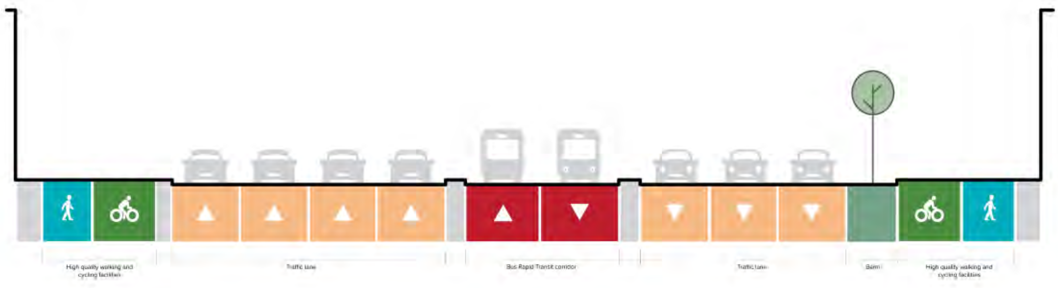
NoRs 4a and 4b – SH20/20B Interchange to Orrs Road



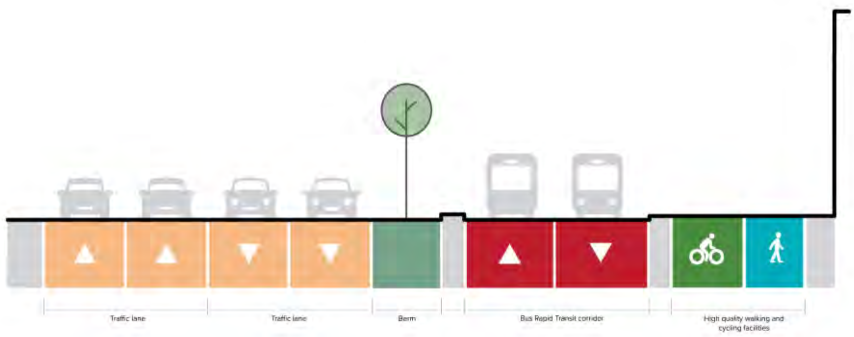
Key features	
BRT corridor	• Centre-running on Puhinui Road through to the Manukau Memorial Gardens intersection (approx. 600 m west of SH20/20B Interchange); and • South running to Orrs Road.
Walking and cycling facilities	Walking and cycling facilities on southern side of the corridor
General traffic	• Two lanes in each direction; and • New southbound ramp from SH20B onto SH20.
Access	• Limited access; and • Access maintained via signals at Manukau Memorial Gardens and Campana Road.
Speed environment	60 km/h

Signalised intersections	• SH20/SH20B Interchange; • Puhinui Road and Manukau Memorial Gardens; and • Puhinui Road and Campana Road.

NoR 4b typical cross section



NoR 4a typical cross section



3 Performance standards

Construction noise and vibration levels are generally higher than would be expected from ongoing day to day operations of a site or transport corridor. However, higher noise and/or vibration levels are not necessarily unreasonable if they are managed and mitigated by implementing the best practicable option (**BPO**).

New designations are sought for the Project for NoR 1, NoR 2, NoR 3 and NoR 4a and an alteration to an existing designation (NoR 4b) to enable the construction operation and maintenance of the Project. Therefore, we have reviewed a variety of criteria and standards and have recommended noise and vibration performance standards that in our opinion should apply to the relevant NoRs depending on the Requiring Authority.

3.1 Noise

3.1.1 Guidelines and standards reviewed

We reviewed the following guidelines and standards for the assessment of construction noise:

- AUP:OP, specifically rule E25.6.27 relating to construction noise in all zones except the City Centre and Metropolitan Centre zones, and rule E25.6.29 relating to construction noise in the road;
- New Zealand Standard NZS6803:1999 Acoustics – Construction Noise (**NZS6803**); and
- The Waka Kotahi “State Highway Construction and Maintenance Noise and Vibration Guide” (**Guide**), V1.1, August 2019.

While NoR 4b will be under the jurisdiction of Waka Kotahi and NoRs 1 to 3 and 4a will be Auckland Transport designations, we consider that consistent construction noise limits should be applied to all NoRs. The AUP:OP and Guide construction noise criteria are largely the same, with any differences (generally night-time criteria) having no effect on the outcome of the assessment.

We recommend applying the requirements of the Guide to the NoRs. The Guide takes account of the intended application of NZS6803 criteria and provides a solid and tested management structure to achieve the best practicable outcome for construction noise.

3.1.2 Recommended criteria all NoRs

Table 8 below shows the relevant noise standards for long duration works (more than 20 weeks), which applies to all projects. These criteria are those of the Guide and NZS6803, and largely reflect the AUP:OP criteria.

Table 8: Construction noise criteria at occupied buildings (at 1m from the most affected façade)

Day of week	Time period	Noise criteria	
		dB L_{Aeq}	dB L_{AFmax}
Dwellings and other buildings containing activities sensitive to noise			
Weekdays	0630 – 0730	55	75
	0730 – 1800	70	85

Day of week	Time period	Noise criteria	
		dB L_{Aeq}	dB L_{AFmax}
	1800 – 2000	65	80
	2000 – 0630	45	75
Saturdays	0630 – 0730	45	75
	0730 – 1800	70	85
	1800 – 2000	45	75
	2000 – 0630	45	75
Sundays and public holidays	0630 – 0730	45	75
	0730 – 1800	55	85
	1800 – 2000	45	75
	2000 – 0630	45	75
Other occupied buildings			
All days	0730 – 1800	70	n/a
	1800 – 0730	75	n/a

While construction of each NoR would be generally of longer duration (several years), each individual building would likely be affected only for limited periods of high noise levels as construction moves along the alignment in a linear fashion.

3.1.3 Exceedance of criteria

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

NZS6803 anticipates that at times construction noise cannot be made to comply with the recommended criteria. Statements such as *"construction noise from any site should not generally exceed the numerical noise limits"*[1] suggest that intermittent exceedances are not unreasonable, as long as the BPO has been applied to the management and mitigation of that construction noise.

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

> *"(4) Construction activities that cannot meet the noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects."* [2]

And

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

[1] NZS 6803:1999 Acoustics – Construction Noise, Section 7.1.2.
2 Chapter E25.2 of the AUP:OP.

> *[…]*
>
> *The practicability of complying with permitted noise and vibration standards.”*[3]

Whether the duration of a construction activity that exceeds the standards can be considered reasonable, depends on site specific circumstances, and may vary from site to site and activity to activity. For instance, where daytime noise standards are exceeded for several days, but neighbouring residents are not at home, no one would be affected and therefore mitigation may not be required beyond communication with the residents.

If night-time works occur, this would likely only happen for few nights in any one location. In that instance, this may be acceptable if residents have been informed and a clear time frame has been provided. However, if night-time works are expected to be ongoing for several consecutive nights, and at a noise level that affects residents’ ability to sleep, then alternative strategies may need to be implemented, such as offering temporary relocation for those affected residents. Such management measures are further discussed in Section 10.

3.2 Vibration

3.2.1 Guidelines and standards reviewed

We reviewed the following guidelines and standards for the assessment of construction vibration:

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

Both the AUP:OP and the Guide reference relevant vibration standards for construction works. These criteria are similar insofar as they address two vibration responses:

- One set of standards are based on the provisions of German Standard DIN 4150-3:1999 “Structural Vibration – Part 3: Effects of Vibration on Structures” which avoids cosmetic building damage (**building standards**); and
- The other set has reference criteria for human amenity which act as trigger levels for consultation and communication (**amenity standards**).

The amenity standards of the AUP:OP are slightly less stringent than those in the Guide (2 mm/s PPV vs the 1 mm/s PPV), while the building standards of the Guide have different criteria for unoccupied buildings by allowing higher vibration levels to be generated where this is safe (but where no people are disturbed).

3 Chapter E25.3 of the AUP:OP.

3.2.2 Recommended criteria (All NoRs)

NoRs 1 to 4a are sought by Auckland Transport, and NoR 4b is sought by Waka Kotahi. Table 9 below sets out the vibration standards to be applied to all NoRs.

Table 9: Vibration standards at all buildings for all NoRs

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

It is noted that Waka Kotahi generally adopts the vibration standards based on the Guide, however, for this Project, the AUP limits are applied to all NoRs as a result of the overlap between the proposed designations for NoR 4a and NoR 4b and the likelihood of construction occurring simultaneously. In addition, there are very few (if any) buildings close by to NoR 4b and the risk of exceeding the above vibration standards is low.

In general terms, the Category A standards aim to avoid annoyance of receivers. Because these criteria are conservative, there is a provision in the Guide to relax the criteria if they cannot be practicably met, provided a vibration expert is engaged to assess and manage construction vibration to comply with the Category A standards as far as practicable. In addition, affected people should receive communication about the proposed works and anticipated effects, to avoid concern.

If Category A is not practicably achievable, the focus is then shifted to avoiding building damage rather than avoiding annoyance by applying the Category B standards. If the Category B standards are complied with, then building damage is unlikely to occur. If Category B standards are predicted to be exceeded, prior to the relevant construction activities commencing, building condition surveys, must be undertaken and vibration levels must be monitored during those works. This allows an assessment of and response to any effects.

The DIN 4150-3:1999 Standard, which the 5mm/s Category B criterion is taken from, is a conservative standard designed to avoid all (including cosmetic) damage to buildings, e.g. superficial damage like cracking in plaster. Significantly higher standards would be applied if damage to structural foundations was the only consideration.

4 Assessment methodology

4.1 Overview

The following methodology has been used for the construction noise and vibration assessment for all NoRs:

- We reviewed noise and vibration emission data for each construction task / process based on equipment data previously measured by Marshall Day Acoustics (**MDA**) for similar activities. Data from appropriate noise and vibration standards (e.g. BS5228-1:2009) has also been considered, where relevant.
- We predicted noise and vibration levels from construction based on relevant standards and guidelines and determined setback distances where compliance with the relevant standards can be achieved. These setback distances have been plotted on the Project drawings and are shown in **Appendix A** for noise and **Appendix B** for vibration.
- Where construction is predicted to exceed the noise or vibration standards, we recommend management and mitigation through a framework of management plans and schedules.

4.2 Assumptions

The assessment of construction noise and vibration effects is based on assumptions of construction activities and equipment. Given that the Project will be implemented many years in the future, an indicative construction methodology has been prepared to inform the assessment of the Project and is subject to change. The construction methodology for the proposal will be confirmed during the detailed design phase and finalised once a contractor has been engaged for the work.

We have assumed that the different NoRs are not constructed concurrently (with the exception of NoRs 4a and 4b), or, where they are, that the construction activities are sufficiently separated to avoid increased noise levels at individual receivers. For NoRs that are adjacent to each other (e.g. where NoRs 1 to 4 meet), construction may occur at the same time. However, the space required for equipment to operate safely will ensure that no more than the assumed maximum construction activity would occur in any one area. Therefore, our predictions are also relevant should this occur.

We have also assumed that all existing buildings within each of the proposed designation boundaries will be removed or will be vacant during the time of construction. We have therefore not assessed these buildings. Should they be retained and occupied during construction, they will need to be assessed at the time of construction. Some of these buildings may be affected by more than one NoR. We have identified the buildings in each of the NoRs that may affect them.

The detailed methodology for works is not confirmed; therefore, we have based this assessment on similar construction projects we have worked on. Although contractors have not been appointed, it is considered that the methodology set out is representative of activity that has occurred on similar projects and forms a reasonable baseline for the purposes of assessment during the design phase of the Projects.

Information sufficient for the NoR stage has been provided in a Construction Method Statement (refer Section of this Report and Section 6.2 of the AEE for more detail) and drawings provided by the Project team, and has been incorporated in this assessment as relevant.

Given the recent National Policy Statement on Urban Development (**NPS:UD**) and the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021, while we comment on effects on currently existing buildings potentially affected by construction noise and vibration, we are aware that many of the sites neighbouring the corridor may be redeveloped in the future, with higher density residential development. Therefore, our recommendations require a reassessment of the buildings present at the time of construction to ensure that mitigation and management takes account of the environment as it exists at the time of construction.

4.3 Construction sequence and methodology

The construction methodology provided by the Project Team is proposed to follow the following sequence, which is similar for all NoRs. Only noise and/or vibration generating aspects are included in the list below.

4.3.1 Sequences

The general sequence of construction is likely to be as follows:

Site establishment

- Site access construction;
- Establishment of site compound and laydown areas:
    - Each Project will require site compounds and one or more laydown areas;
    - The main site compound will contain office and meeting room facilities, break rooms, ablution block and carparking facilities; and
    - Laydown areas/construction yards will contain material storage and are generally located inside the designation.
- Tree removal and vegetation clearance where required;
- Removal of footpath, streetlights, grass verge berm (where required); and
- Property/ building modification or demolition, including fencing, driveways and gates.

Main works

- Relocation of utilities services;
- Minor earthworks (cut and fill);
- Removal of verge and preparation of subgrade formation;
- Construction of new longitudinal drainage facilities;
- Construction of new pavement, widening works in available areas (following that, move traffic to newly constructed pavement areas and continue with the remaining widening works);
- Pavement reconstruction or reconfiguration of existing road furniture;
- Completion of tie in works, footpaths, cycleways, lighting and landscaping;
- Construction of permanent stormwater wetlands;
- Construction of new culverts including rip rap and headwalls;
- Install road safety barriers (if any);
- Bridge construction works (if any) as follows:
    - Mobilisation and site establishment;
    - Enabling works such as access construction, staging areas and temporary works;
    - Piling, pile caps, and abutment construction;

  - Columns and pier headstock construction;
  - Bridge beam installation;
  - Deck construction and barrier installation; and
  - Finishing works, such as approach construction, settlement slabs, and end terminals.
- Retaining wall construction (if any);
- Accommodation works; and
- Installation of signage and lighting.

Finishing works and demobilisation

- Final road surfacing and road markings; and
- Finishing works e.g. landscaping, street furniture, fencing and outstanding accommodation works.

4.3.2 Construction times

Construction hours will generally be 7am to 6pm, Monday to Saturday. During the summer earthworks seasons, extended hours may be worked (6am to 8pm, Monday to Sunday) where this can be undertaken in compliance with the relevant noise and vibration limits.

Only critical work will occur outside these hours (or on public holidays) where it cannot be undertaken safely within normal working hours.

Similarly, night-time works will only be undertaken where it is impractical to undertake the works during daytime, e.g. where road or rail closures are required.

Where works are undertaken outside normal working hours, they will need to be assessed and mitigated through a schedule (refer Section 10.4).

4.3.3 Construction duration

Construction of the Project will generally be in a linear nature, moving along the corridor. This means that high noise and/or vibration levels are experienced by individual buildings only for a short period (e.g. weeks or months) compared with the overall construction duration of the Project (generally years).

Larger structures would take longer to construct. For example, the estimated construction times for large structures are approximately:

- Three to four years for the ramp across SH20 (NoR 4b);
- Two to three years for the bridge across SH1 (NoR 2); and
- Two to three years for the bus rapid transit bridge over the rail line connecting to the Puhinui Station (NoR 3).

Puhinui Station will require more sustained construction over several months.

The exception are laydown areas and site yards, which will remain in place for generally the full duration of construction of the Project. However, these yards do not generate high noise level (refer Section 4.4.2).

4.4 Construction noise

4.4.1 Predictions

Noise level predictions for construction projects take into account the sound power levels of each item of equipment, and model the noise propagation characteristics over distance, including the effects of ground and air absorption. We have calculated indicative noise levels in accordance with NZS6803:1999 and ISO 9613-2:1996 *"Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation"* for all relevant construction scenarios, assuming multiple items of equipment operating simultaneously, but taking account of spatial separation and time component. This approach is deliberately conservative to represent the reasonable worst-case noise levels that may infrequently occur.

Other than the variations in noise level due to the factors discussed above, there are numerous additional aspects that affect construction noise generation. Some of these aspects are variations among individual items of equipment, the state of equipment repair, exact locations of each item and operator idiosyncrasies. Generally, these factors cannot be accounted for as they cannot be reasonably quantified. However, the conservative approach outlined above is considered to generally provide for these variables.

Predictions are based on existing buildings in the vicinity of the Project. However, if new buildings in the vicinity of the Project are occupied by the time of construction, these will also be assessed and considered when mitigation is determined.

4.4.2 Activity noise levels

We have predicted construction noise levels based on experience with similar projects and in similar circumstances. We assembled a list of likely equipment that would be used on a large-scale infrastructure project throughout New Zealand. Table 10 sets out this list of equipment and its respective sound power levels. It is important to keep in mind that this list is indicative only and is essentially the "best estimate" of equipment that could be used.

Table 10: Construction equipment noise levels

Activity	Plant type	Sound power level (dB L_{WA})
Site establishment (clearance, demolition, compound construction)	Chain saw Chipper Dump trucks Hydraulic excavator Vibratory roller	114 117 106 113 108
Earthworks (alignment works, drainage and culvert construction)	Dump truck Hydraulic excavator Bulldozer Compactor Water truck	106 113 114 112 105

Activity	Plant type	Sound power level (dB L_{WA})
Retaining Wall Construction	Vibration piling rig Rotary Piling Rig Concrete trucks Crane On road trucks	120 111 107 106 100
Bridge foundations (piling)	Rotary piling rig Concrete trucks	111 107
Foundations and structures (bridge construction)	Crane Concrete pump Vibratory pokers Concrete trucks	106 100 114 107
Pavement preparation	Vibratory roller Water trucks	108 105
Surfacing	Paver Road rollers Asphalt delivery trucks	113 106 108
Walking and cycling facilities	Small excavator Plate compactor Small roller Paving machine	102 108 101 103
Yard activities	Vehicle movements Material handling Administration area Workshop	102 105 50 80

Based on the sound power levels in Table 10, we predicted combined “activity sound power levels” (refer Table 11 below). We note that not all equipment will operate consecutively and continuously. For instance, for the site establishment, the chain saws and chipper will operate at the same time, but trucks and vibratory rollers will be used at a later stage of the site establishment when site compounds are constructed.

Although the contractor may use different plant and equipment from what is on this list, based on experience with other large scale infrastructure construction projects we consider that noise emissions will be similar for each activity.

From the activity sound power levels, we determined the distance at which the 70 dB L_{Aeq} day-time noise criterion can be complied with, without mitigation by noise barriers.

Table 11: Activity sound power levels and compliance distance

Activity	Activity Sound Power Level	Distance at which compliance with day-time limit (70 dB L_{Aeq}) is achieved <u>without noise barriers/ intervening buildings</u>
	dB L_{WA}	metres
Site establishment/demolition	115	76
Earthworks	116	83
Retaining wall construction	116	83
Bridge foundations (piling)	111	52
Foundations and structures (concreting)	108	40
Pavement preparation	108	40
Surfacing	110	48
Walking and cycling facility works	103	25
Compounds/construction yard	100	18

Some buildings, especially in NoRs 1, 2, and 3, are close to the potential works. While some may receive screening from intervening buildings, others will be exposed to the works and will need mitigation as set out in Section .

4.5 Construction vibration

4.5.1 Predictions

Construction vibration is a separate issue from construction noise. Construction equipment that produces high noise levels does not necessarily also produce high vibration levels and vice versa.

Vibration prediction is less reliable than noise prediction as it is dependent on accurate modelling of ground conditions. Ground conditions are often non-homogeneous and complex in three dimensions, and consequently difficult to quantify across large construction extents.

As a result, we have determined “safe distances” based on vibration measurements[4] previously performed for high vibration sources such as vibropiling and vibratory rollers. The safe distances are based on vibration prediction tools as contained in Hassan (2006)[5]. These have been cross-checked against empirically derived relationships as contained in BS 5228-2:2009 *Code of practice for noise and vibration control on construction and open sites* Part 2: Vibration, the Transport Research Laboratory Report referenced by that standard, and previous measurements carried out by MDA. In addition, a 100% safety margin has been applied to the regression curve derived from the measured data, to take account of ground condition uncertainty, making the predictions conservative. That

4 Measurements performed at State Highway 18, MacKays to Peka Peka, AMETI and other projects

5 Hassan, O., “Train Induced Groundborne Vibration and Noise in Buildings”, Multi-Science Publishing Co Ltd, ISBN 0906522 439, 2006.

means that measured vibration levels were not used directly to predict potential vibration levels, but rather that the measured levels have been increased by 100%.

We have used the results from these measurements and predictions to determine risk radii within which buildings are at medium or high risk of receiving vibration levels within Category B (refer Section 3.2.2). The risk radii also consider human annoyance effects.

4.5.2 Equipment vibration levels

The activities that pose the greatest risk of exceeding the vibration criteria (human annoyance and building damage as set out in Section 3.2) are vibratory rolling and vibropiling. This assessment has focused on these activities. The regression curves for vibratory rollers and vibropiling are shown in **Figure 2**.

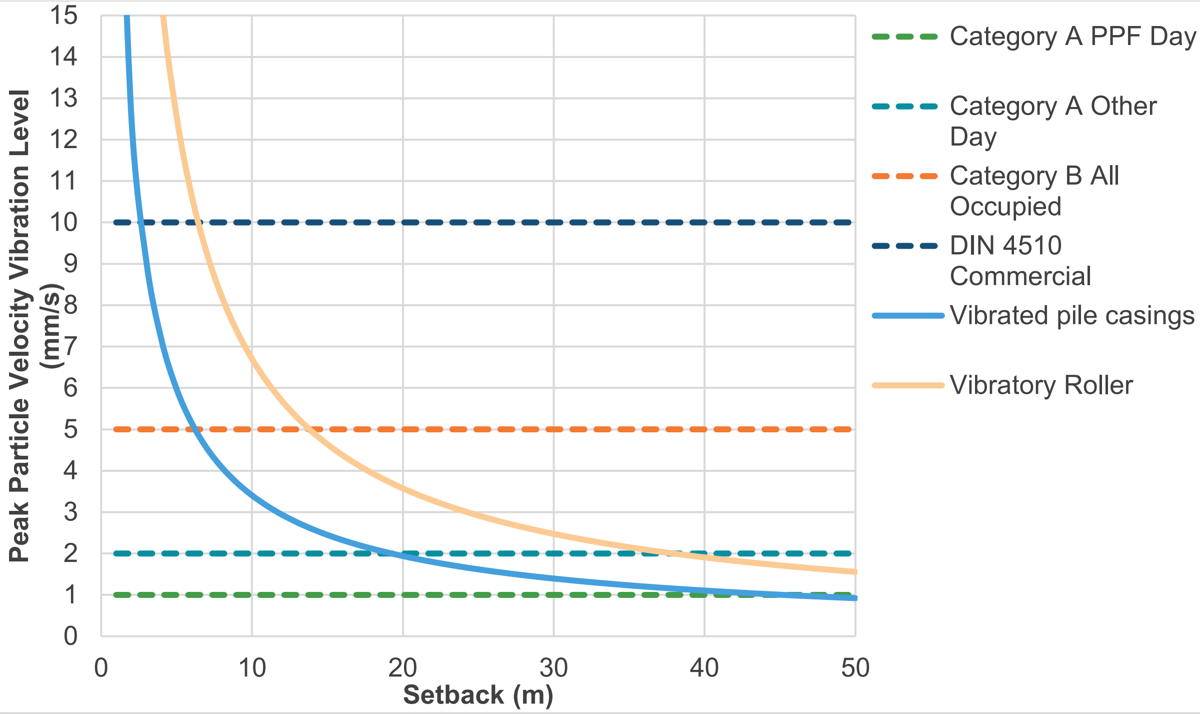


Figure 2: Vibration regression curves (criteria for occupied buildings)

5 General construction noise and vibration effects

5.1 Construction noise

5.1.1 Envelope of noise effects

We have predicted noise levels that include existing buildings (excluding those to be demolished) for shielding. Based on these predicted noise levels, we have developed effects envelopes, i.e. distances at which compliance with the daytime noise criteria can be achieved without noise mitigation in place. The envelopes have been plotted onto aerial photographs to show those areas where mitigation would need to be considered and implemented (refer **Appendix A**).

For those areas not included in the envelopes, we predict that noise levels will comply with the relevant limits, and no noise mitigation beyond normal best practice site management would be required (refer Section 10). In any event, Section 16 of the RMA (Duty to avoid unreasonable noise) applies and the BPO will need to be implemented to manage noise effects on all areas, irrespective of compliance.

The following activities have been used to determine the envelope of effects. These are the activities we consider have the greatest impact on construction noise or will be used across the widest part of the NoRs;

- Construction of bridges and retaining walls may generate high noise levels due to the likely direct line-of-sight between buildings and machinery and the high sound power levels of the equipment – these activities will be localised and apply only for small areas within each NoR (if at all);
- Earthworks will occur across all NoR and generate elevated noise levels due to the equipment that will likely be utilised, and the number of equipment items likely used across the network. However, works will move along the alignments and therefore only be in any one location for limited times (e.g. a few weeks out of several years of construction); and
- Surfacing may need to be undertaken at night-time. This would affect all residential receivers, however, only for a limited time of one or two nights.

5.1.2 Noise effects

Daytime

Noise levels affect people in their place of residence or work. Construction noise is inherently higher than ongoing operational noise, which is reasonable due to its limited duration.

Generally, construction noise is assessed in relation to people inside buildings. It is assumed that people will choose to not spend any extended periods in an outdoor area next to high noise construction activities. It is also assumed that people will keep their windows and doors closed to reduce internal noise levels. Generally, New Zealand dwelling facades reduce noise levels by 20 to 25 decibels. We have assumed conservatively a noise level reduction of 20 decibels, though any new dwellings would achieve 25 to 30 decibels noise level reduction, and commercial buildings with concrete or brick façades can even achieve noise level reductions of more than 35 decibels if there are no windows or doors facing to the works.

How people may experience noise inside or outside a building is described in Table 12. That table does not take account of non-sensitive activities such as factories, storage spaces and similar uses.

Table 12: Potential noise effects for varying noise levels

External Façade Noise Level dB L_{Aeq}	Potential Daytime Effects Outdoors	Corresponding Internal Noise Level dB L_{Aeq}	Potential Daytime Effects Indoors
Up to 65	Conversation becomes strained, particularly over longer distances.	Up to 45	Noise levels would be noticeable but unlikely to interfere with residential or office daily activities.
65 to 70	People would not want to spend any length of time outside, except when unavoidable through workplace requirements.	45 to 50	Concentration would start to be affected. TV and telephone conversations would begin to be affected.
70 to 75	Businesses that involve substantial outdoor use (for example garden centres such as Bunnings) would experience considerable disruption.	50 to 55	Face to face and phone conversations and TV watching would continue to be affected. Office work can generally continue.
75 to 80	Some people may choose hearing protection for long periods of exposure. Conversation would be very difficult, even with raised voices.	55 to 60	Phone conversations would become difficult, and face to face conversations would need slightly raised voices. For residential activities TV and radio sound levels may need to be raised. Continuing office work may become difficult.
80 to 90	Hearing protection would be required for prolonged exposure (8 hours at 85 dB) to prevent hearing loss.	60 to 70	Face to face conversations would require raised voices. In a residential context, people may actively seek respite if these levels are sustained for more than a period of a few hours. Concentration would start to be affected, continuing office work would be difficult and may become unproductive.

Night-time

The noise level received inside a noise sensitive space (e.g. bedroom) will depend on the external noise level, sound insulation performance of the façade (particularly the glazing) and room constants (such as the room dimensions and surface finishes). These factors can vary widely.

The Construction Noise Standard (NZS 6803) recommends noise limits assessed at 1 m from the external façade of a building, assuming a façade sound level difference of 20 decibels. However, a 20-decibel reduction is particularly conservative for modern buildings. The sound insulation performance can be measured, or generally be estimated with knowledge of the façade glazing type as follows:

- Sealed glazing: 30 decibels façade sound level difference

- Closed windows (openable): 20 – 25 decibels façade sound level difference
- Open windows: 15 decibels façade sound level difference

Table 13 provides guidance on the potential night-time effects inside sensitive spaces, depending on the external noise level and façade glazing type. The potential effects are colour coded as follows:

- Typically acceptable (green)
- Sleep disturbance for some occupants (amber)
- Sleep disturbance for most occupants (red)

Table 13: Night-time noise levels in bedrooms of dwellings

External Noise Level (dB L_{Aeq})	Estimated Internal Noise Level (dB L_{Aeq})			
	Sealed glazing	Openable windows (modern building)	Openable windows (older style building)	Open windows
70 – 75	40 – 45	45 – 50	50 – 55	55 – 60
65 – 70	35 – 40	40 – 45	45 – 50	50 – 55
60 – 65	30 – 35	35 – 40	40 – 45	45 – 50
55 – 60	25 – 30	30 – 35	35 – 40	40 – 45
50 – 55	20 – 25	im 25 – 30	30 – 35	35 – 40
45 – 50	15 – 20	20 – 25	25 – 30	30 – 35

The above table shows that consultation and management may be required if night-time works are proposed in the vicinity of dwellings, where internal noise levels would affect sleep.

5.2 Construction vibration

5.2.1 Envelope of vibration effects

There is a risk that the Category A criteria may be exceeded at dwellings close to retaining wall construction where vibropiling may be used, and where vibratory rollers are used for the compaction of new or widened traffic lanes.

The risk categories in Table 14 relate to the risk of exceeding Category A and B criteria for occupied buildings at various distances from the vibration inducing works. Note that these distances include a 100% safety factor as described in Section 4.5.2 above.

The risk categories are defined as follows:

- High Risk: Predicted to exceed both Category A (amenity) and Category B (building) criteria (refer Section 3.2);
- Medium Risk: Predicted to exceed Category A (amenity) criteria, but comply with the Category B (building) criteria; and
- Low Risk: Predicted to comply with both Category A and B criteria.

Table 14: Activity and vibration risk zones

Activity/Equipment	Risk Zones	
	Occupied PPFs	Other Occupied Buildings
Vibratory Roller	High: <15 m Med: 15 – 80 m Low: >80 m	High: <15 m Med: 15 – 40 m Low: >40 m
Vibropiling	High: <7 m Med: 7 – 45 m Low: >45 m	High: <7 m Med: 7 – 20 m Low: >20 m

Drawings showing the approximate risk zones for the highest vibration inducing equipment (vibratory rollers) along each NoR extent are included in Appendix B. Many dwellings in NoR 1, 2 and 3 are within 15 metres from the closest extent of the works, which means that a large number of dwellings will likely be affected by construction vibration. Therefore, the construction methodology will need to be reviewed closer to the time of construction to ensure that vibration levels are managed appropriately.

Vibration criteria are significantly more stringent at dwellings during the night (0.3 mm/s PPV) and have the potential to be exceeded at distances greater than 200 m from any works using vibratory rollers. On this basis, vibration intensive activities adjacent residential areas should be generally scheduled for the daytime wherever practicable.

5.2.2 Vibration effects

Vibration levels can be perceived well below a level at which cosmetic building damage may occur. For structural damage to occur, vibration levels would need to be magnitudes higher again. People tend to react to low vibration levels, and it is important to inform residents in the vicinity of the works of the potential for construction vibration to be felt.

The below table shows how people may react to various vibration levels. These effects do not consider less sensitive uses such as factories, manual works (e.g. the concrete batching plant) and similar.

Table 15: Vibration effects

Vibration level (mm/s PPV)	Potential effects indoors
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments This is the AUP:OP limit for construction vibration generated at night-time for sensitive receivers.
1	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents. What people feel would be subject to the source/activity (i.e., continuous motion or a one-off event) and associated frequency (i.e., fast or slow vibration), but could include a steady vibration from sources such as vibratory compaction, or a small jolt such as from the

Vibration level (mm/s PPV)	Potential effects indoors
	movement of a large digger. Vibration at this level could rattle crockery and glassware. Sleep disturbance would be almost certain for most people.
2	Vibration would clearly be felt in all situations. Can be tolerated in indoor environments such as offices, houses, and retail, where it occurs intermittently during the day and where there is effective prior engagement. This is the AUP:OP limit for occupied buildings for construction projects generating vibration.
5	Unlikely to be tolerable in a workplace or residential environment without prior warning and explanation. If exposure was prolonged, some people could want to leave the building affected. Computer screens would shake, and light items could fall off shelves. This is the AUP:OP limit for construction activities generating vibration for three days or less between the hours of 7:00 am – 6:00 pm
10	Likely to be intolerable for anything more than a very brief exposure.

For dwellings where the Category A (amenity) criteria are predicted to be exceeded, residents may be disturbed by vibration if no prior warning is given. We recommend notification to avoid such a situation. It is noted, however, that vibration inducing equipment generally moves along the alignment, i.e. vibration levels will not remain high for any length of time.

6 Airport to Botany Bus Rapid Transit – NoR 1

This section assesses construction noise and vibration matters relating to NoR 1 – the Project corridor between Botany Town Centre and Rongomai Park.

6.1 Existing and likely future noise environment

The alignment follows Te Irirangi Drive, with the BRT corridor proposed in the central median. The road was already constructed with rapid transit in mind, and therefore the existing road width will remain largely unchanged as the median can accommodate the BRT corridor.

Neighbouring sites contain a mix of established (relatively new) residential development, generally single storey, established (relatively new) commercial premises and currently vacant or developing commercial areas. In addition, there are a number of retirement villages and a school as well as childcare centres abutting the road.

Te Irirangi Drive is an 80 km/h limited access road, with driveways of dwellings connecting with slip roads before entering the main road at specific points. Traffic noise levels for houses in the first row range from mid-60 to about 70 dB L_{Aeq}, which shows that the area is impacted by high traffic noise levels.

The NPS:UD enables higher density dwellings for all sites adjacent to Te Irirangi Drive. We anticipate that:

- Zoning within a walkable catchment of BRT stations along the corridor will enable at a minimum, apartment buildings of six storeys; and
- Beyond walkable catchments, residential zoning will provide for three dwellings up to three storeys in height (subject to meeting the relevant development standards).

However, the developing commercial sites will be fully established by the time the Project is constructed and will need to be taken into consideration.

Where the environment is materially different at the time of construction, any new occupied buildings will need to be assessed against the relevant noise and vibration limits and managed at the receivers that are present at the time of construction as set out in Section 10.3.

6.2 Buildings within proposed designation

The following Table 16 shows the buildings that are within the proposed designation. We have not assessed these buildings further as the assumption is that the relevant requiring authority will acquire the parcels of land that these buildings are located on, or the buildings will be unoccupied during construction. We only note the addresses where the main building is inside designation.

Table 16: Buildings inside designation (not assessed)

Address	Address
25 Aclare Place, East Tāmaki	14 Moravale Lane, Flat Bush
1, 3 Belinda Avenue, Flat Bush	23 Place Road, East Tamaki Heights

Address	Address
15 Brittas Place, East Tamaki Heights	14, 15 Riechelmann Court, Flat Bush
20 Leixlep Lane, East Tamaki Heights	13 Tonu'U Court, Flat Bush
6 Mika Court, Flat Bush	11 Whetstone Road, Flat Bush

6.3 Construction noise effects

6.3.1 Main construction activities

Most works will occur in the existing road corridor, with lanes generally not moving out towards the houses. An exception are intersections, where additional lanes may be constructed. New walking and cycling facilities will also be constructed in the space between the road and the existing property boundaries. These works are of less intensity than those required to construct the BRT corridor but will be closer to houses. Walking and cycling facilities will require smaller equipment to be used, with less resulting effects.

This NoR does not contain any significant structures such as bridges. There are three stations in this NoR: Smales Road, Accent Drive and Ormiston Road stations. These stations are located at busy intersections in areas that are already affected by high noise levels. Accent Drive and Ormiston Road stations are bordered by residential sites to the east only, while Smales Road station is surrounded by residential sites. Construction of the stations may require a slightly longer construction duration in one location than the BRT lanes and walking and cycling lanes that will move along the corridor.

6.3.2 Daytime works

We have predicted noise levels from construction works for the entire alignment, based on likely earthworks and road formation works, with focus on the new BRT corridor in the middle of the road. Due to the distance of buildings from the works, we predict compliance with the 70 dB L_{Aeq} noise limit for the majority of buildings (2/3 of all assessed buildings). Where houses are slightly closer to the works, noise levels may be up to 73 dB L_{Aeq} when works occur in close proximity. However, these works would be temporary and unlikely to last more than a few days at a time.

The figures in **Appendix A** show which of the existing buildings may receive noise levels marginally above the relevant daytime noise limit of 70 dB L_{Aeq}.

Noise can generally be managed and mitigated through normal processes as set out in Section 10.3.

6.3.3 Night-time works

We anticipate that some limited night-time works may be required where works would affect the existing road (e.g. surfacing). These works would be similar to what can be expected across Auckland when existing major roads are resurfaced over night to avoid traffic disruption. The AUP:OP makes allowance for such works in Section E25.6.29.

Any such works will be limited in duration and can be managed through normal communication and site management (refer to Section 10.4).

6.4 Construction vibration effects

The likely highest vibration levels are predicted from the use of vibratory rollers for the compaction of the BRT corridor. Since these works are in the middle of the existing road, we predict that the 5 mm/s PPV criterion can be complied with at all times. Compliance can be achieved at 14 m from the works (assuming a 100% safety margin as discussed in Section 4.5.1.

Dwellings within 38m of vibratory roller works may experience vibration levels above the amenity criterion. For these houses, vibration levels may exceed 2 mm/s PPV for brief durations while the vibratory roller passes. This would occur for one or two days at a time only and be similar to what would be expected for road resurfacing. Such levels can be managed through communication with affected occupants to ensure they are aware of potential times of high vibration generation.

Figures in **Appendix B** show the indicative vibration envelope outside which compliance with the 5 mm/s PPV vibration limit is predicted.

7 Airport to Botany Bus Rapid Transit – NoR 2

This section assesses specific construction noise and vibration matters relating to NoR 2 – the Project corridor between Rongomai Park and Puhinui Interchange, in the vicinity of Plunket Avenue. For assessment purposes, NoR 2 has been split into three sections as shown in Figure 3 below:

Figure 3: Sections of Airport to Botany Bus Rapid Transit NoR 2

7.1 Existing and likely future noise environment

This NoR encompasses three distinct sections as shown in Figure 3 above. Sections A and C are residential in character, with generally established older housing stock and infill housing. Houses are mostly single and double storey. Section B traverses the Manukau City Centre and is commercial in nature.

The southern side of Section C and part of Section B are within the High Aircraft Noise Area (**HANA**), which means that no new noise sensitive activities will be established. The remainder of Section C, and most of Sections A and B are within the Medium Aircraft Noise Area (**MANA**), which means that any new noise sensitive activities would need to be constructed to be insulated against aircraft noise. Such improved building façades and ventilation also assist in mitigating construction noise. The northernmost part of Section A is outside the aircraft noise areas.

A number of sensitive sites such as Puhinui School, AUT South Campus, MIT and several childcare centres are adjacent to the alignment.

The presence of the HANA and MANA indicate elevated noise levels from aircraft noise. In addition, the BRT corridor will follow established major roads which also have a clear influence on the noise levels of neighbouring buildings. Measured noise levels show a range of mid-60 to low-70 dB L_{Aeq} for houses fronting the road, generally controlled by road traffic.

The NPS:UD enables higher density dwellings for sites adjacent to the BRT corridor. We anticipate that:

- Zoning within a walkable catchment of BRT stations along the corridor will enable, at minimum, apartment buildings of six storeys; and
- Beyond walkable catchments, residential zoning will provide for three dwellings up to three storeys in height (subject to meeting the relevant development standards).

Based on the above, we expect significant redevelopment along this NoR in the near to medium future, where sites are outside the HANA.

Therefore, while we have assessed existing buildings in this report, we recommend that where the existing environment is materially different at the time of construction, any new occupied buildings will need to be assessed against the relevant noise and vibration limits and managed at the receivers that are present at the time of construction as set out in Section 10.3.

7.2 Buildings within proposed designation

The following Table 17 shows the buildings that are within the proposed designation. We have not assessed these buildings further as the assumption is that the relevant requiring authority will acquire the parcels of land that these buildings are located on, or the buildings will be unoccupied during construction.

Note that all buildings to be removed, of the three sections of NoR 2, are combined in the table below.

Table 17: Buildings inside designation (not assessed)

Address	Address
1, 3 Belinda Avenue, Flat Bush	66 Othello Drive, Clover Park
19R, 104B, 104C, 131 Boundary Road, Clover Park	2, 4A, 6 Plunket Avenue, Papatoetoe
139, 141, 154 Carruth Road, Papatoetoe	67 – 79 (odd), 80, 81 – 97 (odd), 101 – 107 (odd), 122 – 162 (even) Puhinui Road, Papatoetoe
1 and 2/89 Charntay Avenue, Clover Park	2 Sandrine Avenue, Clover Park
1 and 2/141, 2/148 Dawson Road, Flat Bush	18, 19 Tavistock Street, Papatoetoe
1 – 7 (odd), 9A, 11, 13, 15A Dissmeyer Drive, Flat Bush (uneven numbers only)	44 – 50 (even), 55 – 61 (odd), 56, 60, 62, 1/67, 1/68, 69, 71, 72, 74, 76, 1/80, 82, 83, 3/86, 88, 90, 97, 100, 2/102, 106, 108, 110, 3/112, 118, 120, 124, 126, 130, 132, 134, 140, 142, 146, 147, 148, 149A and B, 152, 154, 155, 157A and B, 2/157, 158, 159, 160, 161, 164, 166, 170, 174 – 180 (even), 190, 194, 199, 210, 214, 218, 220 Te Irirangi Drive, Flat Bush/Clover Park
72C Hollyford Drive, Clover Park	11 Whetstone Road, Flat Bush

7.3 Section A: East of SH1 to Rongomai Park

7.3.1 Construction noise effects

7.3.1.1 Main construction activities

There are three activities when noise levels may potentially exceed the relevant noise limit: during the demolition of buildings inside the designation, during earthworks for the preparation of the new traffic lanes, and for bridge construction across SH1.

We predict that most dwellings adjacent to buildings to be demolished may at times receive noise levels exceeding the 70 dB L_{Aeq} noise criterion. This is due to the fact that works will be very close to neighbouring houses. Any such exceedances will likely be limited to one or two days as high noise levels from demolition are not sustained over a long period. Most houses in the area are of light weight construction, which means that generally an excavator and truck are sufficient to demolish the structures. In rare circumstances, concrete cutting may be required. In that case, temporary barriers should be used to shield neighbouring buildings from the noise.

We understand that access to residential sites will need to be maintained. This means that barriers for longer extents of the works are unlikely to be practicable mitigation. Earthworks will therefore likely be required to be managed by communication, equipment selection and timing. We predict that approximately 110 of the nearly 900 buildings in the vicinity of the works may receive noise levels up to 73 dB L_{Aeq} from earthworks, with the remaining buildings receiving compliant noise levels.

Given the large number of neighbouring houses and the shielding provided by buildings in the first row, we have prepared figures showing which buildings are predicted to receive noise levels above the daytime noise limit from earthworks and lane preparation. This activity would occur over a longer period than demolition and we have therefore based our assessment on this phase of the works.

Section A of NoR 2 includes two stations; Dawson Road and Diorella Drive stations, where works may be somewhat more sustained.

Figures in **Appendix A** show the relevant houses at which minor exceedances are predicted.

7.3.1.2 Daytime works

We predict that noise levels from demolition may be up to 78 dB L_{Aeq} at individual houses, for a few hours when demolition occurs immediately adjacent to the dwelling. However, the duration will be brief and therefore can be managed through communication and consultation.

Part of the excavation would also include the breaking up and excavation of existing concrete driveways and foundations. These may cause high noise levels at neighbouring houses. However, temporary barriers may be installed around any break site to reduce noise levels.

Earthworks will occur over a more sustained period. We predict noise levels up to 73 dB L_{Aeq} at closest houses when earthworks occur in the immediate vicinity, such levels are only marginally above the noise criteria, and given that they are likely to occur for only limited periods (a few days or weeks at most), we consider that besides normal site management, consultation and communication will be the most effective management measures.

7.3.1.3 Night-time works

We anticipate that some limited night-time works may be required where works would affect the existing road (e.g. surfacing). These works would be similar to what can be expected across Auckland when existing major roads are resurfaced over night to avoid traffic disruption. These works would be similar to what can be expected across Auckland when existing major roads are resurfaced over night to avoid traffic disruption. The AUP:OP makes allowance for such works in Section E25.6.29.

Any such works will be limited in duration and can be managed through normal communication and site management through a schedule (refer Section 10.4).

The other area where night-time works will likely be required is the new bridge across SH1. As the construction of the bridge may require closing of SH1, these works will need to be undertaken at night-time. Such works would be limited in duration. There are a small number of dwellings in the vicinity of SH1 which will likely be affected by these works, and a schedule will be required to ensure effects are appropriately managed. Should night-time works be sustained and of high intensity (e.g. should the existing bridge require demolition), an offer of temporary relocation may be considered for closest dwellings in order to manage potential sleep disturbance. This would be recorded in a schedule (refer Section 10.4).

7.3.2 Construction vibration effects

The likely highest vibration levels are predicted from the use of vibratory rollers for the compaction of the extended traffic lanes. With the BRT corridor in the middle of the road, traffic lanes will move out towards the houses. Compliance with the 5 mm/s PPV limit can be achieved at 14 m from the works (assuming a 100% safety margin as discussed in Section 4.5.1).

Due to the distance of the works from the houses remaining, we predict that compliance with the 5 mm/s PPV vibration limit can be achieved at all buildings.

Dwellings within 38m of vibratory roller works may experience vibration levels above the amenity criterion. For these houses, vibration levels may exceed 2 mm/s PPV for brief durations while the vibratory roller passes. This would occur for one or two days at a time only and be similar to what would be expected for road resurfacing. Such levels can be managed through communication with affected occupants to ensure they are aware of potential times of high vibration generation.

Figures in **Appendix B** show the indicative vibration envelope outside which compliance with the 5 mm/s PPV vibration limit is predicted without additional mitigation or management.

7.4 Section B: Ihaka Place to east of SH1

7.4.1 Construction noise effects

7.4.1.1 Main construction activities

Works through the Manukau City Centre will generally occur within the road and existing open space. No main building demolition is required. Most buildings in the area are multi storey.

Specifically, sensitive receivers include MIT and the AUT South Campus. While the AUT South Campus is located in the HANA, MIT is located in the MANA. Both sites would likely include façade noise controls and ventilation to take account of the aircraft noise and will therefore also be somewhat protected against construction noise.

Due to the general distance to buildings, we predict that for most activities, compliance with the daytime noise limit can be achieved. A small number of buildings that are closer to the works are predicted to receive noise levels of up to 6 dB above the daytime limit when works are immediately beside them. This includes MIT, where a noise level of 76 dB L_{Aeq} is predicted. Given that the building is likely already constructed to take account of elevated noise levels, we consider that internal noise levels will be acceptable for teaching activities, with anticipated noise levels below 40 dB L_{Aeq}. The construction of the bridge across SH1 will likely have some effects on the AUT South Campus, however, the buildings are located somewhat further away from the works and therefore levels will likely be manageable.

There are two stations in this section: Ronwood Avenue and Manukau Central stations.

Figures in **Appendix A** show the relevant houses at which minor exceedances are predicted.

7.4.1.2 Daytime works

Works in this area will be similar to common road works expected with transport infrastructure upgrades across Auckland, involving footpath and kerbing works and surface widening and improvements.

Works would be moving along the alignment, which means that elevated noise levels would be experienced for only brief periods at each building. Highest noise levels are predicted where intersections are upgraded and the road moves closer to buildings (e.g. at MIT), and where bridge works are required (across SH1, in the vicinity of AUT South Campus).

Highest predicted noise levels are between 71 and 74 dB L_{Aeq}, with only MIT predicted to receive a noise level of 76 dB L_{Aeq}. However, the duration will be brief and therefore can be managed through communication and consultation. We also recommend that communication with the education facilities is ongoing throughout the construction duration to avoid sensitive times such as exams.

7.4.1.3 Night-time works

We anticipate that some limited night-time works may be required where works would affect the existing road (e.g. surfacing). These works would be similar to what can be expected across Auckland when existing major roads are resurfaced over night to avoid traffic disruption. The AUP:OP makes allowance for such works in Section E25.6.29.

Any such works will be limited in duration and can be managed through normal communication and site management through a schedule (refer Section 10.4).

The other area where night-time works will likely be required is the new bridge across SH1. As the construction of the bridge may require closing of SH1, these works will need to be undertaken at night-time. Such works would be limited in duration. Within Section B of NoR 2, there are no sensitive receivers on the western side of SH1. We anticipate that the AUT campus is not occupied at night-time. Therefore, it is unlikely that sensitive receivers will be affected by these works.

7.4.2 Construction vibration effects

The likely highest vibration levels are predicted from the use of vibratory rollers for the compaction of the extended traffic lanes, and from the bridge pile installation.

For vibratory rollers, compliance with the 5 mm/s PPV limit can be achieved at 14 m from the works (assuming a 100% safety margin as discussed in Section 4.5.1).

A small number of buildings is predicted to receive vibration levels above 5 mm/s PPV (refer Table 18 below). In the vicinity of these houses, we recommend that alternative forms of compaction are used, e.g. non-vibratory compaction, a smaller machine or plate compactors. With these measures, compliance can be achieved.

Table 18: Buildings at which 5 mm/s PPV limit is predicted to be exceeded

Address	Address
639 Great South Road	503/17 Amersham Way
58 Manukau Station Road	2 Ronwood Avenue

Dwellings within 38m of vibratory roller works may experience vibration levels above the amenity criterion. For these houses, vibration levels may exceed 2 mm/s PPV for brief durations while the vibratory roller passes. This would occur for one or two days at a time only and be similar to what would be expected for road resurfacing. Such levels can be managed through communication with affected occupants to ensure they are aware of potential times of high vibration generation.

Some buildings at the AUT South Campus and Countdown may be close to proposed retaining walls leading to the SH1 bridge. Where buildings are within 20m of retaining or bridge piling, we recommend that bored piling is used instead of impact or vibratory piling, to ensure compliance with the 5 mm/s PPV limit.

Figures in **Appendix B** show the indicative vibration envelope outside which compliance with the 5 mm/s PPV vibration limit is predicted without additional mitigation or management.

7.5 Section C: Ihaka Place to Plunket Avenue

7.5.1 Construction noise effects

7.5.1.1 Main construction activities

There are two phases of the works when noise levels may potentially exceed the relevant noise limit: during the demolition of buildings inside the designation, and during earthworks for the preparation of the new traffic lanes.

We predict that most dwellings adjacent to buildings to be demolished may at times receive noise levels exceeding the 70 dB L_{Aeq} noise criterion. This is due to the fact that works will be very close to neighbouring houses. Any such exceedances will likely be limited to one or two days as high noise levels from demolition are not sustained over a long period. Most houses in the area are of light weight construction, which means that generally an excavator and truck are sufficient to demolish the structures. In rare circumstances, concrete cutting may be required. In that case, temporary barriers should be used to shield neighbouring buildings from the noise.

We understand that access to residential sites will need to be maintained. This means that barriers for longer extents of the works are unlikely to be practicable mitigation. Earthworks will therefore likely be required to be managed by communication, equipment selection and timing. We predict that approximately 60 of the 475 buildings in the vicinity of the works may receive noise levels up to 74 dB L_{Aeq} from earthworks, with the remaining buildings receiving compliant noise levels.

Given the large number of neighbouring houses and the shielding provided by buildings in the first row, we have prepared figures showing which buildings are predicted to receive noise levels above the daytime noise limit from earthworks and lane preparation. This activity would occur over a longer period than demolition and we have therefore based our assessment on this phase of the works.

There is one station in this section of NoR 2 at the Lambie Drive/Puhinui Road intersection

Figures in **Appendix A** show the relevant houses at which minor exceedances are predicted.

7.5.1.2 Daytime works

We predict that noise levels from demolition may be up to 78 dB L_{Aeq} at individual houses, for a few hours when demolition occurs immediately adjacent to the dwelling. However, the duration will be brief and therefore can be managed through communication and consultation.

Part of the excavation would also include the breaking up and excavation of existing concrete driveways and foundations. These may cause high noise levels at neighbouring houses. However, temporary barriers may be installed around any break site to reduce noise levels.

Earthworks will occur over a more sustained period. We predict noise levels up to 73 dB L_{Aeq} at closest houses when earthworks occur in the immediate vicinity, Such levels are only marginally above the noise criteria, and given that they are likely to occur for only limited periods (a few days or weeks at most), we consider that besides normal site management, consultation and communication will be the most effective management measures.

Puhinui School fronts the works. The playing fields are located immediately beside the road. During earthworks, communication on the playing fields may be difficult. In consultation with the school, we recommend that a barrier is discussed for the school. This barrier may be retained to reduce traffic noise on the playing fields in the future.

We also recommend that communication with the school is ongoing throughout the construction duration to avoid sensitive times such as exams.

7.5.1.3 Night-time works

We anticipate that some limited night-time works may be required where works would affect the existing road (e.g. surfacing). These works would be similar to what can be expected across Auckland when existing major roads are resurfaced over night to avoid traffic disruption. The AUP:OP makes allowance for such works in Section E25.6.29.

Any such works will be limited in duration and can be managed through normal communication and site management through a schedule (refer Section 10.4).

7.5.2 Construction vibration effects

The likely highest vibration levels are predicted from the use of vibratory rollers for the compaction of the extended traffic lanes. With the BRT corridor in the middle of the road, traffic lanes will move out towards the houses. Compliance with the 5 mm/s PPV limit can be achieved at 14 m from the works (assuming a 100% safety margin as discussed in Section 4.5.1).

A small number of buildings is predicted to receive vibration levels above 5 mm/s PPV (refer Table 19 below). In the vicinity of these houses, we recommend that alternative forms of compaction are used, e.g. non-vibratory compaction, a smaller machine or plate compactors. With these measures, compliance can be achieved.

Table 19: Buildings at which 5 mm/s PPV limit is predicted to be exceeded

Address	Address
2/73, 77A, 2/101, 109, 124B Puhinui Road	4 Plunket Avenue
639 Great South Road	

Dwellings within 38m of vibratory roller works may experience vibration levels above the amenity criterion. For these houses, vibration levels may exceed 2 mm/s PPV for brief durations while the vibratory roller passes. This would occur for one or two days at a time only and be similar to what would be expected for road resurfacing. Such levels can be managed through communication with affected occupants to ensure they are aware of potential times of high vibration generation.

Figures in **Appendix B** show the indicative vibration envelope outside which compliance with the 5 mm/s PPV vibration limit is predicted without additional mitigation or management.

8 Airport to Botany Bus Rapid Transit – NoR 3

This section assesses construction noise and vibration matters relating to NoR 3 – the Project corridor between Puhinui Station, in the vicinity of Plunket Avenue and SH20/20B Interchange.

8.1 Existing and likely future noise environment

NoR 3 traverses largely established residential areas with single and double storey dwellings. To the south of Puhinui Road are a number of commercial and business premises. A significant extent of the sites adjacent to the alignment are within the HANA (all sites south of Puhinui Road), with the remainder in the MANA. This means that existing buildings in the HANA should already have been insulated to reduce aircraft noise, and have ventilation installed. In the MANA, all new dwellings, and some of the existing ones, would also have sound insulation and ventilation incorporated.

The presence of the HANA and MANA indicate elevated noise levels from aircraft noise. In addition, the BRT Corridor will follow an established major road which also has a significant influence on the noise levels of neighbouring buildings. Measured noise levels are in the mid-60 dB L_{Aeq} for houses fronting the road, generally controlled by road traffic.

The NPS:UD enables higher density dwellings for sites adjacent to the BRT corridor outside the HANA (i.e. to the north of the road). We anticipate that zoning within a walkable catchment of BRT stations along the corridor will enable, at minimum, apartment buildings of six storeys.

Therefore, while we have assessed existing buildings in this report, we recommend that where the existing environment is materially different at the time of construction, any new occupied buildings will need to be assessed against the relevant noise and vibration limits and managed at the receivers that are present at the time of construction as set out in Section 10.3.

8.2 Buildings within proposed designation

The following Table 20 shows the buildings that are within the proposed designation. We have not assessed them further as the assumption is that the relevant requiring authority will acquire the parcels of land that these buildings are located on, or these buildings will be unoccupied during construction.

Table 20: Buildings inside designation (not assessed)

Address	Address
3, 5, 7 – 10 Bridge Street, Papatoetoe	2, 4A Plunket Avenue, Papatoetoe
6, 8, 18, 20, 22, 26 Cambridge Terrace, Papatoetoe	146 – 150 (even), 156, 166 – 202 (even), 199, 203,230, 232, 252, 262 – 266 (even), 272 – 280 (even), 281, 284, 286, 290 – 294 (even), 298, 300 – 306 (even), 310, 312 Puhinui Road, Papatoetoe
4, 6, 8 Noel Burnside Road, Papatoetoe	1, 2, 2/3, 5 Ranfurly Avenue, Papatoetoe
98, 104 Kenderdine Road, Papatoetoe	

8.3 Construction noise effects

8.3.1 Main construction works

There are three activities when noise levels may potentially exceed the relevant noise limit: during the demolition of buildings inside the designation, during earthworks for the preparation of the new traffic lanes, and the construction of the bus bridge across the rail line at Puhinui Interchange.

We predict that most dwellings adjacent to buildings to be demolished may at times receive noise levels exceeding the 70 dB L_{Aeq} noise criterion. This is due to the fact that works will be very close to neighbouring houses. Any such exceedances will likely be limited to one or two days as high noise levels from demolition are not sustained over a long period. Most houses in the area are of light weight construction, which means that generally an excavator and truck are sufficient to demolish the structures. In rare circumstances, concrete cutting may be required. In that case, temporary barriers should be used to shield neighbouring buildings from the noise.

We understand that access to residential sites will need to be maintained. This means that barriers for longer extents of the works are unlikely to be practicable mitigation. Earthworks will therefore likely be required to be managed by communication, equipment selection and timing. We predict that approximately 100 of the 673 buildings in the vicinity of the works may receive noise levels up to 77 dB L_{Aeq} from earthworks, with the remaining buildings receiving compliant noise levels.

Given the large number of neighbouring houses and the shielding provided by buildings in the first row, we have prepared figures showing which buildings are predicted to receive noise levels above the daytime noise limit from earthworks and lane preparation. This activity would occur over a longer period than demolition and we have therefore based our assessment on this phase of the works.

The construction of the BRT bridge will occur in close proximity to a small number of dwellings. Some of the bridge works will likely need to be undertaken at night or over a long weekend as rail closures may be required.

There is only one station proposed for this NoR, at Puhinui Station. The station construction is unlikely to materially add to the already intensive works at Puhinui Station associated with the construction of the new BRT bridge structure.

Figures in **Appendix A** show the relevant houses at which minor exceedances are predicted.

8.3.2 Daytime works

We predict that noise levels from demolition may be up to 78 dB L_{Aeq} at individual houses, for a few hours when demolition occurs immediately adjacent to the dwelling. However, the duration will be brief and therefore can be managed through communication and consultation.

Part of the excavation would also include the breaking up and excavation of existing concrete driveways and foundations. These may cause high noise levels at neighbouring houses. However, temporary barriers may be installed around any break site to reduce noise levels.

Earthworks will occur over a more sustained period. We predict noise levels up to 77 dB L_{Aeq} at closest houses when earthworks occur in the immediate vicinity of the Project. Such levels are only marginally above the noise criteria, and given that they are likely to occur for only limited periods (a few days or weeks at most), we consider that besides normal site management, consultation and communication will be the most effective management measures.

8.3.3 Night-time works

We anticipate that some limited night-time works may be required where works would affect the existing road (e.g. surfacing). These works would be similar to what can be expected across Auckland when existing major roads are resurfaced over night to avoid traffic disruption. The AUP:OP makes allowance for such works in Section E25.6.29.

The other area where night-time works will likely be required is the new BRT bridge across the rail line at Puhinui Station. As the construction of the bridge may require a block of line, these works will need to be undertaken at night-time or on a long weekend. Such works would be limited in duration. There are a small number of dwellings in the vicinity of Puhinui Station which will likely be affected by these works, and a schedule will be required to ensure effects are appropriately managed. Should night-time works be sustained and of high intensity (e.g. should the existing bridge require demolition), an offer of temporary relocation may be considered for closest dwellings in order to manage potential sleep disturbance. This would be recorded in a schedule.

Any such works will be limited in duration and can be managed through normal communication and site management through a schedule (refer Section 10.4).

8.4 Construction vibration effects

The likely highest vibration levels are predicted from the use of vibratory rollers for the compaction of the extended traffic lanes. With the BRT corridor in the middle of the road, and on a bridge, traffic lanes will move out towards the houses. Compliance with the 5 mm/s PPV limit can be achieved at 14 m from the works (assuming a 100% safety margin as discussed in Section 4.5.1).

A small number of buildings is predicted to receive vibration levels above 5 mm/s PPV (refer Table 21). In the vicinity of these houses, we recommend that alternative forms of compaction are used, e.g. non-vibratory compaction, a smaller machine or plate compactors. With these measures, compliance can be achieved.

Table 21: Buildings at which 5 mm/s PPV limit is predicted to be exceeded

Address	Address
153, 155, 226, 246, 294A, 316 Puhinui Road	Puhinui Station building
4 Plunket Avenue	

Dwellings within 38m of vibratory roller works may experience vibration levels above the amenity criterion. For these houses, vibration levels may exceed 2 mm/s PPV for brief durations while the vibratory roller passes. This would occur for one or two days at a time only and be similar to what would be expected for road resurfacing. Such levels can be managed through communication with affected occupants to ensure they are aware of potential times of high vibration generation.

Some dwellings are in close proximity to the proposed new BRT bridge across Puhinui Station. Where buildings are within 20m of retaining wall or bridge piling, we recommend that bored piling is used instead of impact or vibratory piling, to ensure compliance with the 5 mm/s PPV limit.

Figures in **Appendix B** show the indicative vibration envelope outside which compliance with the 5 mm/s PPV vibration limit is predicted without additional mitigation or management.

9 Airport to Botany Bus Rapid Transit – NoRs 4a and 4b

This section assesses construction noise and vibration matters relating to NoRs 4a and 4b – the Project corridor between the SH20/20B Interchange and Orrs Road.

As set out in Section 2.1.4 above, NoR 4a involves the widening of Puhinui Road between west of the SH20/20B Interchange and Orrs Road. This NoR is under the jurisdiction of Auckland Transport and overlaps the proposed alteration to the existing Waka Kotahi designation 6717.

NoR 4b involves the proposed widening of State Highway 20B from the SH20/20B Interchange to Manukau Memorial Gardens, a new southbound ramp from SH20B to SH20, high quality walking and cycling facilities and the provision of a Bus Rapid Transit Corridor. This NoR is under the jurisdiction of Waka Kotahi.

9.1 Existing and likely future noise environment

The Project traverses a currently sparsely developed area with intermittent dwellings at distance from the existing road. Most of the area is located within the HANA, with the remainder in the MANA. This means that the area is already affected by aircraft noise, and for the most part noise sensitive activities are not permitted to be developed.

In addition, the existing Puhinui Road (SH20B) and SH20 are major roads that affect the ambient noise environment.

To the north, sites are zoned Future Urban. Should this zone be developed prior to construction of the NoRs, any existing occupied buildings at the time of road construction will need to be assessed for construction noise and vibration impact. Commercial premises have similar protection from construction noise as dwellings. Any future use of the neighbouring sites should be reviewed, and appropriate criteria applied to be commensurate with the sensitivity of the receiving environment (e.g. a concrete batching plant is significantly less sensitive to construction noise than an office).

The Manukau Memorial Gardens are adjacent to the Projects. This cemetery is still operating at present. We recommend that any contractor coordinates work times with the cemetery management to avoid sensitive times such as during funerals or memorials.

Overall, the noise levels at existing houses in the area range from mid-50 to mid-60 dB L_{Aeq} from road traffic only. We measured noise levels of 62 to 65 dB L_{Aeq} including aircraft noise. This shows that the area is clearly affected by traffic and aircraft noise.

Where the existing environment is materially different at the time of construction, any new occupied buildings will need to be assessed against the relevant noise and vibration limits and managed at the receivers that are present at the time of construction as set out in Section 10.3.

9.2 Buildings within proposed designation

The following Table 22 shows the buildings that are within the proposed designation. We have not assessed them further as the assumption is that the relevant requiring authority will acquire the parcels of land that these buildings are located on, or these buildings will be unoccupied during construction. We only note the addresses where the main building is inside designation, and not those where auxiliary buildings such as sheds, or garages may be removed. For some addresses, several buildings are on the site, however, the address is only shown once.

In addition, auxiliary buildings are not generally occupied, so are not considered to be relevant receivers in relation to this assessment.

Table 22: Buildings inside designation (not assessed)

Address	Address
402 Puhinui Road	440 Puhinui Road
408 Puhinui Road	

9.3 Construction noise effects

9.3.1 Main construction works

We predict that noise levels can generally be complied with at all buildings adjacent to the works. Some limited exceedances (up to 73 dB L_{Aeq}) may occur when the walking and cycling facility in the vicinity of Hillside Road and Sabi Place is constructed, when works are immediately adjacent to dwellings. However, given the existing noise level from SH20 is already around 68 to 73 dB L_{Aeq} at houses fronting the road, the works will not generally be unreasonable.

Night-time works may be required for the construction of the ramp across SH20 as the road may need to be closed. These works are likely to cause noise limit exceedances as discussed below.

No stations are proposed for this NoR.

Figures in **Appendix A** show the relevant houses at which minor exceedances are predicted.

9.3.2 Daytime works

The main noise source for the construction of NoR 4a and 4b will be earthworks. We predict noise levels up to 73 dB L_{Aeq} at closest houses when earthworks occur in the immediate vicinity of the Project. Such levels are only marginally above the noise criteria and similar to the existing ambient noise levels in the vicinity of SH20. Given that the earthworks are likely to occur for only limited periods (a few days or weeks at most), we consider that besides normal site management, consultation and communication will be the most effective management measures.

9.3.3 Night-time works

We anticipate that some limited night-time works may be required where works would affect the existing road (e.g. surfacing). These works would be similar to what can be expected across Auckland when existing major roads are resurfaced over night to avoid traffic disruption. The AUP:OP makes allowance for such works in Section E25.6.29.

The other area where night-time works will likely be required is the new bridge for the ramp across SH20. As the construction of the bridge may require the closing of SH20, these works will need to be undertaken at night-time. Such works would be limited in duration. There are a small number of dwellings in the vicinity the bridge which may be affected by these works, and a schedule will be required to ensure effects are appropriately managed. Should night-time works be sustained and of high intensity, an offer of temporary relocation may be considered for closest dwellings in order to manage potential sleep disturbance. This would be recorded in a schedule.

Any such works will be limited in duration and can be managed through normal communication and site management through a schedule (refer Section 10.4).

9.4 Construction vibration effects

The likely highest vibration levels are predicted from the use of vibratory rollers for the compaction of the bus lanes, and from bridge and retaining wall piling. Since these works are at sufficient distance from any buildings, we predict that the 5 mm/s PPV criterion can be complied with at all times. Compliance can be achieved at 14 m from the works (assuming a 100% safety margin as discussed in Section 4.5.1).

Dwellings within 38m of vibratory roller works may experience vibration levels above the amenity criterion. For these houses, vibration levels may exceed 2 mm/s PPV for brief durations while the vibratory roller passes. This would occur for one or two days at a time only and be similar to what would be expected for road resurfacing. Such levels can be managed through communication with affected occupants to ensure they are aware of potential times of high vibration generation.

Figures in **Appendix B** show the indicative vibration envelope outside which compliance with the 5 mm/s PPV vibration limit is predicted.

10 Mitigation and management measures

The most effective way to control construction noise and vibration is through good on-site management and communication between managers, staff and affected receivers. We have included recommended measures in this Report, based on the assumed construction equipment and methodologies.

Good noise and vibration management is essential in reducing adverse effects as far as practicable, irrespective of the low number of dwellings potentially affected or if noise levels may already be compliant with the relevant criteria.

The following sections set out the mitigation and management measures that could apply to each of the Project NoRs. Section 11 sets out the recommended mitigation measures for the NoRs

10.1 General mitigation and management measures

The following general noise mitigation measures will be required to be implemented throughout the construction of the Project. These measures should be implemented as a matter of good practice and are considered the baseline mitigation for most circumstances.

Where an exceedance of the construction noise or vibration standards is likely due to a specific activity or in a specific area, and the general mitigation measures as discussed below are not sufficient to achieve full compliance, further mitigation and management should be investigated and implemented where practicable. Such information would be contained in the Schedule as attachment to the CNVMP.

10.1.1 Communication and consultation

The most important and effective management measure is public liaison and communication with people occupying buildings in the vicinity of the Project. Providing timely and detailed information to those potentially affected helps to alleviate uncertainty and concerns and builds trust between the contractor and the receivers.

A contractor environmental manager or appointed representative should be available for residents to contact by phone and/or email at times when construction occurs. Communication also includes complaints responses, which should be included in the CNVMP.

At sensitive times (e.g. when night-time or public holiday works are required), communication is particularly important, and needs to increase in frequency and content, to ensure residents have the ability to plan around the works where that is practicable.

10.1.2 Training

All staff should participate in an induction training session prior to the start of construction, with attention given to the following matters:

- Construction noise and vibration limits;
- Activities with the potential to generate high levels of noise and/or vibration;
- Noise and vibration mitigation and management procedures; and

- The sensitivity of receivers and any operational requirements and constraints identified through communication and consultation.

Awareness of current noise and vibration matters on, or near active worksites, should be addressed during regular site meetings and/or 'toolbox' training sessions.

10.1.3 Equipment selection

When selecting construction equipment, where practicable:

- Prioritise quieter construction methodologies (e.g. bored piling instead of drop hammer piling);
- Prioritise electric motors over diesel engines;
- Prioritise rubber tracked equipment over steel tracked equipment;
- Equipment will be suitably sized for the proposed task;
- Equipment will be maintained and fitted with exhaust silencers and engine covers; and
- Avoid tonal reversing or warning alarms (suitable alternatives may include flashing lights, broadband audible alarms or reversing cameras inside vehicles).

10.1.4 Timing of works

Where practicable, we recommend that night-time works are avoided. However, where projects affect existing major transport corridors (e.g. at tie ins and intersections or during the construction of new bridges) where potential closures or limitations are required to construct the Project, night-time works will likely be required from time to time. Where necessary, noisy works should be prioritised early in the evening or night-time period to avoid sleep disturbance. People tend to be less disturbed by low frequency, continuous engine noise, than intermittent noise or activities with special audible character (e.g. reversing beepers, whistling, banging tailgates or shouting).

Stakeholder engagement should be undertaken for occupiers of properties within 200m of any high noise night (and weekend) works and within the setback distance for buildings receiving vibration levels meeting or exceeding 1 mm/s PPV (Category A for occupied PPFs).

10.1.5 Noise barriers

Temporary noise barriers should be used where a construction noise limit is predicted to be exceeded and the barriers would noticeably reduce the construction noise level. They should be installed prior to the relevant works commencing and maintained throughout those works. Effective noise barriers typically reduce the received noise level at ground level by up to 10 decibels.

Where practicable, the following guidelines should be incorporated in the design and utilisation of temporary noise barriers:

- To be constructed from materials with a minimum surface mass of 6.5 kg/m2;
- A minimum height of 2 m, and higher if practicable to block line-of-sight;
- Abutted or overlapped to provide a continuous screen without gaps at the bottom or sides of the panels; and
- Positioned as close as practicable to the noisy construction activity to block line-of-sight between the activity and noise sensitive receivers. Where positioned on the site boundary, additional local barriers will be considered near the activity to ensure effective mitigation for sensitive receivers on upper floor levels.

10.1.6 Alternative mitigation options

Where all practicable noise and vibration mitigation measures have been implemented and considered, and noise or vibration levels are predicted to exceed relevant limits by a significant margin or for an extended period (e.g. more than two consecutive nights), an offer of temporary resident relocation should be considered. Such a measure should be considered as a last resort as it will generally inconvenience the building occupiers. Note that temporary relocation offers are generally associated with night-time works and sleep disturbance rather than daytime noise levels, and that this will be similar for the Project.

10.1.7 Best practice general measures

Complaints can arise irrespective of compliance with the noise and vibration limits. To minimise complaints, general mitigation and management measures include, but are not limited to, the following:

- Avoid unnecessary noise, such as shouting, the use of horns, loud site radios, rough handling of material and equipment, and banging or shaking excavator buckets;
- Avoid high engine revs through appropriate equipment selection and turn engines off when idle;
- Maintain site accessways to avoid potholes and corrugations;
- Mitigate track squeal from tracked equipment, such as excavators (may include tensioning and watering or lubricating the tracks regularly);
- Minimise construction duration near sensitive receivers;
- Stationary equipment (e.g. generators) will be located away from noise sensitive receivers and site buildings and material stores used to screen them;
- Orient mobile machinery to maximise the distance between the engine exhaust and the nearest sensitive building façade (e.g. excavators);
- Utilise noise barriers where appropriate;
- Implement specialised mitigation measures for particularly high noise and vibration generating activities such as concrete breaking, piling and vibratory roller use;
- Ensure advanced communication is complete prior to commencing activities that are predicted to exceed the noise and vibration performance standards; and
- Undertake monitoring as appropriate.

10.2 Building condition surveys

For construction activities where buildings are predicted to receive vibration levels approaching or within Category B (refer Section 3.2.2) we recommend that low vibration construction methods be investigated and implemented wherever practicable, with the aim of achieving compliance with Category A vibration criteria. This may include using screw piling methods, non-vibrating rollers or pre-drilling piles.

However, if low vibration methodologies are not deemed practicable, for dwellings identified within the vibration risk radii, we recommend that the following process be implemented before construction commences;

- Engage with the building owner and occupier to discuss the proposed construction activities and likely vibration effects;

- Undertake a pre-construction building condition survey. This will be required where the proposed construction methodology is predicted to approach or exceed the Category B vibration limits, and should be undertaken at a trigger level lower than the Category B limits; and
- Monitor vibration levels during the construction activities which are within the High Risk distance (refer Table 14).

If low vibration methodologies are not deemed practicable for buildings in the Medium Risk Zone of a construction activity, we recommend that all buildings within the Medium Risk Distance be notified of the works in advance via a letter drop which outlines the proposed construction activities and likely vibration effects.

Detailed management and mitigation options for construction vibration will be contained in the CNVMP but follow the guidelines in Section 10 of this report.

Additional vibration monitoring and follow-up building condition surveys will need to be undertaken at all buildings that had pre-construction building condition surveys. The Building Condition Surveys should also be undertaken in response to complaints, to ensure construction activities comply with the Category B criteria and that no building damage has occurred. If any construction-induced damage were shown to have occurred as a result of Project construction activities, this should be remedied by the contractor.

10.3 Construction Noise and Vibration Management Plan

All appropriate mitigation and management are generally set out in a CNVMP, which would be used to manage works on site and sets out how the construction contractor interacts with the neighbouring affected parties.

The CNVMP should include information set out in NZS6803:1999 in Section 8 and Annex E, and the requirements of the AUP:OP such as:

- Summary of noise and vibration standards;
- Summary of assessments/predictions;
- General construction practices, management and mitigation that will be used for the Project;
- Noise management and mitigation measures specific to activities and/or receiving environments, particularly for high noise and/or vibration activities, and all night-time works;
- Monitoring and reporting requirements;
- Procedures for handling complaints; and
- Procedures for review of the CNVMP throughout the works.

Where appropriate, the CNVMP should also follow the approach outlined in the Guide.[6] This includes a requirement for high noise and vibration risk construction projects to have an independently peer reviewed CNVMP and include a comprehensive risk-based quality assurance programme to ensure risks are appropriately managed.

Each NoR should have its own CNVMP. While the base information in each CNVMP will be similar, management and mitigation depend on the works undertaken and the receiving environment. The construction methodology is not yet finalised, therefore, the CNVMPs should be prepared when more

6 https://www.nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Standards/Templates/Construction-noise-and-vibration/NZTA-Construction-noise-and-vibration-management-plan-v1.2.doc

detail is available. In addition to the CNVMPs, Waka Kotahi standard procedures for the management of noise and vibration should be implemented. These will be relied on to avoid, remedy and mitigating adverse effects where appropriate.

10.4 Schedules

In addition, Site Specific Noise and/or Vibration Management Schedules (**Schedules**) are a useful tool in determining how the noise and vibration effects from specific activities or in specific areas will be managed and potentially affected parties communicated with. Schedules would generally be prepared where there is a high risk of exceeding the noise and/or vibration standards.

The Schedules are specific to the activity or receiver they relate to, and would therefore contain detailed information on communication, management and mitigation specific to a certain task or area.

The following information would normally be included in a Schedule:

- The activity start and finish dates;
- The nearest neighbours to the activity;
- A location plan;
- The activity equipment and methodology;
- Predicted noise/vibration levels;
- Recommended BPO mitigation;
- Documented communication and consultation with affected persons;
- Monitoring details; and
- Any pre-activity building condition survey for any buildings predicted to receive vibration levels exceeding the Category A criteria and receiving noise levels towards the Category B criteria.

They would be attached to the CNVMP, providing additional information that would sit alongside the general management and mitigation options within the CNVMP.

11 Recommended specific measures to avoid, remedy or mitigate construction noise and vibration effects

Based on the above, we recommend that common/general best practice mitigation and management should be implemented across all NoRs and this should be documented in the CNVMP. For activities that are predicted to exceed the criteria, a Schedule needs to be prepared.

11.1 Summary of proposed mitigation and management measures

Effect	Assessment	Recommendation
Construction noise	NoRs 1, 2 and 3 traverse well established residential and commercial areas, with buildings in close proximity to construction works. NoR 4a and 4b traverses currently generally greenfield sites (some zoned FUZ). Largest effects anticipated from: demolition of first row houses in NoR 2 and 3, and some of NoR 1 – limited duration and localised, but very close to houses earthworks to prepare alignment, service relocations – longer duration but moving along the alignment bridge piling and installation in NoR 4b, 2/3 – limited duration and localised effects only, but night/weekend works likely required Final surfacing – likely to be done at night-time. Limited duration.	Management and mitigation through the CNVMP Schedules for any specifically noisy activities or where receivers are particularly affected, e.g.: • Any night-time works in all NoRs in the vicinity of residential areas; and • Any specifically high noise works where they affect sensitive receivers. Communication and consultation prior to high noise works
Construction vibration	NoRs 1, 2 and 3 traverse well established residential and commercial areas, with buildings in close proximity to construction works. There are no close buildings in NoR 4a and 4b. Largest effects anticipated from: demolition of first row houses in NoR 2 and 3, and some of NoR 1 – limited duration and localised, but very close to houses. Road preparation: use of vibratory rollers – along entire alignment, therefore limited duration but affecting all immediately fronting houses Construction of bridge piles and retaining walls	Management and mitigation through the CNVMP Schedules for any specifically vibration inducing activities or where receivers are particularly affected, e.g.: • Piling; • Demolition of existing driveways and structures close to other houses; and • Vibratory rolling (if to be undertaken at night-time). Choice of piling methodology to be bored rather than impact or vibrated Use of non-vibratory compaction close to buildings Building condition surveys

11.2 Specific management measures

There are a small number of construction activities that should be addressed specifically in relation to noise and vibration generation. Those are discussed below:

- NoR 2: night-time bridge construction across SH1. Consider offer of temporary relocation to most affected residents to manage sleep disturbance, depending on duration and noise level;
- NoR 2: works in the vicinity of MIT and AUT South Campus. Consult with the educational facilities and schedule works to avoid exams or other sensitive times;
- NoR 3: night-time and/or long weekend bridge construction across Puhinui Station and rail line. Consider offer of temporary relocation to most affected residents to manage sleep disturbance, depending on duration and noise level;
- NoR 3: works close to Puhinui School. Consult with school and schedule works to avoid exams or other sensitive times. Potentially offer noise barrier (to be retained following construction) to mitigate traffic noise to the sports fields; and
- NoRs 4a and 4b: works close to Manukau Memorial Garden. Consult with operator and schedule works to avoid services or other sensitive times.

12 Conclusions

An assessment of construction noise and vibration effects was prepared for the Project based on indicative information available at the NoR stage. The assessment will need to be updated in the future during detailed design considering the receivers as they exist at the time of construction and the confirmed construction methodology.

Assessment across all NoRs indicates exceedances of the noise and vibration criteria for residential and commercial receivers where works are close to buildings, and where large structures such as bridges are required. Exceedances are also predicted for any night-time works such as where bridges are constructed across SH20, SH1 and the rail line at Puhinui Station.

Mitigation measures are required to manage effects on receivers in the vicinity of the Project. Common measures have been recommended, such as the use of barriers, communication and consultation with affected receivers, appropriate choice of equipment and timing of works. All of these measures will be included in the CNVMP, with the details responding to the detailed design works and equipment to be used, and the receiving environment how it exists at the time of construction.

I have recommended that a CNVMP is prepared for all NoRs as this is the most effective way to manage construction noise and vibration effects on sensitive receivers with the necessary agility and responsiveness required by large construction projects. Where further exceedances are predicted or determined throughout the construction phase, schedules will be prepared. Schedules are mini-CNVMPs that respond to a specific activity or area and set out detailed measures for that activity or area. Any schedules would be attached to the CNVMP.

NoR specific recommendations are set out below.

12.1 NoR 1

NoR 1 will be constructed in the central median of Te Irirangi Drive, which has already made allowances for future rapid transit. Therefore, works will be well contained and away from dwellings and commercial buildings.

We expect daytime construction noise to generally comply with the limits, with potential minor exceedances up to 3 dB for some houses that are slightly closer to the works. Overall, we consider the construction noise effects to be reasonable. Construction vibration may exceed the amenity criterion for some buildings by a small margin. However, such exceedances would be limited in duration and magnitude and can be managed through communication with affected parties.

We recommend that a CNVMP is prepared and implemented throughout construction, and that, for specific activities such as night-time works, a schedule is prepared.

Overall, the construction noise and vibration impact of NoR 1 is relatively benign and unlikely to cause significant adverse effects.

12.2 NoR 2

12.2.1 Section A

Section A of NoR 2 extends through established residential areas with mainly single and double storey dwellings. This area may be redeveloped as several sections are owned by Kāinga Ora. The NPS:UD allows for significantly higher density dwellings for all sites adjacent to the alignment with a move from low density residential zones to Terraced Housing and Apartment buildings. If these changes have occurred by the time the Project is constructed, any buildings existing and occupied at the time of construction will need to be assessed and construction noise and vibration effects managed.

We predict that general compliance can be achieved at the majority of houses. The exceptions are demolition of existing houses, where neighbouring dwellings may receive elevated noise levels for a few hours when main demolition occurs, general earthworks where a limited number of dwellings is predicted to receive noise levels up to 73 dB L_{Aeq} and potentially bridge works across SH1, which may need to occur at night time.

Vibration levels are predicted to comply with the 5 mm/s PPV limits at all times. However, the amenity criterion may be exceeded for dwellings when vibratory rollers are used to compact the new traffic lanes.

We recommend that a CNVMP is prepared and implemented throughout construction, and that, for specific activities such as night-time works, a schedule is prepared.

Overall, the construction noise and vibration impact of Section A of NoR 2 is reasonable and manageable and unlikely to cause significant adverse effects.

12.2.2 Section B

Section B of NoR 2 traverses the Manukau City Centre. Generally, no building demolition will be required as there is sufficient space within the existing road and open space to construct the bus lanes.

Most of this Section is within the HANA with the remainder in the MANA. This means that buildings are likely to already incorporate sound insulation and ventilation in the building envelope, which will also mitigate construction noise.

Most activities are predicted to comply with the daytime noise limits at all buildings, with only a small number of buildings predicted to receive noise levels up to 76 dB L_{Aeq} for times when works are closest. Such noise levels would result in internal noise levels of generally less than 40 dB L_{Aeq} in this area, which are appropriate internal daytime noise levels for residential and commercial use.

Vibration levels can be managed by choosing non-vibratory compaction within 15m of buildings and choosing bored piling for retaining walls and bridge supports as well as good communication with affected parties. Some buildings at the AUT South Campus and Countdown may be close to proposed retaining walls leading to the SH1 bridge. Where buildings are within 20m of retaining or bridge piling, we recommend that bored piling is used instead of impact or vibratory piling, to ensure compliance with the 5 mm/s PPV limit.

We recommend that a CNVMP is prepared and implemented throughout construction, and that, for specific activities such as night-time works, a schedule is prepared.

Overall, the construction noise and vibration impact of Section B of NoR 2 is reasonable and manageable and unlikely to cause significant adverse effects.

12.2.3 Section C

Section C of NoR 2 will be constructed by demolishing a number of dwellings adjacent to Puhinui Road to create the space for the BRT. Removing buildings which provided shielding to those buildings behind, means that the second row will be more affected by the works.

Highest noise levels are anticipated from the demolition of buildings in close proximity to other buildings, and from earthworks necessary to prepare the new traffic lanes. Highest vibration levels are anticipated from the use of vibratory rollers for the compaction of the new lanes.

We expect daytime construction noise to generally comply with the limits, with potential minor exceedances up to 3-5 dB for some houses that are slightly closer to the works. Demolition works may result in exceedances of up to 10 dB for individual houses, for some hours or days at most. Overall, we consider the construction noise effects to be reasonable. Construction vibration may exceed the amenity criterion for some buildings by a small margin. However, such exceedances would be limited in duration and magnitude and can be managed through communication with affected parties.

Vibration levels can be managed by choosing non-vibratory compaction within 15m of buildings and good communication with affected parties.

We recommend that a CNVMP is prepared and implemented throughout construction, and that, for specific activities such as night-time works, a schedule is prepared.

Overall, the construction noise and vibration impact of Section C of NoR 2 is reasonable and manageable and unlikely to cause significant adverse effects.

12.3 NoR 3

NoR 3 traverses an established residential area, with some commercial premises to the south of the road. All of the neighbouring sites are either in the HANA or MANA, which means that new noise sensitive activities cannot be established in the HANA, and in the MANA sound insulation and ventilation will be required for any new dwellings. This means that our assessment assumes that dwellings are already somewhat protected from construction noise.

We predict that general compliance with the relevant noise limits can be achieved at the majority of houses. The exceptions are demolition of existing houses, where neighbouring dwellings may receive elevated noise levels for a few hours when main demolition occurs, general earthworks where a limited number of dwellings is predicted to receive noise levels up to 77 dB L_{Aeq} and potentially bridge works at Puhinui Station, which may need to occur at night-time.

Vibration levels are predicted to comply with the 5 mm/s PPV limits at all but 5 buildings. There, compliance can be achieved by using non-vibratory compaction and bored piles rather than impact or vibrated piling. However, the amenity criterion may be exceeded for dwellings when vibratory rollers are used to compact the new traffic lanes.

We recommend that a CNVMP is prepared and implemented throughout construction, and that, for specific activities such as night-time works, a schedule is prepared.

Overall, the construction noise and vibration impact of NoR 3 is reasonable and manageable and unlikely to cause significant adverse effects.

12.4 NoRs 4a and 4b

NoRs 4a and 4b will be constructed in a currently little developed area with the exception of the SUP and ramp at SH20. Therefore, works will be well contained and generally away from buildings.

We expect daytime construction noise to generally comply with the limits, with potential minor exceedances up to 3 dB for some houses that are slightly closer to the works. Night-time works will need to be managed in the vicinity of bridge works. Overall, we consider the construction noise effects to be reasonable.

Construction vibration may exceed the amenity criterion for some buildings by a small margin. However, such exceedances would be limited in duration and magnitude and can be managed through communication with affected parties.

We recommend that a CNVMP is prepared and implemented throughout construction, and that, for specific activities such as night-time works, a schedule is prepared.

Overall, the construction noise and vibration impact of NoRs 4a and 4b is slight and unlikely to cause significant adverse effects.

TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix A

Noise compliance envelope

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

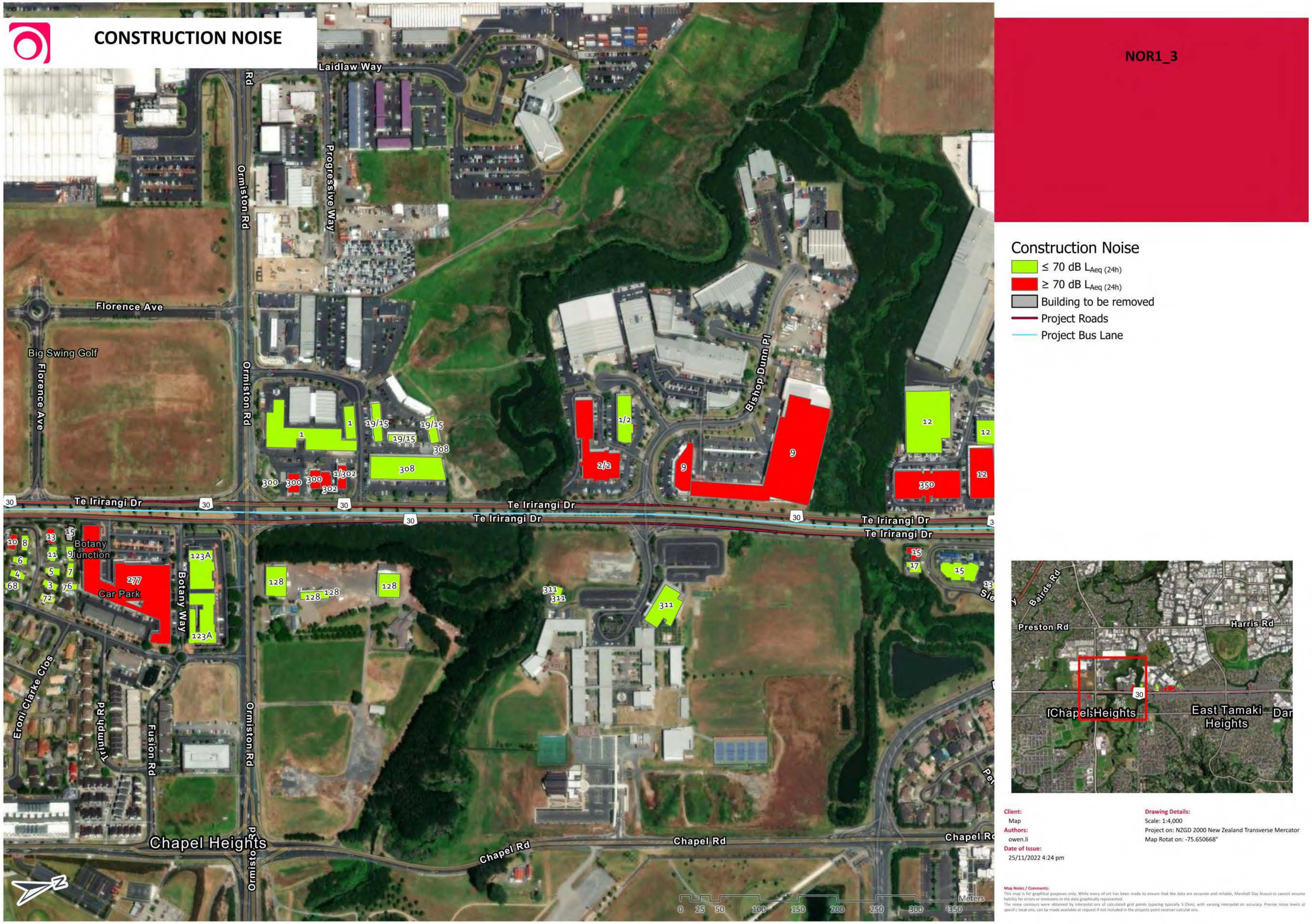
Appendix A – Noise compliance envelope

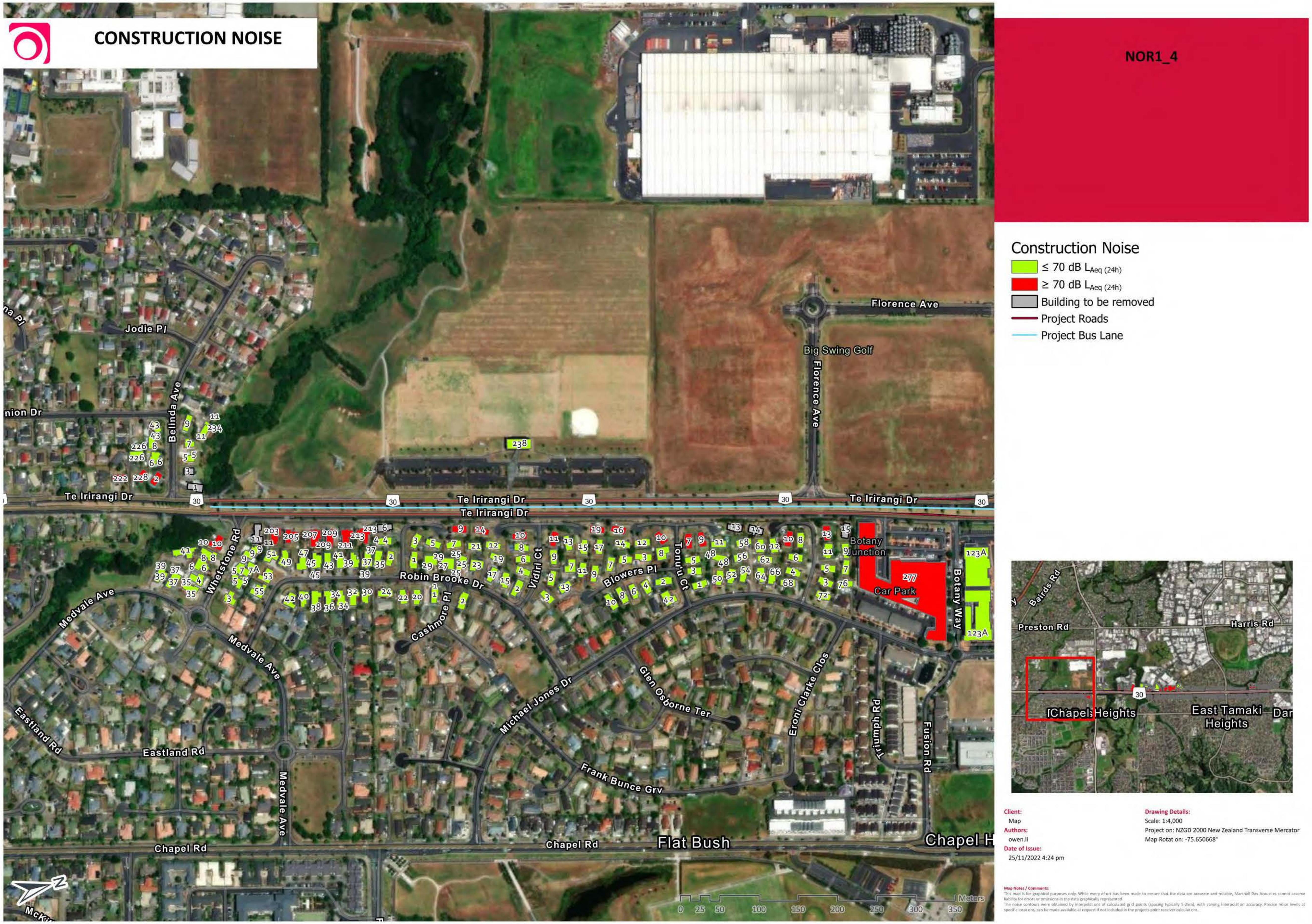
NoR 1


CONSTRUCTION NOISE
NOR1 OVERALL
Construction Noise
≤ 70 dB $L_{Aeq\ (24h)}$
≥ 70 dB $L_{Aeq\ (24h)}$
Building to be removed
Project Roads
Project Bus Lane
Te Irirangi Dr
Chapel Rd
Springs Rd
East Tamaki
Harris Rd
Flat Bush
Chapel Heights
East Tamaki Heights
Ormiston Rd
Accent Dr
Wayne Francis Dr
Kelvin Hart Dr
Smales Rd
Redcastle Dr
East Tamaki Rd
Hampton Park
Big Swing Golf
Barry Curtis Park
Preston Road Reserve
Otara Creek Reserve
Mayfield Park
Pearl Baker Reserve
East Tamaki War Memorial Park
Client:
Map
Authors:
owen.li
Date of Issue:
28/11/2022 3:08 pm
Drawing Details:
Scale: 1:15,000
Map Rotat on: -75.650668°
Meters

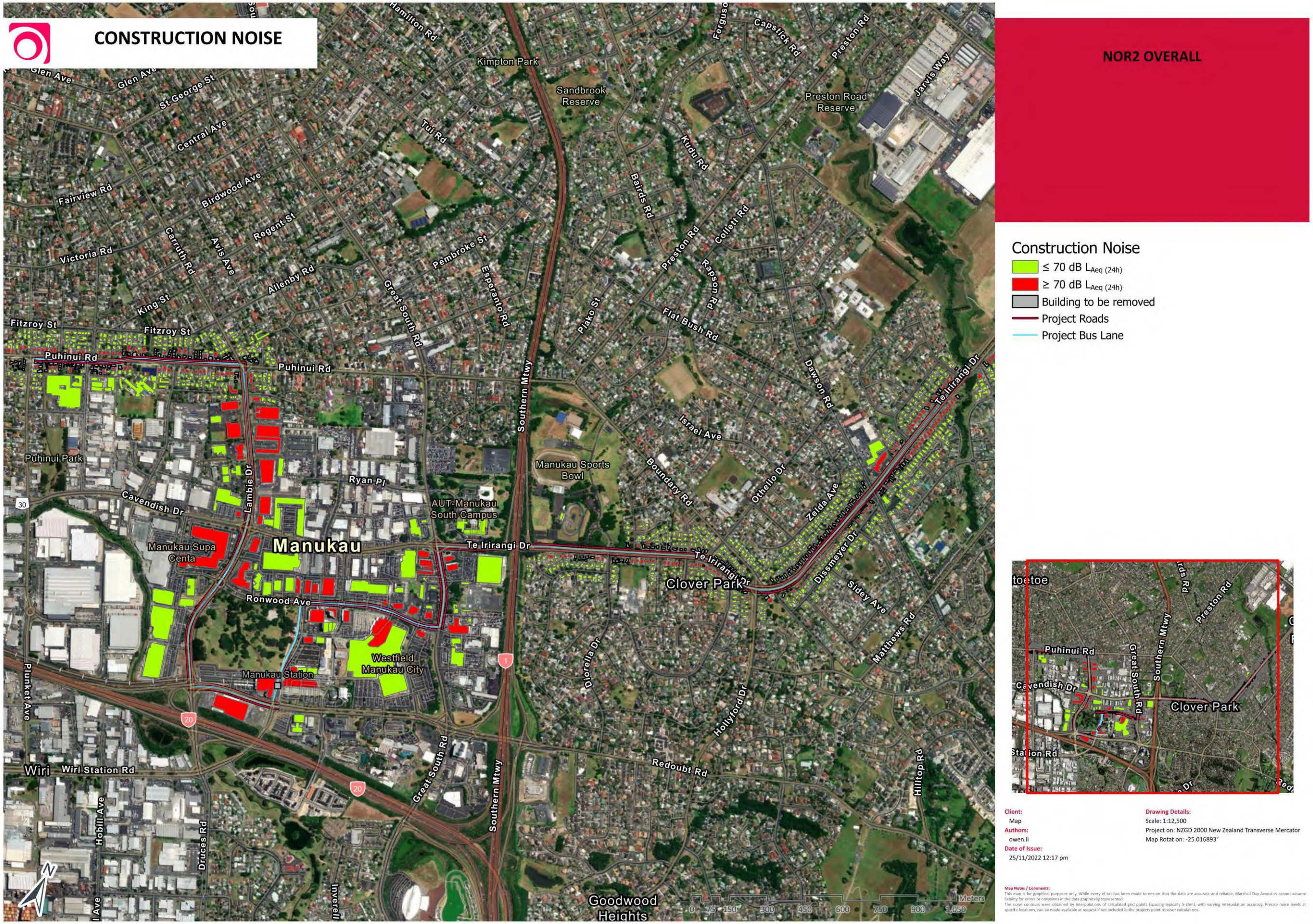

CONSTRUCTION NOISE
NOR1_1
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Snave Pl
Redcastle Dr
Shankill Pl
Smales Rd
Kelvin Hart Dr
Guys Rd
Moresteadd Ave
Riplington Rd
Matarangi Rd
Liffey Dr
Lissleton Dr
Haven Dr
Leixlep Ln
Te Irirangi Dr
Aaronville Way
Marlon Ln
Franco Ln
Balrath Rd
Caltra Pl
Chapeltown Dr
Brittas Pl
Brinlack Dr
Boderg Way
Borris Clos
Aclare Pl
Wayne Francis Dr
Armoy Dr
Ballybay Rd
Attymon Ln
Caragh Pl
Carlingford Dr
Ardee Clos
Balla Pl
Bandon Clos
Arigna Pl
Chapel Rd
Claremont
East Tamaki Heights
Meters
0 25 50 100 150 200 250 300 350
Bairds Rd
Preston Rd
Harris Rd
Chapel Heights
East Tamaki Heights
Client:
Map
Authors:
owen.li
Date of Issue:
28/11/2022 3:08 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°
Map Notes / Comments:

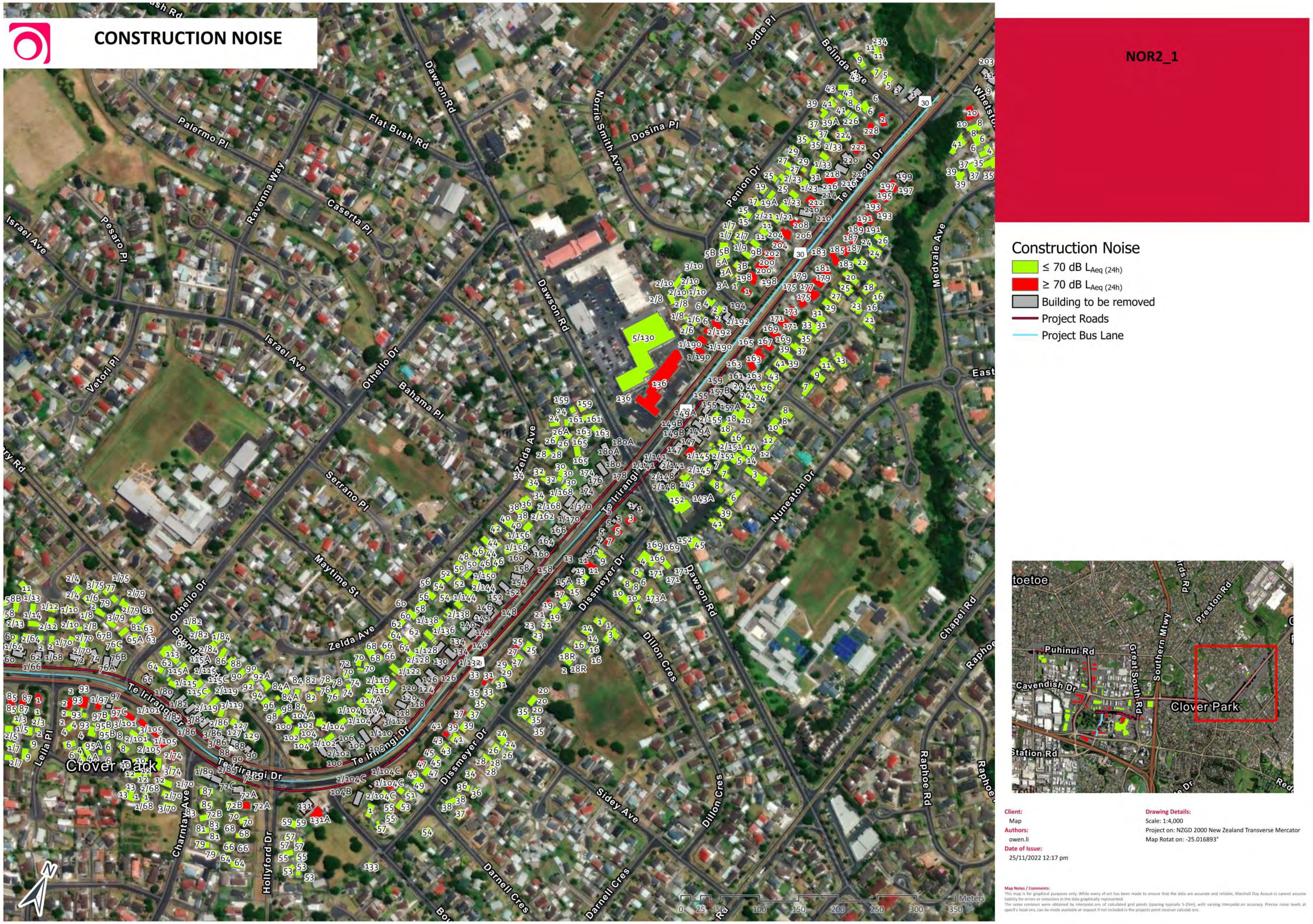

CONSTRUCTION NOISE
NOR1_2
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Te Irirangi Dr
East Tamaki Rd
Accent Dr
Lady Ruby Dr
Basalt Pl
Derg Pl
Kordel Pl
Redcastle Dr
Craigavon Dr
Reg Savory Pl
Beale Pl
Wando Ln
Sheddings Ln
Clavoy Pl
Balrath Rd
Siedeberg Dr
Gordal Pl
Strathdeen Clos
Wayne Francis Dr
Spenbrooke Rd
Premwood Rd
Banville Rd
Savona Dr
Pertosa Dr
Chapel Rd
Duntrune Rd
Baltersan Dr
Preston Rd
Bairds Rd
Harris Rd
Chapel Heights
East Tamaki Heights
Metres
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°


CONSTRUCTION NOISE
NOR1_3
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Laidlaw Way
Ormiston Rd
Progressive Way
Florence Ave
Big Swing Golf
Bishop Dunn Pl
Te Irirangi Dr
Botany Junction
Car Park
Botany Way
Eroni Clarke Clos
Triumph Rd
Fusion Rd
Chapel Heights
Chapel Rd
Preston Rd
Bairds Rd
Harris Rd
East Tamaki Heights
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°
Map Notes / Comments:
Meters
0 25 50 100 150 200 250 300 350


CONSTRUCTION NOISE
NOR1_4
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Te Irirangi Dr
Florence Ave
Big Swing Golf
Jodie Pl
Belinda Ave
Whetstone Rd
Medvale Ave
Robin Brooke Dr
Cashmore Pl
Vidiri Ct
Blowers Pl
Tonuu Ct
Botany Junction
Car Park
Botany Way
Michael Jones Dr
Glen Osborne Ter
Eroni Clarke Clos
Triumph Rd
Fusion Rd
Frank Bunce Grv
Eastland Rd
Chapel Rd
Flat Bush
Preston Rd
Harris Rd
Chapel Heights
East Tamaki Heights
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°
Meters
0 25 50 100 150 200 250 300 350

NoR 2


CONSTRUCTION NOISE
NOR2 OVERALL
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Manukau
Clover Park
Te Irirangi Dr
Puhinui Rd
Cavendish Dr
Ronwood Ave
Lambie Dr
Great South Rd
Southern Mtwy
Westfield Manukau City
Manukau Station
Manukau Supa Centa
AUT-Manukau South Campus
Manukau Sports Bowl
Kimpton Park
Sandbrook Reserve
Preston Road Reserve
Puhinui Park
Wiri
Wiri Station Rd
Redoubt Rd
Goodwood Heights
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:12,500
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.



CONSTRUCTION NOISE
NOR2_1
Construction Noise
≤ 70 dB $L_{Aeq\ (24h)}$
≥ 70 dB $L_{Aeq\ (24h)}$
Building to be removed
Project Roads
Project Bus Lane
Flat Bush Rd
Dawson Rd
Palermo Pl
Dosina Pl
Norrie Smith Ave
Jodie Pl
Belinda Ave
Penion Dr
Te Irirangi Dr
Israel Ave
Pesaro Pl
Ravenna Way
Caserta Pl
Othello Dr
Bahama Pl
Vatori Pl
Zelda Ave
Serrano Pl
Maytime St
Dissmeyer Dr
Dillon Cres
Nuneaton Dr
Medvale Ave
Chapel Rd
Leila Pl
Clover Park
Charntay Ave
Hollyford Dr
Sidey Ave
Darnell Cres
Meters
Puhinui Rd
Cavendish Dr
Great South Rd
Southern Mtwy
Preston Rd
Station Rd
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Map Notes / Comments:
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The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.

NOR2_2

Construction Noise

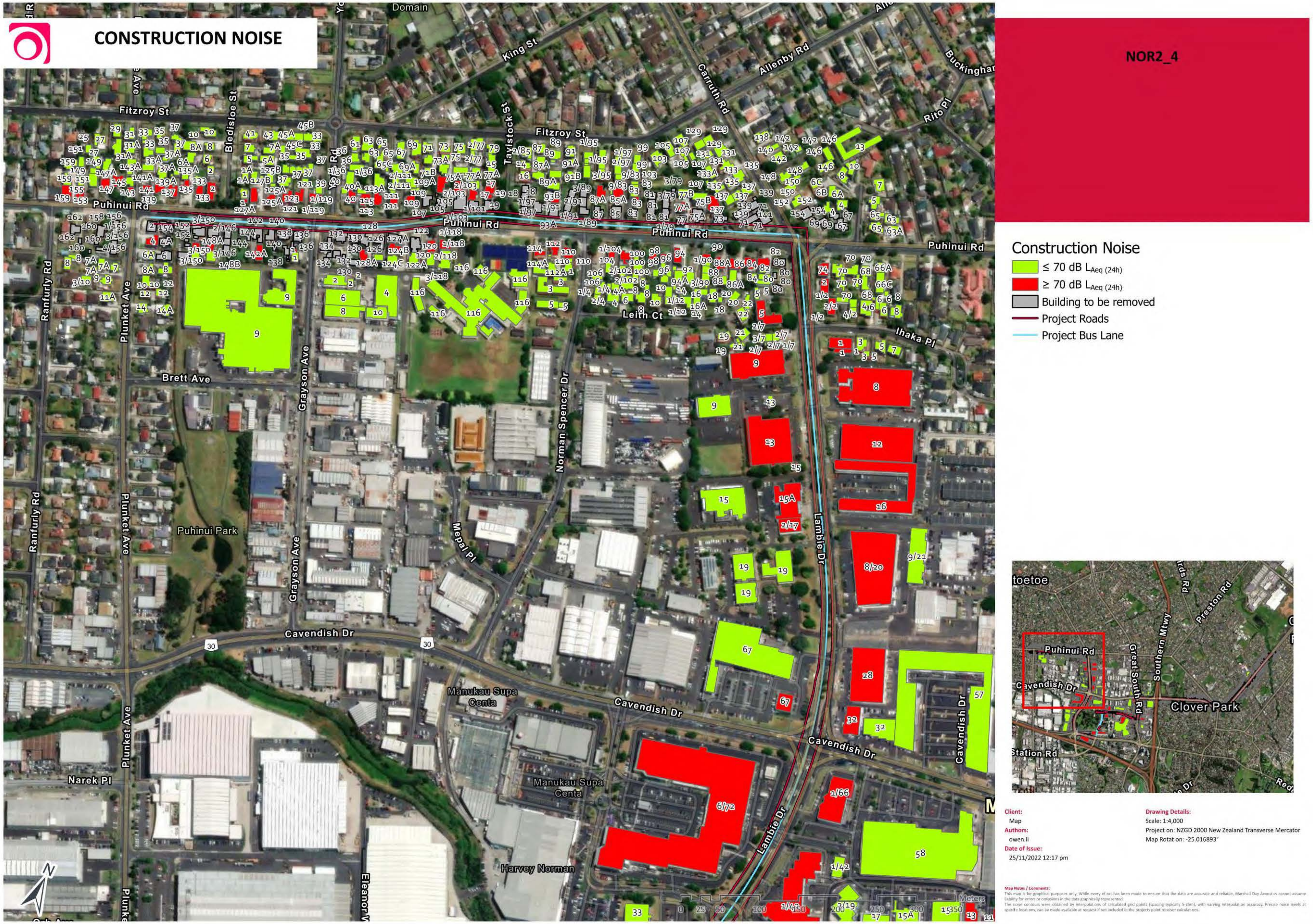
- ≤ 70 dB $L_{Aeq\ (24h)}$
- ≥ 70 dB $L_{Aeq\ (24h)}$
- Building to be removed
- Project Roads
- Project Bus Lane

Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm

Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°

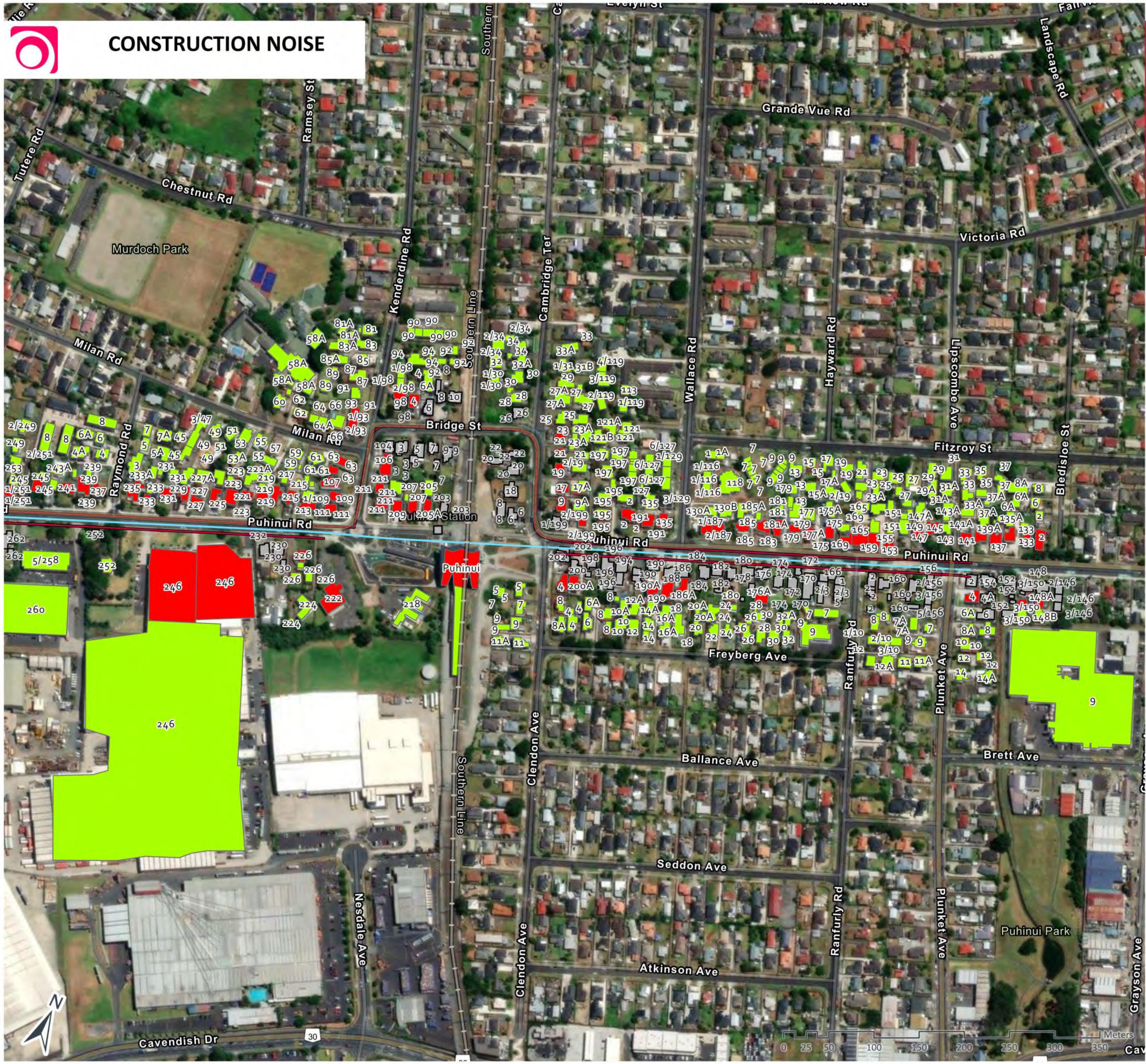
Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.


CONSTRUCTION NOISE
NOR2_3
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Manukau
Cavendish Dr
Ronwood Ave
Lambie Dr
Great South Rd
Ryan Pl
Freeman Way
Jack Conway Ave
Sharkey St
Amersham Way
Davies Ave
Osterley Way
Putney Way
Leyton Way
Manukau Station Rd
Manukau Station
Manukau Branch
Hayman Park
Harvey Norman
Manukau Supa Centa
Kmart-Manukau Supa Centa
Bunnings
Farmers-Westfield Manukau City
Westfield Manukau City
Countdown-Westfield Manukau City
Clover Park
Puhinui Rd
Southern Mtwy
Preston Rd
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Meters


CONSTRUCTION NOISE
NOR2_4
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Fitzroy St
Puhinui Rd
Brett Ave
Puhinui Park
Cavendish Dr
Lambie Dr
Norman Spencer Dr
Grayson Ave
Plunket Ave
Ranfurly Rd
Ihaka Pl
Leith Ct
Narek Pl
Manukau Supa Centa
Harvey Norman
Clover Park
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.

NoR 3

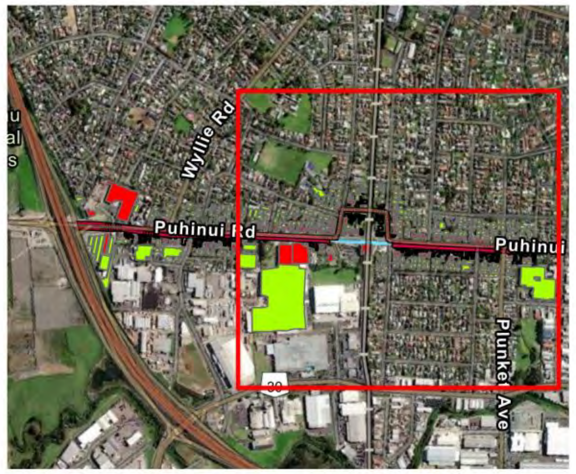

CONSTRUCTION NOISE
NOR3 OVERALL
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Puhinui Rd
Bridge St
Puhinui Station
Fitzroy St
Freyberg Ave
Ballance Ave
Brett Ave
Seddon Ave
Atkinson Ave
Cavendish Dr
Puhinui Park
Murdoch Park
Wyllie Park
Chestnut Rd
Milan Rd
Gifford Rd
Hillside Rd
Pah Rd
Wyllie Rd
Tutere Rd
Ramsey St
Verdi St
Kenderdine Rd
Cambridge Ter
Wallace Rd
Miles Ave
Fairview Rd
Landscape Rd
Victoria
Clendon Ave
Ranfurly Rd
Grayson Ave
Diversey Ln
Noel Burnside Rd
South-Western Mtwy
Onslow Ave
Glasgow Ave
Meters
0 37.5 75 150 225 300 375 450 525
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:6,250
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.



NOR3_1

Construction Noise

- ≤ 70 dB $L_{Aeq\ (24h)}$
- ≥ 70 dB $L_{Aeq\ (24h)}$
- Building to be removed
- Project Roads
- Project Bus Lane



Client:
Map

Authors:
owen.li

Date of Issue:
25/11/2022 12:17 pm

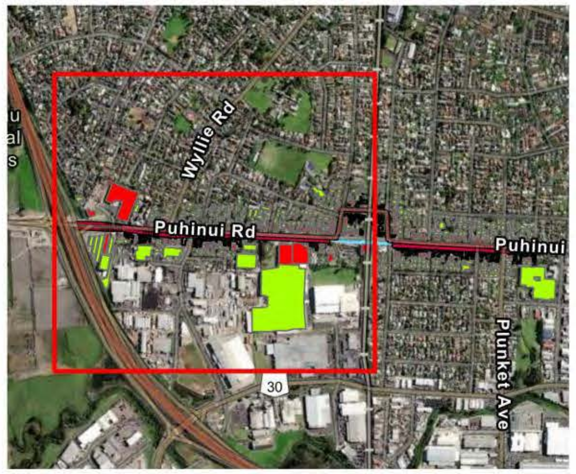
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°

Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.

NOR3_2

Construction Noise

- ≤ 70 dB $L_{Aeq\ (24h)}$
- ≥ 70 dB $L_{Aeq\ (24h)}$
- Building to be removed
- Project Roads
- Project Bus Lane

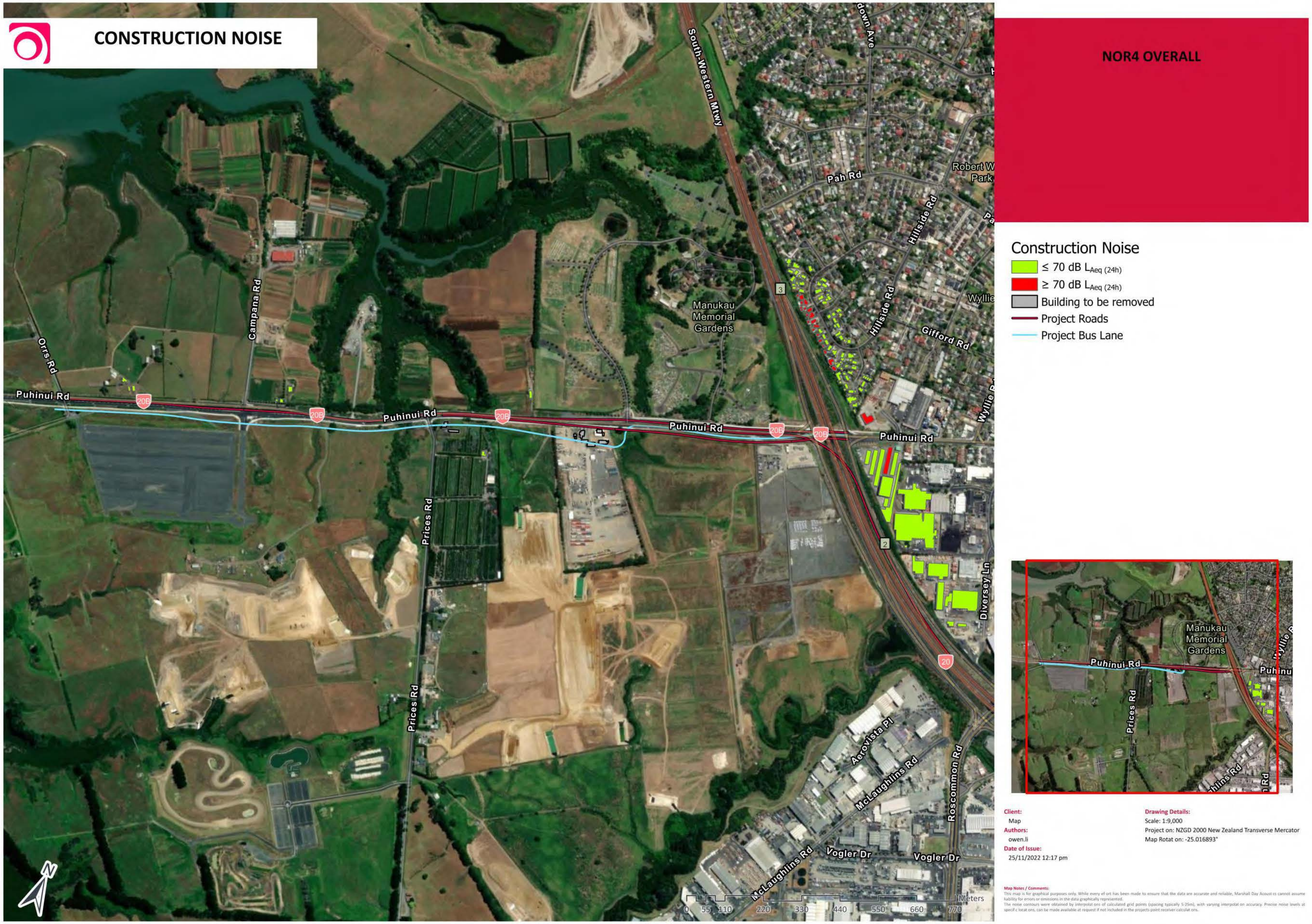


Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm

Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°

Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.

NoRs 4a and 4b


CONSTRUCTION NOISE
NOR4 OVERALL
Construction Noise
≤ 70 dB LAeq (24h)
≥ 70 dB LAeq (24h)
Building to be removed
Project Roads
Project Bus Lane
Puhinui Rd
Orrs Rd
Campana Rd
Prices Rd
South-Western Mtwy
Manukau Memorial Gardens
Pah Rd
Hillside Rd
Gifford Rd
Robert W Park
Diversey Ln
Aerovista Pl
McLaughlins Rd
Roscommon Rd
Vogler Dr
Meters
0 55 110 220 330 440 550 660 770
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:9,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.

CONSTRUCTION NOISE

NOR4_1

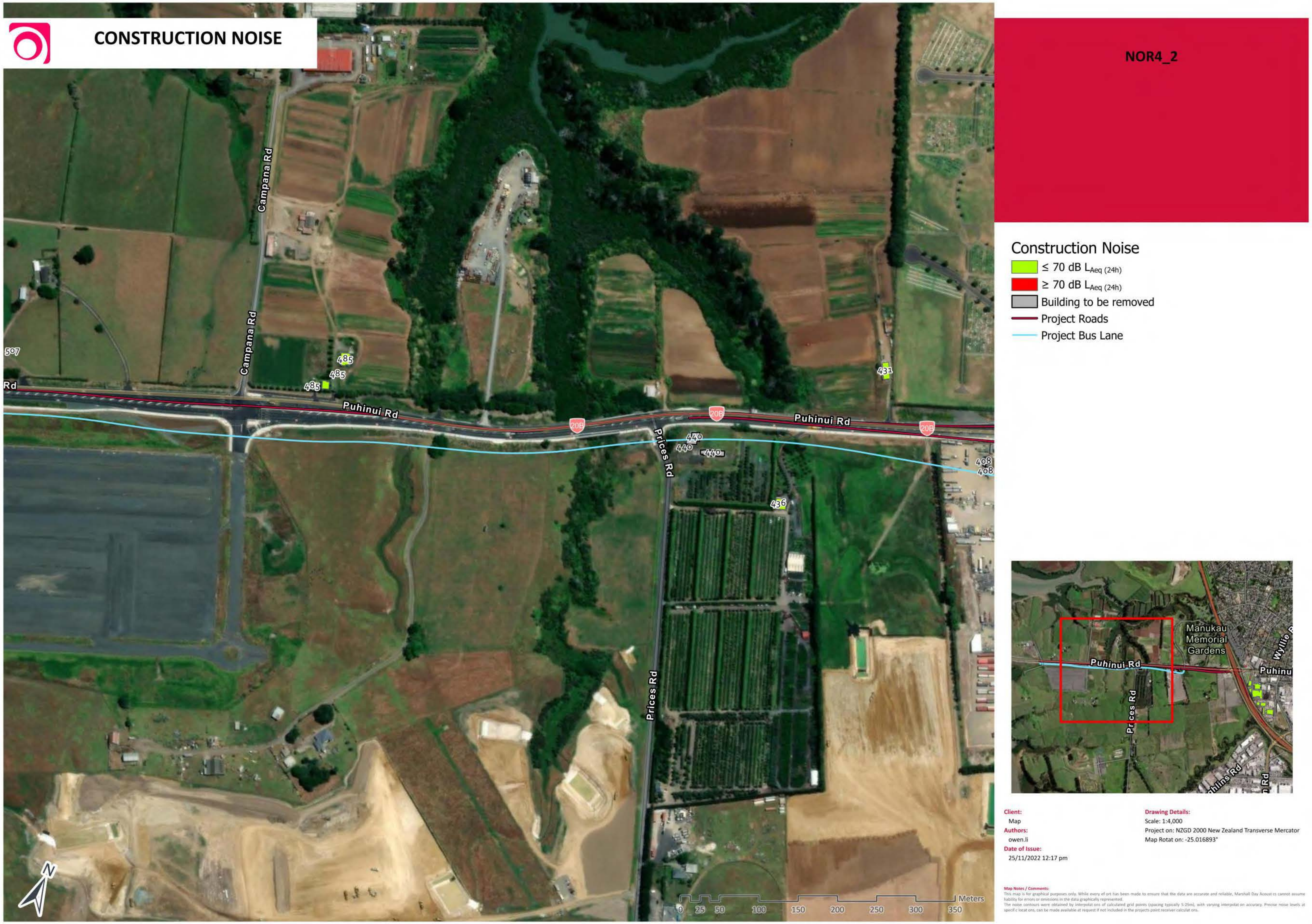
Construction Noise

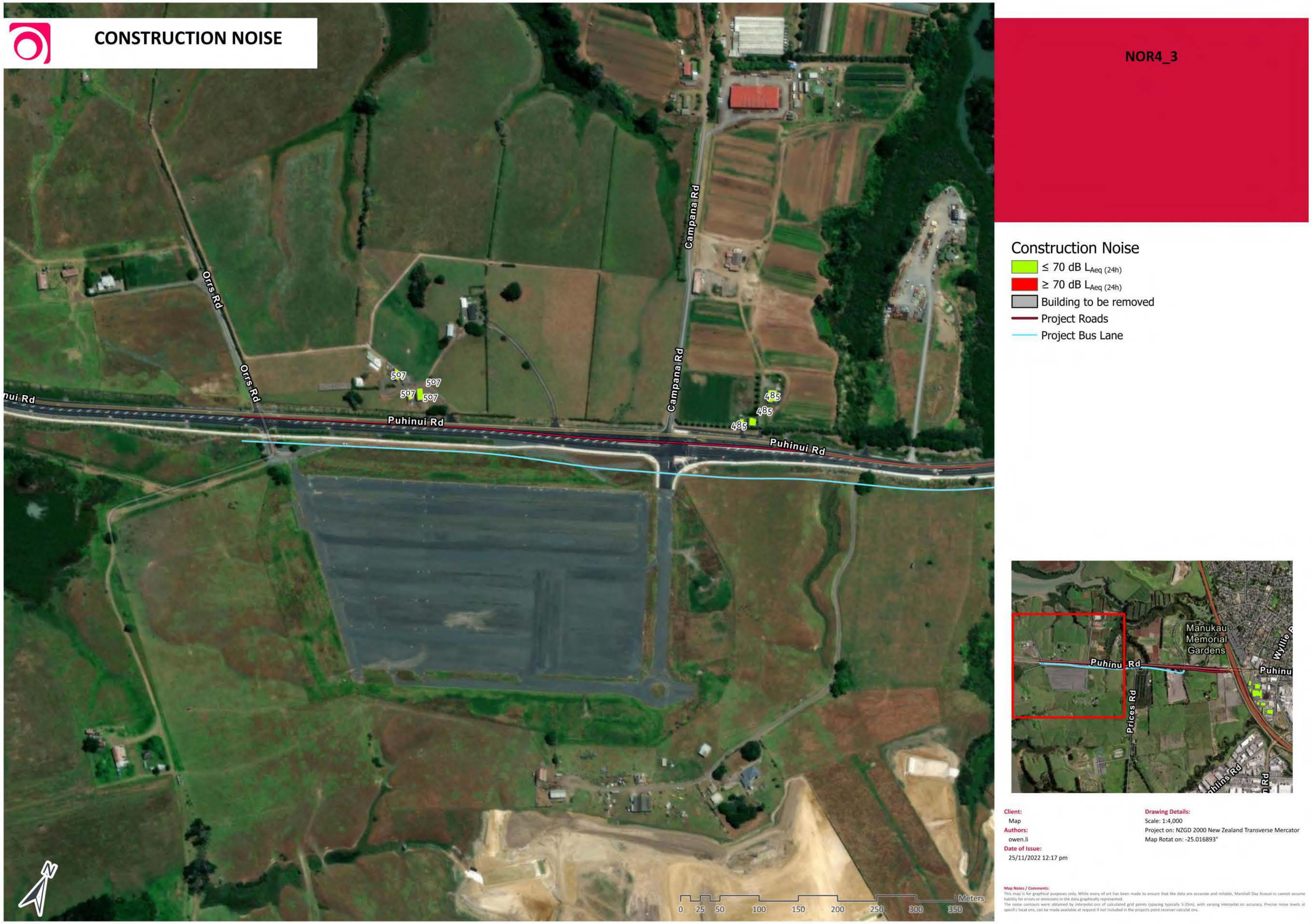
- ≤ 70 dB $L_{Aeq\ (24h)}$
- ≥ 70 dB $L_{Aeq\ (24h)}$
- Building to be removed
- Project Roads
- Project Bus Lane

Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm

Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°

Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.


CONSTRUCTION NOISE
NOR4_2
Construction Noise
≤ 70 dB $L_{Aeq (24h)}$
≥ 70 dB $L_{Aeq (24h)}$
Building to be removed
Project Roads
Project Bus Lane
Campana Rd
Puhinui Rd
Prices Rd
20B
485
431
440
436
408
507
Manukau Memorial Gardens
Meters
0 25 50 100 150 200 250 300 350
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
The noise contours were obtained by interpolat ons of calculated grid points (spacing typically 5-25m), with varying interpolat on accuracy. Precise noise levels at specif c locat ons, can be made available at request if not included in the projects point receiver calculat ons.


CONSTRUCTION NOISE
NOR4_3
Orrs Rd
Campana Rd
Puhinui Rd
507
485
0 25 50 100 150 200 250 300 350 Meters
Construction Noise
≤ 70 dB $L_{Aeq\ (24h)}$
≥ 70 dB $L_{Aeq\ (24h)}$
Building to be removed
Project Roads
Project Bus Lane
Manukau Memorial Gardens
Prices Rd
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 12:17 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Map Notes / Comments:
This map is for graphical purposes only. While every ef ort has been made to ensure that the data are accurate and reliable, Marshall Day Acoust cs cannot assume liability for errors or omissions in the data graphically represented.
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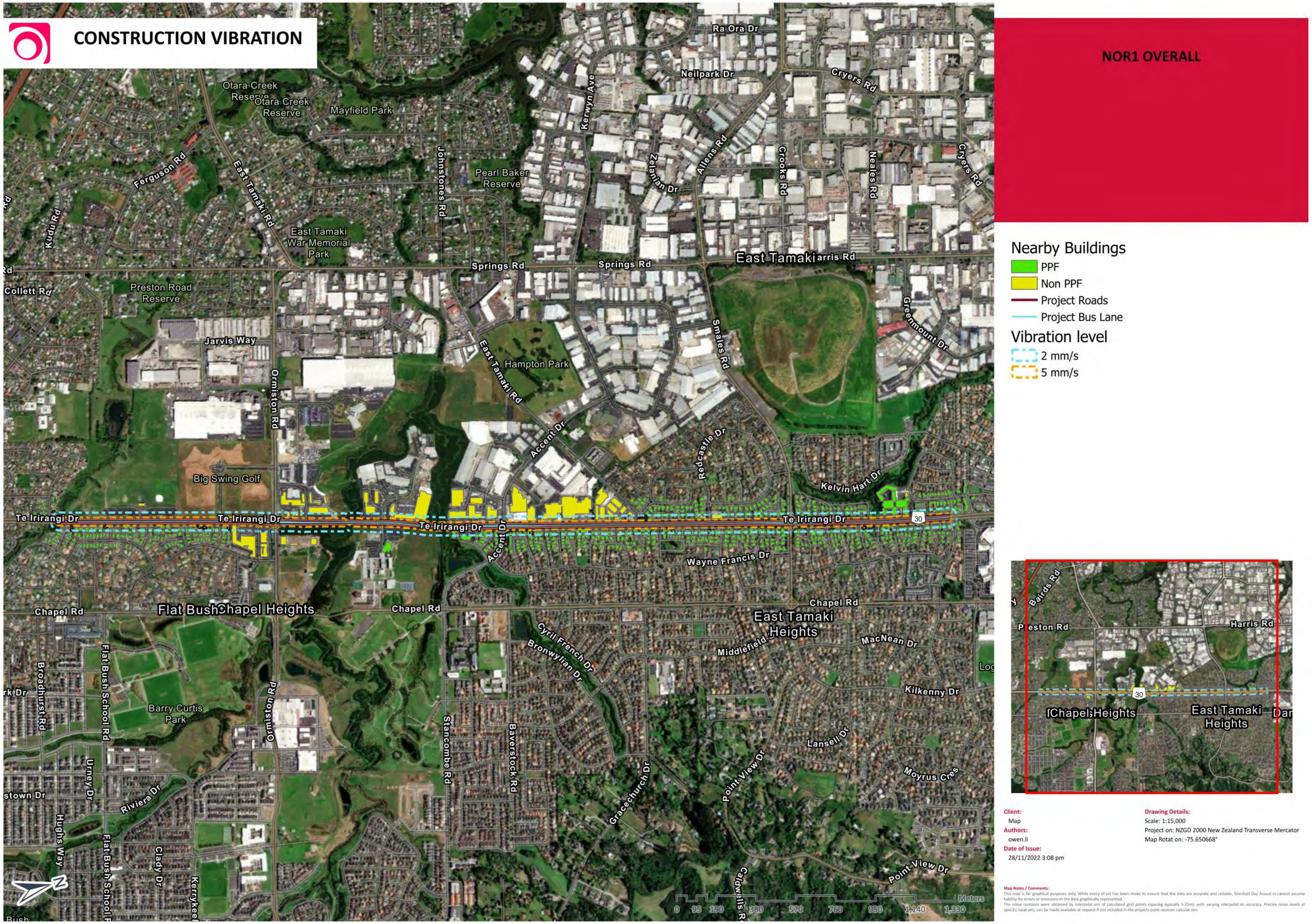
TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix B

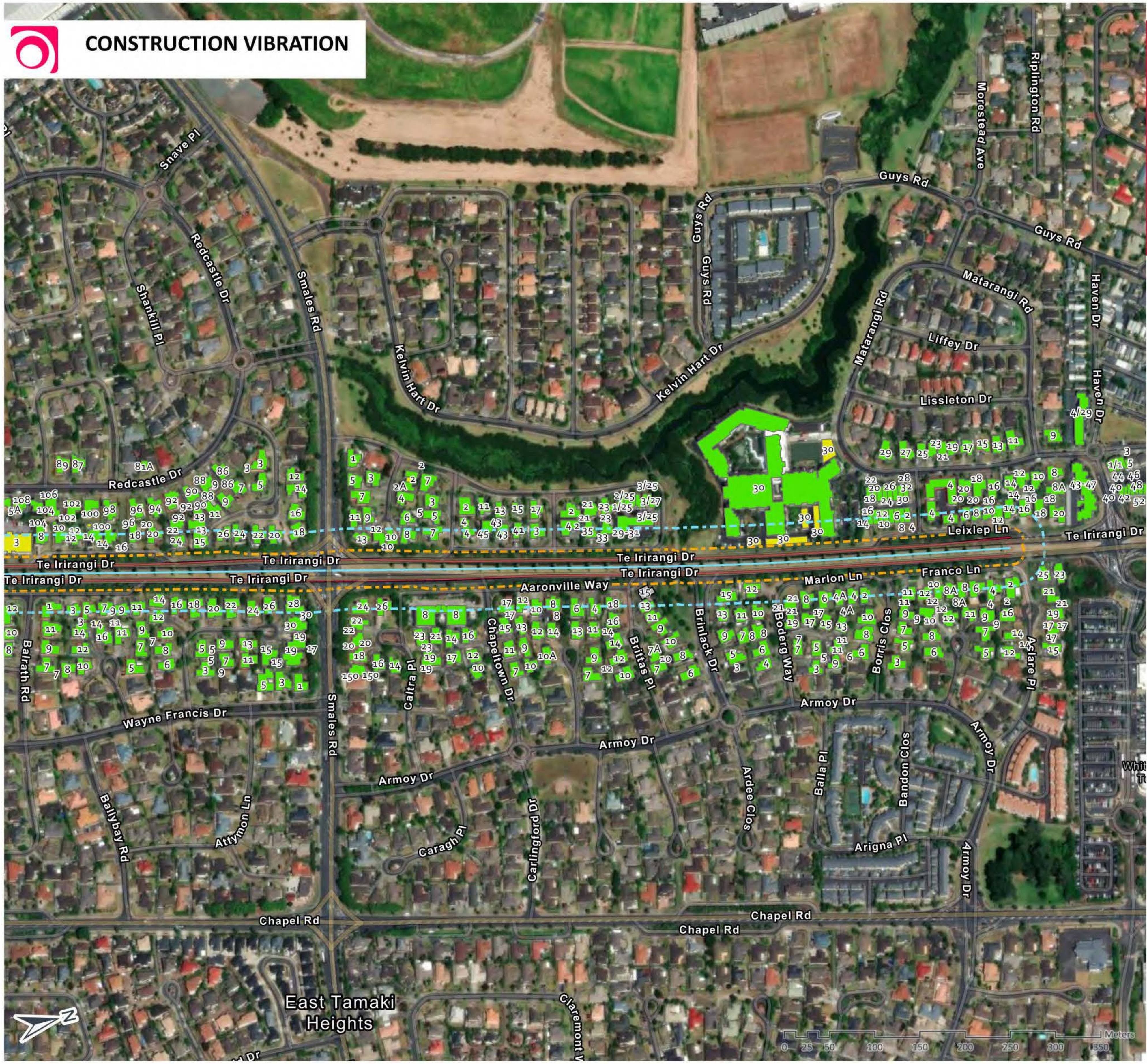
Vibration compliance envelope

Appendix B – Vibration compliance envelope

NoR 1


CONSTRUCTION VIBRATION
NOR1 OVERALL
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Te Irirangi Dr
Chapel Rd
Springs Rd
East Tamaki Rd
Ormiston Rd
Flat Bush
Chapel Heights
East Tamaki Heights
Big Swing Golf
Hampton Park
Barry Curtis Park
Preston Road Reserve
Otara Creek Reserve
Mayfield Park
Pearl Baker Reserve
East Tamaki War Memorial Park
Client:
Map
Authors:
owen.li
Date of Issue:
28/11/2022 3:08 pm
Drawing Details:
Scale: 1:15,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°
Meters
0 95 190 380 570 760 950 1,140 1,330

CONSTRUCTION VIBRATION



NOR1_1

Nearby Buildings
- PPF
- Non PPF
- Project Roads
- Project Bus Lane

Vibration level
- 2 mm/s
- 5 mm/s

Client:
Map

Authors:
owen.li

Date of Issue:
28/11/2022 3:08 pm

Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°

Map Notes / Comments:
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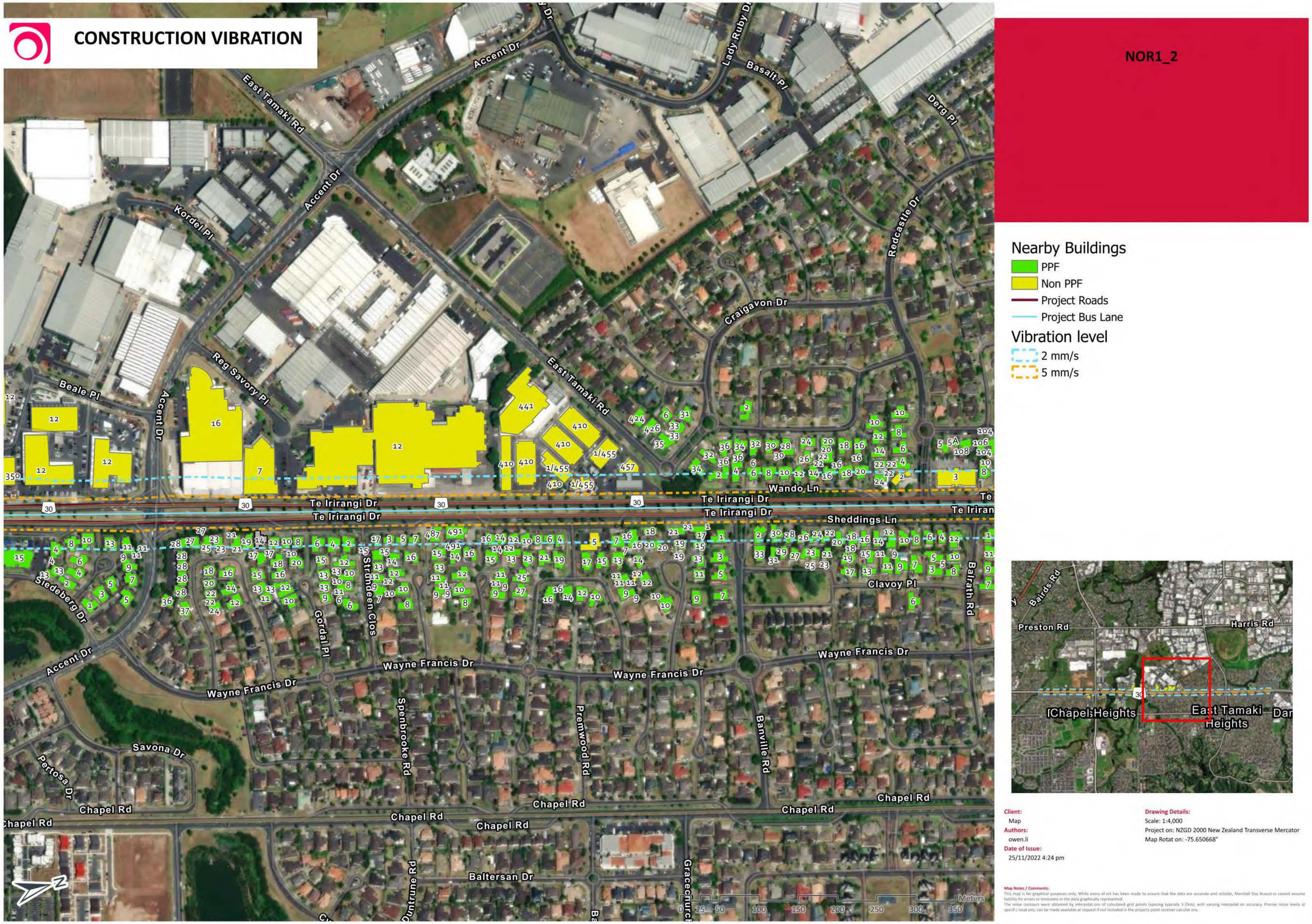
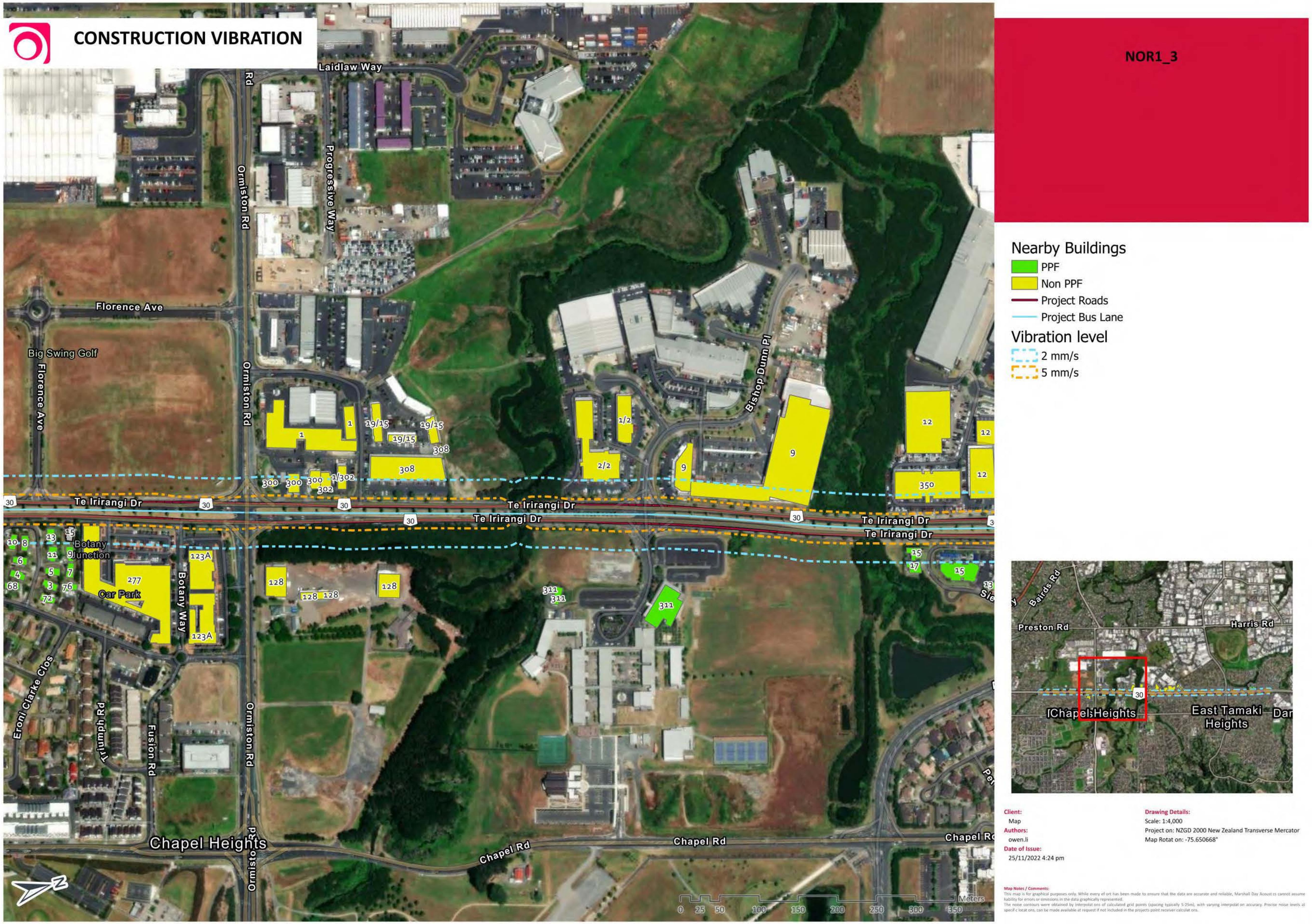

CONSTRUCTION VIBRATION
NOR1_2
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
East Tamaki Rd
Accent Dr
Lady Ruby Dr
Basalt Pl
Derg Pl
Kordel Pl
Redcastle Dr
Craigavon Dr
Reg Savory Pl
Beale Pl
Te Irirangi Dr
Wando Ln
Sheddings Ln
Siedeberg Dr
Gordal Pl
Strathdeen Clos
Clavoy Pl
Balrath Rd
Wayne Francis Dr
Spenbrooke Rd
Premwood Rd
Banville Rd
Savona Dr
Pertosa Dr
Chapel Rd
Baltersan Dr
Duntrune Rd
Gracechurch
Preston Rd
Bairds Rd
Harris Rd
Chapel Heights
East Tamaki Heights
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°
Map Notes / Comments:
Meters
0 25 50 100 150 200 250 300 350


CONSTRUCTION VIBRATION
NOR1_3
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Laidlaw Way
Progressive Way
Ormiston Rd
Florence Ave
Big Swing Golf
Bishop Dunn Pl
Te Irirangi Dr
Botany Junction
Car Park
Botany Way
Eroni Clarke Clos
Triumph Rd
Fusion Rd
Chapel Heights
Chapel Rd
Preston Rd
Bairds Rd
Harris Rd
East Tamaki Heights
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°
Map Notes / Comments:
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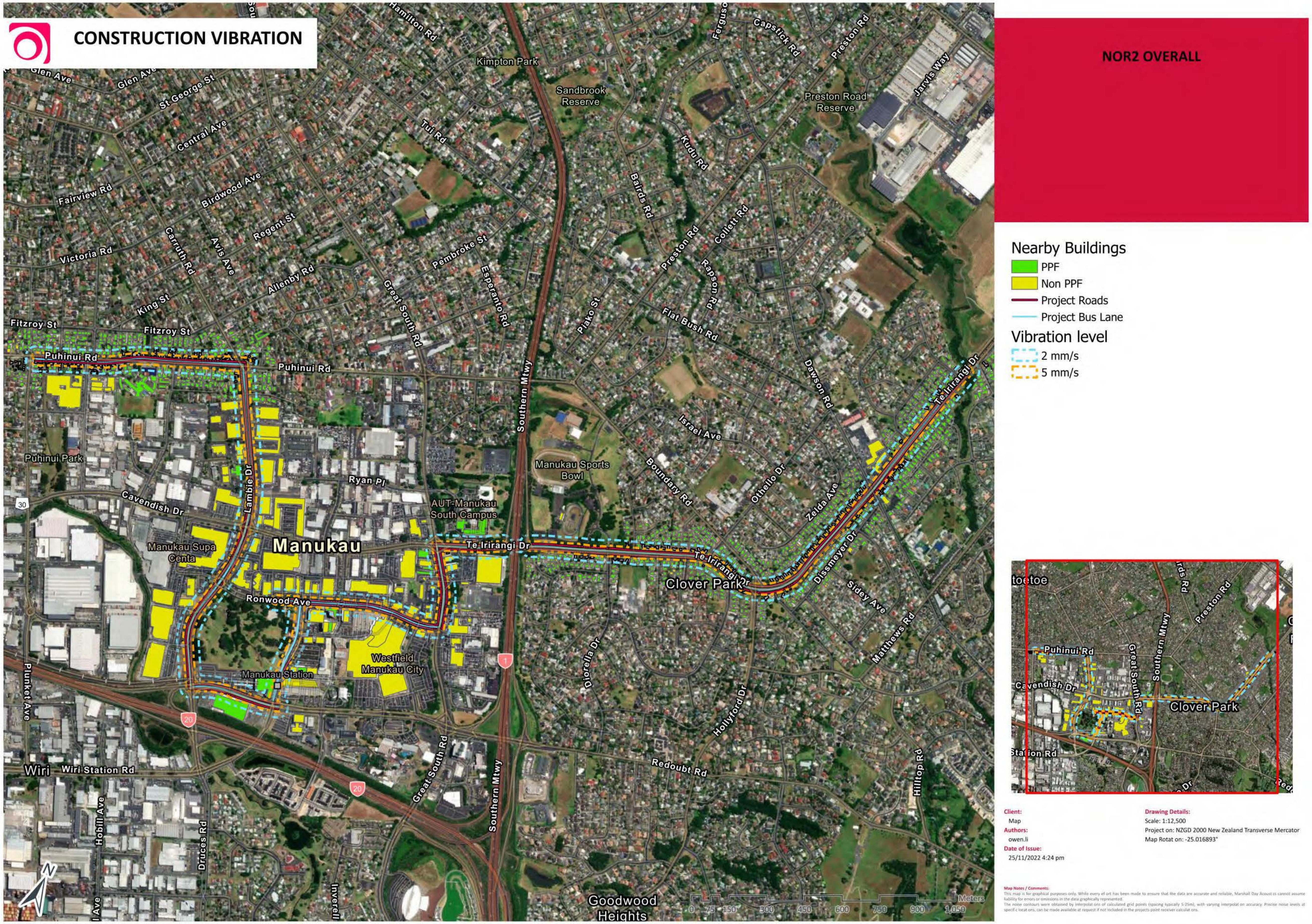
Meters
0 25 50 100 150 200 250 300 350


CONSTRUCTION VIBRATION
NOR1_4
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Jodie Pl
Belinda Ave
Te Irirangi Dr
Florence Ave
Big Swing Golf
Whetstone Rd
Robin Brooke Dr
Vidiri Ct
Blowers Pl
Tonuru Ct
Botany Junction
Car Park
Botany Way
Medvale Ave
Cashmore Pl
Michael Jones Dr
Glen Osborne Ter
Eroni Clarke Clos
Triumph Rd
Fusion Rd
Eastland Rd
Frank Bunce Grv
Chapel Rd
Flat Bush
Preston Rd
Harris Rd
Chapel Heights
East Tamaki Heights
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -75.650668°
Meters
0 25 50 100 150 200 250 300 350

NoR 2


CONSTRUCTION VIBRATION
NOR2 OVERALL
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Manukau
Clover Park
Puhinui Rd
Fitzroy St
Lambie Dr
Cavendish Dr
Ronwood Ave
Te Irirangi Dr
Great South Rd
Southern Mtwy
Manukau Station
Westfield Manukau City
AUT-Manukau South Campus
Manukau Supa Centa
Manukau Sports Bowl
Puhinui Park
Kimpton Park
Sandbrook Reserve
Preston Road Reserve
Wiri
Wiri Station Rd
Redoubt Rd
Goodwood Heights
Dissmeyer Dr
Zelda Ave
Othello Dr
Boundary Rd
Israel Ave
Dawson Rd
Flat Bush Rd
Preston Rd
Rapson Rd
Collett Rd
Bairds Rd
Kudu Rd
Capstick Rd
Jarvis Way
Hamilton Rd
Tui Rd
Glen Ave
St George St
Central Ave
Birdwood Ave
Fairview Rd
Regent St
Victoria Rd
Carruth Rd
Avis Ave
Allenby Rd
Pembroke St
Esperanto Rd
King St
Piako St
Ryan Pl
Sidey Ave
Matthews Rd
Hollyford Dr
Diorella Dr
Hilltop Rd
Plunket Ave
Hobill Ave
Druces Rd
Meters
0 75 150 300 450 600 750 900 1,050
Client:
Map
Authors:
owen.li
Date of Issue:
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Map Rotat on: -25.016893°
Map Notes / Comments:
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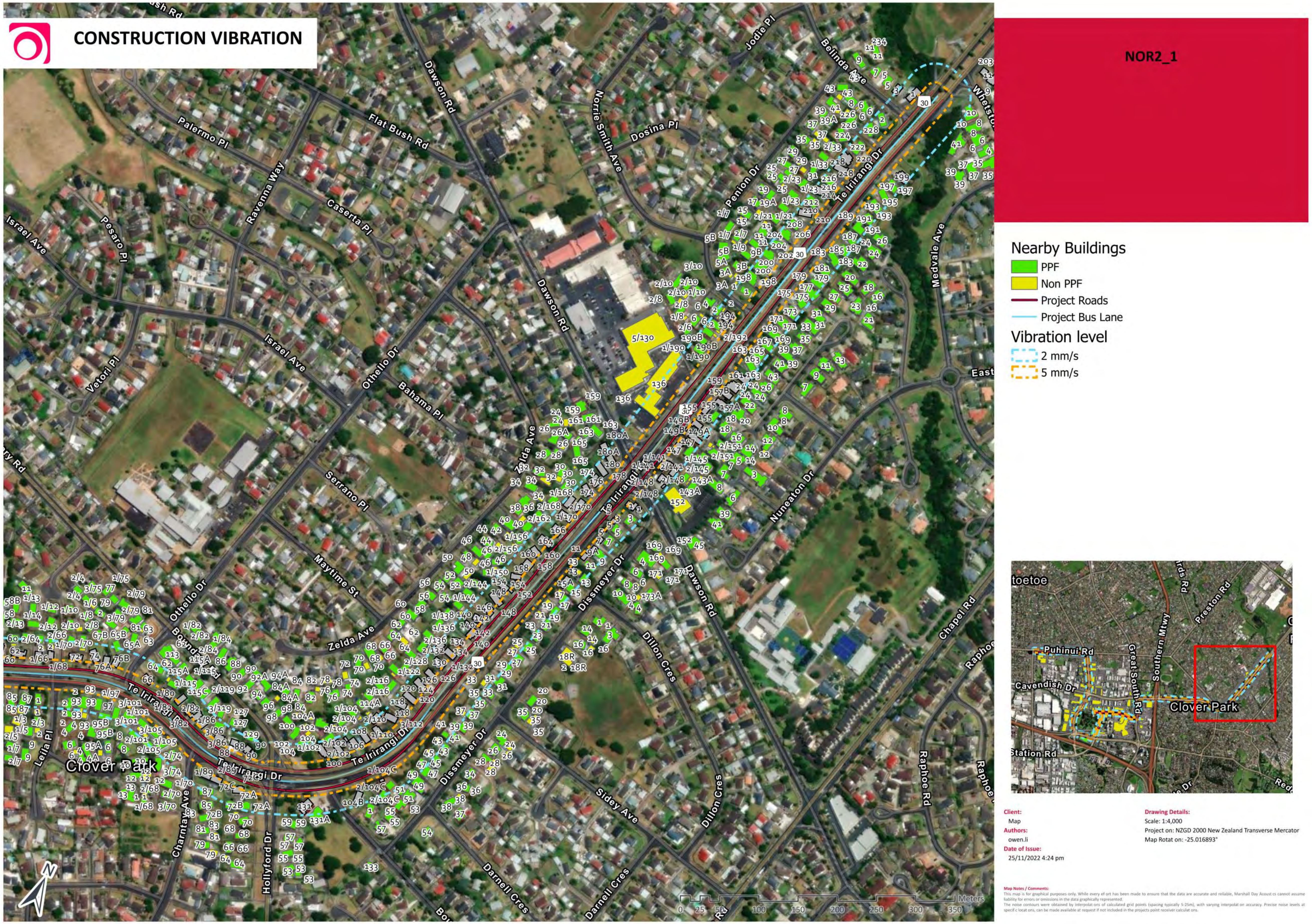
CONSTRUCTION VIBRATION
NOR2_1
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Te Irirangi Dr
Dawson Rd
Flat Bush Rd
Palermo Pl
Israel Ave
Pesaro Pl
Ravenna Way
Caserta Pl
Norrie Smith Ave
Dosina Pl
Jodie Pl
Belinda Ave
Penion Dr
Medvale Ave
Othello Dr
Bahama Pl
Vetori Pl
Serrano Pl
Maytime St
Zelda Ave
Dissmeyer Dr
Nuneaton Dr
Dillon Cres
Sidey Ave
Darnell Cres
Chapel Rd
Raphoe Rd
Hollyford Dr
Charnta Ave
Leila Pl
Clover Park
Puhinui Rd
Cavendish Dr
Great South Rd
Southern Mtwy
Preston Rd
Station Rd
Meters
0 25 50 100 150 200 250 300 350
Client:
Map
Authors:
owen.li
Date of Issue:
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Drawing Details:
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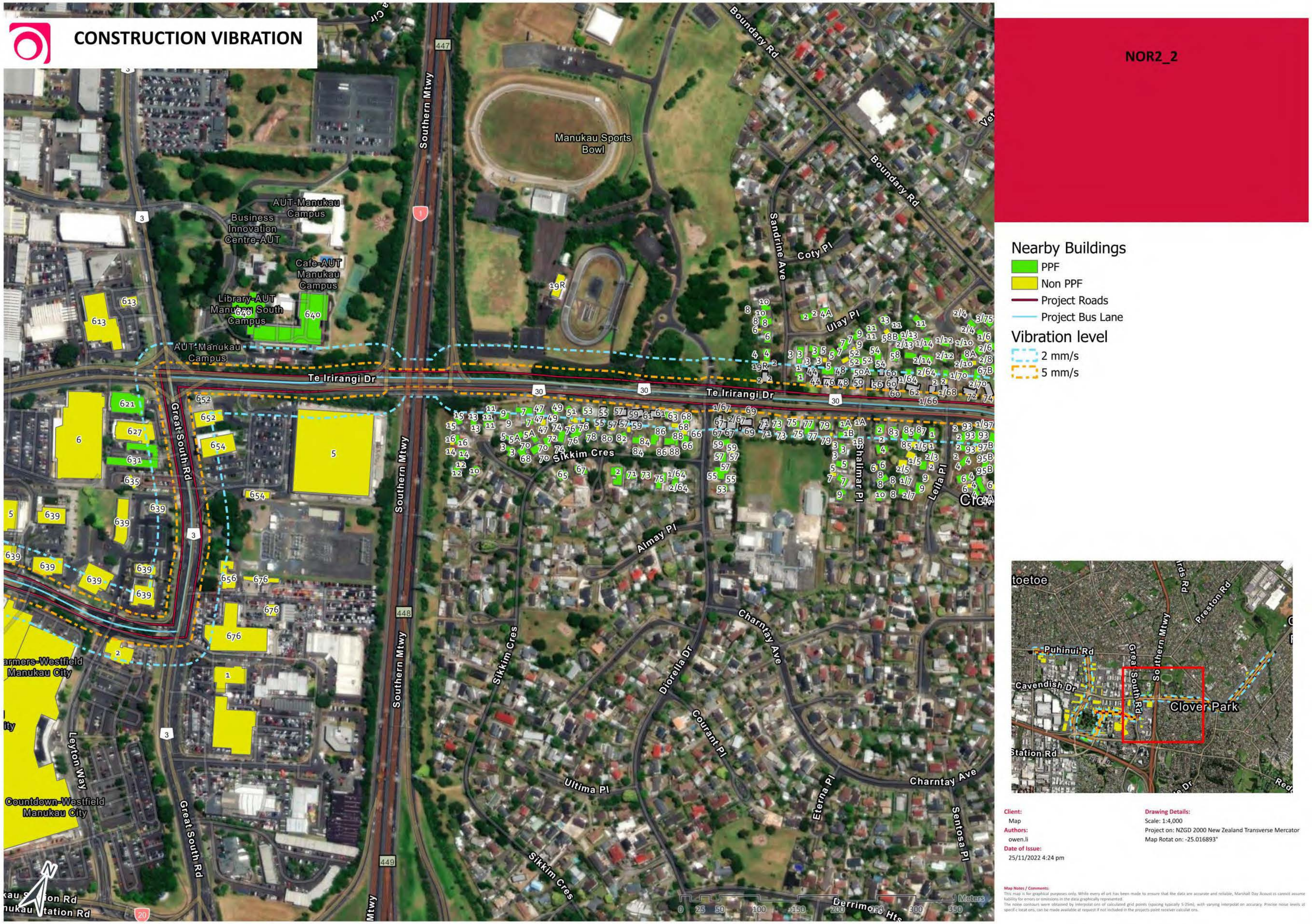

CONSTRUCTION VIBRATION
NOR2_2
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Manukau Sports Bowl
AUT-Manukau Campus
Business Innovation Centre-AUT
Cafe-AUT Manukau Campus
Library-AUT Manukau South Campus
Te Irirangi Dr
Southern Mtwy
Great South Rd
Boundary Rd
Sandrine Ave
Coty Pl
Ulay Pl
Sikkim Cres
Shalimar Pl
Almay Pl
Charntay Ave
Diorella Dr
Courant Pl
Ultima Pl
Eterna Pl
Sentosa Pl
Leyton Way
Farmers-Westfield Manukau City
Countdown-Westfield Manukau City
Puhinui Rd
Cavendish Dr
Clover Park
Station Rd
Preston Rd
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
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Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Meters
0 25 50 100 150 200 300 350


CONSTRUCTION VIBRATION
NOR2_3
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Manukau
Cavendish Dr
Lambie Dr
Ryan Pl
Freeman Way
Jack Conway Ave
Sharkey St
Great South Rd
Ronwood Ave
Amersham Way
Davies Ave
Osterley Way
Leyton Way
Putney Way
Manukau Station
Manukau Station Rd
Manukau Branch
Hayman Park
Harvey Norman
Bunnings
Kmart-Manukau Supa Centa
Manukau Supa Centa
Farmers-Westfield Manukau City
Westfield Manukau City
Countdown-Westfield Manukau City
Puhinui Rd
Clover Park
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
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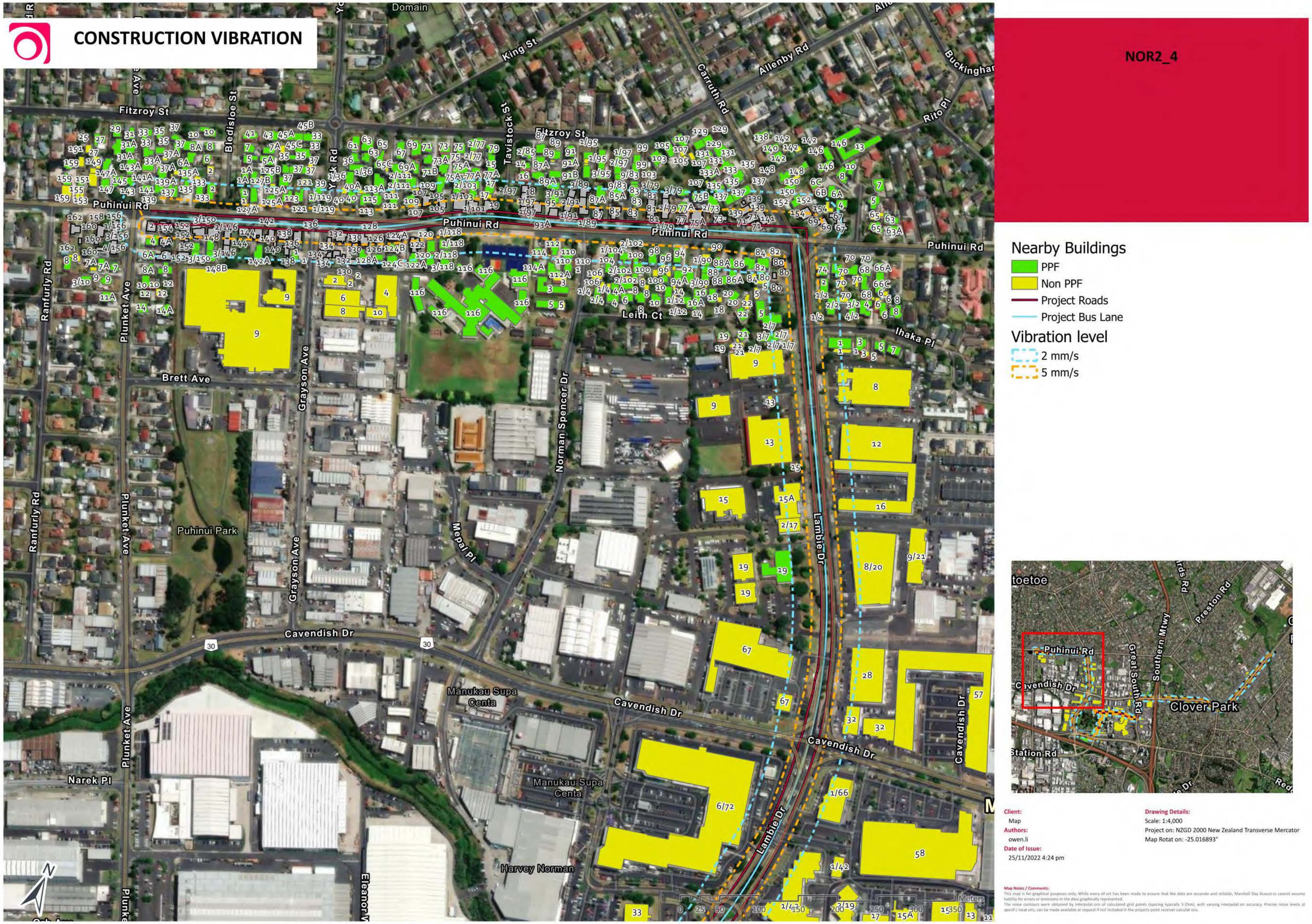
Meters


CONSTRUCTION VIBRATION
NOR2_4
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Fitzroy St
Puhinui Rd
King St
Allenby Rd
Carruth Rd
Buckingham
Rito Pl
Tavistock St
Bledisloe St
York Rd
Domain
Ranfurly Rd
Plunket Ave
Brett Ave
Grayson Ave
Puhinui Park
Norman Spencer Dr
Leith Ct
Ihaka Pl
Lambie Dr
Mepal Pl
Cavendish Dr
Narek Pl
Manukau Supa Centa
Harvey Norman
Eleanor
toetoe
Clover Park
Great South Rd
Southern Mtwy
Preston Rd
Station Rd
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
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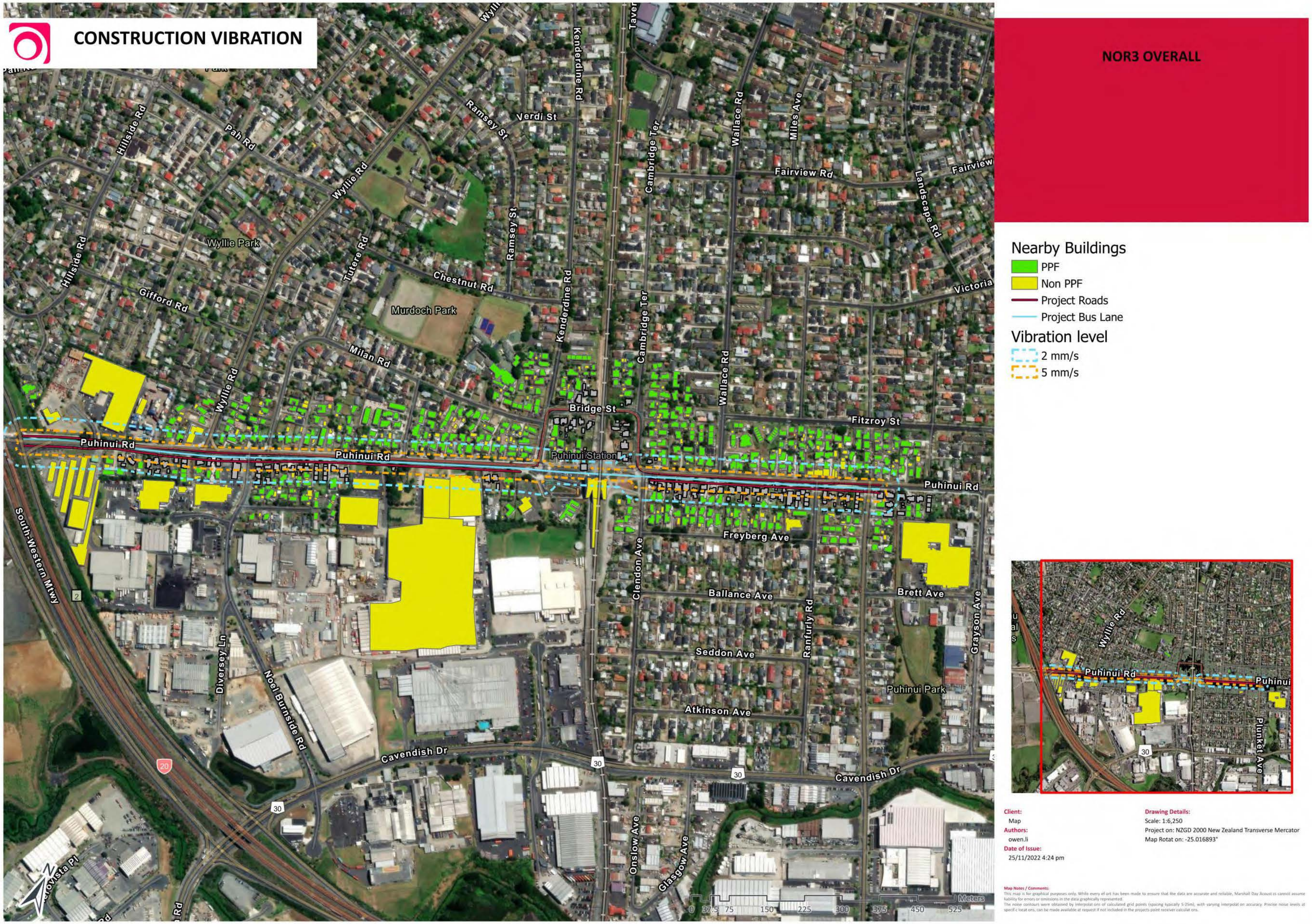
Map Notes / Comments:
Meters

NoR 3


CONSTRUCTION VIBRATION
NOR3 OVERALL
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Puhinui Rd
Puhinui Station
Bridge St
Fitzroy St
Freyberg Ave
Ballance Ave
Seddon Ave
Atkinson Ave
Brett Ave
Cavendish Dr
Murdoch Park
Wyllie Park
Puhinui Park
Chestnut Rd
Gifford Rd
Milan Rd
Wyllie Rd
Hillside Rd
Pah Rd
Ramsey St
Verdi St
Kenderdine Rd
Cambridge Ter
Wallace Rd
Miles Ave
Fairview Rd
Landscape Rd
Victoria
Tutere Rd
Clendon Ave
Ranfurly Rd
Grayson Ave
South-Western Mtwy
Diversey Ln
Noel Burnside Rd
Onslow Ave
Glasgow Ave
Plunket Ave
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:6,250
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Map Notes / Comments:
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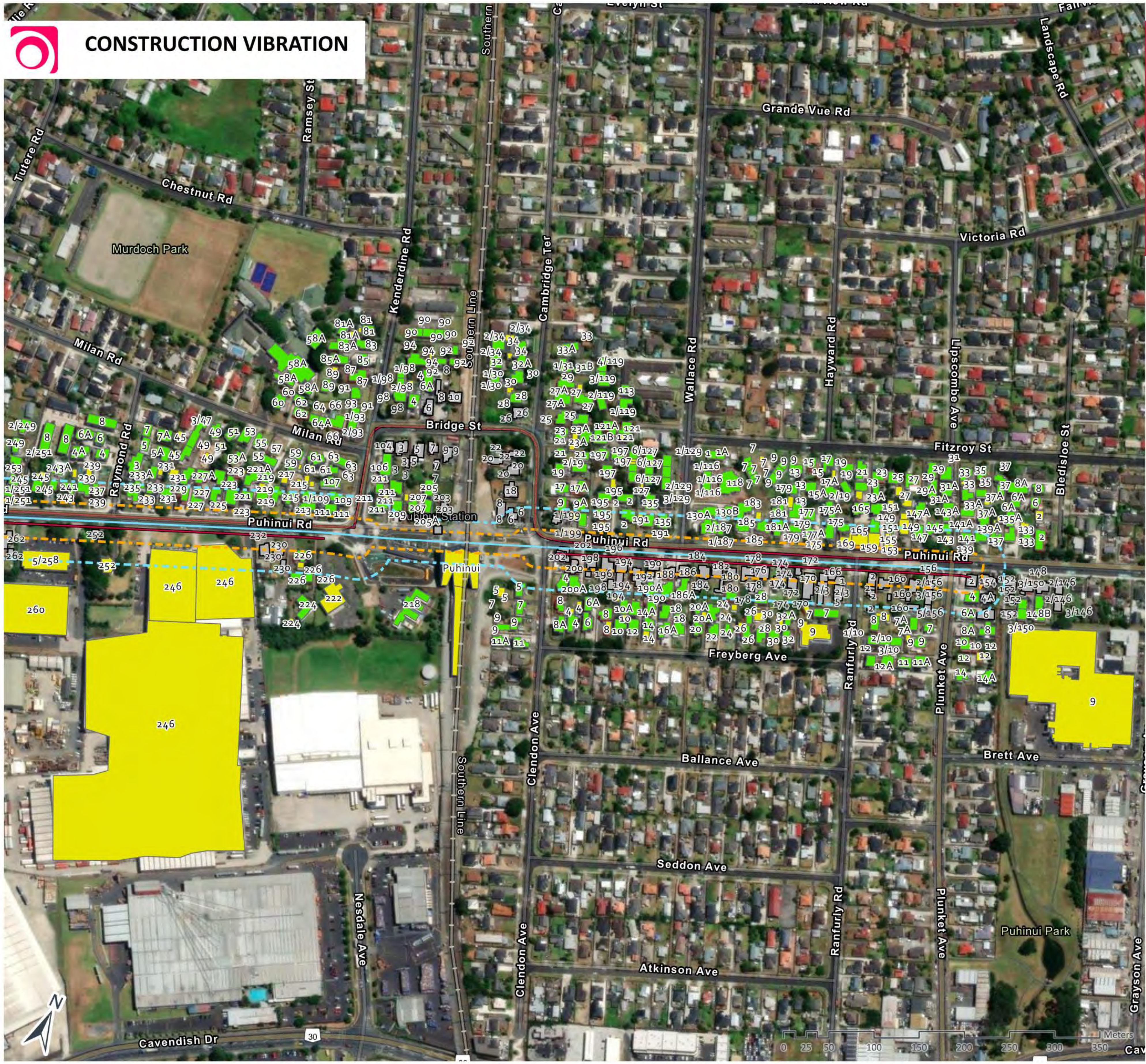
Meters

CONSTRUCTION VIBRATION



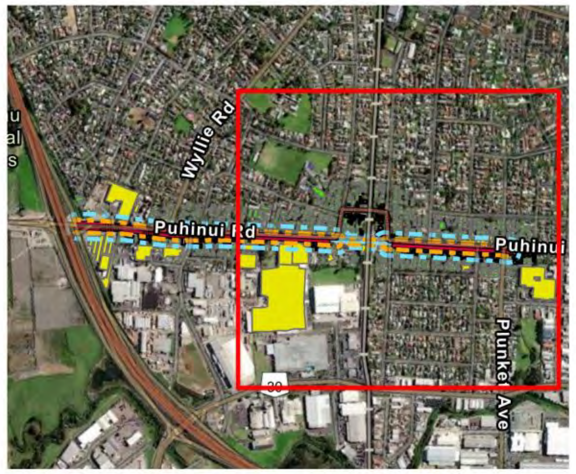
NOR3_1

Nearby Buildings

- PPF
- Non PPF
- Project Roads
- Project Bus Lane

Vibration level

- 2 mm/s
- 5 mm/s



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Authors:
owen.li

Date of Issue:
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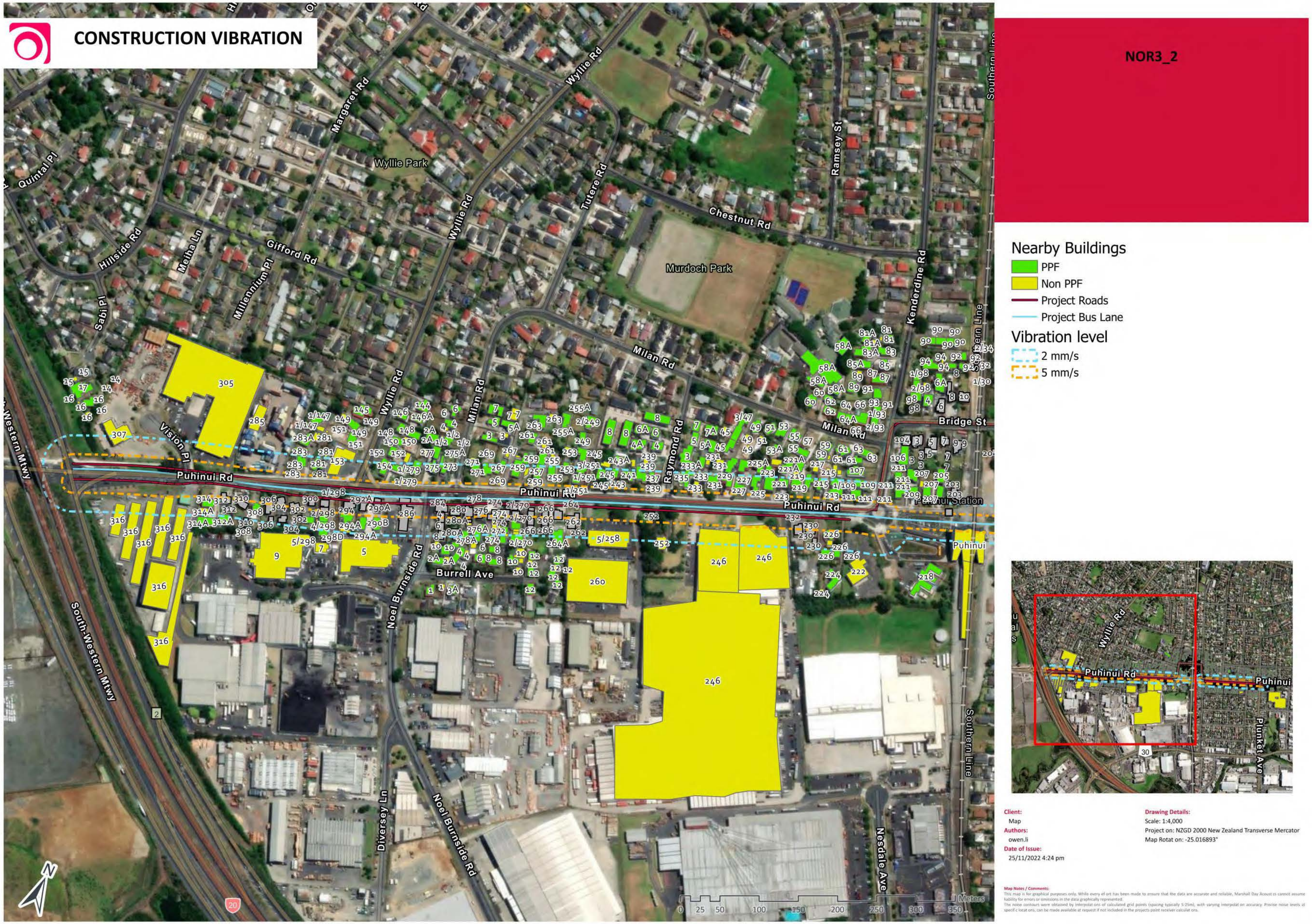
CONSTRUCTION VIBRATION
NOR3_2
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
2 mm/s
5 mm/s
Puhinui Rd
Burrell Ave
Milan Rd
Chestnut Rd
Murdoch Park
Wyllie Park
Gifford Rd
Bridge St
Kenderdine Rd
Noel Burnside Rd
Diversey Ln
Nesdale Ave
South-Western Mtwy
Southern Line
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
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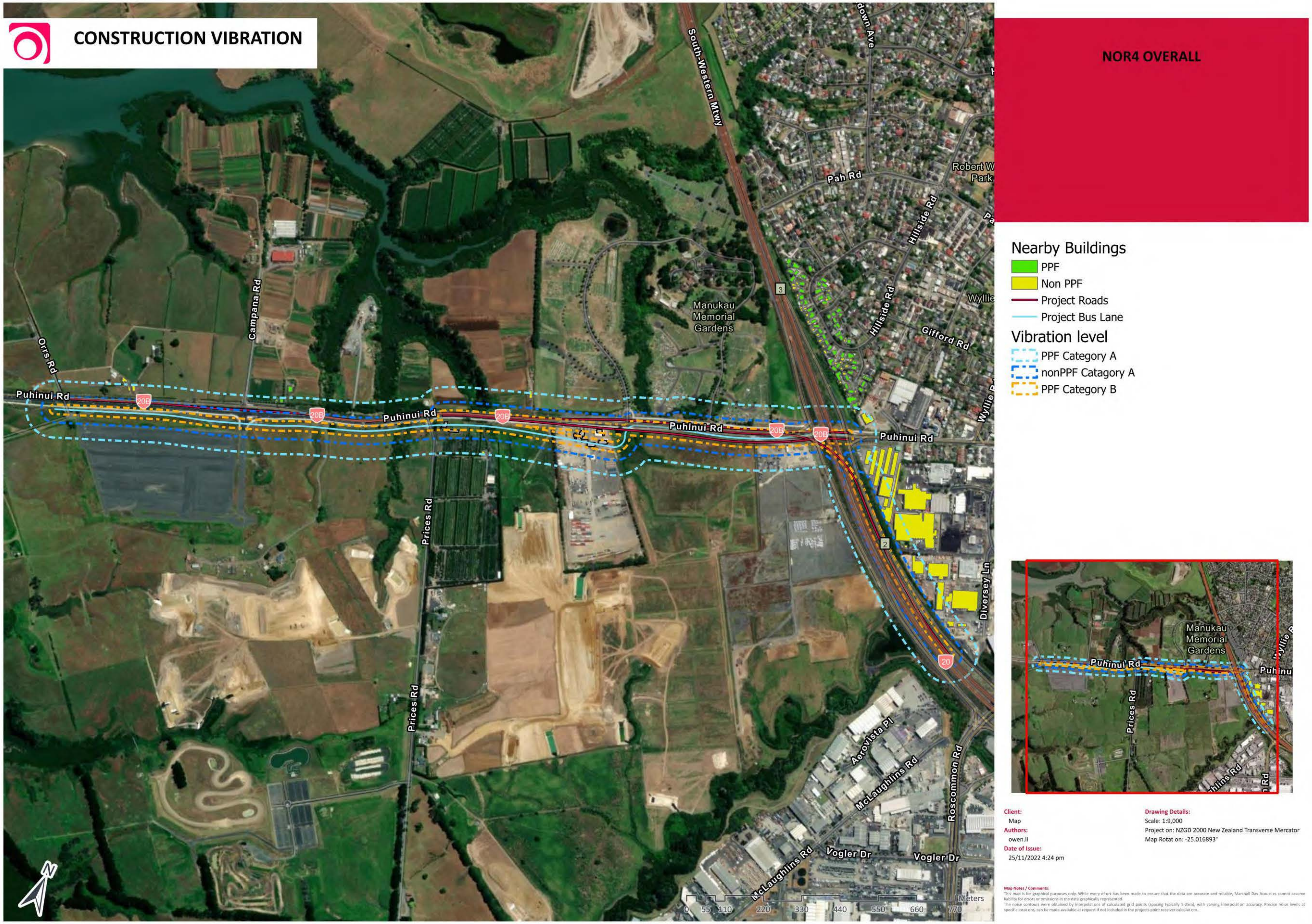
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Meters

NoRs 4a and 4b


CONSTRUCTION VIBRATION
NOR4 OVERALL
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
PPF Category A
nonPPF Catagory A
PPF Category B
Puhinui Rd
Orrs Rd
Campana Rd
Prices Rd
South-Western Mtwy
Pah Rd
Hillside Rd
Gifford Rd
Manukau Memorial Gardens
Diversey Ln
Aerovista Pl
McLaughlins Rd
Roscommon Rd
Vogler Dr
0 55 110 220 330 440 550 660 770 Meters
Client:
Map
Authors:
owen.li
Date of Issue:
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Project on: NZGD 2000 New Zealand Transverse Mercator
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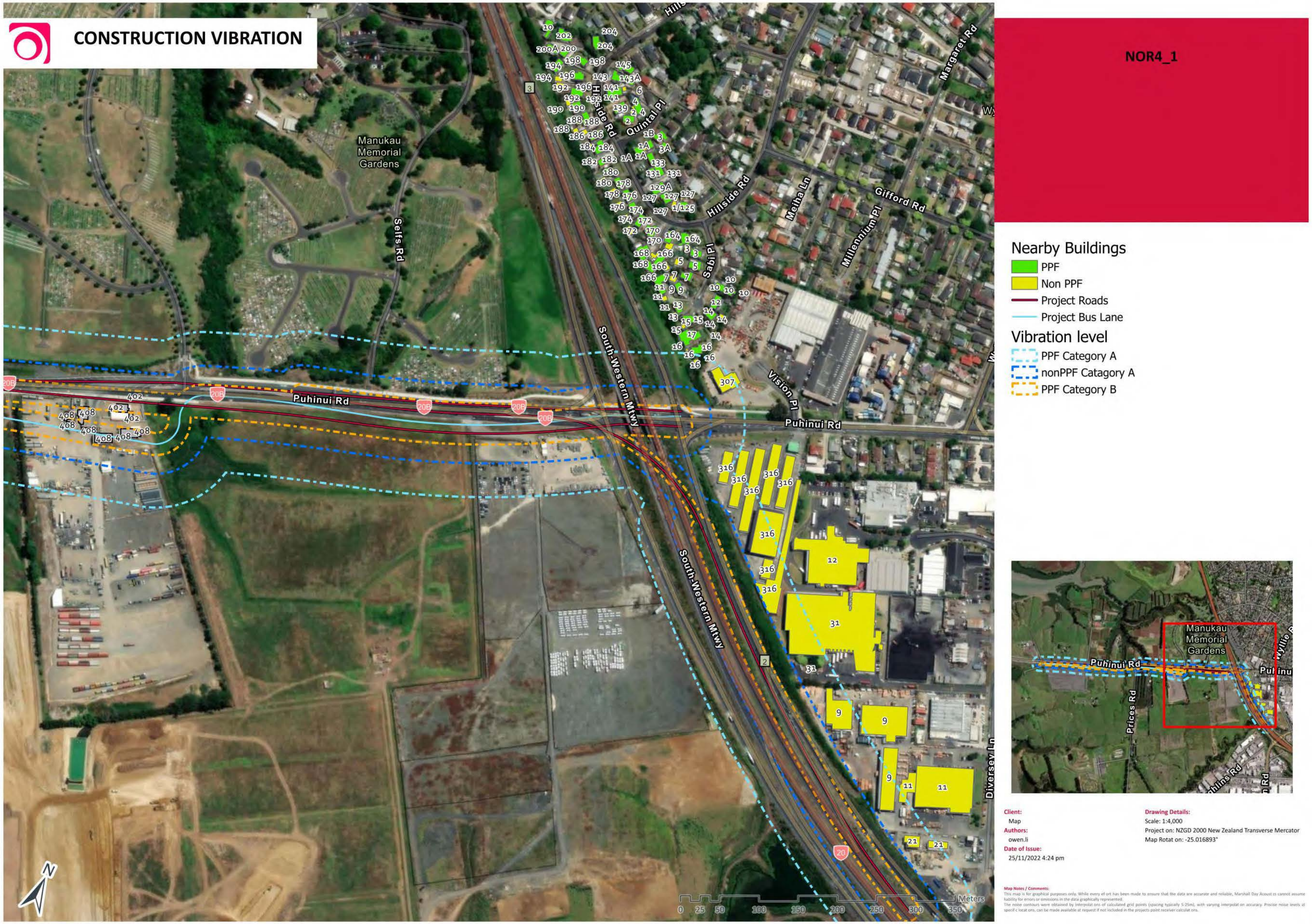
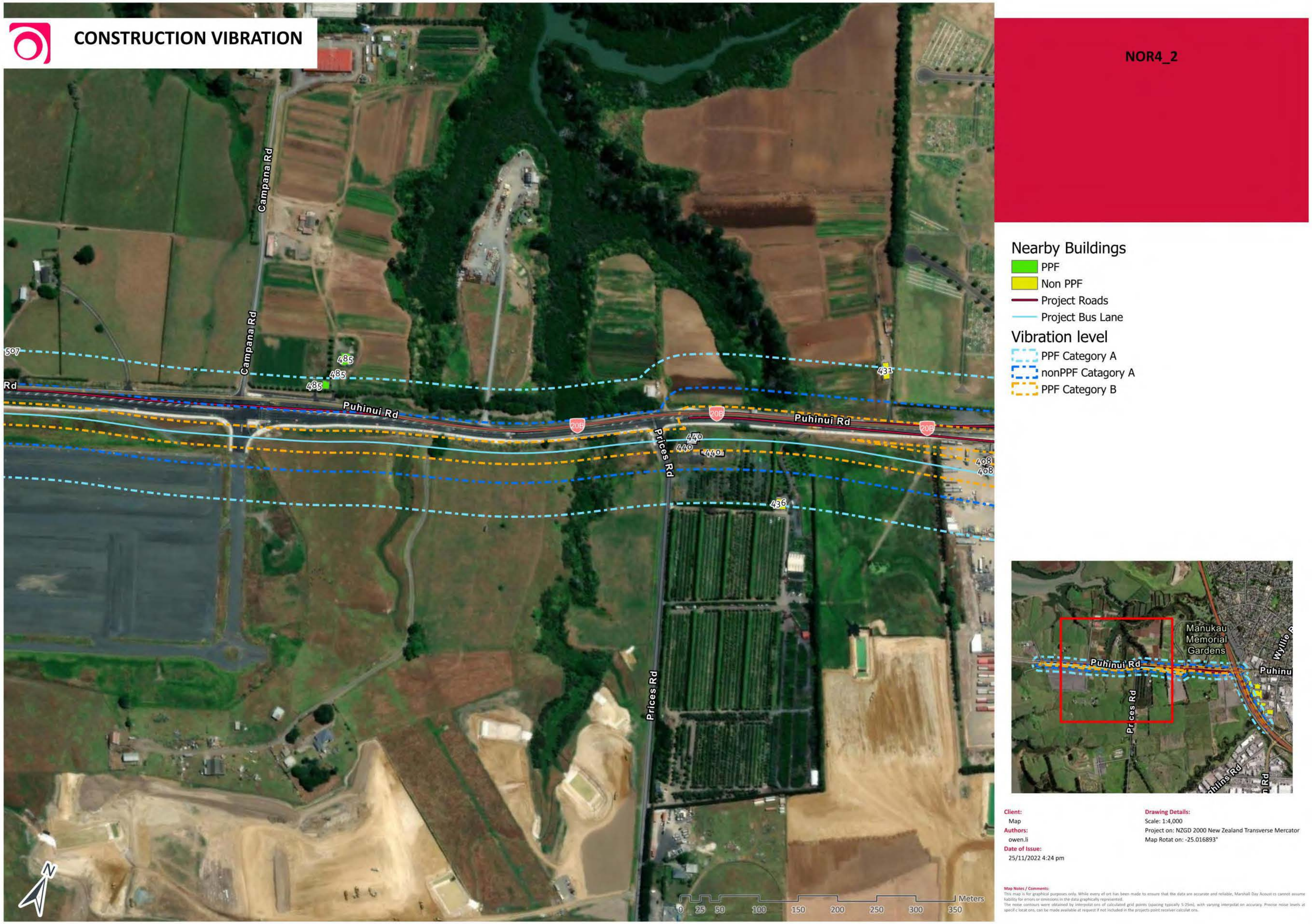


CONSTRUCTION VIBRATION
NOR4_1
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
PPF Category A
nonPPF Catagory A
PPF Category B
Manukau Memorial Gardens
Selfs Rd
Puhinui Rd
South-Western Mtwy
Hillside Rd
Quintal Pl
Sabi Pl
Vision Pl
Melha Ln
Millennium Pl
Gifford Rd
Margaret Rd
Diversey Ln
Prices Rd
Client:
Map
Authors:
owen.li
Date of Issue:
25/11/2022 4:24 pm
Drawing Details:
Scale: 1:4,000
Project on: NZGD 2000 New Zealand Transverse Mercator
Map Rotat on: -25.016893°
Meters
0 25 50 100 150 200 250 300 350


CONSTRUCTION VIBRATION
NOR4_2
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
PPF Category A
nonPPF Catagory A
PPF Category B
Campana Rd
Puhinui Rd
Prices Rd
Manukau Memorial Gardens
Meters
0 25 50 100 150 200 250 300 350
Client:
Map
Authors:
owen.li
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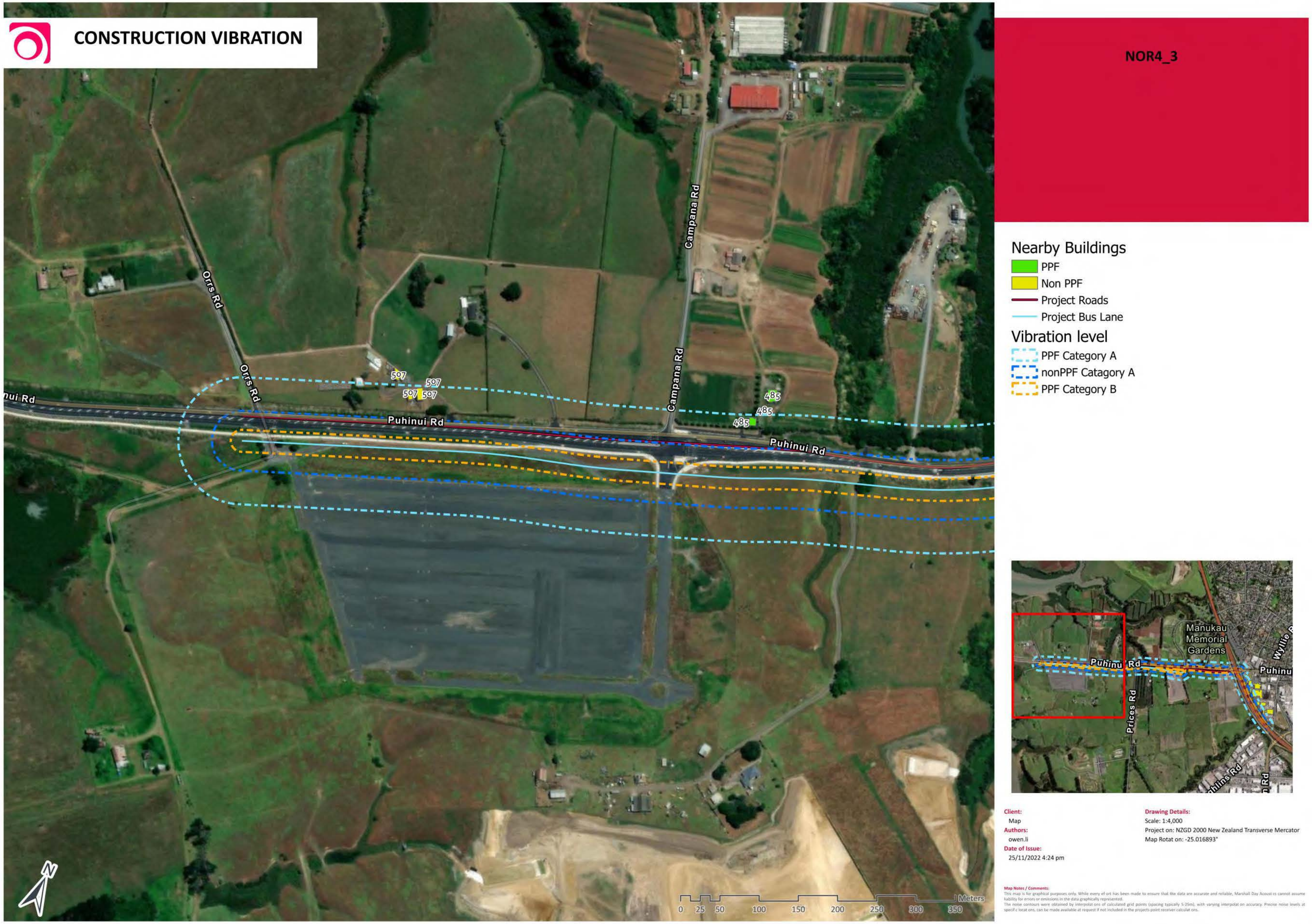
CONSTRUCTION VIBRATION
NOR4_3
Nearby Buildings
PPF
Non PPF
Project Roads
Project Bus Lane
Vibration level
PPF Category A
nonPPF Catagory A
PPF Category B
Orrs Rd
Campana Rd
Puhinui Rd
507
485
Manukau Memorial Gardens
Prices Rd
0 25 50 100 150 200 250 300 350 Meters
Client:
Map
Authors:
owen.li
Date of Issue:
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TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

Airport to Botany – Assessment of Traffic Noise Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

Document Status

Responsibility	Name
Author	Siiri Wilkening
Reviewer	Siiri Wilkening
Approver	Adam Jellie

Revision Status

Version	Date	Reason for Issue
1.0	9 December 2022	Final for lodgement

Table of Contents

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Table of Tables

Appendices

Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AC	Asphaltic Concrete
AEE	Assessment of Effects on the Environment report
AUP:OP	Auckland Unitary Plan: Operative in Part
BRT	Bus Rapid Transit
CVA	Cultural Values Assessments
FUZ	Future Urban Zone
HANA	High Aircraft Noise Area
HCV	Heavy commercial vehicles
MANA	Moderate Aircraft Noise Area
N/A	Not Applicable
NIMT	North Island Main Trunk railway
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Airport to Botany Bus Rapid Transit (Botany Town Centre to Rongomai Park)
NoR 2	Notice of Requirement 2: Airport to Botany Bus Rapid Transit (Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue)
NoR 3	Notice of Requirement 3: Airport to Botany Bus Rapid Transit (Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange)
NoR 4a	Notice of Requirement 4a: Airport to Botany Bus Rapid Transit (SH20/20B Interchange to Orrs Road)
NoR 4b	Notice of Requirement 4b: Alteration to NZ Transport Agency Designation 6717 – State Highway 20B
NPS:UD	National Policy Statement for Urban Development 2020
PPF	Protected Premise and Facility
Programme partners	Te Ākitai Waiohua, Auckland Airport, Auckland Transport and Waka Kotahi
RCA	Road Controlling Authority
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
SEA	Significant Ecological Area
SH1	State Highway 1
SH20	State Highway 20
SH20B	State Highway 20B
SWGP	Southwest Gateway Programme
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
Waka Kotahi	Waka Kotahi NZ Transport Agency

Executive summary

This report provides an assessment of traffic noise effects for the Airport to Botany Bus Rapid Transit project (**the Project**) to inform the Assessment of Effects on the Environment (**AEE**) for five Notices of Requirement (**NoR**) being sought by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport.

Methodology

The following methodology has been used for the traffic noise assessment for all NoRs:

- The noise criteria categories of NZS6806 Acoustics – Road-traffic noise – New and altered roads (**NZS6806**); and
- Noise effects (both positive and adverse) through determining the noise level changes due to the Project.

The NoRs provide for various transport modes which have different noise effects as discussed below:

- **Bus Rapid Transit (BRT):** We understand that only electric buses will use the bus lanes. Electric buses generate a small to moderate level of noise. For speeds above 40 km/h the road tyre interaction is the main noise source of traffic, and buses are expected to travel at speeds at or above 40 km/h. Nevertheless, electric buses are quieter than diesel buses, particularly at stations, and can be quieter than petrol and diesel passenger vehicles. Where the rapid transit lanes are located in the centre of the road, which is the case for most of the Project corridor, buses may contribute to the overall traffic levels at all (e.g. for majority of the Project corridor, where the lanes are in the middle of the general traffic lanes) or may contribute slightly. We have assessed the rapid transit traffic noise against the noise criteria of NZS6806.
- **Walking and Cycling**: Walking and cycling improvements will not result in noticeable changes to the traffic noise level and are not discussed in detail.
- **Road traffic on 'Altered roads'**: The existing traffic lanes will be changed to enable rapid transit to be implemented. In addition, intersection upgrades will be required. We have therefore assessed the NoRs against the provisions of NZS6806.

We have assessed the bus rapid transit corridor and existing road upgrades together as they are intrinsically linked to each other. We assumed that the same or a similar road surface material (currently PA10 on SH20B and generally Asphaltic Concrete (**AC**) on all other roads) would be retained in the future, based on information provided by Auckland Transport and Waka Kotahi.

We used computer noise modelling to predict existing, and future traffic noise levels (both without and with the Project in place). Noise levels were predicted for each individual Protected Premise and Facility (**PPF**) and also noise level contours over a wider area.

The National Policy Statement on Urban Development (**NPS:UD**) enables higher density dwellings for sites adjacent to the BRT corridor. We anticipate that apart from areas within the High Aircraft Noise Area (**HANA**):

- Zoning within a walkable catchment of BRT stations along the corridor will enable at a minimum, apartment buildings of six storeys; and

- Beyond walkable catchments, residential zoning will provide for three dwelling up to three storeys in height (subject to meeting the relevant development standards).

While we have not assessed the potential noise levels received by possible future dwellings, we have commented on the likelihood of any potential changes to the mitigation options if more intensive development were to eventuate.

Mitigation recommendations

We have assessed all existing PPFs within 100m of the Project edge. A small number may benefit from improved boundary fences (potentially in NoR 1 where no site access from the Project road is required). In NoRs 2 and 3, sites have driveway access to the road. Therefore, fences are unlikely to be effective given the gaps required to retain access.

Overall, we recommend the implementation of low noise road surface, in this instance the retention of existing road surface materials, across all NoRs. This mitigation will also benefit any future sensitive receivers, e.g. where the NPS:UD enables higher density dwellings along the alignment.

Generally, no new noise sensitive activities are permitted in the HANA. In the Medium Aircraft Noise Area (**MANA**) any new noise sensitive activities will need to insulate appropriately against aircraft noise, which in turn will also provide mitigation against traffic noise. Given the likelihood of multi storey dwellings in an urban or suburban environment, barriers are unlikely to be a practicable mitigation measure. Low noise road surface is already proposed, and buildings will need to include improved building insulation and ventilation within the MANA. Outside the MANA, we consider that responsible developers would take account of the high noise levels from the existing major roads in the vicinity and ensure that dwellings are appropriately insulated and ventilated to ensure a suitable indoor noise environment for future residents.

Effects analysis

We compared the result of the individual traffic noise level predictions with the noise criteria categories A, B and C of NZS6806, and calculated the anticipated noise level change due to the Project.

The aim is to achieve the lowest practicable traffic noise level where the Project would otherwise result in an adverse effect on the noise level experienced by sensitive receivers (PPFs).

Overall, the change in noise level is predicted to be minimal due to the traffic generation itself. However, many dwellings are intended to be removed to make space for the Project. The removal of the first row of houses will result in noticeable to significant noise level changes to PPFs behind. Mostly, those PPFs would still receive noise levels within Category A (the preferred noise criteria category), however, a small number of PPFs would receive a noticeable noise level increase and noise levels within Category B or C.

For the vast majority of PPFs (1,536 of the total of 1,781 PPFs assessed across all NoRs), the noise level changes due to the Project will be insignificant (ranging from +2 to -2 dB).

Should more intensive housing be developed adjacent to the Project, the design would need to take account of the anticipated noise environment. That would be assisted by the fact that much of the Project is within the MANA and HANA, where sound insulation is a requirement of the AUP:OP, and by the recommended low noise road surface to be used both on the BRT and the surrounding traffic lanes.

Summary of assessment of effects and recommendations

Effect	Assessment	Recommendation
Traffic noise – all NoRs	NoRs 1, 2 and 3 traverse well established residential and commercial areas, with buildings in close proximity to construction works. NoR 4a and 4b traverses currently generally greenfield sites (some zoned FUZ), which will likely be developed as commercial areas. PPFs include dwellings, schools, childcare centres and other educational facilities. Only existing PPFs have been assessed in detail. The largest effects are anticipated from the removal of the first row of house in NoR 2 and 3, and parts of NoR 1. This will leave PPFs behind exposed to traffic noise. Other effects are likely from traffic lanes moving closer to some houses.	Mitigation is already assumed in the form of low noise road surface, by retaining the existing surface in the future. Some individual boundary fences may be effective in NoR 1, 2 and 3. Fencing in NoR 2 and 3 is unlikely to be suitable due to driveway access requirements.

1 Introduction

1.1 Purpose and scope of this Report

This Assessment of Traffic Noise and Vibration Effects report (**Report**) has been prepared to inform the AEE for five NoRs being sought by Waka Kotahi and Auckland Transport for the Project under the Resource Management Act 1991 (**RMA**). Specifically, this report considers the actual and potential effects associated with operation of the project on the existing and likely future environment as it relates to traffic noise and vibration effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

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 within each NoR, and the typical construction methodology that is anticipated to 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 construction noise and vibration effects. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this report for clarity.

1.2 Report structure

In order to provide a clear assessment of each NoR, this Report follows the structure set out in the AEE. That is, each notice has been separated out into its own section, and each section contains an assessment of the actual and potential effects for the specific NoR. Where appropriate, measures to avoid, remedy or mitigate effects are recommended in a subsequent section.

Each section is arranged in geographical order, starting from the northernmost point of the Project to the southernmost point. Table 1 below describes the extent of each section, and where the description of effects can be found in this report.

Table 1 Report structure

Sections	**Section number**
Description of the Project	2
Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines	4
Identification and description of the existing and likely receiving noise environment;	6.1, 7.1, 8.1, 9.1
Assessment of specific traffic noise matters for Airport to Botany Bus Rapid Transit NoR 1	6
Assessment of specific traffic noise matters for Airport to Botany Bus Rapid Transit NoR 2	7
Assessment of specific traffic noise matters for Airport to Botany Bus Rapid Transit NoR 3	8
Assessment of specific traffic noise matters for Airport to Botany Bus Rapid Transit NoR 4a and 4b	9
Overall conclusion of the level of potential adverse traffic noise effects of the Airport to Botany Bus Rapid Transit Project	10

1.3 Preparation for this Report

Work undertaken for this Report commenced in January 2022. In summary, the preparation for this report has included:

- Information from other experts, namely traffic, construction, design and planning amongst others;
- A site visit of all NoRs on 2 March 2022;
- Ambient noise level surveys in the Project area;
- Computer noise modelling of traffic noise levels from the BRT and general road traffic; and
- A review of findings from a workshop with the Project technical specialists on 8 March 2022.

Where information we rely on was provided by other experts, this is noted in the report.

2 Project description

2.1 Overview of the Project

The overall Project is proposed to be an 18 km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations. It is part of Auckland's wider Rapid Transit Network (**RTN**) connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany.

As set out in the AEE, this Report specifically relates to a portion of the overall Project (approximately 14.9 km) which extends from the Botany Town Centre in the vicinity of Leixlep Lane to Orrs Road in the Puhinui peninsula, off SH20B. The Project primarily involves the upgrade and widening of existing transport corridors to provide for a dedicated BRT corridor and high-quality walking and cycling facilities.

Nine BRT stations are proposed as part of the Project. These stations are generally located at signalised intersections and will be staggered on either side of the intersection.

These stations are situated in the following locations:

- Smales Road;
- Accent Drive;
- Ormiston Road – Botany Junction Shopping Centre;
- Dawson Road;
- Diorella Drive;
- Ronwood Avenue (Manukau Central);
- Manukau Station;
- Puhinui Road/Lambie Drive; and
- Puhinui Station.

As part of the Project, two new structures are proposed:

- A BRT bridge crossing the North Island Main Trunk (**NIMT**) and connecting to the concourse level of the Puhinui Station; and
- A southbound ramp from SH20B to SH20.

Upgrades to existing structures are proposed at the:

- Bridge over Otara Creek (NoR 1);
- Bridge over SH1 (NoR 2);
- Bridge over NIMT (NoR 3); and
- Bridge over Waokauri Creek (NoR 4a).

Figure 1: Overview of the Project and NoR extents

Table 2: Overview of NoRs

Notice	Description	Requiring Authority
NoR 1	Bus Rapid Transit corridor and high quality walking and cycling facilities from Botany Town Centre to Rongomai Park	Auckland Transport
NoR 2	Bus Rapid Transit corridor and high quality walking and cycling facilities from Rongomai Park to Puhinui Interchange, in the vicinity of Plunket Avenue	Auckland Transport
NoR 3	Bus Rapid Transit corridor and high quality walking and cycling facilities from Puhinui Interchange, in the vicinity of Plunket Avenue to SH20/SH20B Interchange	Auckland Transport
NoR 4a	Bus Rapid Transit corridor and high quality walking and cycling facilities from SH20B/20 Interchange to Orrs Road	Auckland Transport
NoR 4b	Alteration to designation 6717 to provide for the widening of SH20B, including a southbound on-ramp onto SH20, high quality walking and cycling facilities and enable a Bus Rapid Transit corridor	NZ Transport Agency

2.2 Overview and description of each NoR

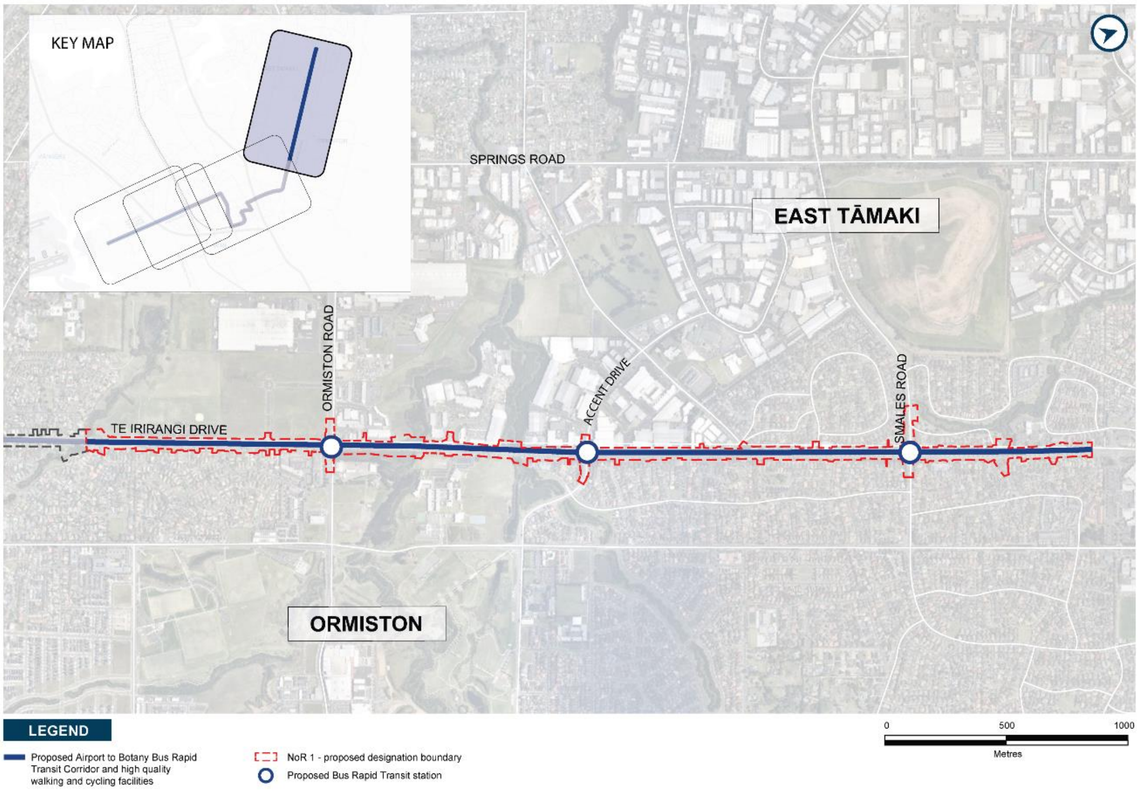
The following sections provide an overview of the NoRs that make up the Project, in relation to traffic noise generation. For more detail, refer to the AEE.

2.2.1 NoR 1

As set out in Table 3 below, the proposed works in NoR 1 include the widening of existing Te Irirangi Drive to accommodate a centre-running BRT corridor, two vehicle lanes in each direction and high quality walking and cycling facilities.

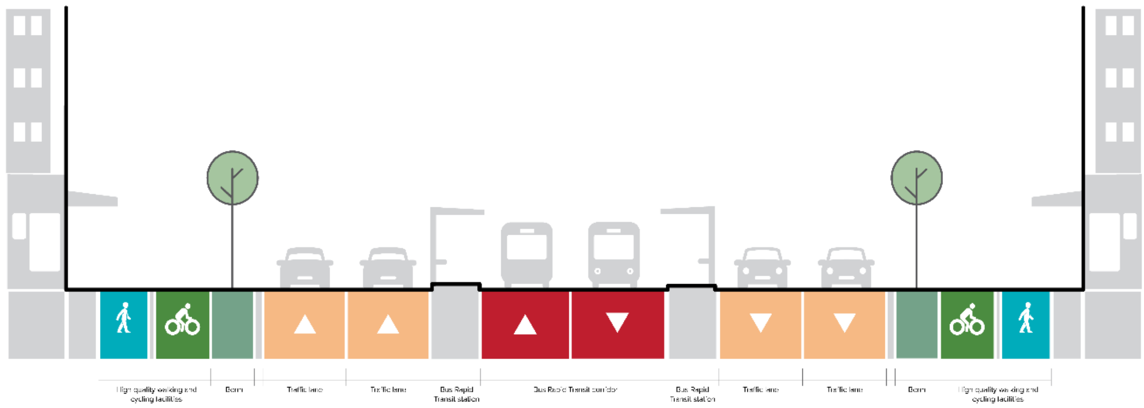
Table 3: Overview of NoR 1

NoR 1 – Botany Town Centre to Rongomai Park



Key features	
BRT Corridor	Centre-running along Te Irirangi Drive
BRT Stations	• Smales Road Station; • Accent Drive Station; and • Ormiston Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	Two lanes in each direction (existing)
Access	There is an existing central median along the majority of Te Irirangi Drive which restricts right-turn access
Speed environment	50km/h

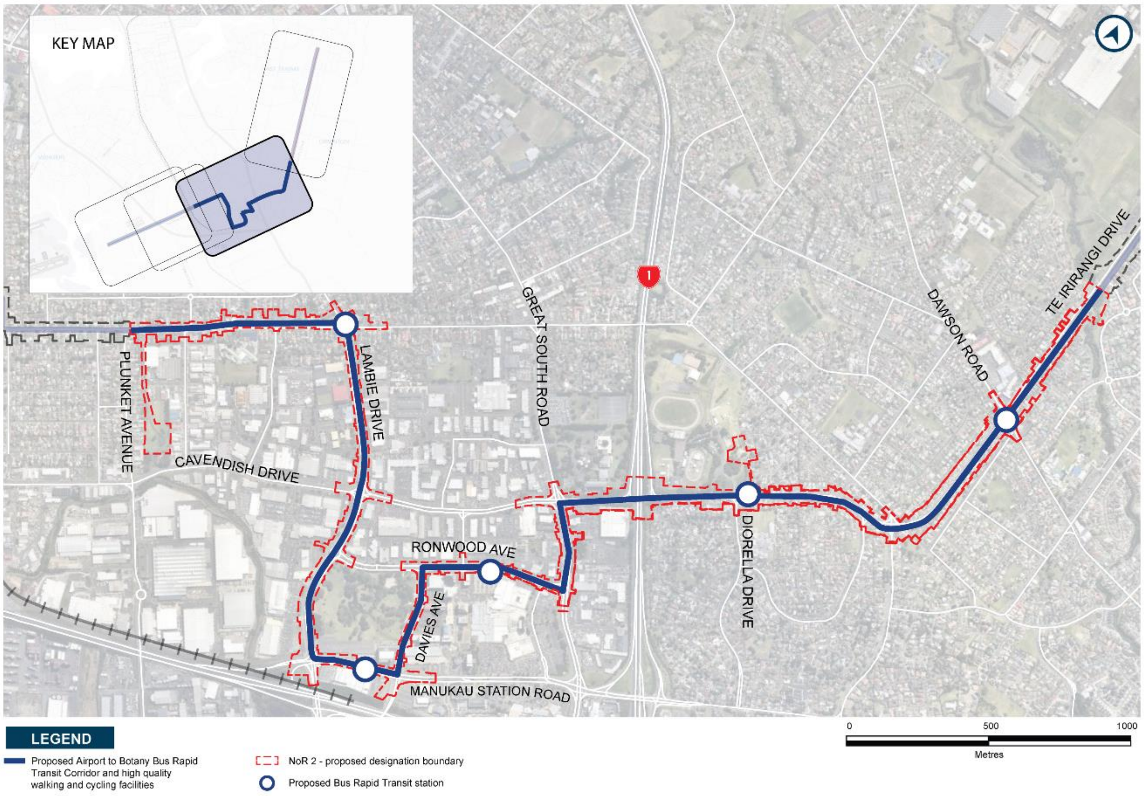
Signalised intersections	• Te Irirangi Drive and Smales Road; • Te Irirangi Drive and Accent Drive; • Te Irirangi Drive and Bishop Dunn Avenue; and • Te Irirangi Drive and Ormiston Road.
NoR 1 typical cross section	



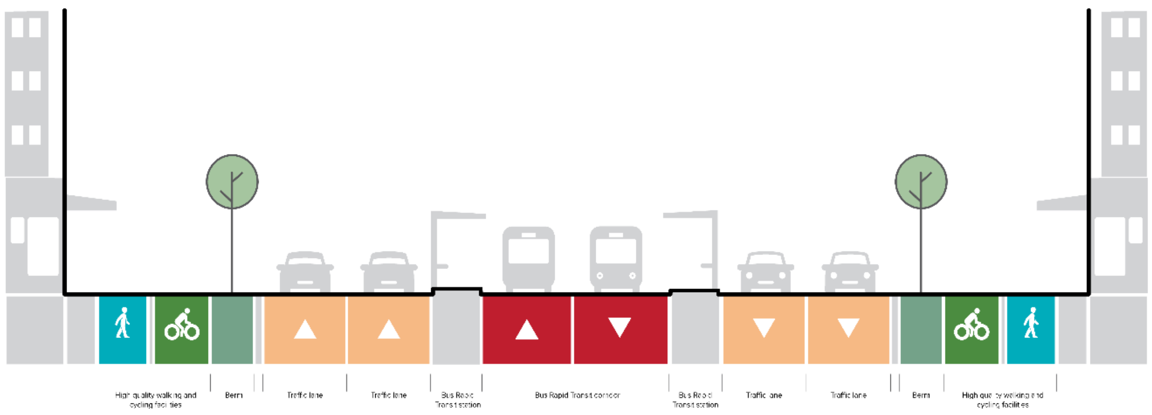
2.2.2 NoR 2

As set out in Table 4 below, the proposed works in NoR 2 include the widening of several existing roads to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities.

Table 4: Overview of NoR 2

NoR 2 – Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue	
	
Key features	
BRT Corridor	Centre-running for the majority of the corridor along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, Lambie Drive, and Puhinui Road West-running on Davies Avenue along the edge of Hayman Park
BRT stations	• Dawson Road Station; • Diorella Drive Station; • Ronwood Avenue Station; • Manukau Station; and • Corner of Lambie Drive and Puhinui Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	• Two lanes in each direction along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, and Lambie Drive; • One-way single lane along Davies Avenue; and

	• One lane in each direction along Puhinui Road.
Access	Existing central medians limit right turn access on Te Irirangi Drive, Great South Road, Ronwood Avenue, and Lambie Drive. New signalised intersection at Mitre 10 and Bunnings Warehouse on Lambie Drive. Priority access for fire engine movements across the BRT corridor at Papatoetoe Fire Station.
Speed environment	• 30 km/h on Ronwood Avenue and Davies Avenue; and • 50 km/h on Te Irirangi Drive, Great South Road, Manukau Station Road, Lambie Drive and Puhinui Road.
Signalised intersections (**new intersections in bold**)	• Te Irirangi Drive and Dawson Road; • Te Irirangi Drive, Boundary Road and Hollyford Drive; • Te Irirangi Drive and Diorella Drive; • Te Irirangi Drive, Great South Road and Cavendish Drive; • Great South Road and Ronwood Avenue; • Ronwood Avenue and Davies Avenue; • Davies Avenue, Wiri Station Road and Manukau Station Road; • Manukau Station Road and Lambie Drive; • **Mitre 10 and Bunnings Warehouse;** • **Lambie Drive and Ronwood Avenue;** • Lambie Drive and Cavendish Drive; • Lambie Drive and Puhinui Road; and • **Puhinui Road and Plunket Avenue.**
NoR 2 typical cross section	

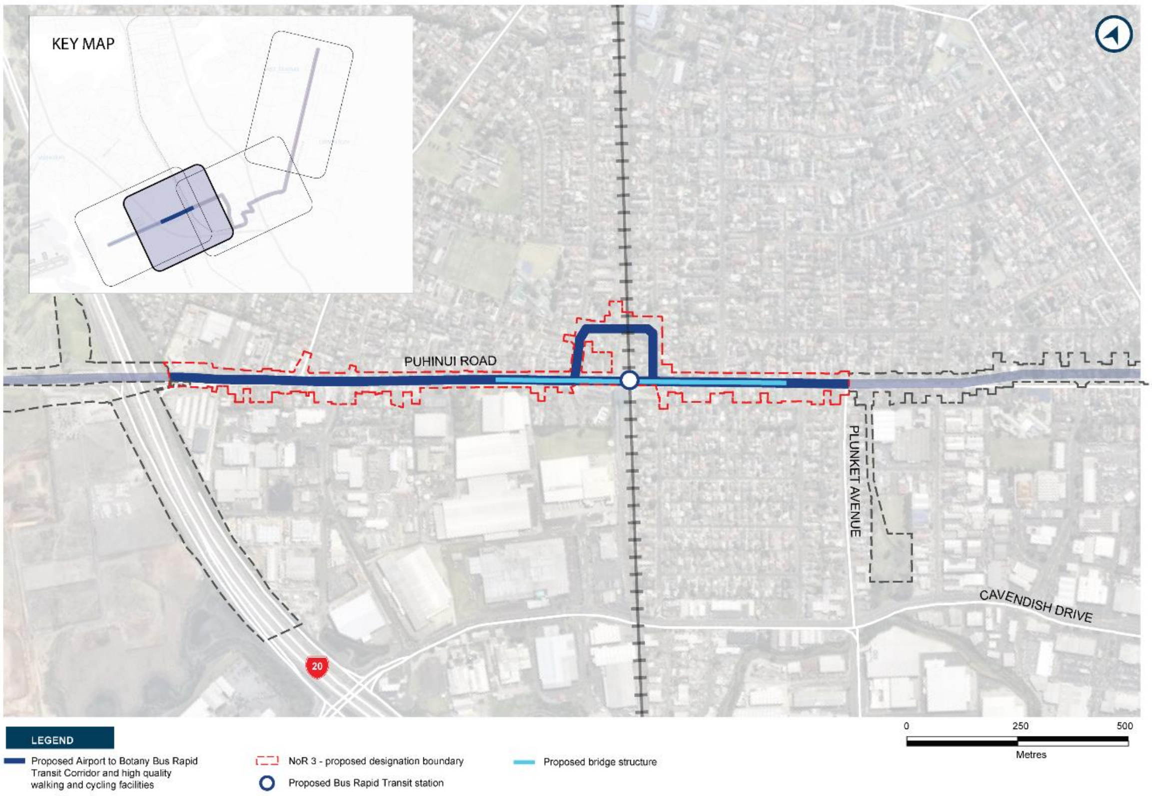


2.2.3 NoR 3

As set out in Table 5 below, the proposed works in NoR 3 include the widening of the existing Puhinui Road to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities. As part of the proposed works, a BRT bridge over the NIMT is proposed to connect to the Puhinui Station.

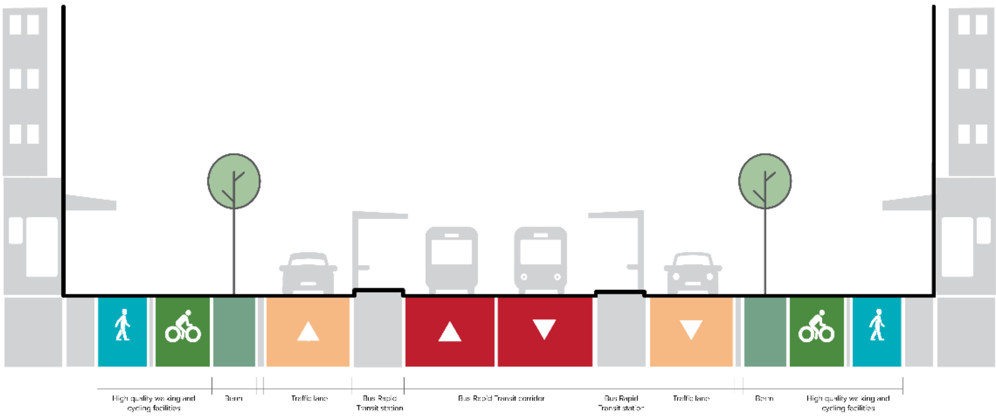
Table 5: Overview of NoR 3

NoR 3 – Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange



Key features	
BRT Corridor	Centre-running along Puhinui Road connecting to the Puhinui Station concourse via a new BRT bridge structure
BRT Stations	Puhinui Station
Walking and cycling facilities	• Walking and cycling facilities on both sides of the corridor; and • Walking and cycling facilities will be provided along Cambridge Terrace, Bridge Street and Kenderdine Road.
General traffic	One lane in each direction on Puhinui Road
Access	Limited right turn access
Speed environment	50 km/h
Signalised intersections	• Puhinui Road and Noel Burnside Road; and • Puhinui Road and Wyllie Road.

NoR 3 typical cross section

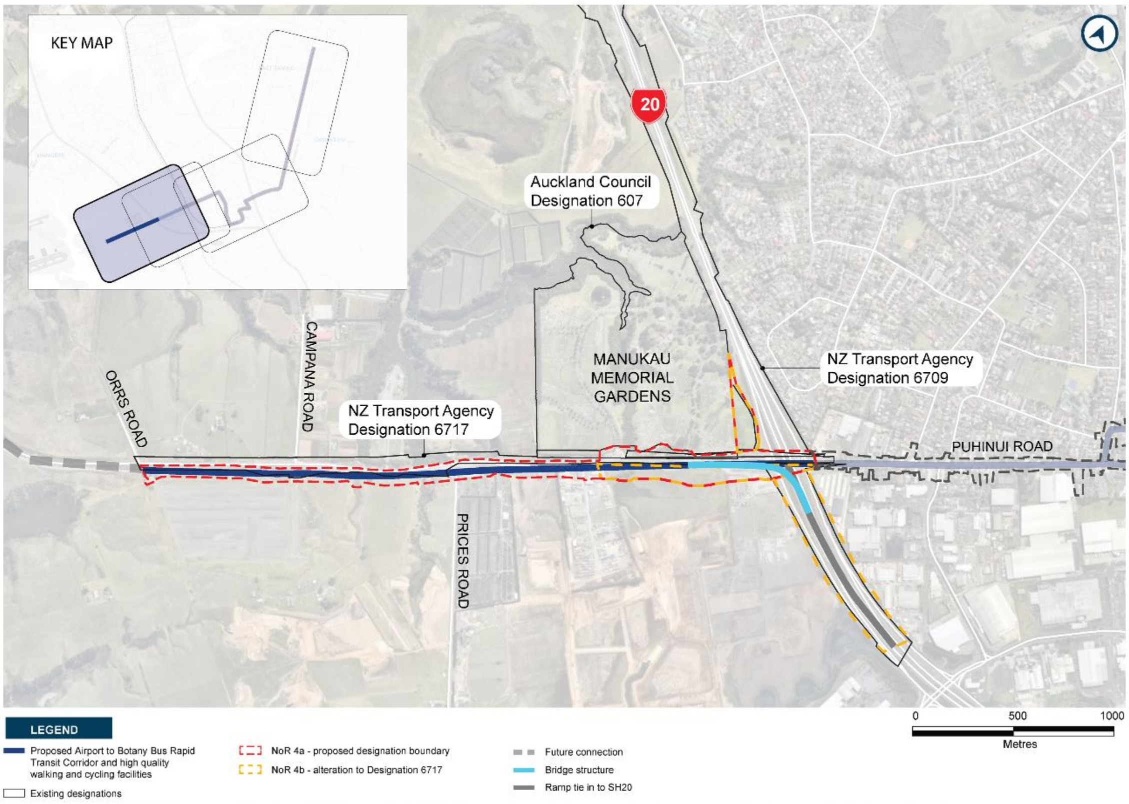


2.2.4 NoRs 4a and 4b

As set out in Table 6 below, the proposed works in NoRs 4a and 4b include the widening of SH20B to accommodate a centre-running BRT corridor until the Manukau Memorial Gardens. From this point, the BRT corridor shifts south of SH20B until Orrs Road. Proposed works also include high quality walking and cycling facilities, eastbound lanes to Auckland Airport and a ramp from SH20B onto SH20 for southbound traffic.

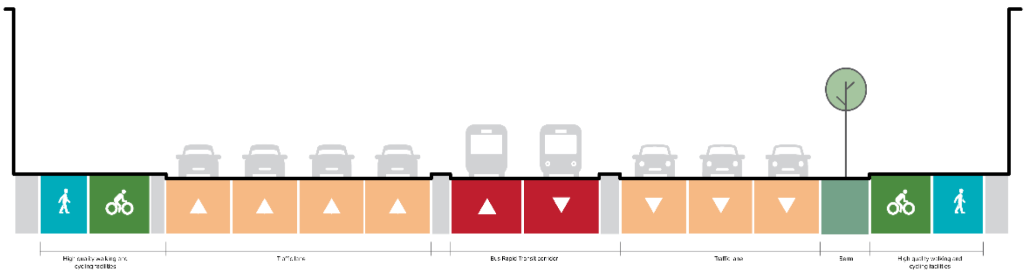
Table 6: Overview of NoR 4a and 4b

NoRs 4a and 4b – SH20/20B Interchange to Orrs Road

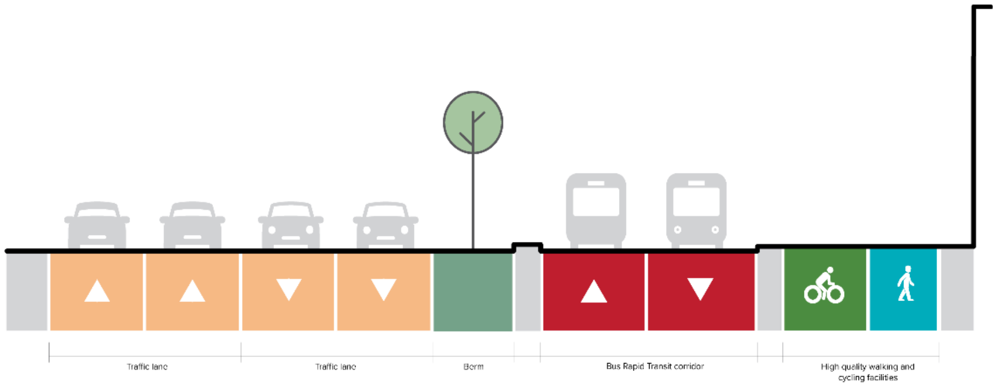


Key features	
BRT corridor	Centre-running on Puhinui Road through to the Manukau Memorial Gardens intersection (approx. 600 m west of SH20/20B Interchange); and South running to Orrs Road.
Walking and cycling facilities	Walking and cycling facilities on southern side of the corridor
General traffic	Two lanes in each direction; and New southbound ramp from SH20B onto SH20.
Access	Limited access; and Access maintained via signals at Manukau Memorial Gardens and Campana Road.
Speed environment	60 km/h
Signalised intersections	SH20/SH20B Interchange; Puhinui Road and Manukau Memorial Gardens; and Puhinui Road and Campana Road.

NoR 4b typical cross section



NoR 4a typical cross section



3 Performance standards

New designations are sought for the Project for NoR 1, NoR 2, NoR 3 and NoR 4a and an alteration to an existing designation (NoR 4b) to enable the construction and operation of the Project. Therefore, we have reviewed a variety of criteria and standards and have recommended noise and vibration performance standards that in our opinion should apply to the relevant NoRs depending on the Requiring Authority.

3.1 Noise

3.1.1 Guidelines and standards reviewed

We reviewed the following guidelines and standards for the assessment construction noise:

- Auckland Unitary Plan Operative in Part (**AUP:OP**), specifically rule E25.6.33 relating to transport noise and referencing New Zealand Standard NZS6806:2010 (**NZS6806**);
- NZS6806:2010 Acoustics – Road-traffic Noise – New and altered roads; and
- Waka Kotahi's "Guide to assessing road-traffic noise using NZS 6806 for state highway asset improvement projects" (**Guide**), V1.1, August 2016.

We recommend applying the requirements of NZS6806, within the relevant framework of both Waka Kotahi and Auckland Transport depending on the Requiring Authority for each NoR.

Waka Kotahi's Guide provides further guidance on how NZS6806 should be implemented. It describes some Waka Kotahi specific processes, such as the use of a Waka Kotahi internal matrix of project discipline feedback when determining the best practicable option (**BPO**) for noise mitigation. Overall, the Guide provides background on how to implement NZS6806, and is therefore a useful complimentary document to NZS6806. We recommend that is it used for the assessment of NoR 4b.

3.1.2 NZS6806

NZS6806 has been adopted as the appropriate standard for the assessment of traffic noise by Waka Kotahi and is also required to be implemented by the AUP:OP and therefore has been adopted by Auckland Transport.

We consider the intent of NZS6806 is to provide a pragmatic approach to the use of noise mitigation. This approach includes the requirement that a roading project needs to have a noticeable noise effect before mitigation is considered, and that any mitigation needs to achieve a noticeable reduction in noise level.

NZS6806 applies to traffic noise assessments where a project falls within its thresholds, which are briefly explained below.

- **Assessment Positions** are described as "Protected Premises and Facilities". PPFs include dwellings (including those that have building consent but are not built yet), educational facilities and their playgrounds within 20m of any school building, boarding houses, retirement villages, Marae, hospitals with in-patient facilities and motels/hotels in residential zones. Areas earmarked for future residential development are not PPFs as the location and specific type of the receiving buildings is not known. However, to provide information for the future developers, we have provided noise level predictions over vacant land also. Businesses are not PPFs as they are not considered noise sensitive and are often noise generators in their own right.

- **Assessment Extent** is 100m from the edge of the carriageway (i.e. the kerb) for urban areas. The entire Project corridor is within an existing urban area in accordance with Statistics New Zealand, as required by NZS6806.
- **Assessment Areas** are areas which combine PPFs that would benefit from the same mitigation (e.g. noise barriers). For this Project, given the longer implementation period, we have prepared an overview of proposed mitigation for each of the NoRs rather than dividing the areas further.
- **Design Year** is a year 10 to 20 years after opening of the Project. Since there are a number of NoRs assessed, without a defined implementation year, we chose a scenario where all NoRs are implemented, and the area is developed to its fullest potential. The design year for this scenario is 2048.
- **Noise Criteria Categories** are set out in the Standard for 'new' and 'altered' roads. This Project consist of altered roads only. The Noise Criteria Categories are set out in Table 7 below.

Table 7: Noise criteria categories

Category	Altered Road dB $L_{Aeq(24h)}$
A (primary external noise category)	≤ 64
B (secondary external noise category)	64 – 67
C (internal noise category)	40 (provided the external noise level is > 67)

The applicable category at any PPF depends on the BPO test, by progressively applying the noise criteria categories to determine which can practicably be achieved. NZS6806 is clear that preference is to be given to structural mitigation over building modification mitigation. NZS 6806 also requires achievement of the lowest external noise level with practicable structural mitigation, before considering building modification to mitigate internal noise levels.

- **Applicability of the Standard**: There are two steps that must be followed to determine whether an assessment is required to be carried out in accordance with NZS6806. The first step in this process is to determine if the proposal includes roads defined in the Standard as a 'new road' or as an 'altered road'. For this Project, all roads may be considered "altered roads".

  The second step is then to determine whether the standard would further apply to the Project with respect to clause 1.5.2 for altered roads. In summary, the standard applies only when the Do-minimum noise environment is compared to the Do–nothing noise environment, and certain criteria are met. These are:

  a. the do-minimum noise environment is greater than or equal to 64 dB $L_{Aeq(24h)}$ and noise levels are predicted to increase by 3 dB, or;
  b. the do minimum noise environment is greater than or equal to 68 dB $L_{Aeq(24h)}$ and noise levels are predicted to increase by 1 dB.

- **Assessment Scenarios** are the various operational scenarios that we assess and compare. The Standard includes the following scenarios:

  a. Existing noise environment: consists of the current road layout and traffic volume (for this Project we sourced traffic data to be as current as practical while excluding data that was significantly affected by COVID-19 restrictions, ranging from 2015 to 2021).

b. Future Do-nothing scenario: This scenario consists of the existing roads as for the existing noise environment, with traffic volume at the Design Year (2048). This scenario assumes that the full development of all surrounding areas has occurred, and traffic volumes have increased because of that development.

c. Future Do-minimum scenario: consists of the proposed Project at the Design Year (2048), without any specific noise mitigation. This scenario means that the only barriers included are solid safety barriers, which are required for reasons other than noise mitigation. Where a low noise road surface such as AC14 or PA10 30mm is proposed as the "base" road surface (as is the case for all NoRs), this is also included in the Do-minimum scenario. Local roads that are not proposed to be altered by the Project are not included in the assessment.

d. Future Project with mitigation: consists of the proposed Project roads at the Design Year, and includes mitigation that is designed specifically to reduce noise levels

- **Mitigation Requirements** are set out in the Standard based on the BPO. Mitigation is split into structural (road surface, barriers, bunds) and building modification mitigation (improvement of building façades and ventilation, subsequent to the implementation of the structural mitigation, generally only considered for PPFs receiving noise levels within Category C). Any mitigation should achieve a noticeable noise level reduction of an average of 3 decibels within each assessment area.

3.1.3 Subjective perception of noise level changes

The subjective impression of changes in noise can generally be correlated with the numerical change in noise level. While every person reacts differently to noise level changes, research shows a general correlation between noise level changes and subjective responses.[1] Table 8 shows indicative subjective responses to explain the noise level changes discussed in this report.

The perception of these noise level changes generally applies to immediate changes in noise level, as would be the case for a new road. This is not the case for this Project as an existing road is proposed to be modified in a minor way. However, people may subjectively have an annoyance reaction to a greater or lesser degree, depending on their perception of the Project.

Table 8: Noise level change compared with general subjective perception

Noise level change	General subjective perception[2]
1–2 decibels	Insignificant/imperceptible change
3–4 decibels	Just perceptible change
5–8 decibels	Appreciable to clearly noticeable change
9–11 decibels	Halving/doubling of loudness
>11 decibels	More than halving/doubling of loudness

Noise is measured on a logarithmic scale, meaning that a doubling in traffic volume (e.g. from 10,000 vehicles per day (vpd) to 20,000 vpd) results in a noise level increase of 3 decibels, a just-perceptible

[1] For instance, LTNZ Research Report No. 292: Road traffic noise: determining the influence of New Zealand Road surfaces on noise levels and community annoyance, Table 18.

[2] Based on research by Zwicker & Scharf (1965); and Stevens (1957, 1972).

change. A tenfold increase in traffic volume (e.g. from 10,000 to 100,000 vpd) would result in a noise level increase of 10 decibels, which would sound twice as loud.

3.1.4 Annoyance effects

People's responses to a particular level of road traffic noise can vary greatly. Many studies have been carried out overseas in an attempt to determine a general relationship of response to noise of a residential community as a whole.

The most notable studies include that of Schultz[3] and those of Miedema and Oudshoorn[4], as shown in Figure 2. These studies combined the results of several different studies to produce a 'curve' of the percentage of people highly annoyed (%HA) versus external noise level (Ldn)[5]. The studies were for different transportation noise sources including trains, road traffic and aircraft. Only the curve for road traffic noise is shown in the figure below.

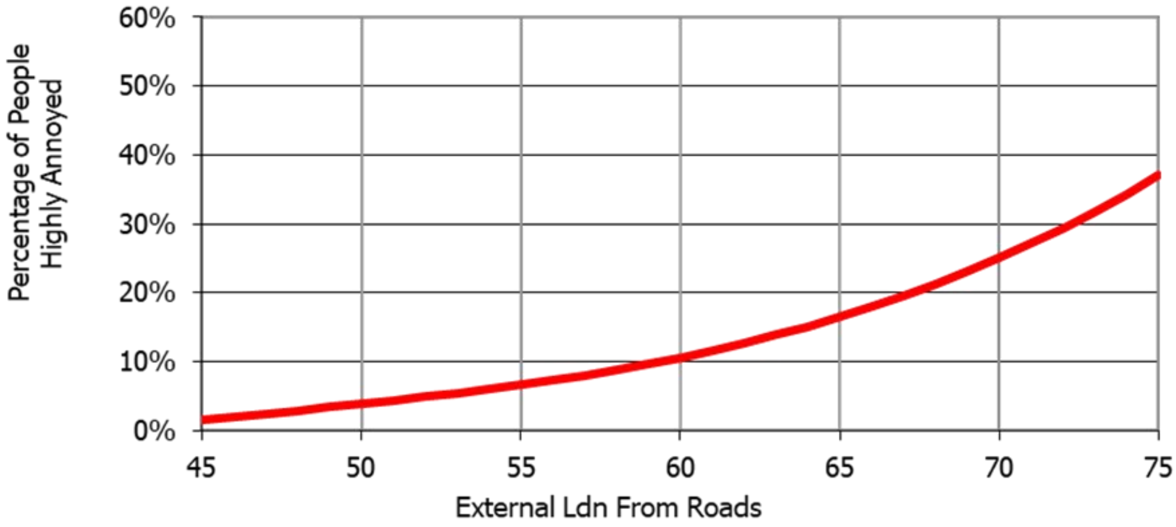


Figure 2: Miedema and Oudtshoorn Dose-Response Relationship

The curve shows that about 10% of people may be highly annoyed at an external road traffic noise level of 57 dB LAeq(24h) (equivalent to 59 dB Ldn), which is the upper end of the NZS 6806 Category A for new roads. For an external noise level of 64 dB LAeq(24h) (equivalent to 66 dB Ldn), the upper end of Category B for new roads and Category A for altered roads, 18% of people may be highly annoyed. At 67 dB LAeq(24h) (equivalent to 69 dB Ldn), the upper end of Category B for altered roads, 23% of people may be highly annoyed.

Using BPO mitigation to achieve the lowest practicable noise levels will ensure better amenity for people and that a smaller number of people will be annoyed by road traffic noise.

Using the descriptor of the number of people highly annoyed allows a comparison of population responses over a wider area. We have used this measure to represent a comparison from the existing situation to the proposed Project situation over the area affected by the change in traffic flows not just in the directly affected roads but also the surrounding ones.

3 Schultz T J (1978) "Synthesis of social surveys on noise annoyance" J.Acoust. Soc. Am. 64, 2, 337-405.

4 Miedema, H M E and Oudshoorn, G M (2001) "Annoyance from transportation noise: relationships with exposure metrics DNL and DENL and their confidence intervals." Environmental Health Perspectives 109 (4) 409 – 416.

5 L_{dn} levels can be converted into $L_{Aeq(24h)}$ by subtracting 2.5 dB.

Our assessment is based on Statistics New Zealand information,[6] which shows that for the Howick Local Board there are approximately 3.1 people per household and the Otara-Papatoetoe Local Board there are approximately 3.6 people per household. These numbers do not include any allowance for future intensification.

3.2 Vibration

The AUP:OP does not contain applicable vibration criteria for transport infrastructure. However, Waka Kotahi does reference the Norwegian Standard NS 8176.E:2005 in its reverse sensitivity guidelines.

3.2.1 Norwegian Standard NS 8176.E:2005

The Norwegian Standard NS 8176.E:2005 specifically addresses transportation vibration, both in relation to road and rail. The Standard's criteria (shown in Table 9 below) are based on studies of vibration annoyance in residences, and it provides guideline values for four vibration "classes".

The appropriate class for new infrastructure is considered to be Class C, which is the *"recommended limit value … in connection with the planning and building of new transport infrastructures"*.[7] According to the Section B.3.3 of the Standard, at this level of vibration "about 15% of the affected persons in Class C dwellings can be expected to be disturbed by vibration" and this is deemed by the Standard to be acceptable.

Table 9: Human response criteria for transport sources in NS 8176.E:2005

Type of vibration value	Class A	Class B	Class C	Class D
Statistical maximum value for weighted velocity, $v_{w,95}$ (mm/s)*	0.1	0.15	0.3	0.6

* $v_{w,95}$ = value exceeded for 5% of events (equivalent to L_{05} centile level in noise terminology)

3.2.2 Road traffic

Traffic vibration is usually only generated when heavy commercial vehicles (**HCV**) drive over bumps or dips in the road. We have determined the road traffic vibration risk by reviewing data of HCVs travelling on existing roads with a range of surface conditions. Assessing this data against the recommended traffic vibration criterion (Class C of the Norwegian Standard NS 8176.E:2005) indicates that compliance with the criteria can be achieved at 25 metres from the road edge, even for roads in a degraded state.

For a newly sealed pavement, the risk contour is less than 2 metres from the road edge. There will be no receivers this close to any traffic lane edge. Therefore, we do not consider that traffic vibration needs to be assessed for this Project.

[6] https://www.stats.govt.nz/information-releases/2018-census-population-and-dwelling-counts/

[7] From NS 8176.E:2005, Annex B.3.

4 Assessment methodology

We have assessed the traffic noise effects on people based on:

- The noise criteria categories of NZS6806; and
- Noise effects (both positive and adverse) through determining the noise level changes due to the Project.

The reason for the two-pronged approach is that in some circumstances, the effects of a noise level increase can be small (e.g. a noise level increase of less than 3 decibels). At the same time, the resulting noise environment can be very high, particularly adjacent to existing major roads, and cause (potentially further) adverse effects for residential use.

The NoRs provide for various transport modes which, based on our experience, have different noise effects as discussed below:

- Bus Rapid Transit: using electric buses generates a small to moderate level of noise. For speeds above 40 km/h the road tyre interaction is the main noise source of traffic, and buses are expected to travel at speeds at or above 40 km/h. Nevertheless, electric buses are quieter than diesel buses, particularly at stations, and can be quieter than petrol and diesel passenger vehicles. Depending on the location of the rapid transit lanes, buses may not contribute to the overall traffic levels at all (e.g. for majority of the Project corridor, where the lanes are in the middle of the general traffic lanes) or may contribute slightly to the overall traffic noise level. We have assessed the rapid transit traffic noise against the noise criteria of NZS6806.
- **Walking and Cycling**: Walking and cycling improvements will not result in noticeable changes to the traffic noise level and are not discussed in detail.
- **Road traffic on Altered roads**: The existing traffic lanes will be changed to enable rapid transit to be implemented. In addition, intersection upgrades will be required. We have therefore assessed the NoRs against the provisions of NZS6806.

We have assessed the bus rapid transit corridor and existing road upgrades together as they are intrinsically linked to each other.

4.1 Assumptions

We have assumed that buses used on the Project are all electric, in line with the Auckland Transport "Low Emission Bus Roadmap"[8]. Electric buses emit significantly lower noise levels than diesel buses at common city speeds and would not generate noticeable noise levels at stations given that the stations are all located in busy high noise environments. Nevertheless, to be conservative, all buses have been modelled as diesel buses and therefore represent a worst case scenario that is unlikely to occur.

Our modelling assumes that the design year is 2048, in line with other Te Tupu Ngātahi Supporting Growth projects. That year allows for the most extensive development of neighbouring zones, which we understand is incorporated in the traffic modelling.

We have assumed that the existing road surface materials (AC14 on all roads, except SH20B in NoR 4a, which is surfaced in PA10 30mm) will be retained in the future. Should a higher noise road surface

[8] https://at.govt.nz/media/1985010/aucklands-low-emission-bus-roadmap-version-2-october-2020.pdf

be chosen (e.g. chip seal), then predicted future noise levels would be higher and additional mitigation may need to be investigated.

The modelling is based on traffic data received from the transportation specialist.

Our discussion of potential future higher density and multi storey housing adjacent to the corridor is based on the provisions of the NPS:UD. However, we have assumed that nay new dwellings in the MANA will be appropriately designed to mitigate against aircraft (and traffic) noise, and that no new noise sensitive buildings are constructed in the HANA.

4.2 Existing noise environment

The existing noise environment provides a baseline for assessing noise effects. Effects can be assessed by quantifying the noise levels and noise level changes that people would experience due to the implementation of a project. The change in noise environment can be interpreted in relation to subjective responses of people and possible annoyance. In addition, measured noise levels are used to verify the computer noise model.

The existing noise environment for all NoRs are controlled by traffic on the existing major roads and for NoRs 2, 3, and 4a and 4b, the aircraft noise from Auckland Airport as set out in the AUP:OP as MANA and HANA.

4.2.1 Surveys

We undertook short duration (15 minute) attended noise level surveys on 7 June 2022 between 10 am and 4 pm, in the vicinity of the Projects. As traffic distribution over the day is known, the short duration survey results can be used to derive a 24-hour traffic noise level.

The location of the surveys is shown in Figure 3.

Figure 3: Noise survey locations

All noise level survey results are shown in Table 10. Note that while the measured noise levels are presented with the decimal point, for the derived 24-hour noise level this would imply an excessive accuracy. Therefore, the derived levels are reported only to the full decibel level.

Table 10: Noise survey results

Meas. Position	Location	NoR	Measured noise level	Derived noise level
			dB $L_{Aeq(T)}$	dB $L_{Aeq(24h)}$
MP1	485A Puhinui Road, Wiri	4a	64.8	63
MP2	Manukau Memorial Gardens (Manukau Cemetery)	4a/4b	61.9	60
MP3	14 Sabi Place, Papatoetoe	3	64.5	63
MP4	269 Puhinui Road, Papatoetoe	3	63.8	62
MP5	Puhinui Station	3	53.8	52
MP6	26 Cambridge Terrace, Papatoetoe	3	68.3	66
MP7	1A Bledisloe Street, Papatoetoe	2	49.0	47
MP8	Puhinui School	2	64.5	63

MP9	19 Lambie Drive, Papatoetoe	2	66.2	64
MP10	2 Davies Avenue, Manukau City Centre	2	62.4	60
MP11	627 Great South Road, Manukau City Centre	2	77.1	75
MP12	63 Te Irirangi Drive, Clover Park	2	71.3	69
MP13	65A Othello Drive, Clover Park	2	61.9	60
MP14	104 Boundary Road, Clover Park	2	65.4	63
MP15	5 Mika Court, Flat Bush	1	66.9	65
MP16	15 Brittas Place, East Tāmaki	1	62.6	61
MP17	Dannemora Gardens - Metlifecare Retirement Village	1	71.0	69
MP18	12 Shingleton Lane, Flat Bush	1	65.1	63

4.2.2 Modelling

In addition to measuring the noise levels at a few locations along the projects, computer noise modelling enables the prediction of existing noise levels at all PPFs. The model of the existing situation reflects the roads as they currently are, including the current posted speed limits.

The PPFs for each project have been assessed separately. Where a PPF would be affected by more than one NoR, this is noted in the report. For each NoR, we have calculated the noise levels received by all PPFs.

The number of PPFs for each NoR are shown in Table 11.

Table 11: Number of PPFs in each NoR

NoR	Number of PPFs
1	628
2	768
3	380
4a and 4b	5

4.3 Computer noise modelling

The propagation of traffic noise is affected by multiple factors, such as:

- Terrain elevations, including shielding from intervening terrain and exposure due to elevation;
- Ground condition, including absorptive ground such as meadows or hard reflective ground;
- Atmospheric conditions, including wind or temperature inversions; and
- Road parameters, including road surface, traffic speed, vehicle types and gradient.

Because of the multiple factors and their interaction, computer noise modelling is a vital tool in predicting traffic noise impacts in the vicinity of major roads and for the determination of mitigation measures. Modelling enables a comprehensive and overall picture of noise impacts to be produced, taking into consideration all factors potentially affecting noise propagation.

We used the software SoundPLAN, which is an internationally recognised computer noise modelling programme. In summary, SoundPLAN uses a three-dimensional digital topographical terrain map of the area as its base. In addition, we entered data into the model for existing buildings, proposed earthworks edges and ground absorption within the assessment area. We digitised road traffic noise sources, with road lanes located on the terrain file, for the existing/Do-nothing scenarios and the Do-minimum scenario (refer Section 3.1.2).

The SoundPLAN model implements the calculation algorithms of the "Calculation of Road Traffic Noise" methodology which is referenced in NZS6806 in Section 3.1.2.

The calculation algorithms take account of the factors set out above, including relevant atmospheric and ground conditions within appropriate parameters.

We have used the adjustments for New Zealand road conditions, specifically road surface types, as set out in the Waka Kotahi "Guide to state highway road surface noise", V1.0, January 2014, Table 2.1. Therefore, modelling results can be compared with the relevant criteria without further adjustment.

To verify the accuracy of the computer model, we used the measurement results from the noise level surveys set out in Section 4.2.1 to verify that the computer model operates within satisfactory tolerances.

Table 12: Computer noise model verification

Position	Location	NoR	Derived Level	Predicted Level	Difference
			dB $L_{Aeq(24h)}$	dB $L_{Aeq(24h)}$	decibels
MP1	485A Puhinui Road, Wiri	4a	63	62	-1
MP2	Manukau Memorial Gardens	4a/4b	60	62	+2
MP3	14 Sabi Place, Papatoetoe	3	63	66	+3
MP4	269 Puhinui Road, Papatoetoe	3	62	68	+6*
MP5	Puhinui Station	3	52	54	+2
MP6	26 Cambridge Tce, Papatoetoe	3	66	68	+2
MP7	1A Bledisloe Street, Papatoetoe	2	47	52	+5*
MP8	Puhinui School	2	63	62	-1
MP9	19 Lambie Drive, Papatoetoe	2	64	66	+2
MP10	2 Davies Ave, Manukau	2	60	61	+1
MP11	627 Great South Road, Manukau	2	75	73	-2
MP12	63 Te Irirangi Drive, Clover Park	2	69	69	±0
MP13	65A Othello Drive, Clover Park	2	60	62	+2
MP14	104 Boundary Road, Clover Park	2	63	65	+2

Position	Location	NoR	Derived Level	Predicted Level	Difference
MP15	5 Mika Court, Flat Bush	1	65	67	+2
MP16	15 Brittas Place, East Tāmaki	1	61	63	+2
MP17	Dannemora Gardens - Metlifecare Retirement Village	1	69	71	+2
MP18	12 Shingleton Lane, Flat Bush	1	63	66	+3

* Traffic volumes during the survey were lower than the modelled AADT

A comparison of the measured and predicted levels shows that there is good agreement between measured and predicted levels for most of the positions, with a difference of no more than 2 decibels. This accuracy fulfils the requirements of NZS 6806 which states in Section 5.3.4.2: *"The difference between measured and predicted levels should not exceed ± 2 dB."*

Where the difference is greater, the reason was generally that during the brief survey period less traffic passed than would be expected based on the daily traffic volume modelled. Overall, we consider that the computer noise model performs within reasonable standards and is suitable to predict current and future traffic noise levels.

4.3.1 Individual receiver noise levels

We have assessed noise effects at all PPFs. We have included predicted noise levels for all PPFs, for all scenarios, in the tables in **Appendix A**. The locations of these dwellings are shown in the drawings in **Appendix B**.

Noise criteria categories for the PPFs are shown as a graphic representation by colouring the buildings with a colour scale, showing buildings receiving noise levels within NZS6806 Category A in green, Category B in orange and Category C in red. Any buildings not shown in these three colours on the figures are outside the assessment area, or are not PPFs, e.g. garages, sheds or business premises, or buildings to be removed for the Project.

4.3.2 Noise contour plans

Noise contour plans are a useful tool to obtain a graphical overview of a project area including currently vacant land that may be developed in the future. The contours are calculated by SoundPLAN by interpolating a large number of individual points. Therefore, noise contour maps should not be used to "read" noise levels for specific locations. For individual noise levels specific for each PPF, the receiver noise levels in the tables should be used (refer **Appendix A**).

Noise contour plans are contained in drawings in **Appendix B**. These plans show interpolated noise level bands at 5 decibel intervals from 55 dB to 70 dB $L_{Aeq(24h)}$.

5 Potential options to mitigate traffic noise effects

There are broadly three mitigation options that can be applied to manage road traffic noise, and are discussed in NZS6806:

- The choice of road surface material, a mitigation option that reduces noise at the source (especially for roads with speeds above 40-50 km/h where the road-tyre interaction is the controlling noise source rather than engine noise);
- The installation of noise barriers either on the roadside or on the property boundary; and
- The inclusion (for new builds) or retrofitting (for existing buildings) of Building Modification Mitigation (e.g., alternative ventilation to enable windows and doors to remain closed, improved joinery and/or glazing, or, in rare cases, the installation of additional wall and ceiling lining).

NZS6806 states:

> *The noise criteria are intended to address the adverse effects of road-traffic noise on people. Land-use planning is the preferred method of avoiding these effects. Where this is impracticable, the Standard sets out procedures and methods of the prediction, measurement and assessment, and guidelines for mitigation of road-traffic noise in accordance with the duty to adopt the best practicable option*[9]

This indicates that NZS6806 deals with the residual noise effects after land-use planning has been implemented (or where it has been omitted in the planning stage).

Generally, mitigation is implemented from source to receiver. This means that the road surface is the first choice of mitigation measure as it protects the largest extent of receivers. Second are barriers placed either on the road edge or the property boundary. Barriers protect the area behind them, so are not suitable to shield upper floors of multi storey buildings, however, they are suitable to protect ground floors and outdoor living areas where these are facing a road. Lastly, building modification can be implemented to existing PPFs where these are not sufficiently designed to reduce internal noise levels. Building modification is the last choice as it only protects individual living areas and has no benefit to the wider community.

Where future developments are not yet implemented, the road controlling authorities and developers have a shared responsibility to implement reasonable and appropriate mitigation.

Overall, for this Project, the choice of road surface material both for the rapid transit lanes and for the (changed and upgraded) traffic lanes is the most important and effective noise mitigation measure. All existing roads to be altered currently already have low noise road surface; SH20B Puhinui Road PA10 30mm, Puhinui Road AC14, and Te Irirangi Drive AC14. This should be maintained (or upgraded to a lower noise road surface if necessary). Any change to a higher noise generating road surface would result in noise level increases above existing levels irrespective of the Project and would result in an adverse noise effect.

Barriers are unlikely to be generally practicable, particularly in NoR 2 and 3 where access to many individual residential sites will need to be maintained. However, NoR 1 may make use of barriers if practicable, as dwellings are set back from the road. Notwithstanding this, we understand that there are opportunities identified through the Airport to Botany: Urban Design Evaluation to repurpose the

[9] NZS 6806:2010, Section 1.1.1

design of the current slip lanes to provide for an integrated active mode and stormwater infrastructure design. Therefore, barriers may not be BPO in this context.

The recommended low noise road surface will benefit not only the existing PPFs, but also any new noise sensitive development that may be established through the NPS:UD. Should intensification occur adjacent to the Project, as is envisaged, then other road noise mitigation would be limited. Barriers are unlikely to be BPO in an urban/suburban context and would only protect the ground floor. Higher floors would overlook any barrier. Therefore, it would be most appropriate to design any future sensitive buildings with the road noise environment in mind. This would include appropriate façade materials to reduce noise transmission into rooms and providing alternative ventilation for the closest houses to ensure that a suitable internal noise environment can be achieved while having fresh air intake and cooling available.

Such design solution can be aided by providing noise level contours for the design year that enable future development design to be appropriately managed. Since this Project traverses largely well established and developed residential areas, we consider that the location of the PPFs is a good proxy for any future development. It is unlikely that houses would move closer to the road. Therefore, we consider the assessment to also cover the noise level likely received at any future buildings.

6 Airport to Botany Bus Rapid Transit – NoR 1

This section assesses specific traffic noise matters relating to NoR 1 – the Project corridor between the Botany Town Centre and Rongomai Park.

6.1 Existing and likely future noise environment

The alignment follows Te Irirangi Drive, with the BRT corridor proposed in the central median. The road was already constructed with rapid transit in mind, and therefore the existing road width will remain largely unchanged as the median can accommodate the BRT corridor.

Neighbouring sites contain a mix of established (relatively new) residential development, generally single storey, established (relatively new) commercial premises and currently vacant or developing commercial areas. There are a school (Sancta Maria College, well set back from the road edge) and two retirement villages adjacent to the road. In addition, there are a number of early childhood education centres which have all been assessed as PPFs.

Te Irirangi Drive is an 80 km/h limited access road, with driveways of dwellings connecting with slip roads before entering the main road at specific points. Traffic noise levels for houses in the first row range from mid-60 to about 70 dB L_{Aeq}, which shows that the area is impacted by high traffic noise levels.

The NPS:UD enables higher density dwellings for all sites adjacent to Te Irirangi Drive. We anticipate that:

- Zoning within a walkable catchment of BRT stations along the corridor will enable at a minimum, apartment buildings of six storeys; and
- Beyond walkable catchments, residential zoning will provide for three dwellings up to three storeys in height (subject to meeting the relevant development standards).

Should higher density housing have been established, this would not have an effect on the assessment of traffic noise mitigation, given that mitigation options are limited to low noise road surface. Any potential new dwellings constructed should take account of the fact that they are next to an existing high flow road with existing high noise levels and incorporate appropriate façade design and ventilation provisions into any such dwellings.

6.2 Buildings within proposed designation

The following Table 13 shows the buildings that are within the proposed designation. We have not assessed these buildings further as the assumption is that the relevant requiring authority will acquire the parcels of land that these buildings are located on. We only note the addresses where the main building is inside designation.

Table 13: Buildings within designation (not assessed)

Address	Address
25 Aclare Place, East Tāmaki	14 Moravale Lane, Flat Bush

Address	Address
1, 3 Belinda Avenue, Flat Bush	23 Place Road, East Tamaki Heights
15 Brittas Place, East Tamaki Heights	14, 15 Riechelmann Court, Flat Bush
20 Leixlep Lane, East Tamaki Heights	13 Tonu'U Court, Flat Bush
6 Mika Court, Flat Bush	11 Whetstone Road, Flat Bush

6.3 Assessment of traffic noise effects

The alignment traverses established residential areas and established and developing commercial areas. There is a low likelihood of change within the residential areas. Nevertheless, if higher density dwellings are constructed in the future, the mitigation options remain similar to those for the existing houses. The commercial areas do not contain PPFs, and therefore any changes will not affect this assessment.

The BRT corridor will be accommodated in the middle of the road where space had already been provided for a rapid transport facility. The road edges will not move materially closer to the dwellings.

The road currently has a posted speed of 80 km/h, however, we understand this will be reduced to 50 km/h irrespective of the Project implementation, which will result in a small noise level reduction.

The road is currently surfaced with Asphaltic concrete. Based on information from Auckland Transport, we have assumed that similar road surface will be used for future works on the road.

This NoR accommodates three stations Smales Road, Accent Drive and Ormiston Road stations. All are located in the centre of the road, in close proximity to busy urban intersections.

6.3.1 NZS6806

As set out in 2.2.1, Te Irirangi Drive is an existing road, that will be upgraded. There are currently 628 PPFs within 100m of the road edge.

Existing noise levels range from 43 dB $L_{Aeq(24h)}$ for those houses well shielded by the first row of dwellings, to 73 dB $L_{Aeq(24h)}$ for houses close to and fronting Te Irirangi Drive.

We understand from the transport specialists that the speed limit will be reduced irrespective of the Project, i.e. the Do-nothing scenario already includes a speed reduction from 80 km/h to 50 km/h. In addition, we understand that a reduction in traffic volume is anticipated, which also affects the noise levels received at the PPFs.

Based on our predictions, NoR 1 fulfils the trigger levels of NZS 6806 (refer Section 3.1.2), as the noise level for at least one PPF is predicted to increase by 1 dB or more where the Do-minimum noise level is 68 dB $L_{Aeq(24h)}$ or higher.

Overall, the reduction in traffic speed and volume is predicted to result in a noticeable reduction in traffic noise for those dwellings fronting Te Irirangi Drive, shown in the significant reduction in PPFs receiving noise levels within Category C (reducing from 169 PPFs in the existing situation to 1 and 8 PPFs in the Do-nothing and Do-minimum scenarios respectively).

A small number of PPFs are predicted to still receive noise levels within Category C.[10] All of these PPFs are single storey, with the exception of the retirement village at 30 Matarangi Road. We recommend that acoustic boundary fences are investigated for the single storey dwellings. Access to Te Irirangi Drive is not required, which means that a continuous barrier can be provided that will effectively reduce noise levels. We consider that a boundary fence would achieve a noise level reduction of at least 3 dB, and potentially more, which would reduce noise levels for all PPFs to be within Category B or A.

The number of PPFs is summarised in Table 14, shown in detail in **Appendix A**, and figures showing the location of the PPFs are included in **Appendix B**.

Table 14: Summary of NZS 6806 assessment

Scenario	Number of PPFs		
	NZS 6806 Categories		
	Category A	Category B	Category C
Existing	441	18	169
Do-nothing	506	121	1
Do-minimum (incl. bus rapid transit)	466	154	8

6.3.2 Change in noise levels

Noise effects can be described based on the change in noise level with and without the Project. For the comparison of noise levels, we have included the Project and other local roads in the area that would have an effect on the overall noise levels.

The reduction in traffic speed and volume between the Existing and Do-nothing scenarios is predicted to lead to a noticeable reduction in traffic noise of between 2 and 6 dB, with an average of 4 dB noise level reduction.

With the implementation of the bus lanes in the centre of Te Irirangi Drive, slight changes in level are predicted, ranging from -2 dB to +4 dB, with an average less than 1 dB increase. The exception is a small number of dwellings where the front row dwellings are removed, leaving houses behind exposed to traffic noise. For those, noise level increases of between 5 and 9 dB are predicted. However, all of these dwellings are predicted to receive noise levels within Category A.

Figure 4 shows the number of PPFs in each of the change in noise level bands discussed in Table 8. This shows that the vast majority (603 of the total 628 PPFs assessed) will have no noticeable change in noise level.

[10] 30 Matarangi Road, 15 Brittas Place, 12 Boderg Way, 15 Riechelmann Court, 13 Tonu'u Court, 6 and 9 Mika Court, 11 Whetstone Road

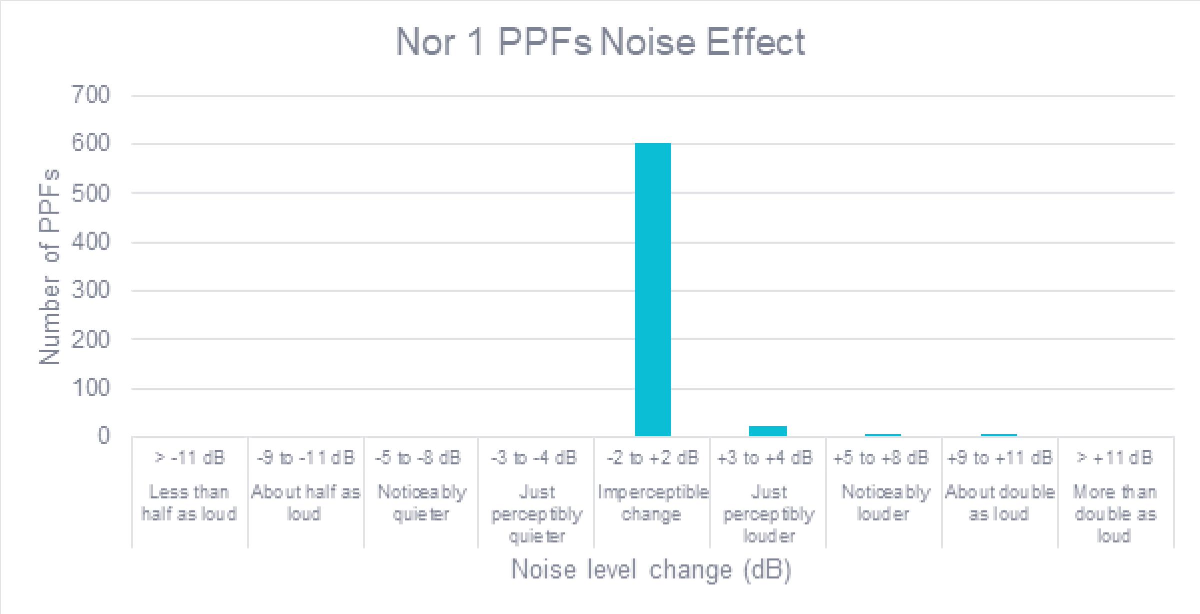


Figure 4: Change in noise level

6.3.3 Annoyance effects

As described in Section 3.1.4, we have determined the number of people potentially "highly annoyed" by the noise effects of the Project, by comparing the results of the existing and Do-nothing scenarios with the results of the Do-minimum scenario. For all scenarios, we have included local roads that have an effect on the noise level to represent the noise level that is likely to be experienced.

In addition, we have provided a figure showing the number of PPFs in each noise level band (in 2dB steps) and the number of people potentially highly annoyed.

Our results are summarised in Table 15 below.

Table 15: Number of people highly annoyed

Scenario	Number of people highly annoyed
Existing	276
Do-nothing	191
Do-minimum	204

Table 15 shows that the number of people highly annoyed by road traffic noise would remain generally similar with or without the Project.

Figure 5 shows the number of PPFs and the number of people potentially highly annoyed in a combined graph. It can be seen that the largest number of people highly annoyed occurs at noise levels 68 dB $L_{Aeq(24h)}$ and above for the existing situation and at 64 to 66 dB $L_{Aeq(24h)}$ for the future situations.

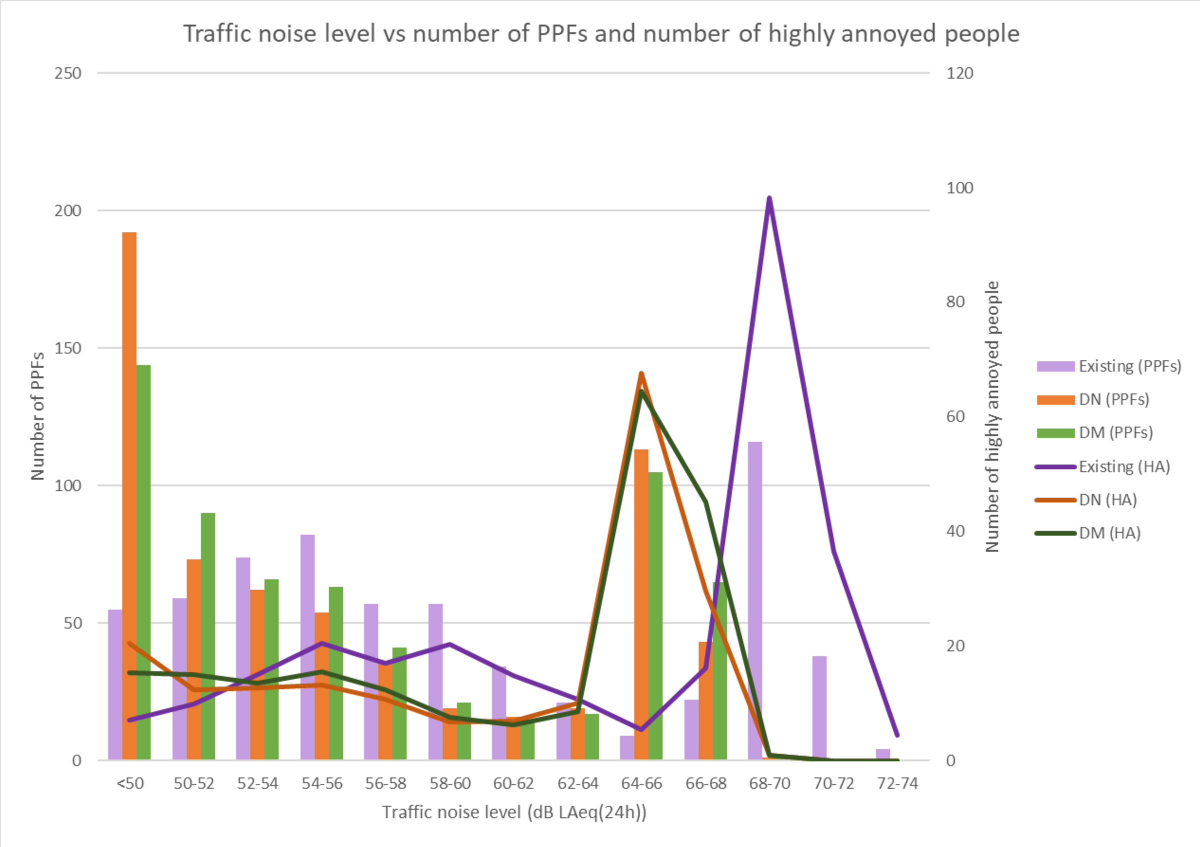


Figure 5: Number of PPFs and number of people highly annoyed by noise band

6.4 Recommended measures to avoid, remedy or mitigate traffic noise effects

As noted above, there is a small number of PPFs where noise levels are predicted to be within Category C. For those dwellings that are single storey (all except 30 Matarangi Road, which is a retirement village), an acoustic boundary fence would reduce noise levels to be within Category A or B. However, such fences may not be practicable if the slip lanes are repurposed into integrated active mode and stormwater infrastructure lanes as discussed in Section 5 . For those areas the use of barriers should be reassessed at the time of construction, to confirm if a boundary fence represents the BPO.

The most appropriate (and already included) mitigation option is the use of low noise road surface, in this instance AC14.

7 Airport to Botany Bus Rapid Transit – NoR 2

This section assesses specific traffic noise matters relating to NoR 2 – the Project corridor between Rongomai Park and the Puhinui Interchange in the vicinity of Plunket Avenue. For assessment purposes, NoR 2 has been split into three sections as shown in Figure 6 below:

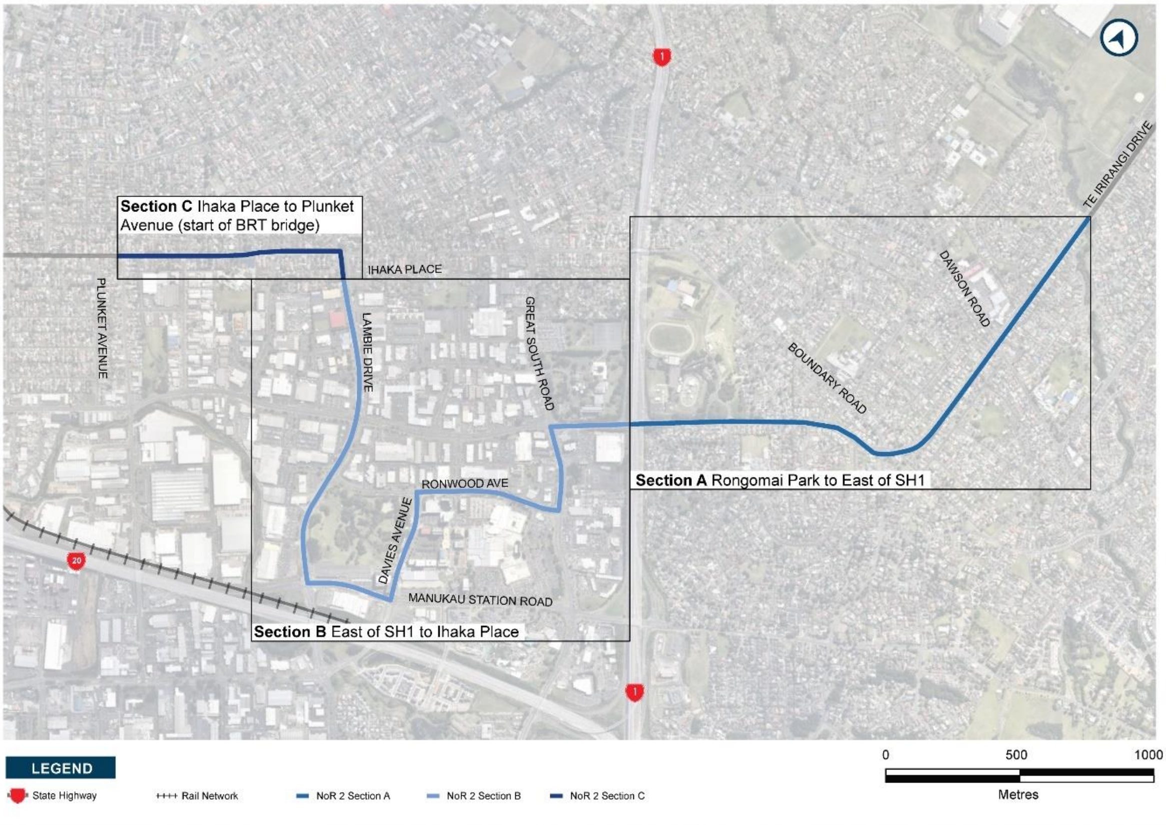


Figure 6: Sections of NoR 2

7.1 Existing and likely future noise environment

This NoR encompasses three distinct sections as shown in Figure 6 above. Section A and C are residential in character, with generally established older housing stock and infill housing. Houses are mostly single and double storey. Section B traverses the Manukau City Centre and is largely commercial in nature.

The southern side of Section C and part of Section B are within the HANA, which means that no new noise sensitive activities will be established. The remainder of Section C, and most of Sections A and B are within the MANA, which means that any new noise sensitive activities would need to be constructed to be insulated against aircraft noise. Such improved building façades and ventilation also assist in mitigating traffic noise. The northernmost part of Section A is outside the aircraft noise areas.

A number of sensitive sites such as Puhinui School, AUT South Campus, MIT and several childcare centres are adjacent to the Project.

The presence of the HANA and MANA indicate elevated noise levels from aircraft noise. In addition, the BRT corridor will follow established major roads which also have a clear influence on the noise levels of neighbouring buildings. Measured noise levels show a range of mid-60 to low-70 dB L_{Aeq} for houses fronting the road, generally controlled by road traffic.

The NPS:UD enables higher density dwellings for sites adjacent to the BRT corridor. We anticipate that:

- Zoning within a walkable catchment of BRT stations along the corridor will enable, at minimum, apartment buildings of six storeys; and
- Beyond walkable catchments, residential zoning will provide for three dwelling up to three storeys in height (subject to meeting the relevant development standards).

Based on the above, we expect significant redevelopment along this NoR in the near to medium future, where sites are outside the HANA.

The existing Puhinui Road is surfaced with AC14 and based on Auckland Transport information we have assumed that this surface will continue to be used for future surfacing.

7.2 Buildings within proposed designation

The following Table 16 shows the buildings that are within the proposed designation. We have not assessed these buildings further as the assumption is that that the relevant requiring authority will acquire the parcels of land that these buildings are located on.

Note that all buildings that are fully within the proposed designation footprint of the three sections of NoR 2, are combined in the table below.

Table 16: Buildings within designation (not assessed)

Address	Address
1, 3 Belinda Avenue, Flat Bush	66 Othello Drive, Clover Park
19R, 104B, 104C, 131 Boundary Road, Clover Park	2, 4A, 6 Plunket Avenue, Papatoetoe
139, 141, 154 Carruth Road, Papatoetoe	67 – 77, 79 (odd), 80, 81 – 97 (odd), 101 – 107 (odd), 122 – 162 (even) Puhinui Road, Papatoetoe
1 and 2/89 Charntay Avenue, Clover Park	2 Sandrine Avenue, Clover Park
1 and 2/141, 2/.148 Dawson Road, Flat Bush	18, 19 Tavistock Street, Papatoetoe
1 – 7 (odd), 9A, 11, 13, 15A Dissmeyer Drive, Flat Bush (uneven numbers only)	44 – 50 (even), 55 – 61 (odd), 56, 60, 62, 1/667, 1/68, 69, 71, 72, 74, 76, 1/80, 82, 83, 3/86, 88, 90, 97, 100, 2/102, 106, 108, 110, 3/112, 118, 120, 124, 126, 130, 132, 134, 140, 142, 146, 147, 148, 149A and B, 152, 154, 157A and B, 158, 159, 160, 161, 164, 166, 170, 174 – 180 (even), 190, 194, 199, 210, 214, 218, 220 Te Irirangi Drive, Flat Bush/Clover Park
72C Hollyford Drive, Clover Park	11 Whetstone Road, Flat Bush

7.3 Section A: Rongomai Park to east of SH1

7.3.1 Overview and noise environment

This section of NoR 2 traverses an established residential area. As set out in Section 7.1 above, the NPS:UD enables higher density dwellings for all residential sites adjacent to the corridor. A such, we expect significant redevelopment along this NoR in the near to medium future, where sites are outside the HANA.

Most sites are generally within the MANA, which will require aircraft noise mitigation as part of the new construction, which would similarly work to mitigate traffic noise.

Houses facing Te Irirangi Drive have existing traffic noise levels in the high 60 dB $L_{Aeq(24h)}$ while houses in the second row have noise levels at and below 50 dB $L_{Aeq(24h)}$.

7.3.2 Assessment of traffic noise effects

This is an established residential area with older housing stock. It is likely that in the future this area will be redeveloped with higher density and multi storey dwellings. While we have not assessed traffic noise at potential for future houses, we provide noise level contours over the area to identify potential façade noise levels, should new houses move closer to the road edge (refer **Appendix B**).

Some small areas generally around intersections will have some houses facing the road removed to provide the space required to construct the Project. This means that a small number of houses will be newly exposed to traffic noise from Te Irirangi Drive and the BRT corridor. This results in a significant increase in noise levels for these houses. The change in noise level falls within the trigger levels of NZS6806 (refer Section 3.1.2) and therefore we have undertaken an assessment of traffic noise effects in accordance with NZS6806.

Section A of NoR 2 accommodates two stations: Dawson Road and Diorella Drive stations. All are located in the centre of the road, in close proximity to busy urban roads and intersections.

7.3.2.1 NZS6806

Te Irirangi Drive is an existing road. The proposed changes will move the road outside the current road corridor in parts, and the removal of some dwellings currently fronting the road will result in significant noise level increases for houses behind.

We have identified 481 PPFs currently in the vicinity of the road. A large number of PPFs (66 of the 481) are predicted to currently receive noise levels within Category C (> 67 dB $L_{Aeq24h)}$) as they are close to a major road. While this number will reduce significantly in the future, based on reduced traffic numbers as provided by the transport experts, there will still be 14 and 15 PPFs receiving noise levels in Category C, for the Do-nothing and Do-minimum scenarios respectively.

Most PPFs in this area are single storey; however, many are located elevated above the road and access to the road will need to be maintained. Therefore, boundary fences are unlikely to be a suitable mitigation option.

Should higher density housing be developed adjacent to the Project, we would expect any future houses to take account of the major road close by and incorporate sound insulation and ventilation as appropriate to ensure that any future residents have a suitable internal noise environment.

The number of PPFs is summarised in Table 17, individual traffic noise levels for all PPFs provided in the table in **Appendix A**, and figures showing the location of the PPFs are included in **Appendix B**.

Table 17: Summary of NZS 6806 assessment

Scenario	**Number of PPFs**		
	NZS 6806 Categories		
	Category A	Category B	Category C
Existing	393	24	66
Do-nothing	417	52	14
Do-minimum (incl. bus rapid transit)	407	61	15

7.3.2.2 Change in Noise Levels

Noise effects can be described based on the change in noise level with and without the Project. For the comparison of noise levels, we have included the Project and other local roads in the area that would have an effect on the overall noise levels.

We predict a slight noise level reduction of 1 dB on average from the existing to Do-nothing scenario due to the projected reduction in traffic volume.

With the Project in place, noise levels are predicted to increase on average by 1 dB compared with the Do-nothing scenario. A small number of PPFs (49 of the 481 assessed) is predicted to receive noticeable to significant noise level increases of between 5 and 12 dB. This is generally the case where front row houses are removed.

Figure 7 shows the number of PPFs in each of the change in noise level bands discussed in Table 8. This shows that the vast majority (392 of the 483 PPFs assessed) would have no noticeable change to their noise environment.

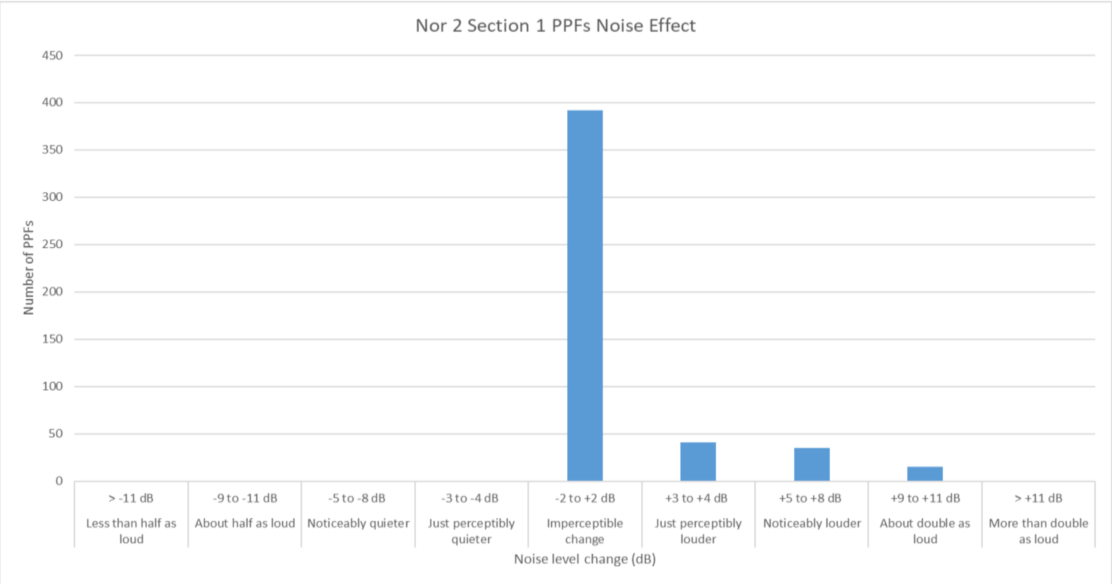


Figure 7: Change in noise level

7.3.2.3 Annoyance effects

As described in Section 3.1.4, we have determined the number of people potentially "highly annoyed" by the noise effects of the Project, by comparing the results of the existing and Do-nothing scenarios with the results of the Do-minimum scenario. For all scenarios, we have included local roads that have an effect on the noise level to represent the noise level that is likely to be experienced.

In addition, we have provided a figure showing the number of PPFs in each noise level band (in 2dB steps) and the number of people potentially highly annoyed.

Our results are summarised in Table 18 below.

Table 18: Number of people highly annoyed

Scenario	Number of people highly annoyed
Existing	210
Do-nothing	190
Do-minimum	214

Table 18 shows that the number of people highly annoyed by road traffic noise would increase slightly with the Project.

Figure 8 shows the number of PPFs and the number of people potentially highly annoyed in a combined graph. It can be seen that the largest number of people highly annoyed occurs at noise levels 66 dB $L_{Aeq(24h)}$ and above for all situations, with a downward shift from the existing situation where the main contributor are noise levels above 68 dB $L_{Aeq(24h)}$.

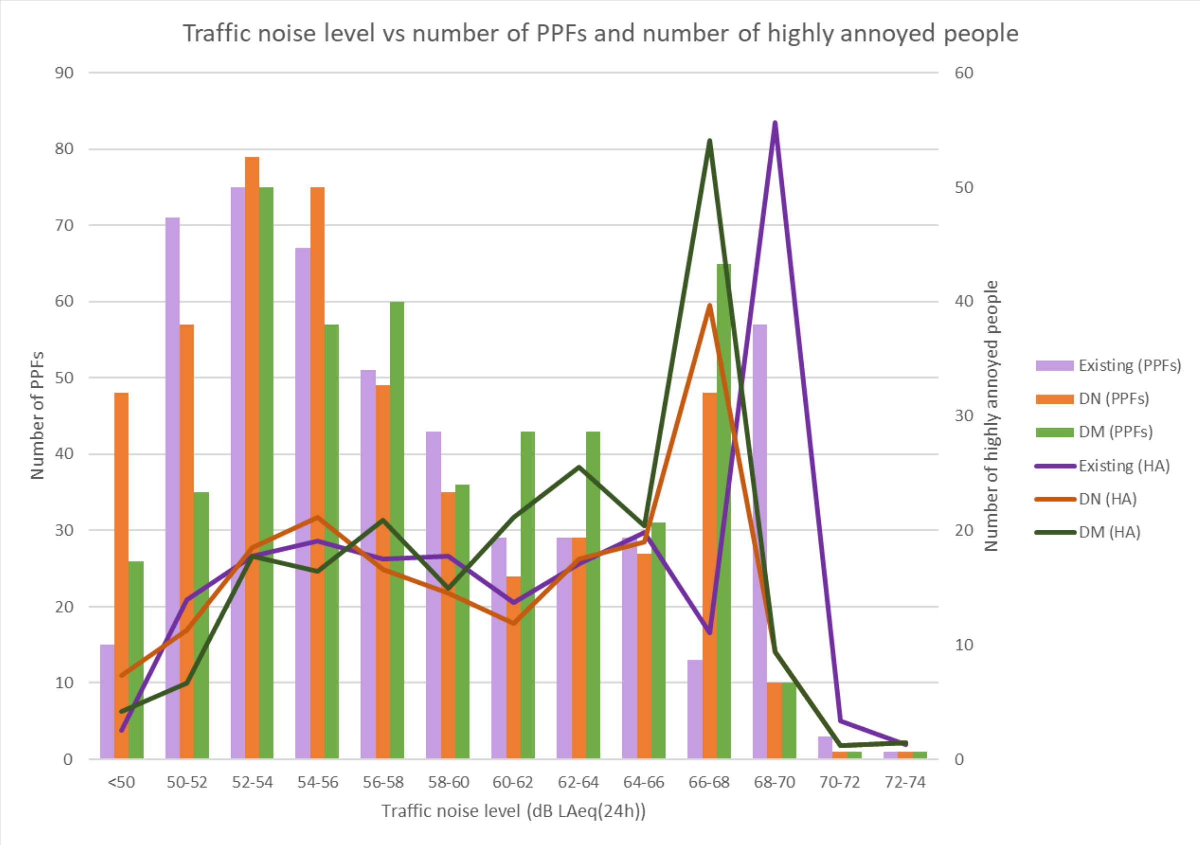


Figure 8: Number of PPFs and number of people highly annoyed by noise band

7.3.3 Recommended measures to avoid, remedy or mitigate tragic noise effects

As noted above, there is a small number of PPFs where noise levels are predicted to be within Category C. However, it is unlikely that boundary fences are practicable given that some houses are elevated above the road, and that site access has to be maintained.

The most appropriate (and already included) mitigation option is the use of low noise road surface, in this instance AC14.

7.4 Section 2: East of SH1 to Ihaka Place

7.4.1 Overview and noise environment

NoR 2 Section B traverses through the Manukau City Centre where we expect no significant changes to the receiving environment. In any event, should additional buildings be completed, these are expected to be generally of commercial nature and therefore not constitute PPFs.

This section of NoR 2 is within a town centre and commercial area. Therefore, there are only few PPFs in this area. Educational facilities such as MIT, AUT South Campus and residential uses such as The Renaissance and MCentral apartment buildings have been assessed as PPFs.

Parts of the alignment are in the HANA, with the remainder generally in the MANA. Therefore, noise sensitive uses are expected to already be insulated against aircraft noise.

Of the 11 identified PPFs, AUT South Campus is located in the HANA, while the MANA incorporates all apartment buildings. The MIT campus is outside the MANA and may therefore not include specific sound insulation provisions

Existing traffic noise levels range from high-50s to high 60s dB $L_{Aeq(24h)}$. In addition, commercial and aircraft noise would add to the ambient sound environment.

7.4.2 Assessment of traffic noise effects

The alignment traverses established commercial areas interspersed with educational facilities and apartment buildings. The road is currently surfaced with Asphaltic concrete. Based on information from Auckland Transport, we have assumed that similar road surface will be used for future works on the road.

The NPS:UD enables significantly higher density for parts of the Manukau Metropolitan Centre, at a minimum of six storeys (outside the HANA). Should higher density housing be established, this would not have an effect on the assessment of traffic noise mitigation, given that mitigation options are limited to low noise road surface. Any potential new dwellings constructed should take account of the fact that they are next to an existing high flow road with existing high noise levels, and in the MANA, and incorporate appropriate façade design and ventilation provisions into any such dwellings.

Section B of NoR 2 accommodates two stations: Ronwood Avenue and Manukau Central. These are located in close proximity to busy urban roads and intersections, and generally in the Manukau City Centre.

7.4.2.1 NZS6806

The Project involves the upgrade of existing (generally major) roads. There are currently 11 PPFs identified within 100m of the road edge.

Existing noise levels range from 54 dB $L_{Aeq(24h)}$ for a building away from main roads, to 70 dB $L_{Aeq(24h)}$ for buildings fronting Great South Road and SH1.

Based on our predictions, NoR 2 Section B does not fall under the trigger levels of NZS 6806 (refer Section 3.1.2), as the noise levels are not predicted to increase by 3 dB or more where the Do-minimum noise level is 64 dB $L_{Aeq(24h)}$ or higher, or increase by 1 dB or more where the Do-minimum noise level is 68 dB $L_{Aeq(24h)}$ or higher. Nevertheless, for completeness, we have included an assessment in accordance with NZS6806 below.

The number of PPFs is summarised in Table 19, shown in detail in **Appendix A**, and figures showing the location of the PPFs are included in **Appendix B**.

Overall, the Project is predicted to result in no PPFs receiving noise levels in Category C, and a larger number is predicted to receive noise levels in Category A.

Table 19: Summary of NZS 6806 assessment

Scenario	Number of PPFs		
	NZS 6806 Categories		
	Category A	Category B	Category C
Existing	3	4	4
Do-nothing	6	4	1
Do-minimum (incl. bus rapid transit)	7	4	0

7.4.2.2 Change in noise levels

Noise effects can be described based on the change in noise level with and without the Project. For the comparison of noise levels, we have included the Project road and other local roads in the area that would have an effect on the overall noise levels.

We predict no significant traffic noise level change for the PPFs when comparing the existing and Do-nothing scenarios. With the Project in place (Do-minimum scenario), noise levels are predicted to remain largely unchanged compared with the Do-nothing scenario.

Figure 9 shows the number of PPFs in each of the change in noise level bands discussed in Table 8.

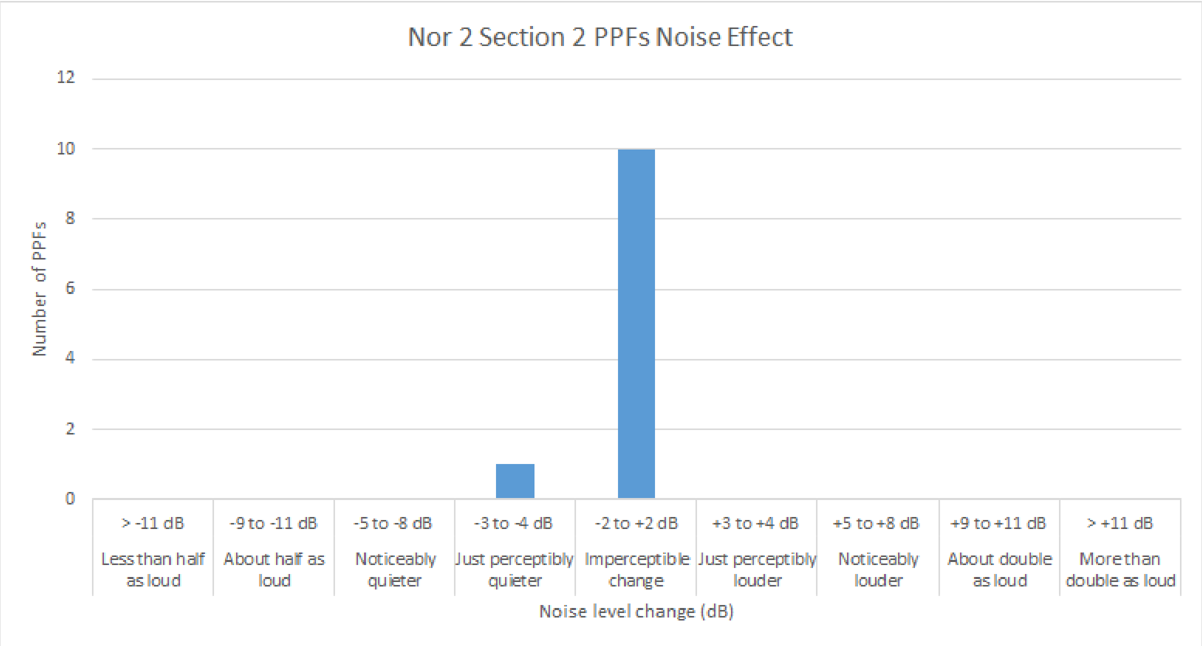


Figure 9: Change in noise level

7.4.2.3 Annoyance effects

As described in Section 3.1.4, we have determined the number of people potentially “highly annoyed” by the noise effects of the Project, by comparing the results of the existing and Do-nothing scenarios with the results of the Do-minimum scenario. For all scenarios, we have included local roads that have an effect on the noise level to represent the noise level that is likely to be experienced.

In addition, we have provided a figure showing the number of PPFs in each noise level band (in 2dB steps) and the number of people potentially highly annoyed.

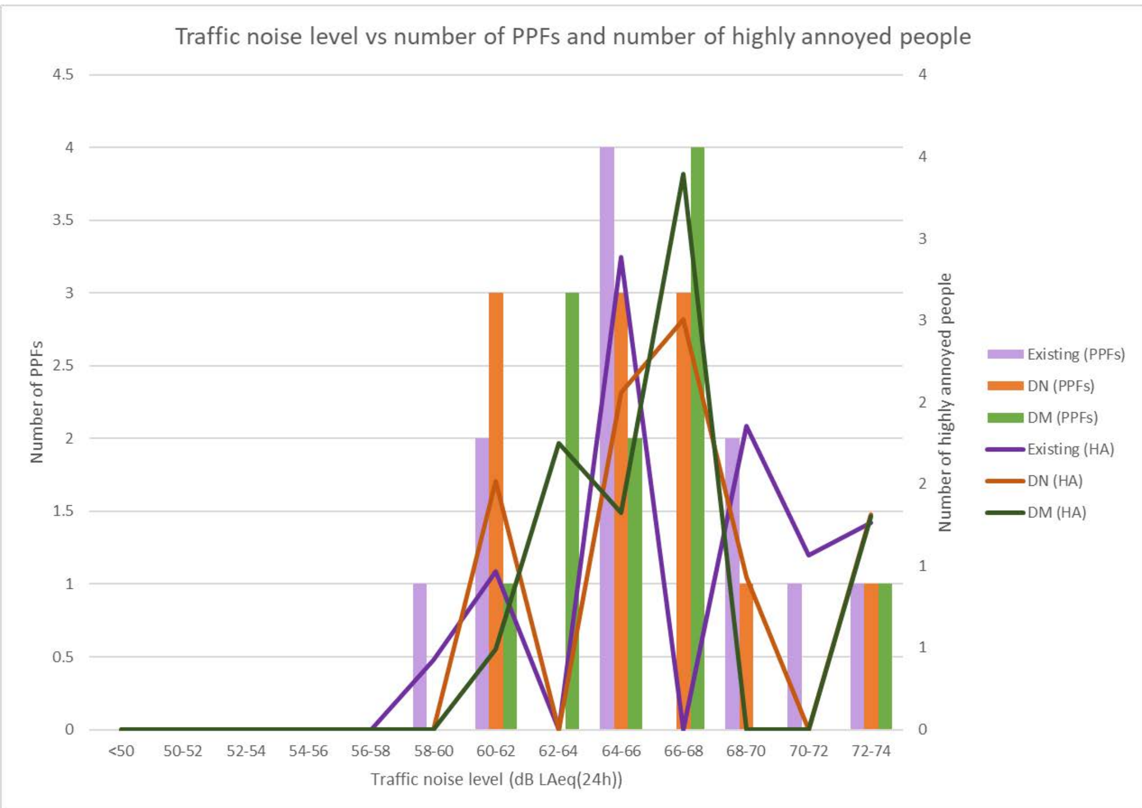
We note that the PPFs in Manukau Central are multi storey apartment buildings for which we do not have an accurate number of residents. Therefore, for comparison reasons, we have retained the value of 3.6 persons[11] per PPF, which will underpredict the actual effects, but provides a trend in terms of effects. It is also important to note that the buildings are located in the MANA and therefore already include noise reduction measures. Our results are summarised in Table 20Table 18 below.

Table 20: Number of people highly annoyed

Scenario	Number of people highly annoyed
Existing	8
Do-nothing	8
Do-minimum	8

Table 20 shows that the number of people highly annoyed by road traffic noise would remain the same for all scenarios. If more residents are counted in the apartment buildings, the number may increase, but the relationship between the scenarios will remain similar.

Figure 10 shows the number of PPFs and the number of people potentially highly annoyed in a combined graph. It can be seen that the largest number of people highly annoyed occurs at noise levels between 64 and 70 dB $L_{Aeq(24h)}$ for all situations.



[11] Based on the people per household for the Otara-Papatoetoe Local Board

Figure 10: Number of PPFs and number of people highly annoyed by noise band

7.4.3 Recommended measures to avoid, remedy or mitigate traffic noise effects

Since the change in traffic noise level is generally imperceptible, and all PPFs will receive noise levels within the same Noise Criteria Category as without the Project, no noise mitigation is recommended. The most appropriate and effective noise mitigation is the use of low noise road surface, which is already proposed for this area (i.e. AC14).

7.5 Section 3: Ihaka Place to Plunket Avenue

7.5.1 Overview and noise environment

Some sites south of Puhinui Road is within the HANA. This means that existing houses would already have been upgraded with improved sound insulation and ventilation to protect residents from aircraft noise. Such improvements would also benefit the mitigation of traffic noise. In the HANA, no new noise sensitive uses can be established. As such, it is assumed that existing housing stock would remain largely unchanged between now and the implementation of the Project.

The northern side of Puhinui Road is in the MANA, where some houses may already have been upgraded, with the help of Auckland International Airport. New noise sensitive development is permitted in the MANA where new houses are appropriately insulated and ventilated. Therefore, we have assumed that any future potentially higher density and multi storey houses would be appropriately designed to mitigate environmental noise from aircraft and road traffic.

Houses facing Puhinui Road have existing traffic noise levels in the mid to high 60 dB $L_{Aeq(24h)}$ while houses in the second row have noise levels at and below 50 dB $L_{Aeq(24h)}$.

Puhinui School is located immediately beside Puhinui Road, with the sport field abutting the footpath. The school buildings are somewhat set back from the road and not particularly affected by road traffic noise. We have recommended engaging with the school during the construction phase. If the school would like to retain a barrier between the road and the sports fields, additional benefit can be achieved for the fields and buildings behind.

7.5.2 Assessment of traffic noise effects

The Project will result in the first row of houses adjacent to the road being removed to provide the space required to construct the Project. The widening is proposed to occur on the southern side of Puhinui Road from approximately Plunket Avenue to the western end of Puhinui School. From there, the widening moves to the north of Puhinui Road up to the corner with Lambie Drive. The removal of the first row of houses will result in the second row of houses being exposed to traffic noise from Puhinui Road and the rapid transit lanes. This results in a noticeable increase in noise levels for these houses. The change in noise level falls within the trigger levels of NZS6806 (refer Section 3.1.2) and therefore we have undertaken an assessment of traffic noise effects in accordance with NZS6806.

Section C of NoR 2 accommodates one station at the intersection of Lambie Drive and Puhinui Road

7.5.2.1 NZS6806

Puhinui Road is an existing road that will be altered. The proposed Project will move the road well outside the current road corridor in parts, and the removal of dwellings currently fronting the road will result in significant noise level increases for houses behind. For some houses, the widening will move traffic further away, resulting in a noise level reduction. No changes are proposed to the road surface or posted speed.

There are currently 276 PPFs in the vicinity of the road in Section C of NoR 2.

The anticipated increase in traffic volume from the existing to the Do-nothing scenario means that on average PPFs would receive a slight noise level increase. This is reflected in the one additional PPF receiving noise levels in Category B (refer to Table 21). The Do-minimum scenario includes the removal of dwellings, and the move of the traffic lanes into the widened areas. This results in an adjustment of traffic noise levels with an overall positive outcome, with no PPFs receiving noise levels in Category C.

For 11 PPFs (4 Plunket Ave, 2/73, 77A, 83, 85A, 93B, 2/101, 124B, 128A, 142A, 148A Puhinui Rd), we predict a significant noise level increase between 5 and 13 dB, and a shift in noise level from Category A to Category B. All of these houses are in the MANA, so may already incorporate some sound insulation provisions. In order to mitigate traffic noise levels further, it may be possible to install a boundary fence on a case-by-case basis. However, access to the site will need to be maintained, and the urban design specialists in a suburban environment may not consider such measures appropriate. The use of barriers for these PPFs should be reassessed at the time of construction, to confirm if a boundary fence represents the BPO.

Should these houses be replaced with higher density housing in the future, these new houses would need to incorporate sound insulation due to the buildings being located in the MANA, which would also result in reduced internal traffic noise levels. For multi storey high density housing, barriers are not a suitable mitigation option given that they would only protect the ground floor, Access to the site would need to be retained, making barriers a generally impracticable choice of mitigation.

If that is the case, we would not recommend any additional mitigation at this stage.

The number of PPFs is summarised in Table 21, individual traffic noise levels in **Appendix A** and figures showing the location of the PPFs are included in **Appendix B**.

Table 21: Summary of NZS 6806 assessment

Scenario	**Number of PPFs**		
	NZS 6806 Categories		
	Category A	Category B	Category C
Existing	245	26	5
Do-nothing	244	28	4
Do-minimum (incl. bus rapid transit)	249	27	0

7.5.2.2 Changes in noise levels

Noise effects can be described based on the change in noise level with and without the Project. For the comparison of noise levels, we have included the Project and other local roads in the area that would have an effect on the overall noise levels.

There are no significant changes between the Existing and Do-nothing scenarios, which is reflected in the overall similar noise levels and an average noise level increase of less than 1 dB due to traffic volume increase.

The Project will shift the traffic lanes outside the existing roading corridor, from Plunket Ave to approximately 107 Puhinui Road to the south of Puhinui Road, and from 107 Puhinui Road to Ihaka Place to the north of Puhinui Road.

With the removal of the first row houses, and shift of the traffic lanes, noise levels increase for those houses that are newly exposed to traffic noise by up to 13 dB, perceived as more than a doubling in noise level.

On the other side, where the road moves further away from houses, a slight noise level reduction of 2 dB is experienced by some dwellings. For the majority of these PPFs, the resultant noise level remains in Category A irrespective of the increase. For 45 PPFs, we predict a noticeable to significant noise level increase between 5 and 13 dB. Of those 45 PPFs, all but 11 will receive noise levels within Category A.

Figure 11 shows the number of PPFs in each of the change in noise level bands discussed in Table 8. This shows that the vast majority (215 of the total 276 PPFs assessed in Section C of NoR 2) will have no noticeable change in noise level.

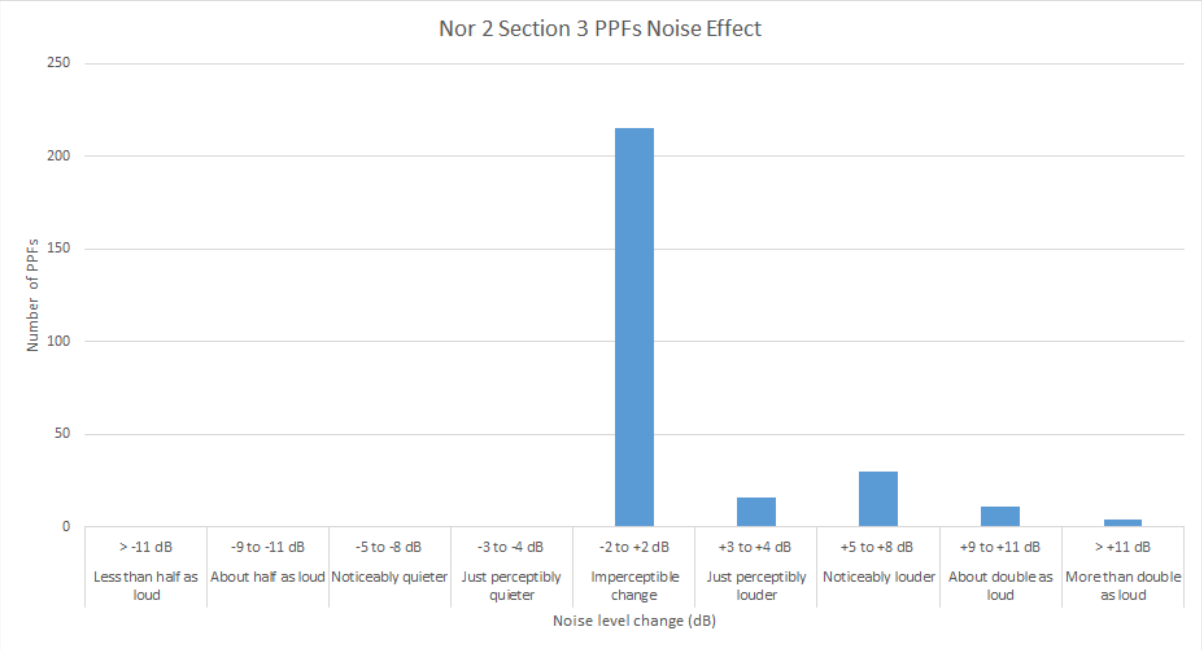


Figure 11: Change in noise level

7.5.2.3 Annoyance effects

As described in Section 3.1.4, we have determined the number of people potentially “highly annoyed” by the noise effects of the Project, by comparing the results of the existing and Do-nothing scenarios with the results of the Do-minimum scenario. For all scenarios, we have included local roads that have an effect on the noise level to represent the noise level that is likely to be experienced.

In addition, we have provided a figure showing the number of PPFs in each noise level band (in 2dB steps) and the number of people potentially highly annoyed.

Our results are summarised in Table 22Table 18 below.

Table 22: Number of people highly annoyed

Scenario	Number of people highly annoyed
Existing	87
Do-nothing	91
Do-minimum	102

Table 22 shows that the number of people highly annoyed by road traffic noise would increase slightly with the Project.

Figure 12 shows the number of PPFs and the number of people potentially highly annoyed in a combined graph. It can be seen that for the existing and Do-nothing scenarios there are two peaks of annoyance, at the relatively low level of 52 to 56 dB $L_{Aeq(24h)}$ and at 64 to 68 dB $L_{Aeq(24h)}$. With the Project in place, the pronounced peak is at 64 t0 66 dB $L_{Aeq(24h)}$ with a larger number of PPFs located in this band. We note that the PPFs are located generally in the MANA and would therefore already include noise reduction provision, which means that the effect may be less pronounced than would otherwise be the case.

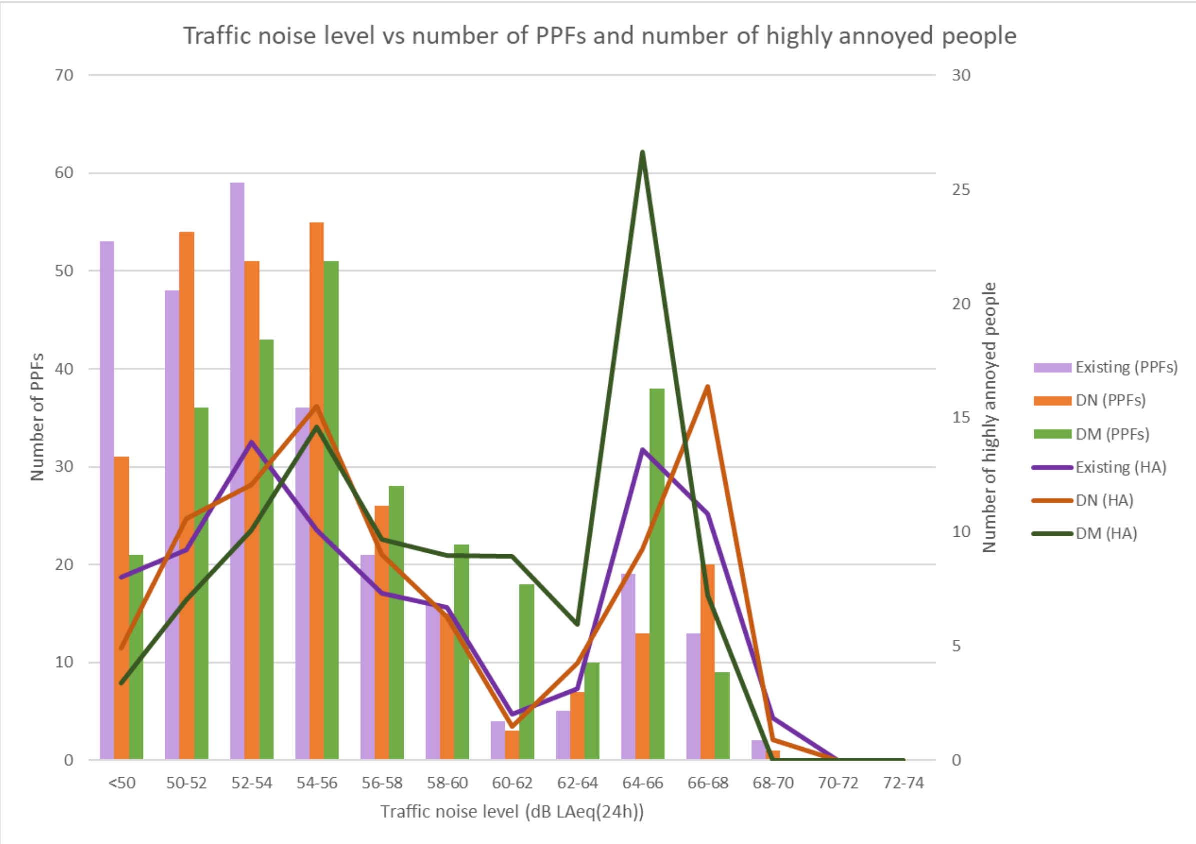


Figure 12: Number of PPFs and number of people highly annoyed by noise band

7.5.3 Recommended measures to avoid, remedy or mitigate construction effects

As noted above, it is unlikely that additional mitigation will be practicable for this section of road. Only a small number of PPFs are predicted to receive a significant noise level increase and would receive noise levels within Category B. Since these houses are located in the MANA, some may already include upgrades to their sound insulation and ventilation.

Should additional mitigation be required, barriers could be investigated. They would be in the form of a 2m high boundary fence, but would need to make allowance for site access, which reduces the fences' effectiveness for noise mitigation.

The most appropriate (and already included) mitigation option is the use of low noise road surface, in this instance AC14.

8 Airport to Botany Bus Rapid Transit – NoR 3

This section assesses specific traffic noise matters relating to NoR 3 – the Project corridor between Puhinui Station, in the vicinity of Plunket Avenue and the SH20/20B Interchange.

8.1 Existing and likely future noise environment

NoR 3 traverses through established residential areas. We anticipate some changes to the environment, in particular an increase in density of residential areas to the north of the Project where the sites are outside the HANA, however we do not anticipate that these changes will impact this assessment. The NPS:UD enables higher density dwellings for all sites adjacent to Puhinui Road outside the HANA.

Houses to the south of Puhinui Road are in the HANA. Most of them will be removed as part of the project. It is assumed that the remaining dwellings will have been insulated and provided with fresh air intake as part of the Auckland Airport noise mitigation packages. No new noise sensitive activities are anticipated in this area.

Houses to the north of Puhinui Road are in the MANA. These may also have been upgraded as part of the Auckland Airport noise mitigation package. Where new houses are built in the MANA, they will need to incorporate sound insulation and ventilation to mitigate against aircraft noise. Such mitigation will also be effective against road traffic noise.

Existing traffic noise levels in this area range up to 72 dB $L_{Aeq(24h)}$ for houses fronting Puhinui Road, to less than 50 dB $L_{Aeq(24h)}$ where houses are well shielded by intervening dwellings (some of which will be removed as part of the Project). Aircraft and commercial noise sources will add to the overall noise environment experienced by residents in the area.

8.2 Buildings within proposed designation

The following Table 23 shows the buildings that are within the proposed designation. We have not assessed them further as the assumption is that the relevant requiring authority will acquire the parcels of land that these buildings are located on.

Table 23: Buildings inside designation (not assessed)

Address	Address
3, 5, 7 – 10 Bridge Street, Papatoetoe	2, 4A Plunket Avenue, Papatoetoe
6, 8, 18, 20, 22, 26 Cambridge Terrace, Papatoetoe	146 – 150 (even), 156, 166 – 202 (even), 199, 203, 230, 232, 252, 262 – 266 (even), 2702 – 280 (even), 281, 284, 286, 290 – 294 (even), 298, 300 – 306 (even), 310, 312 Puhinui Road, Papatoetoe
4, 6, 8 Noel Burnside Road, Papatoetoe	1, 2, 2/3, 5 Ranfurly Avenue, Papatoetoe
98, 104 Kenderdine Road, Papatoetoe	

8.3 Assessment of traffic noise effects

The Project will result in the first row of houses adjacent to the road being removed to provide the space required to construct the Project. The widening is proposed to occur on the southern side of Puhinui Road. The removal of the first row of houses will result in the second row of houses being exposed to traffic noise from Puhinui Road and the BRT corridor. This results in a noticeable noise level change for those houses. In addition, the new bus bridge will cross over Puhinui Station, exposing PPFs to traffic noise that are currently somewhat removed from traffic. The change in noise level falls within the trigger levels of NZS6806 (refer Section 3.1.2) and therefore we have undertaken an assessment of traffic noise effects in accordance with NZS6806.

One station is proposed at the existing Puhinui Station. This station would be located above the rail station and rail line, allowing direct access from the bus to the rail.

8.3.1 NZS6806

As set out in 2.2.3, Puhinui Road is an existing road. The proposed changes will move the road well outside the current road corridor in parts, and the removal of dwellings currently fronting the road will result in significant noise level increases for houses behind.

There are currently 380 PPFs in the vicinity of the road. The road is surfaced with AC14, and based on information from Auckland Transport, we have assumed that this road surface will be retained.

The majority of PPFs (326 of 380) currently receive noise levels within Category A. This will remain similar in the Do-nothing and Do-minimum scenarios, with 335 and 338 PPFs respectively. The number of PPFs receiving noise levels within Category C is predicted to reduce from 11 to 5 when comparing the Do-nothing and Do-minimum scenarios.

Eight PPFs[12] are predicted to have a noticeable to significant noise level increase between 7 and 13 dB and would receive noise levels within Category B or C due to the project. These PPFs are generally in areas where the road will move significantly closer and intervening buildings have been removed. Since most of these dwellings are single storey, a boundary fence may be an appropriate mitigation option. However, site access will need to be maintained and therefore the fence may have reduced effectiveness. With a boundary fence in place, we consider that noise levels can be reduced to be within Category A or B.

The number of PPFs is summarised in Table 24, individual predicted noise levels at all PPFs are shown in the table in **Appendix A**, and figures showing the location of the PPFs are included in **Appendix B**.

Table 24: Summary of NZS 6806 assessment

Scenario	**Number of PPFs**		
	NZS 6806 Categories		
	Category A	Category B	Category C
Existing	326	45	9
Do-nothing	335	34	11

[12] 148A, 186A, 290, 292B, 294A, and 3/298 Puhinui Road, 4 Plunket Avenue,

Scenario	**Number of PPFs**		
	NZS 6806 Categories		
	Category A	Category B	Category C
Do-minimum (incl. bus rapid transit)	338	37	5

8.3.2 Change in noise levels

Noise effects can be described based on the change in noise level with and without the Project. For the comparison of noise levels, we have included the Project road and other local roads in the area that would have an effect on the overall noise levels.

We predict a slight noise level increase of an average of 1 dB from the existing to Do-nothing scenario. With the Project in place, noise levels are predicted to on average increase by less than 1 dB compared with the Do-nothing scenario. Individual PPFs are predicted to receive significant noise level increases where the road moves closer or where the first row dwelling is removed. For those PPFs, noise levels may increase up to 13 dB. However, only 34 of the assessed 380 PPFs are predicted to receive a noticeable to significant increase, with most of these PFPs receiving noise levels within Category A.

Figure 13 shows the number of PPFs in each of the change in noise level bands discussed in Table 8. This shows that the vast majority (311 of the 380 PPFs assessed) would not receive a noticeable noise level change.

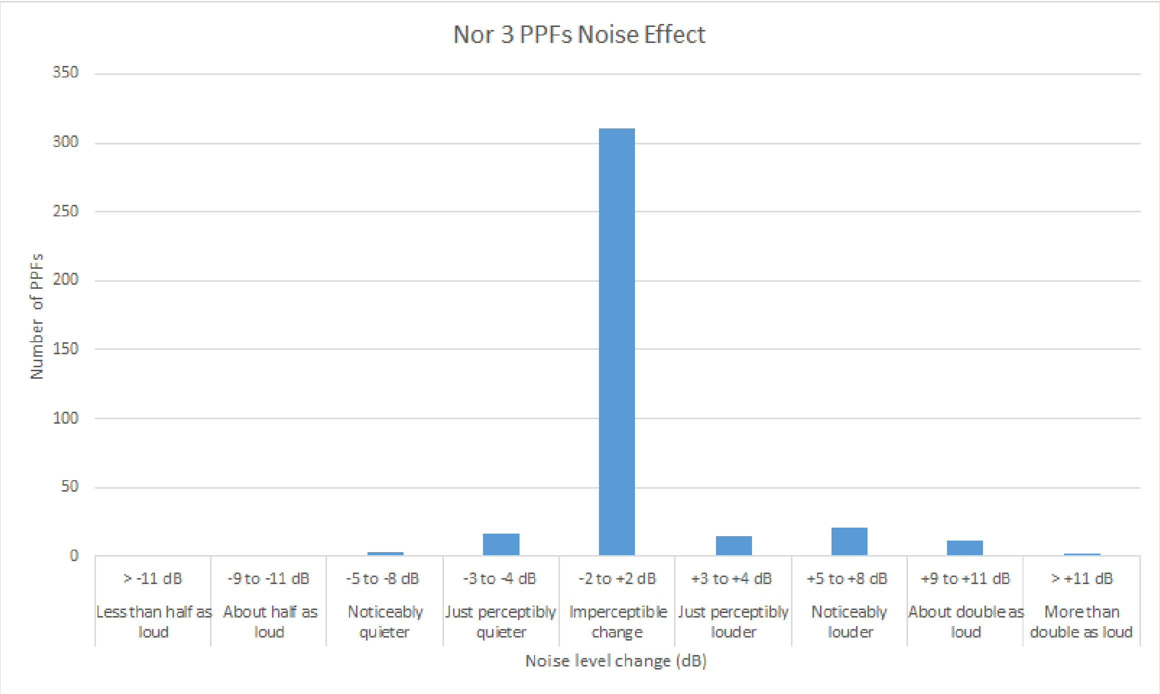


Figure 13: Change in noise level

8.3.3 Annoyance effects

As described in Section 3.1.4, we have determined the number of people potentially "highly annoyed" by the noise effects of the Project, by comparing the results of the existing and Do-nothing scenarios with the results of the Do-minimum scenario. For all scenarios, we have included local roads that have an effect on the noise level to represent the noise level that is likely to be experienced.

In addition, we have provided a figure showing the number of PPFs in each noise level band (in 2dB steps) and the number of people potentially highly annoyed.

Our results are summarised in Table 25 below.

Table 25: Number of people highly annoyed

Scenario	Number of people highly annoyed
Existing	133
Do-nothing	141
Do-minimum	149

Table 25 shows that the number of people highly annoyed by road traffic noise would remain generally similar with or without the Project.

Figure 14 shows the number of PPFs and the number of people potentially highly annoyed in a combined graph. The distribution of annoyance remains largely unchanged, with peaks at 54 to 58 dB $L_{Aeq(24h)}$ and 64 to 68 dB $L_{Aeq(24h)}$ representing the number of PPFs one row removed from the road and fronting the road respectively.

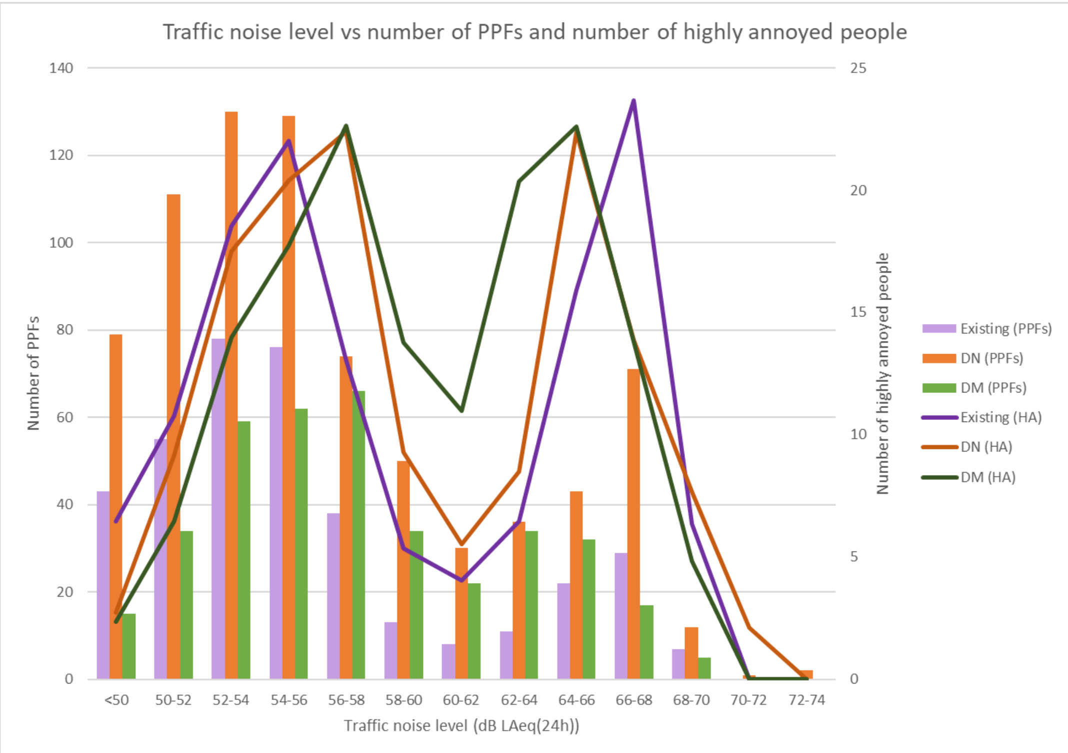


Figure 14: Number of PPFs and number of people highly annoyed by noise band

8.4 Recommended measures to avoid, remedy or mitigate traffic noise effects

As noted above, there is a small number of PPFs where noise levels are predicted to increase noticeably and be within Category B or C. Boundary fences may be practicable given that most of the PPFs are single storey, however, site access will need to be maintained.

The most appropriate (and already included) mitigation option is the use of low noise road surface, in this instance AC14.

9 Airport to Botany Bus Rapid Transit – NoRs 4a and 4b

This section assesses specific traffic noise matters relating to NoRs 4a and 4b – the Project corridor between the SH20/20B Interchange and Orrs Road.

9.1 Existing and likely future noise environment

NoRs 4a and 4b extends along the boundary of two zones, the FUZ to the north and Business to the south. We understand that the FUZ will eventually be rezoned to a commercial zone, not least because the area is within the MANA, which somewhat restricts residential use due to the elevated aircraft noise levels. Neither area is currently developed. Therefore, the receiving environment may be different to the current environment as the future business areas are developed. However, due to the receiving environment being businesses, we do not anticipate any additional PPFs to be created. In fact, the few existing dwellings may be removed during the redevelopment of the sites.

Only a small number of dwellings are within 100m of the alignment. We consider that these dwellings may not remain when the sites are developed, however, in the interim we have assessed them as PPFs as required by NZS6806.

The current SH20B is surfaced in PA10 30mm. We have assumed that this road surface is retained in the future.

The existing noise environment is mostly affected by traffic on SH20B and aircraft noise. Levels range from 52 dB $L_{Aeq(24h)}$ for houses further away, to 68 dB $L_{Aeq(24h)}$ for houses close to the road. Aircraft noise would add to that noise level.

9.2 Buildings within proposed designation

The following Table 26 shows the buildings that are within the proposed designation. We have not assessed them further as the assumption is that the relevant requiring authority will acquire the parcels of land that these buildings are located on. We only note the addresses where the main building is inside designation, and not those where auxiliary buildings such as sheds, or garages may be removed. For some addresses, several buildings are on the site, however, the address is only shown once.

In addition, auxiliary buildings are not generally occupied, so are not considered to be relevant receivers in relation to this assessment.

Table 26: Buildings inside designation (not assessed)

Address	Address
402 Puhinui Road	440 Puhinui Road
408 Puhinui Road	

9.3 Assessment of traffic noise effects

9.3.1 NZS6806

As set out in Section 2.2.4, SH20B is an existing road with an existing designation (designation 6717). The proposed works in this section will take the alignment outside its designation in parts. Therefore, we have assessed the project against NZS6806 for the entirety of the alignment within NoR 4a and 4b.

Auckland Transport is the Requiring Authority for NoR 4a which extends from the SH20/20B interchange to Orrs Road. Waka Kotahi is the Requiring Authority for NoR 4b which is an alteration of the existing designation 6717 which incorporates the new ramp across and connecting with SH20 and the walking and cycling facility.

We anticipate that both projects will be constructed and operated in conjunction and have therefore assessed both together as their traffic noise effects cannot be separated.

The predicted change in noise level is below the threshold of NZS6806 (refer Section 3.1.2). Therefore, an assessment in accordance with NZS6806 is not required as the effects are insignificant. However for completeness, we have included an NZS 6806 assessment.

There are currently five PPFs in the vicinity of the road that would remain in place. The anticipated increase in traffic volume is predicted to result in two PPFs receiving noise levels within Category C for both the Do-nothing and Do-minimum scenarios. However, as there is no change predicted due to the Project, no additional mitigation is proposed.

The number of PPFs is summarised in Table 27, individual noise level results for all PPFs are shown tables in **Appendix A**, and figures showing the location of the PPFs are included in **Appendix B**.

Table 27: Summary of NZS 6806 assessment

Scenario	**Number of PPFs**		
	NZS 6806 Categories		
	Category A	Category B	Category C
Existing	2	2	1
Do-nothing	3	0	2
Do-minimum (incl. bus rapid transit)	3	0	2

9.3.2 Change in noise levels

Noise effects can be described based on the change in noise level with and without the Project. For the comparison of noise levels, we have included the Project road and other local roads in the area that would have an effect on the overall noise levels.

We predict noise level increases from the existing to Do-nothing scenario of up to 3 dB, and an average noise level increase of 2.5 dB across all PPFs.

With the Project in place (with low noise road surface PA10 30mm as discussed above), noise levels are predicted to remain unchanged compared with the Do-nothing scenario.

Figure 15 shows the number of PPFs in each of the change in noise level bands discussed in Table 8.

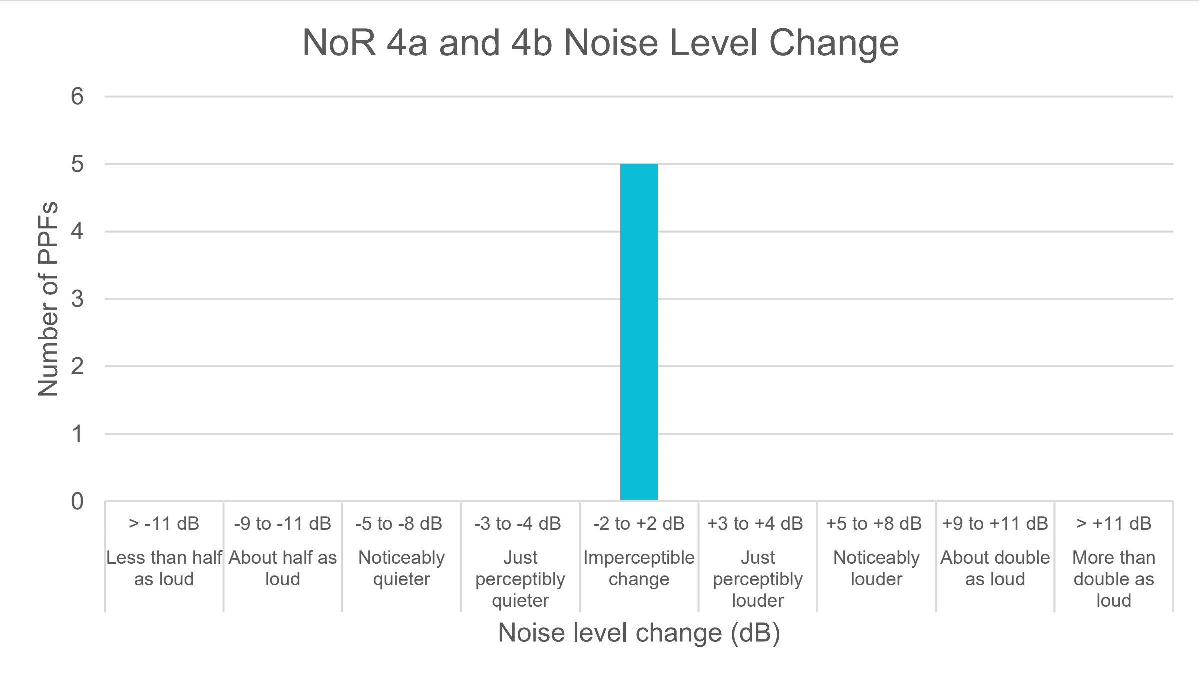


Figure 15: Change in noise level

9.3.3 Annoyance effects

As described in Section 3.1.4, we have determined the number of people potentially “highly annoyed” by the noise effects of the Project, by comparing the results of the existing and Do-nothing scenarios with the results of the Do-minimum scenario. For all scenarios, we have included local roads that have an effect on the noise level to represent the noise level that is likely to be experienced.

In addition, we have provided a figure showing the number of PPFs in each noise level band (in 2dB steps) and the number of people potentially highly annoyed.

Our results are summarised in Table 28 below.

Table 28: Number of people highly annoyed

Scenario	Number of people highly annoyed
Existing	4
Do-nothing	4
Do-minimum	4

Table 28 shows that the number of people highly annoyed by road traffic noise would remain the same with or without the Project.

Figure 16 shows the number of PPFs and the number of people potentially highly annoyed in a combined graph. The peak number of people highly annoyed (albeit low as there are very few dwellings in the area) moved slightly up from the 66-68 dB $L_{Aeq(24h)}$ band to the 70 to 72 dB $L_{Aeq(24h)}$ band.

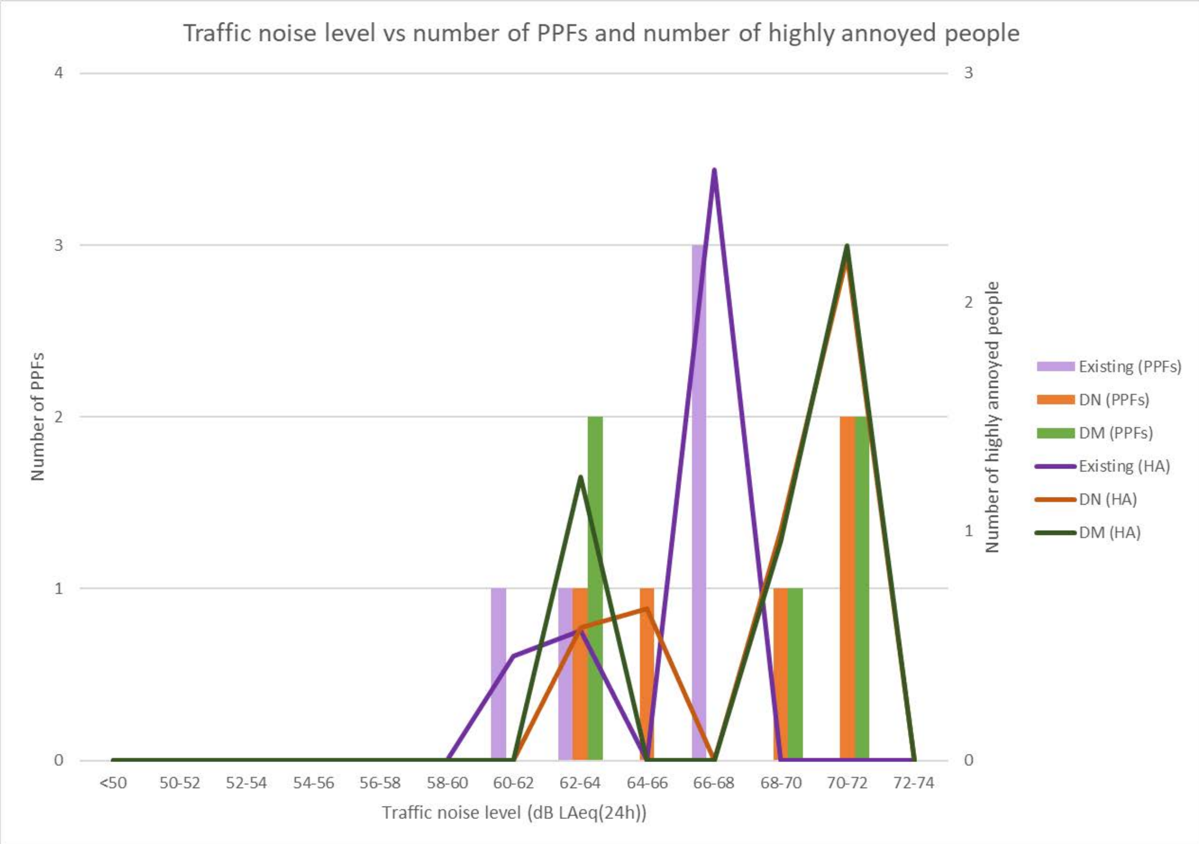


Figure 16: Number of PPFs and number of people highly annoyed by noise band

9.4 Recommended measures to avoid, remedy or mitigate traffic noise effects

We do not recommend any mitigation for the PPFs in this area given that the changes due to the Project will be unnoticeable.

The most appropriate (and already included) mitigation option is the use of low noise road surface.

10 Conclusions

An assessment of traffic noise effects has been carried out for the Project based on NZS6806, in relation to the change in noise level and the potential annoyance effects from the resulting noise levels.

All existing PPFs within 100m of the Project corridor have been considered in the assessment. Buildings that are within the proposed designation have not been assessed as it is assumed that these buildings will not remain once the Project has been implemented.

A comparison of the predicted traffic noise levels in the Do-nothing scenario (design year without the Project) and the Do-minimum scenario (with the Project). The table below provides a summary of the assessment of traffic noise effects across the NoRs and mitigation measures to manage potential effects.

Table 29: Assessment of traffic noise effects – Project wide

Effect	Assessment	Recommendation
Traffic noise – all NoRs	NoRs 1, 2 and 3 traverse well established residential and commercial areas, with buildings in close proximity to construction works. NoR 4a and 4b traverses currently generally greenfield sites (some zoned FUZ), which will likely be developed as commercial areas. PPFs include dwellings, schools, childcare centres and other educational facilities. Only existing PPFs have been assessed in detail. The largest effects are anticipated from the removal of the first row of house in NoR 2 and 3, and parts of NoR 1. This will leave PPFs behind exposed to traffic noise. Other effects are likely from traffic lanes moving closer to some houses. The traffic noise effects are generally slight in areas where no houses are demolished. Where the first row of houses is demolished, effects are noticeable to significant. However, overall, noise levels are predicted to be generally in Category A for most of those houses. For the vast majority of PPFs, any noise level changes will be insignificant ranging from -2 to + 2 dB.	Mitigation is already assumed in the form of low noise road surface, by retaining the existing surface in the future. Some individual boundary fences may be effective, particularly in NoR 1. Fencing in NoR 2 and 3 is unlikely to be suitable due to driveway access requirements. Since no new houses are permitted in the HANA, and new houses in the MANA will need to incorporate sound insulation and ventilation, effects from traffic noise on future dwellings will likely be limited. In addition, developers of any new dwelling outside the MANA would likely take account of the existing high noise roads and design the dwellings accordingly.

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Appendix A

Predicted noise levels at all PPFs

Appendix A – Predicted noise levels at all PPFs

NoR 1

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
4 Aaronville Way	1	69.2	66.2	66.6
6 Aaronville Way	1	69.2	66.2	66.5
8 Aaronville Way	1	56.6	53.7	54.4
8 Aaronville Way	2	69.8	66.8	67
10 Aaronville Way	1	69.1	66.1	66.3
12 Aaronville Way	1	69.7	66.7	66.9
28 Accent Drive	2	69.8	64.4	64.4
28 Accent Drive	2	61.5	55.9	55.6
28 Accent Drive	2	60.9	55.4	54.7
28 Accent Drive	2	59.9	54.4	54.2
28 Accent Drive	2	59.4	53.9	53.8
36 Accent Drive	2	58.5	53.1	52.1
12 Aclare Place	1	50.5	47.5	51.2
14 Aclare Place	2	53.7	50.7	53.3
15 Aclare Place	1	51.8	48.8	51.9
16 Aclare Place	1	54.7	51.5	55
17 Aclare Place	2	54.6	51.6	53.4
17 Aclare Place	1	48.3	45.3	45.8
19 Aclare Place	1	54.7	51.8	54.5
21 Aclare Place	1	60.3	57.4	62.8
23 Aclare Place	1	71.6	68.5	68.8
25 Aclare Place	1	71.2	68.3	68.5
2 Adrigole Place	1	50.8	46	46.8
3 Ardkeen Place	1	49.9	45.6	46.6
5 Ardkeen Place	1	53.4	49.1	50.6
6 Ardkeen Place	1	49.6	45.3	45.9
7 Ardkeen Place	1	52.9	48.4	48.9
8 Ardkeen Place	1	51.1	46.7	47.4
9 Ardkeen Place	1	55.2	50.7	51.7

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
10 Ardkeen Place	1	54.3	49.7	52.5
11 Ardkeen Place	1	50.4	46.3	46.8
12 Ardkeen Place	1	57	52.4	54.4
13 Ardkeen Place	1	56.3	51.6	52.1
14 Ardkeen Place	1	71.1	66.2	66.4
15 Ardkeen Place	1	53.5	49.3	51.1
16 Ardkeen Place	1	70.5	65.6	65.9
17 Ardkeen Place	1	54	50.9	51.1
18 Ardkeen Place	1	70.1	65.2	65.5
19 Ardkeen Place	1	56.5	53.2	53.5
20 Ardkeen Place	1	70.2	65.4	65.5
22 Ardkeen Place	1	70.2	65.4	65.5
24 Ardkeen Place	1	69.2	64.4	64.7
26 Ardkeen Place	1	70.6	65.8	66
28 Ardkeen Place	1	71.1	66.4	66.6
30 Ardkeen Place	1	60.8	57.3	57.7
6 Ballydonegan Rise	1	49.5	44.5	45.2
7 Balrath Road	1	56.3	51.5	52.4
8 Balrath Road	1	57	52.2	53.5
9 Balrath Road	1	58.9	54	54.9
10 Balrath Road	1	59.8	55	55.8
11 Balrath Road	1	61.3	56.6	57.7
12 Balrath Road	1	69.2	64.3	64.8
1 Banville Road	1	69.3	64.2	63.8
2 Banville Road	1	69.4	64.3	64.7
3 Banville Road	1	60.8	55.6	55.4
5 Banville Road	1	57	52	51.7
7 Banville Road	1	55.2	50.1	50.3
2 Belinda Avenue	1	68.1	65.6	66.6
5 Belinda Avenue	1	61	57.5	62.3
6 Belinda Avenue	1	61.9	58.8	60.9
6 Belinda Avenue	2	62.5	59.3	61
7 Belinda Avenue	1	59.6	55.9	57.7
8 Belinda Avenue	1	58.2	54.6	57

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
9 Belinda Avenue	1	58.6	55.1	56.2
11 Belinda Avenue	1	58.1	54.6	57.1
5 Beragh Place	1	49.1	46.1	46.6
6 Beragh Place	1	49	46	46.5
7 Beragh Place	1	49.5	46.5	47
8 Beragh Place	1	50.6	47.7	48.2
9 Beragh Place	1	52	49.1	49.6
10 Beragh Place	1	52.2	49.3	49.7
11 Beragh Place	1	52.1	49.2	49.6
12 Beragh Place	1	52.6	49.7	50.6
2 Blowers Place	1	56.1	51.4	52.6
3 Blowers Place	1	54.8	50.4	51
4 Blowers Place	1	51.7	47.3	48.3
5 Blowers Place	1	54.5	50	50.3
6 Blowers Place	1	52.3	48	49.3
7 Blowers Place	1	56.7	52.4	53
8 Blowers Place	1	51.8	47.5	48.5
9 Blowers Place	1	55.6	51.2	52
10 Blowers Place	1	52	47.7	48.6
11 Blowers Place	1	56.4	51.9	52.7
13 Blowers Place	1	53.5	49.2	50
3 Boderg Way	1	49.7	46.7	47.2
4 Boderg Way	1	54.4	51.3	51.9
5 Boderg Way	1	52	49	49.8
6 Boderg Way	1	57.4	54.2	55
7 Boderg Way	1	52.5	49.3	49.9
8 Boderg Way	1	59.1	56.1	56.6
9 Boderg Way	1	49.3	46.3	46.7
10 Boderg Way	1	63.4	60.3	61.1
11 Boderg Way	1	51.4	48.4	48.9
12 Boderg Way	1	72.2	69.4	69.3
13 Boderg Way	1	53	50.1	51.7
15 Boderg Way	1	52.3	49.3	50
17 Boderg Way	1	55.6	52.6	53.4

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
19 Boderg Way	1	59	55.9	56.3
21 Boderg Way	2	67.6	64.7	65
3 Borris Close	1	52.5	49.5	51.1
5 Borris Close	1	55.2	52.3	55
6 Borris Close	1	50.7	47.8	49.9
7 Borris Close	1	58.3	55.3	57
8 Borris Close	1	54.8	51.9	53.5
9 Borris Close	1	61.6	58.6	59.9
10 Borris Close	1	61.3	58.3	59.5
11 Borris Close	1	67.6	64.6	66.1
5 Brinlack Drive	1	55.4	52.5	52.8
6 Brinlack Drive	1	56.8	53.9	53.4
7 Brinlack Drive	1	52.3	49.3	50.6
8 Brinlack Drive	1	59.3	56.4	56
9 Brinlack Drive	1	59.6	56.7	57.1
10 Brinlack Drive	1	61.6	58.6	58.4
11 Brinlack Drive	1	60.7	57.8	59.5
13 Brinlack Drive	1	62.9	59.9	60.1
15 Brinlack Drive	1	70.3	67.4	67.5
7 Brittas Place	1	50.4	47.3	48.1
9 Brittas Place	1	63.3	60.4	60.1
10 Brittas Place	1	54.4	51.2	51.9
11 Brittas Place	1	63.7	60.8	60.9
12 Brittas Place	1	55.7	52.7	53.5
13 Brittas Place	1	64.4	61.4	64.8
14 Brittas Place	1	57	53.9	55.5
16 Brittas Place	1	58.4	55.3	57.4
18 Brittas Place	1	69.2	66.1	66.6
7A Brittas Place	1	55.8	52.7	53.5
5 Brosna Place	1	50.4	45.9	46.7
7 Brosna Place	1	50.4	45.8	46.6
8 Brosna Place	1	52.5	47.8	48.5
9 Brosna Place	1	53.9	49.4	50.8
10 Brosna Place	1	50.2	45.8	46.5

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
11 Brosna Place	1	52.9	48.4	49
12 Brosna Place	1	51.8	47	47.8
14 Brosna Place	1	52.5	47.8	48.4
16 Brosna Place	1	55.2	50.5	51.1
14 Caltra Place	1	57.2	54	54.9
16 Caltra Place	1	56.9	53.8	54.7
17 Caltra Place	1	51.5	48.5	48.9
18 Caltra Place	1	55.4	52.3	53.1
19 Caltra Place	1	53	49.9	51.1
20 Caltra Place	1	57	53.4	54.8
21 Caltra Place	1	52.3	49.2	49.6
22 Caltra Place	1	61.3	57.2	57.8
23 Caltra Place	1	57.3	54.3	54.9
24 Caltra Place	1	69.8	66.6	66.8
26 Caltra Place	1	69.9	66.8	66.8
1 Cashmore Place	1	51.2	47.3	48.3
2 Cashmore Place	1	51.6	47.3	48.3
7 Chapletown Drive	1	53.5	50.6	50.9
9 Chapletown Drive	1	51.6	48.6	50
10 Chapletown Drive	2	56.3	53.5	54
11 Chapletown Drive	1	57	54.1	54.4
12 Chapletown Drive	2	57.7	54.8	55.1
13 Chapletown Drive	1	56.8	54	53.8
14 Chapletown Drive	1	52.1	49.1	49.4
15 Chapletown Drive	1	62.2	59.3	59.8
16 Chapletown Drive	1	60.5	57.7	58.3
17 Chapletown Drive	1	68.6	65.6	65.9
3 Clavoy Place	1	50.4	45.8	46.5
5 Clavoy Place	1	55.6	50.8	51.5
6 Clavoy Place	1	49.9	45.3	46
7 Clavoy Place	1	54.2	49.5	50.6
9 Clavoy Place	1	53.5	48.7	50.4
11 Clavoy Place	1	54.7	50	51.5
13 Clavoy Place	1	50.9	46.2	46.9

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
15 Clavoy Place	1	56.7	51.9	52.8
17 Clavoy Place	2	53.9	49.4	50.3
19 Clavoy Place	2	59	54.3	55
21 Clavoy Place	2	59	54.3	55.1
23 Clavoy Place	2	56.4	51.7	53.2
25 Clavoy Place	2	56.4	51.7	53.2
27 Clavoy Place	2	57.2	52.4	53.2
29 Clavoy Place	2	59.8	55	55.5
31 Clavoy Place	2	59.2	54.3	55.2
33 Clavoy Place	1	62.3	57.3	57.1
7 Coleraine Place	1	49.4	46.4	46.9
9 Coleraine Place	1	51.6	48.6	49.1
10 Coleraine Place	1	49.8	46.8	47.7
11 Coleraine Place	1	54.1	51.1	51.9
12 Coleraine Place	1	55.8	52.6	53.1
13 Coleraine Place	1	57.1	53.9	54.6
14 Coleraine Place	1	55.7	52.6	53.3
10A Coleraine Place	2	55.9	52.8	53.5
10 Corrofin Drive	1	50.5	45.7	46.3
12 Corrofin Drive	1	51.6	46.9	47.6
14 Corrofin Drive	1	54.3	49.3	50
16 Corrofin Drive	1	53.5	48.6	49.3
18 Corrofin Drive	1	52.2	47.3	48
20 Corrofin Drive	1	51.4	46.6	47.3
22 Corrofin Drive	1	58.7	53.9	54.4
24 Corrofin Drive	1	51.4	46.6	47.7
26 Corrofin Drive	1	58.1	53.2	54.8
28 Corrofin Drive	1	51.3	46.5	47.2
30 Corrofin Drive	1	51.6	46.7	48
32 Corrofin Drive	1	54.5	49.5	50.1
34 Corrofin Drive	1	54.7	49.9	50.5
36 Corrofin Drive	1	53.2	48.4	49.1
31 Craigavon Drive	1	50.5	45.7	46.5
32 Craigavon Drive	1	54.5	49.7	50.4

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
33 Craigavon Drive	1	52.6	47.6	48.5
34 Craigavon Drive	1	63	58.1	58.3
35 Craigavon Drive	1	56.9	51.9	52.6
8 Cratloe Lane	1	68.3	65.3	65.9
8 Cratloe Lane	1	68.3	65.3	65.9
424 East Tamaki Road	1	54.5	49.3	51.3
426 East Tamaki Road	1	54.8	49.7	51.3
2 Franco Lane	1	68.7	65.8	66.3
4 Franco Lane	1	67.9	64.9	66
6 Franco Lane	1	67.5	64.6	66.3
8 Franco Lane	1	67.4	64.4	66.3
10 Franco Lane	1	67.9	65	66.3
12 Franco Lane	1	67.2	64.3	65.7
8A Franco Lane	1	67.5	64.6	66.3
9 Gordal Place	2	50	44.8	45.9
10 Gordal Place	1	47.9	42.7	43.5
12 Gordal Place	1	48.8	43.6	44.5
13 Gordal Place	2	53.7	48.5	49
13 Gordal Place	2	51.8	46.7	47.4
15 Gordal Place	2	56.3	51.1	52
16 Gordal Place	1	49.4	44.1	46.5
18 Gordal Place	1	51.1	45.7	49.4
20 Gordal Place	1	57.8	52.5	52.2
8 Gransna Lane	1	68.1	63.5	64.1
10 Gransna Lane	1	68.4	63.8	64.3
12 Gransna Lane	1	69	64.4	64.9
14 Gransna Lane	1	68	63.4	63.9
16 Gransna Lane	1	69	64.5	65
18 Gransna Lane	1	68.9	64.3	64.8
20 Gransna Lane	1	68.9	64.3	64.9
22 Gransna Lane	2	61.7	57.1	57.6
24 Gransna Lane	2	69.6	65.2	65.8
40 Haven Drive	3	55.6	51.6	50.3
42 Haven Drive	3	55.8	52	50.8

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
44 Haven Drive	3	43.1	39.8	39.7
46 Haven Drive	3	55.6	51.7	50.8
48 Haven Drive	3	55.3	51.7	50.8
50 Haven Drive	3	55.3	51.6	50.8
52 Haven Drive	3	55.4	51.8	50.9
54 Haven Drive	3	55.5	51.8	50.9
4/29 Haven Drive	3	49	46	47.9
43-47 Haven Drive	3	66.8	63.2	62.6
8 Kalmore Place	1	48	42.8	43.7
9 Kalmore Place	2	51.4	46.2	47.5
10 Kalmore Place	1	48	42.9	43.7
11 Kalmore Place	2	53.1	47.9	49.7
12 Kalmore Place	1	48.5	43.2	44
13 Kalmore Place	2	53.7	48.5	50.2
14 Kalmore Place	2	54.6	49.4	50.2
15 Kalmore Place	2	59.2	53.8	54.7
16 Kalmore Place	1	55.6	50.4	52.2
2 Kanturk Close	1	58.3	55.4	56.1
3 Kanturk Close	1	68.9	65.9	66.2
4 Kanturk Close	1	68.1	65.1	65.7
1 Kellaway Drive	1	55.7	51.6	52
7 Kellaway Drive	1	51.8	48.8	49.5
11 Kellaway Drive	1	57.5	54.6	54.9
13 Kellaway Drive	1	53.1	50.2	51.1
15 Kellaway Drive	2	58.9	55.9	56.4
17 Kellaway Drive	1	58.9	55.9	56.4
21 Kellaway Drive	1	55.5	52.6	52.8
23 Kellaway Drive	1	53.6	50.7	51.8
33 Kellaway Drive	1	68.9	65.9	66
35 Kellaway Drive	1	69.2	66.2	66.3
41 Kellaway Drive	2	69.1	66.1	66.2
43 Kellaway Drive	1	68.4	65.5	66.1
45 Kellaway Drive	2	68.8	65.8	65.9
1/25 Kellaway Drive	2	54.5	51.6	52.3

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
2/25 Kellaway Drive	2	52.7	49.8	50.3
3/25 Kellaway Drive	2	53.7	50.8	51.1
1/27 Kellaway Drive	2	56	53	53.3
2/27 Kellaway Drive	2	58.4	55.4	55.2
3/27 Kellaway Drive	2	61	57.9	57.7
29-31 Kellaway Drive	2	69.3	66.3	66.5
2 Kilbaha Close	2	53.1	49.8	50.4
3 Kilbaha Close	1	50.4	47.2	47.6
4 Kilbaha Close	1	51.9	48.7	49.2
5 Kilbaha Close	1	58.1	54.1	54.6
6 Kilbaha Close	1	57.6	54.4	55.3
7 Kilbaha Close	1	58.9	54.8	55.3
8 Kilbaha Close	1	69.6	66.5	66.6
9 Kilbaha Close	1	59.4	55.3	55.9
10 Kilbaha Close	1	69.5	66.5	66.6
11 Kilbaha Close	1	63.3	59.3	59.8
12 Kilbaha Close	1	70.1	66.9	67.1
13 Kilbaha Close	1	68.4	65	65.4
2A Kilbaha Close	1	48.6	45.6	45.9
2 Kippure Close	1	59.8	56.8	57.1
3 Kippure Close	1	56.6	53.7	54
4 Kippure Close	1	68.9	65.9	66.1
4 Kippure Close	2	63.9	60.9	61.2
5 Kippure Close	1	59.7	56.7	56.9
7 Kippure Close	1	69.1	66.1	66.3
4 Leixlep Lane	2	67.9	65	65.4
4 Leixlep Lane	2	69	66	66.3
4 Leixlep Lane	2	57.3	54.4	55.6
6 Leixlep Lane	2	68.5	65.5	65.9
8 Leixlep Lane	2	68.5	65.5	66
10 Leixlep Lane	2	68.5	65.5	66.1
12 Leixlep Lane	2	68.5	65.6	66.1
14 Leixlep Lane	2	68.4	65.4	66
16 Leixlep Lane	1	68.1	65	65.6

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
18 Leixlep Lane	1	68.1	65.1	65.4
20 Leixlep Lane	1	68.9	65.6	65.7
2 Leneford Drive	2	68.2	65.3	65.7
4 Leneford Drive	2	68.3	65.3	65.7
6 Leneford Drive	2	68.3	65.3	65.7
8 Leneford Drive	2	68.3	65.4	65.7
10 Leneford Drive	2	68.3	65.3	65.7
12 Leneford Drive	2	68.3	65.3	65.6
14 Leneford Drive	2	68.3	65.3	65.6
16 Leneford Drive	2	68.3	65.3	65.6
18 Leneford Drive	2	59.3	56.3	56.9
20 Leneford Drive	2	54.4	51.4	51.7
22 Leneford Drive	2	50	47.1	47.5
24 Leneford Drive	2	50	47.1	47.5
26 Leneford Drive	2	50.1	47.2	47.5
28 Leneford Drive	2	50.2	47.2	47.6
30 Leneford Drive	2	52.4	49.5	50
32 Leneford Drive	2	57.9	55	55.7
2 Marlon Lane	1	69.2	66.2	66.6
4 Marlon Lane	1	69.3	66.3	66.6
6 Marlon Lane	1	69	66	66.4
8 Marlon Lane	1	69.1	66.2	66.6
4A Marlon Lane	1	69.2	66.2	66.6
8 Matarangi Road	1	51.2	45.5	45.7
9 Matarangi Road	1	46.8	43.5	43.9
10 Matarangi Road	1	52.8	49.8	51.6
11 Matarangi Road	1	47.4	44.4	44.7
12 Matarangi Road	1	51.4	48.4	48.6
13 Matarangi Road	1	47.4	44.4	44.7
14 Matarangi Road	2	54.3	51.2	51.4
15 Matarangi Road	2	48	44.9	45.3
16 Matarangi Road	1	50.9	47.9	48.2
17 Matarangi Road	2	48.2	45.2	45.6
18 Matarangi Road	1	49.4	46.4	46.7

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
19 Matarangi Road	2	48.1	45.1	45.5
20 Matarangi Road	1	49.1	46.2	48.2
21 Matarangi Road	2	48.1	45.1	45.6
23 Matarangi Road	2	51.4	48.4	49.8
25 Matarangi Road	2	52.7	49.8	51.7
27 Matarangi Road	1	51.8	48.9	51.5
29 Matarangi Road	1	47.1	44.1	45.5
30 Matarangi Road	3	70.4	67.4	67.6
8A Matarangi Road	1	54	48.3	57.7
35 Medvale Avenue	1	52.1	49.4	50.4
37 Medvale Avenue	1	57.8	55.1	55.9
39 Medvale Avenue	1	58.7	55.9	56.9
41 Medvale Avenue	1	64.9	61.9	62.1
42 Michael Jones Drive	1	54.4	49.7	50.7
48 Michael Jones Drive	1	52.2	47.8	50.1
50 Michael Jones Drive	1	51	46.7	47.7
52 Michael Jones Drive	1	51.7	47.3	49.7
54 Michael Jones Drive	1	50.4	46	47.1
56 Michael Jones Drive	1	57.3	52.7	51.4
58 Michael Jones Drive	1	62.5	57.8	63.1
60 Michael Jones Drive	1	60.6	56.2	60.3
62 Michael Jones Drive	1	53.8	49.3	50.4
64 Michael Jones Drive	1	50.3	45.9	47.2
66 Michael Jones Drive	1	50.7	46.3	47.2
68 Michael Jones Drive	1	49.9	45.5	46.4
72 Michael Jones Drive	1	51.8	47.5	48.7
76 Michael Jones Drive	1	52.9	48.5	49.9
1 Mika Court	1	59.4	54.9	57.5
2 Mika Court	1	62.4	58	58.8
3 Mika Court	1	68.7	64.2	65
4 Mika Court	1	64.8	60.3	64.7
5 Mika Court	1	67.5	63	63.9
7 Mika Court	1	65.2	60.7	61.9
9 Mika Court	1	71.6	67.2	67.8

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
8 Monash Place	2	49.7	44.6	45.5
9 Monash Place	1	49.6	44.4	46.3
10 Monash Place	1	48.6	43.4	44.3
11 Monash Place	1	48.3	43.1	44
12 Monash Place	1	49.2	44.1	45
13 Monash Place	1	48.3	43.1	43.9
14 Monash Place	1	57.6	52.4	53.8
15 Monash Place	2	60.2	55	55.7
16 Monash Place	1	62.3	57.1	58.2
2 Moravale Lane	1	69.6	64.2	65.1
3 Moravale Lane	2	70	64.7	65.3
4 Moravale Lane	1	69.2	63.8	64
5 Moravale Lane	2	69.9	64.5	65.2
6 Moravale Lane	1	69.7	64.4	65.1
7 Moravale Lane	2	69.6	64.3	65
8 Moravale Lane	2	69.6	64.3	65.2
10 Moravale Lane	2	69.4	64.1	65.2
12 Moravale Lane	2	69.2	63.9	65
3 Opito Way	3	48.4	43.6	42.3
5 Opito Way	3	48.1	43.9	42.7
1/1 Opito Way	3	48.4	43.2	42.1
4 Redcastle Drive	1	61.7	57	57.5
5 Redcastle Drive	2	60.1	55.4	55.9
6 Redcastle Drive	1	58.5	53.8	54.2
8 Redcastle Drive	1	56.7	52.1	52.5
10 Redcastle Drive	1	55	50.3	50.7
86 Redcastle Drive	1	48.5	44.2	44.8
87 Redcastle Drive	1	50.3	45.8	46.5
88 Redcastle Drive	1	49.6	45.3	45.8
89 Redcastle Drive	1	50	45.5	46.2
90 Redcastle Drive	1	50	45.6	48
92 Redcastle Drive	1	55.1	50.5	51
94 Redcastle Drive	1	55.9	51.4	51.8
96 Redcastle Drive	1	54.1	49.5	51.5

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
98 Redcastle Drive	1	55.5	51	53.9
100 Redcastle Drive	1	52.4	47.8	48.4
102 Redcastle Drive	1	55.6	50.8	52
104 Redcastle Drive	2	56.6	51.9	52.7
106 Redcastle Drive	2	56.6	51.9	52.8
108 Redcastle Drive	2	57	52.3	53
5A Redcastle Drive	1	56.4	51.6	52.1
81A Redcastle Drive	1	50.6	46.2	46.9
1 Reinheimer Place	1	53.3	47.9	49
2 Reinheimer Place	2	53.4	47.9	49
3 Reinheimer Place	1	52.9	47.3	48.1
4 Reinheimer Place	1	53	47.5	48.1
5 Reinheimer Place	1	54.9	49.3	49.5
6 Reinheimer Place	1	55.5	49.9	50.1
7 Reinheimer Place	2	60	54.6	53.4
8 Reinheimer Place	1	70.9	65.2	65.8
9 Reinheimer Place	1	61.5	56.1	53.7
10 Reinheimer Place	1	72.1	66.4	66.8
11 Reinheimer Place	1	66.9	61.3	60.7
13 Reinheimer Place	1	67.1	61.5	60.5
3 Riechelmann Court	1	53	48.6	49.9
4 Riechelmann Court	1	52.3	47.9	48.9
5 Riechelmann Court	1	55	50.6	51.1
6 Riechelmann Court	1	55.6	51.2	51.3
7 Riechelmann Court	1	56	51.3	51.9
8 Riechelmann Court	1	68.6	64.1	64.4
9 Riechelmann Court	1	59.9	55.4	59.4
10 Riechelmann Court	1	69.5	65	65.9
11 Riechelmann Court	1	61.8	57.3	59.1
12 Riechelmann Court	1	66.6	62.1	64.1
13 Riechelmann Court	1	70.9	66.4	67.4
15 Robin Brooke Drive	1	56.5	52.1	53.1
17 Robin Brooke Drive	1	52.7	48.4	49.3
19 Robin Brooke Drive	1	57.5	52.9	53.8

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
20 Robin Brooke Drive	1	54.1	50.1	52.3
21 Robin Brooke Drive	1	62.9	58.4	59.6
22 Robin Brooke Drive	1	56.4	52.1	53.9
23 Robin Brooke Drive	1	54.5	50.1	51.1
24 Robin Brooke Drive	1	56.3	52	53
25 Robin Brooke Drive	1	57	52.5	53.4
27 Robin Brooke Drive	1	58.1	53.8	54.6
29 Robin Brooke Drive	1	54.3	50	50.8
30 Robin Brooke Drive	1	53.4	49.7	50.8
32 Robin Brooke Drive	1	53.5	49.9	51
34 Robin Brooke Drive	1	53.4	50	51.1
35 Robin Brooke Drive	1	57.1	52.8	53.5
36 Robin Brooke Drive	1	53.2	49.8	50.9
37 Robin Brooke Drive	1	58.5	54.4	57.1
38 Robin Brooke Drive	1	53.1	49.6	50.7
39 Robin Brooke Drive	1	57.9	53.8	55
40 Robin Brooke Drive	1	52.4	48.9	50
41 Robin Brooke Drive	1	58.9	54.7	55.7
42 Robin Brooke Drive	1	51.6	48.3	49.3
43 Robin Brooke Drive	1	58	53.9	54.8
45 Robin Brooke Drive	1	58	53.7	54.5
47 Robin Brooke Drive	1	61.9	57.7	58.4
49 Robin Brooke Drive	1	59.1	55.2	57.6
51 Robin Brooke Drive	1	60	56.2	60.5
53 Robin Brooke Drive	1	55.6	52.1	53.8
55 Robin Brooke Drive	1	53.5	50	51.7
1 Sheddings Lane	1	69.4	64.6	65.2
3 Sheddings Lane	1	68.9	64.1	64.5
4 Sheddings Lane	2	69.7	64.9	65.2
5 Sheddings Lane	1	69.5	64.7	65.1
6 Sheddings Lane	2	69.5	64.7	65.1
7 Sheddings Lane	1	69.4	64.6	65
8 Sheddings Lane	1	69.4	64.6	65.2
9 Sheddings Lane	1	68.6	63.7	64.5

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
10 Sheddings Lane	1	69.6	64.7	65.2
11 Sheddings Lane	1	69.1	64.2	64.7
12 Sheddings Lane	1	69.6	64.7	65.2
14 Sheddings Lane	1	69.6	64.7	65.2
16 Sheddings Lane	1	69.7	64.8	65.2
18 Sheddings Lane	1	69.5	64.6	65.2
20 Sheddings Lane	1	69.7	64.8	65.2
22 Sheddings Lane	2	69.9	65	65.4
24 Sheddings Lane	2	69.7	64.9	65.4
26 Sheddings Lane	2	69.7	64.8	65.3
28 Sheddings Lane	2	69.6	64.7	65.2
30 Sheddings Lane	1	71.7	66.7	66.9
4 Shingleton Lane	2	69.6	64.3	65
6 Shingleton Lane	2	69.6	64.3	65
7 Shingleton Lane	2	68.9	63.6	64.2
8 Shingleton Lane	2	69.6	64.2	64.9
10 Shingleton Lane	2	70.1	64.7	65.3
12 Shingleton Lane	2	70.1	64.7	65.3
14 Shingleton Lane	2	70	64.6	65.2
16 Shingleton Lane	2	70	64.6	65.2
5 Siedeberg Drive	1	52.3	46.8	46.7
13 Siedeberg Drive	2	59.9	54.2	54.6
13 Siedeberg Drive	1	59	53.3	54.2
15 Siedeberg Drive	1	67.3	61.6	62.4
150 Smales Road	1	54	50	50.9
11 Speyside Crescent	2	49.3	44.1	45.5
12 Speyside Crescent	1	47.6	42.4	43.2
13 Speyside Crescent	2	50.5	45.3	46.1
14 Speyside Crescent	1	48.5	43.3	44.1
15 Speyside Crescent	1	48.4	43.1	44
16 Speyside Crescent	1	56.3	51	50.6
17 Speyside Crescent	2	53.8	48.7	56.5
18 Speyside Crescent	2	52.5	47.3	48
19 Speyside Crescent	2	70	64.6	66.2

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
20 Speyside Crescent	2	51.4	46.2	47
21 Speyside Crescent	2	69.7	64.4	65.1
22 Speyside Crescent	2	49	43.8	44.7
23 Speyside Crescent	2	69.8	64.4	64.9
24 Speyside Crescent	2	48.7	43.5	44.4
25 Speyside Crescent	2	70.3	65	65.4
27 Speyside Crescent	2	70	64.7	65
37 Speyside Crescent	2	54.2	48.6	49.1
3 Srah Place	1	50	46	47.1
5 Srah Place	2	55	50.8	51.7
7 Srah Place	1	52.3	48.1	50
9 Srah Place	1	52.4	48.2	50.3
11 Srah Place	1	53.9	49.5	52.1
12 Srah Place	1	55.4	52.3	52.8
13 Srah Place	1	57.2	52.5	54.1
14 Srah Place	1	59.5	56	56.3
15 Srah Place	2	70	65.6	66.4
16 Srah Place	1	61.5	58.1	58.5
18 Srah Place	1	66.9	62.9	63.8
20 Srah Place	1	69.3	65	65.6
22 Srah Place	1	68.8	64.4	65.4
24 Srah Place	1	68.3	63.9	65
26 Srah Place	1	67.9	63.5	64.5
6 Strundeen Close	2	54.4	49.1	50.3
8 Strundeen Close	1	54.5	49.2	50.1
9 Strundeen Close	2	54.7	49.3	50.7
10 Strundeen Close	1	55.7	50.5	51.2
11 Strundeen Close	2	57.2	51.8	52.9
12 Strundeen Close	1	58.9	53.6	55
13 Strundeen Close	2	59.4	54.1	55.1
15 Strundeen Close	2	62.2	56.8	57.9
17 Strundeen Close	2	69.9	64.6	65.2
203 Te Irirangi Drive	1	70.9	66.6	67.5
205 Te Irirangi Drive	1	70.4	66	66.7

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
207 Te Irirangi Drive	1	70.7	66.4	67.1
209 Te Irirangi Drive	1	70.7	66.3	67.1
211 Te Irirangi Drive	1	70.8	66.3	67.1
213 Te Irirangi Drive	1	71.1	66.6	67.6
226 Te Irirangi Drive	1	57.6	55	57.6
228 Te Irirangi Drive	1	67.7	65.2	66
311 Te Irirangi Drive	1	61.2	55.7	56.8
311 Te Irirangi Drive	1	61.6	56.2	57.7
311 Te Irirangi Drive	2	64.2	58.5	59.6
487 Te Irirangi Drive	1	72.3	67	67.3
491 Te Irirangi Drive	2	72.5	67.2	67.5
1 Tonu'U Court	1	51.8	47.4	48.1
3 Tonu'U Court	1	55.6	51.2	49.6
5 Tonu'U Court	1	59.3	54.6	54.3
7 Tonu'U Court	1	68.9	64.3	64.8
8 Tonu'U Court	1	61.7	57	56.9
9 Tonu'U Court	1	69.1	64.5	62.4
10 Tonu'U Court	1	68.5	63.9	64.9
11 Tonu'U Court	1	65.3	60.8	62.9
12 Tonu'U Court	1	67.3	62.7	63.6
14 Tonu'U Court	1	64.9	60.3	61.2
16 Tonu'U Court	1	71.1	66.6	67
4 Treneary Lane	1	69.6	63.9	64.6
15 Treneary Lane	1	71.5	65.8	66.6
17 Treneary Lane	1	65.6	59.8	60.9
2 Vidiri Court	1	55.2	50.8	51.6
3 Vidiri Court	1	56.7	52	53
4 Vidiri Court	1	57.9	53.5	54.2
5 Vidiri Court	1	58.1	53.6	54.6
6 Vidiri Court	1	61.5	57	57.8
7 Vidiri Court	1	58.5	54	54.8
8 Vidiri Court	1	63.9	59.3	60.1
9 Vidiri Court	1	61.6	57	58
10 Vidiri Court	1	69.8	65.2	66

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
11 Vidiri Court	1	69.6	65.1	65.8
12 Vidiri Court	1	65.6	61	61.9
13 Vidiri Court	1	68.2	63.7	64.4
14 Vidiri Court	1	71.1	66.6	67.3
15 Vidiri Court	1	66.3	61.7	62.4
17 Vidiri Court	1	61.9	57.3	58
19 Vidiri Court	1	71.7	67.1	67.5
9 Walter Haddrell Crescent	1	47.6	42.5	43.4
10 Walter Haddrell Crescent	1	48.7	43.6	44.5
11 Walter Haddrell Crescent	1	49.4	44.2	45.5
12 Walter Haddrell Crescent	1	52.2	47	49.3
13 Walter Haddrell Crescent	1	58.8	53.4	54.3
14 Walter Haddrell Crescent	2	54.8	49.6	51.6
15 Walter Haddrell Crescent	1	58.5	53.2	54.8
16 Walter Haddrell Crescent	2	51.8	46.6	47.8
17 Walter Haddrell Crescent	1	58.2	53	54.4
19 Walter Haddrell Crescent	1	59.1	53.7	56.3
21 Walter Haddrell Crescent	1	48.8	43.6	44.4
23 Walter Haddrell Crescent	1	53.1	48	49.8
25 Walter Haddrell Crescent	1	48.4	43.3	44.2
27 Walter Haddrell Crescent	1	47.7	42.6	43.5
2 Wando Lane	1	67.7	62.9	63.5
4 Wando Lane	1	69.2	64.4	65
6 Wando Lane	2	69.1	64.3	64.9
8 Wando Lane	2	69.1	64.3	64.9
10 Wando Lane	2	69	64.3	64.8
12 Wando Lane	1	68.9	64	65.1
14 Wando Lane	1	69.1	64.3	64.9
16 Wando Lane	1	69.2	64.4	65
18 Wando Lane	2	68.9	64.1	64.7
20 Wando Lane	2	68.7	63.9	64.5
22 Wando Lane	2	61.4	56.6	57.2
24 Wando Lane	2	70	65.3	65.8
1 Wayne Francis Drive	1	54.4	51.2	50.4

PPF Address (NoR 1)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, traffic 2048)	Do-Minimum (Project, traffic 2048)
		dB LAeq(24h)		
3 Wayne Francis Drive	1	51.3	47.2	49.2
5 Wayne Francis Drive	1	50.2	46	46.8
3 Whetstone Road	1	55.7	52.1	53
4 Whetstone Road	1	54.8	52.1	53.7
5 Whetstone Road	1	58.3	54.8	55.6
6 Whetstone Road	1	55.4	52.6	53.6
7 Whetstone Road	1	60.8	57.2	58.3
8 Whetstone Road	1	62.7	59.9	60.8
9 Whetstone Road	1	63	59.5	62.1
10 Whetstone Road	1	67.1	63.7	64.8
7A Whetstone Road	1	55.3	52.2	53.2
9 William Woods Court	2	51.6	47	47.8
10 William Woods Court	1	49.7	44.7	45.5
11 William Woods Court	2	55.9	51	52
12 William Woods Court	2	54.4	49.1	50
13 William Woods Court	2	57.7	52.8	53.6
14 William Woods Court	2	57.8	52.5	53.4
15 William Woods Court	2	63.2	58.3	59
16 William Woods Court	1	70.6	65.3	65.8
17 William Woods Court	1	71	65.9	66.6
18 William Woods Court	2	71.3	66.1	66.5
19 William Woods Court	2	60.9	55.9	56.9
20 William Woods Court	2	63.3	58.3	59
21 William Woods Court	1	71.1	66	66.3

NoR 2

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
17 Amersham Way	16	54.0	53.9	55.9
2 Astral Place	1	49.9	48.4	49.7
2 Belinda Avenue	1	68.1	65.6	66.6
5 Belinda Avenue	1	61.0	57.5	62.3

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
6 Belinda Avenue	1	61.9	58.8	60.9
6 Belinda Avenue	2	62.5	59.3	61.0
7 Belinda Avenue	1	59.6	55.9	57.7
8 Belinda Avenue	1	58.2	54.6	57.0
9 Belinda Avenue	1	58.6	55.1	56.2
11 Belinda Avenue	1	58.1	54.6	57.1
1 Bledisloe Street	1	61.7	62.0	61.1
2 Bledisloe Street	1	67.1	67.4	65.5
5 Bledisloe Street	1	52.9	53.2	53.0
6 Bledisloe Street	1	51.5	51.8	50.4
7 Bledisloe Street	1	51.6	52.0	51.0
8 Bledisloe Street	1	51.6	51.8	48.9
10 Bledisloe Street	1	50.1	50.3	47.7
1A Bledisloe Street	1	56.1	56.3	55.8
5A Bledisloe Street	2	51.0	51.5	51.7
6A Bledisloe Street	2	51.7	52.1	52.2
7A Bledisloe Street	2	48.7	48.8	48.9
8A Bledisloe Street	2	50.3	50.6	51.0
1 Boundary Road	1	61.0	59.3	63.0
77 Boundary Road	1	47.3	45.8	46.6
81 Boundary Road	1	51.2	49.8	49.5
86 Boundary Road	1	50.1	48.4	50.0
88 Boundary Road	1	51.0	49.3	51.4
90 Boundary Road	1	51.1	49.3	51.9
92 Boundary Road	1	52.2	50.4	51.7
94 Boundary Road	1	54.3	52.4	52.6
96 Boundary Road	1	56.0	54.0	53.9
98 Boundary Road	1	59.6	57.7	56.1
100 Boundary Road	1	61.9	59.9	58.3
102 Boundary Road	1	63.7	61.7	59.8
104 Boundary Road	1	65.5	63.6	61.1
104 Boundary Road	1	62.5	60.6	59.5
113 Boundary Road	1	54.3	52.4	52.5
127 Boundary Road	2	58.5	56.5	61.1

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
129 Boundary Road	1	58.4	56.5	59.8
133 Boundary Road	1	55.7	53.8	54.9
1/75 Boundary Road	1	47.3	45.8	46.5
3/75 Boundary Road	1	47.4	45.8	46.6
2/79 Boundary Road	1	47.7	45.8	46.8
3/79 Boundary Road	1	48.3	46.6	49.2
1/82 Boundary Road	1	51.2	49.8	50.7
2/82 Boundary Road	1	49.4	47.5	49.3
1/84 Boundary Road	1	48.8	47.2	48.1
2/84 Boundary Road	1	49.5	47.8	49.4
1/104C Boundary Road	1	65.8	64.0	66.8
1/115 Boundary Road	1	49.1	47.3	53.8
1/119 Boundary Road	1	52.7	50.9	58.3
104A Boundary Road	1	53.8	52.0	54.1
115A Boundary Road	1	52.3	50.5	51.4
115C Boundary Road	1	52.4	50.6	56.7
131A Boundary Road	2	65.1	63.3	64.9
2/104C Boundary Road	1	64.2	62.4	64.7
2/119 Boundary Road	1	50.7	48.8	55.8
3/119 Boundary Road	1	52.5	50.7	56.1
92A Boundary Road	1	48.1	46.3	47.4
94A Boundary Road	1	48.5	46.7	47.9
3 Brooks Way	1	45.4	44.7	49.2
4 Brooks Way	1	47.3	46.8	57.1
5 Brooks Way	2	50.1	49.5	55.3
7 Brooks Way	1	45.2	44.7	50.2
8 Brooks Way	1	45.6	45.2	45.7
10 Brooks Way	2	48.9	48.3	49.8
11 Brooks Way	1	45.7	45.2	46.3
6A Brooks Way	1	47.4	47.0	51.8
6B Brooks Way	1	48.5	48.3	59.1
6C Brooks Way	1	46.3	46.1	58.2
3 Caldecote Place	1	49.2	46.5	48.2
5 Caldecote Place	1	49.4	47.0	48.5

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
6 Caldecote Place	1	48.7	46.2	47.7
7 Caldecote Place	1	48.9	46.4	48.3
8 Caldecote Place	1	49.0	46.4	47.4
129 Carruth Road	1	44.8	44.5	46.4
129 Carruth Road	1	44.8	44.6	46.7
131 Carruth Road	1	48.7	48.3	48.1
131 Carruth Road	1	45.2	44.9	49.3
133 Carruth Road	1	45.8	45.4	46.6
135 Carruth Road	1	51.6	51.3	51.1
135 Carruth Road	1	47.6	47.4	48.9
135 Carruth Road	2	52.3	52.2	57.2
137 Carruth Road	1	50.7	50.6	62.3
137 Carruth Road	1	52.3	52.0	61.4
137 Carruth Road	1	54.3	54.4	62.3
138 Carruth Road	1	53.6	53.1	53.0
140 Carruth Road	1	55.5	54.8	55.0
142 Carruth Road	1	56.4	55.7	55.7
146 Carruth Road	1	44.5	44.4	45.7
146 Carruth Road	1	45.8	45.4	47.2
148 Carruth Road	1	46.5	46.2	55.0
148 Carruth Road	1	58.3	57.8	58.3
150 Carruth Road	1	59.5	59.1	60.1
152 Carruth Road	1	61.6	61.1	62.7
133A Carruth Road	2	47.2	46.8	49.9
79 Charntay Avenue	1	53.5	51.6	52.0
81 Charntay Avenue	1	54.1	52.3	52.7
83 Charntay Avenue	1	54.2	51.9	55.3
85 Charntay Avenue	1	57.8	55.6	60.5
87 Charntay Avenue	1	58.6	56.7	63.8
1/68 Charntay Avenue	1	49.4	47.4	48.6
2/68 Charntay Avenue	1	51.7	49.9	50.6
1/70 Charntay Avenue	1	59.9	57.8	59.5
2/70 Charntay Avenue	1	57.3	55.2	57.3
3/70 Charntay Avenue	1	56.9	54.7	57.2

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
1/74 Charntay Avenue	1	60.0	57.9	57.6
2/74 Charntay Avenue	1	67.8	65.9	65.6
3/74 Charntay Avenue	1	64.2	62.2	62.4
4 Constance Place	1	48.6	47.1	47.6
6 Constance Place	1	53.8	52.0	52.5
8 Constance Place	1	54.2	52.5	52.8
10 Constance Place	1	56.6	54.8	55.2
12 Constance Place	1	50.9	49.2	49.5
13 Constance Place	1	51.5	49.7	50.3
13 Constance Place	1	50.4	48.7	49.5
4A Constance Place	2	55.5	54.0	54.5
37 Darnell Crescent	1	49.3	47.5	48.6
54 Darnell Crescent	1	51.0	49.2	50.4
159 Dawson Road	1	54.3	51.7	50.9
161 Dawson Road	1	57.3	54.8	53.4
163 Dawson Road	1	59.7	57.3	58.0
163 Dawson Road	1	53.2	51.2	55.9
165 Dawson Road	1	51.5	49.6	55.7
165 Dawson Road	1	52.8	50.8	55.3
169 Dawson Road	1	56.4	54.1	58.2
171 Dawson Road	1	52.6	49.9	52.0
173A Dawson Road	1	49.6	47.8	49.1
1 Dillon Crescent	1	51.6	49.9	51.9
3 Dillon Crescent	1	49.1	47.3	48.7
4 Dillon Crescent	1	48.6	46.8	48.2
53 Diorella Drive	1	49.1	47.6	49.8
55 Diorella Drive	1	55.4	54.0	54.7
57 Diorella Drive	1	57.1	55.7	56.3
59 Diorella Drive	1	57.7	56.2	62.3
66 Diorella Drive	1	60.0	58.4	60.0
68 Diorella Drive	1	69.3	67.7	68.5
1/64 Diorella Drive	1	54.6	52.9	54.9
2/64 Diorella Drive	1	53.4	51.8	53.7
3 Dissmeyer Drive	1	64.4	62.6	67.1

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
4 Dissmeyer Drive	1	55.2	53.1	57.1
5 Dissmeyer Drive	1	59.6	57.8	68.2
6 Dissmeyer Drive	1	53.5	51.7	54.8
7 Dissmeyer Drive	1	59.4	57.8	67.0
8 Dissmeyer Drive	1	52.3	50.5	53.5
9 Dissmeyer Drive	1	57.8	56.1	66.0
10 Dissmeyer Drive	1	51.0	49.3	51.7
11 Dissmeyer Drive	1	62.0	60.4	66.4
13 Dissmeyer Drive	1	55.8	54.1	58.8
14 Dissmeyer Drive	1	51.9	50.2	51.6
15 Dissmeyer Drive	1	52.6	51.0	63.8
16 Dissmeyer Drive	1	50.9	49.3	50.5
16 Dissmeyer Drive	1	47.5	45.7	46.5
17 Dissmeyer Drive	1	58.4	56.7	57.7
19 Dissmeyer Drive	1	57.9	56.3	57.1
20 Dissmeyer Drive	1	52.2	50.5	51.6
21 Dissmeyer Drive	1	58.5	56.8	57.8
23 Dissmeyer Drive	1	60.6	59.0	59.7
24 Dissmeyer Drive	1	51.9	50.2	52.1
25 Dissmeyer Drive	1	61.3	59.6	60.3
26 Dissmeyer Drive	1	51.4	49.7	51.6
27 Dissmeyer Drive	1	62.4	60.8	61.2
28 Dissmeyer Drive	1	51.6	49.9	51.6
29 Dissmeyer Drive	1	61.7	60.0	60.4
31 Dissmeyer Drive	1	60.0	58.3	60.4
31 Dissmeyer Drive	1	69.8	68.0	67.3
33 Dissmeyer Drive	1	62.9	61.1	61.2
34 Dissmeyer Drive	1	51.7	50.0	52.2
35 Dissmeyer Drive	1	64.3	62.6	62.7
36 Dissmeyer Drive	1	51.6	49.7	51.2
37 Dissmeyer Drive	1	64.2	62.5	62.6
38 Dissmeyer Drive	1	51.4	49.7	50.9
39 Dissmeyer Drive	1	62.9	61.2	61.4
39 Dissmeyer Drive	1	68.1	66.4	66.1

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
41 Dissmeyer Drive	1	63.0	61.3	61.7
41 Dissmeyer Drive	1	68.6	66.8	66.6
43 Dissmeyer Drive	1	61.0	59.3	59.8
45 Dissmeyer Drive	1	62.4	60.6	61.3
47 Dissmeyer Drive	1	60.4	58.5	58.0
47 Dissmeyer Drive	1	67.9	66.1	66.7
49 Dissmeyer Drive	1	67.4	65.6	66.1
49 Dissmeyer Drive	1	61.9	60.0	59.8
51 Dissmeyer Drive	1	62.0	60.1	60.8
51 Dissmeyer Drive	1	63.1	61.2	62.2
53 Dissmeyer Drive	1	53.3	51.6	53.3
55 Dissmeyer Drive	1	56.0	54.3	56.1
57 Dissmeyer Drive	1	56.8	54.9	56.1
29 Fitzroy Street	2	45.5	46.8	46.9
31 Fitzroy Street	2	46.3	46.6	46.9
33 Fitzroy Street	1	45.5	46.9	46.8
35 Fitzroy Street	1	44.3	45.0	45.1
37 Fitzroy Street	1	44.2	45.0	45.1
41 Fitzroy Street	1	50.5	50.8	49.8
43 Fitzroy Street	2	47.3	47.6	48.5
61 Fitzroy Street	1	49.5	49.8	50.6
63 Fitzroy Street	1	44.6	44.5	45.4
65 Fitzroy Street	1	45.3	45.3	46.1
67 Fitzroy Street	1	46.0	45.9	45.6
69 Fitzroy Street	1	43.3	43.3	46.2
71 Fitzroy Street	1	42.6	42.6	44.1
73 Fitzroy Street	1	46.2	46.0	47.1
75 Fitzroy Street	1	44.9	44.7	46.4
79 Fitzroy Street	1	50.7	50.5	54.5
87 Fitzroy Street	2	46.3	46.3	48.8
89 Fitzroy Street	1	43.5	43.4	47.8
91 Fitzroy Street	2	45.6	45.3	48.5
99 Fitzroy Street	1	48.7	48.7	52.2
99 Fitzroy Street	1	48.8	48.8	53.0

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
103 Fitzroy Street	1	49.2	49.3	52.7
105 Fitzroy Street	2	48.0	47.9	52.7
107 Fitzroy Street	1	45.1	44.9	46.4
2/77 Fitzroy Street	1	45.4	45.3	46.9
2/85 Fitzroy Street	1	51.2	51.0	53.8
1/95 Fitzroy Street	1	45.1	45.0	45.8
2/95 Fitzroy Street	1	45.3	45.3	49.5
3/95 Fitzroy Street	1	48.9	49.0	54.3
1/97 Fitzroy Street	1	46.1	46.0	47.8
2/97 Fitzroy Street	1	46.1	46.2	46.4
3/97 Fitzroy Street	1	46.6	46.7	48.4
4/97 Fitzroy Street	1	47.5	47.5	51.1
29A Fitzroy Street	1	45.3	46.5	46.5
31A Fitzroy Street	2	48.4	48.9	49.0
33A Fitzroy Street	2	48.9	50.6	50.2
35A Fitzroy Street	1	47.0	47.6	47.6
37A Fitzroy Street	1	45.5	46.2	46.3
45A Fitzroy Street	1	45.5	45.6	46.3
45B Fitzroy Street	1	45.6	45.7	46.4
45C Fitzroy Street	1	49.8	49.8	50.5
65B Fitzroy Street	1	44.3	44.3	44.9
65C Fitzroy Street	1	46.9	46.9	47.8
67A Fitzroy Street	2	50.9	50.9	52.8
69A Fitzroy Street	2	50.4	50.3	55.1
71A Fitzroy Street	2	45.3	45.1	46.2
71B Fitzroy Street	2	51.0	51.0	55.8
73A Fitzroy Street	2	47.6	47.4	48.5
73B Fitzroy Street	2	49.7	49.6	52.8
75A Fitzroy Street	1	47.4	47.3	51.3
77A Fitzroy Street	2	49.2	49.0	52.9
87A Fitzroy Street	2	47.5	47.3	49.7
87B Fitzroy Street	2	52.6	52.5	60.3
89A Fitzroy Street	2	48.0	47.9	55.7
91A Fitzroy Street	2	46.6	46.4	50.7

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
91B Fitzroy Street	2	50.5	50.4	57.9
93A Fitzroy Street	1	46.0	45.9	48.3
93B Fitzroy Street	1	46.5	46.3	56.3
1 Grayson Avenue	1	56.0	56.1	61.5
621 Great South Road	2	68.3	65.0	66.3
631 Great South Road	2	69.8	65.2	66.9
640 Great South Road	2	59.4	58.6	57.5
640 Great South Road	3	64.1	64.2	63.8
640 Great South Road	1	68.1	68.2	63.7
53 Hollyford Drive	1	53.2	51.2	51.9
53 Hollyford Drive	1	53.0	51.0	54.4
55 Hollyford Drive	1	53.2	51.0	52.4
55 Hollyford Drive	1	54.4	52.3	55.1
57 Hollyford Drive	1	58.2	56.1	57.6
57 Hollyford Drive	1	55.0	53.0	55.8
59 Hollyford Drive	1	62.5	60.5	63.3
64 Hollyford Drive	1	54.3	52.2	52.8
66 Hollyford Drive	1	57.5	55.6	57.2
66 Hollyford Drive	1	51.2	49.5	52.2
68 Hollyford Drive	1	58.3	56.4	57.4
70 Hollyford Drive	1	61.2	59.2	59.8
72A Hollyford Drive	1	64.3	62.3	65.3
72B Hollyford Drive	1	60.5	58.6	63.8
1 Ihaka Place	2	67.4	66.8	65.8
3 Ihaka Place	1	56.5	55.7	55.3
4 Ihaka Place	1	55.9	55.2	54.2
5 Ihaka Place	1	52.2	51.5	51.5
6 Ihaka Place	1	53.8	53.0	52.3
7 Ihaka Place	2	51.2	50.3	49.9
8 Ihaka Place	1	52.4	51.6	51.2
1/2 Ihaka Place	1	67.1	66.5	65.5
2/2 Ihaka Place	1	65.9	65.3	64.3
3/2 Ihaka Place	1	57.1	56.3	55.4
4/2 Ihaka Place	1	59.3	58.6	57.5

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
3 Jontue Place	1	53.3	52.1	52.0
5 Jontue Place	1	53.5	52.2	51.7
7 Jontue Place	2	68.6	67.0	66.6
7 Jontue Place	1	56.6	55.1	55.3
9 Jontue Place	1	63.1	61.6	60.1
10 Jontue Place	1	54.7	53.4	52.7
11 Jontue Place	1	55.9	54.4	53.7
11 Jontue Place	2	63.3	61.8	60.9
11 Jontue Place	1	61.7	60.1	58.3
12 Jontue Place	1	54.3	53.3	52.1
13 Jontue Place	1	58.1	56.6	55.4
14 Jontue Place	1	52.0	51.0	50.8
15 Jontue Place	1	57.1	55.6	54.4
16 Jontue Place	1	55.8	54.6	53.5
5A Jontue Place	1	56.2	54.7	55.3
2 Lambie Drive	1	68.3	67.8	66.9
5 Lambie Drive	2	67.7	66.7	65.7
19 Lambie Drive	1	65.0	64.1	63.6
1/7 Lambie Drive	1	63.7	62.7	61.9
2/7 Lambie Drive	1	57.9	56.9	56.0
3/7 Lambie Drive	1	55.9	55.1	54.3
1 Leila Place	1	68.8	67.5	67.2
2 Leila Place	1	54.4	53.1	53.3
2 Leila Place	1	67.2	65.9	65.6
4 Leila Place	1	54.8	53.5	53.5
6 Leila Place	1	55.6	54.1	54.2
9 Leila Place	1	49.9	48.5	48.8
1/3 Leila Place	1	54.7	53.3	53.4
2/3 Leila Place	1	58.9	57.4	57.5
1/7 Leila Place	1	50.5	49.1	50.5
2/7 Leila Place	1	49.3	47.9	48.5
4 Leith Court	1	46.6	46.6	46.5
6 Leith Court	1	47.2	47.1	47.4
6 Leith Court	1	46.2	46.1	46.5

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
8 Leith Court	1	47.1	47.1	47.6
10 Leith Court	1	50.0	50.0	50.6
14 Leith Court	1	48.2	48.1	48.2
16 Leith Court	1	50.4	50.4	50.6
18 Leith Court	1	48.7	48.6	49.2
19 Leith Court	1	46.6	46.3	46.7
20 Leith Court	1	49.1	48.7	49.1
21 Leith Court	2	53.3	52.5	51.8
22 Leith Court	2	49.6	49.2	50.7
1/12 Leith Court	1	46.4	46.2	46.3
2/12 Leith Court	1	46.4	46.2	46.5
16A Leith Court	1	46.4	46.0	46.0
4A Leith Court	1	50.1	50.1	50.8
58 Manukau Station Road	6	64.9	67.1	66.9
58 Manukau Station Road	2	64.0	66.3	65.2
35 Medvale Avenue	1	52.1	49.4	50.4
37 Medvale Avenue	1	57.8	55.1	55.9
39 Medvale Avenue	1	58.7	55.9	56.9
41 Medvale Avenue	1	64.9	61.9	62.1
1 Norman Spencer Drive	1	57.4	57.5	57.7
3 Norman Spencer Drive	1	53.5	53.6	53.8
5 Norman Spencer Drive	1	47.8	47.7	48.5
1/4 Norman Spencer Drive	1	49.1	49.0	49.8
2/4 Norman Spencer Drive	1	50.3	50.2	51.2
39 Nuneaton Drive	1	48.8	46.3	47.9
41 Nuneaton Drive	1	49.0	46.6	48.4
45 Nuneaton Drive	1	51.6	49.3	50.8
62 Othello Drive	2	57.5	56.0	57.1
63 Othello Drive	1	56.2	54.6	53.8
64 Othello Drive	1	60.6	59.1	60.1
65A Othello Drive	1	59.0	57.3	58.6
65B Othello Drive	1	57.1	55.5	57.4
67A Othello Drive	1	53.5	51.8	56.1
67B Othello Drive	1	53.8	52.2	60.3

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
1 Penion Drive	1	69.4	66.8	67.8
2 Penion Drive	1	60.1	57.6	63.0
4 Penion Drive	1	59.7	57.2	56.8
11 Penion Drive	1	53.7	50.9	52.0
15 Penion Drive	1	50.9	48.3	49.3
17 Penion Drive	1	50.4	47.8	48.8
19 Penion Drive	1	48.6	46.0	46.9
25 Penion Drive	1	50.7	48.0	49.0
25 Penion Drive	1	48.7	46.1	47.1
27 Penion Drive	1	49.8	46.9	48.1
29 Penion Drive	1	50.9	48.0	49.3
31 Penion Drive	1	57.6	54.5	60.9
35 Penion Drive	1	50.6	47.8	50.0
37 Penion Drive	1	51.4	48.4	49.4
39 Penion Drive	1	50.8	47.6	48.5
41 Penion Drive	1	51.1	48.0	49.0
43 Penion Drive	1	58.3	54.8	56.8
1/33 Penion Drive	1	57.3	54.3	61.0
2/33 Penion Drive	1	55.3	52.7	60.1
1/21 Penion Drive	1	58.6	55.7	59.5
2/21 Penion Drive	1	57.5	54.8	56.5
1/6 Penion Drive	1	53.9	51.4	51.9
2/6 Penion Drive	1	57.7	55.2	55.6
1/7 Penion Drive	1	49.6	47.0	48.0
2/7 Penion Drive	1	51.2	48.5	49.9
1/8 Penion Drive	1	53.0	50.4	51.3
2/8 Penion Drive	1	52.4	50.0	50.9
1/9 Penion Drive	1	53.7	51.2	52.2
1/10 Penion Drive	1	56.4	53.8	53.6
2/10 Penion Drive	1	54.7	52.1	52.2
3/10 Penion Drive	1	53.6	51.1	52.1
1/23 Penion Drive	1	57.8	54.8	60.0
2/23 Penion Drive	1	57.6	55.0	59.6
19A Penion Drive	1	51.4	48.7	50.9

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
27A Penion Drive	1	51.5	48.5	49.5
39A Penion Drive	1	53.6	50.6	52.8
3A Penion Drive	1	54.9	52.4	54.9
3B Penion Drive	1	53.2	50.6	51.6
5A Penion Drive	1	50.5	48.0	49.7
5B Penion Drive	1	51.4	48.8	50.0
9B Penion Drive	1	55.7	53.1	54.1
4 Plunket Avenue	1	57.6	59.2	66.7
7 Plunket Avenue	1	53.5	54.8	57.9
8 Plunket Avenue	1	48.2	48.6	57.2
9 Plunket Avenue	1	48.8	50.5	52.6
10 Plunket Avenue	1	50.7	52.5	55.6
12 Plunket Avenue	1	50.0	51.6	54.7
14 Plunket Avenue	1	49.0	50.6	53.2
11A Plunket Avenue	2	50.0	51.3	54.7
14A Plunket Avenue	1	45.4	46.4	49.2
6A Plunket Avenue	1	55.1	56.7	59.6
7A Plunket Avenue	1	48.1	49.5	59.0
8A Plunket Avenue	1	52.2	53.9	56.8
63 Puhinui Road	1	44.8	44.3	47.5
65 Puhinui Road	1	54.5	54.2	55.9
68 Puhinui Road	1	52.6	52.5	52.7
70 Puhinui Road	1	57.7	57.6	57.4
70 Puhinui Road	1	54.5	54.4	54.2
74 Puhinui Road	1	68.4	67.9	67.4
80 Puhinui Road	1	56.2	55.5	62.8
82 Puhinui Road	1	65.3	65.3	64.4
82 Puhinui Road	2	58.7	58.0	61.3
83 Puhinui Road	2	51.1	51.2	56.2
83 Puhinui Road	2	51.6	51.7	57.4
83 Puhinui Road	2	51.5	51.5	56.8
83 Puhinui Road	2	52.0	52.2	57.8
83 Puhinui Road	2	52.9	53.0	59.8
83 Puhinui Road	2	55.8	55.9	65.6

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
84 Puhinui Road	1	64.8	64.9	64.4
86 Puhinui Road	1	64.2	64.4	63.9
88 Puhinui Road	2	53.1	53.1	53.3
92 Puhinui Road	1	52.7	52.7	51.6
94 Puhinui Road	2	67.1	67.3	66.0
96 Puhinui Road	1	63.4	63.6	61.8
96 Puhinui Road	1	50.1	50.2	49.7
98 Puhinui Road	1	63.7	63.8	63.2
100 Puhinui Road	1	58.5	58.6	57.0
100 Puhinui Road	1	49.2	49.3	49.6
109 Puhinui Road	1	65.5	65.4	64.8
110 Puhinui Road	1	64.2	64.2	64.0
111 Puhinui Road	1	65.7	65.6	64.1
112 Puhinui Road	1	67.7	67.6	66.3
113 Puhinui Road	1	65.7	65.6	65.4
114 Puhinui Road	1	63.9	63.8	63.4
115 Puhinui Road	1	66.4	66.4	65.6
116 Puhinui Road	1	59.3	59.1	59.6
116 Puhinui Road	1	59.9	59.8	60.1
116 Puhinui Road	1	58.8	58.7	59.1
116 Puhinui Road	1	49.1	48.9	49.9
116 Puhinui Road	1	58.4	58.3	59.0
116 Puhinui Road	1	46.6	46.5	48.6
116 Puhinui Road	1	44.8	44.6	46.4
120 Puhinui Road	1	64.9	64.8	64.5
120 Puhinui Road	1	50.6	50.5	50.3
121 Puhinui Road	1	66.5	66.7	65.4
123 Puhinui Road	1	66.3	66.5	64.9
126 Puhinui Road	1	49.6	49.4	58.1
133 Puhinui Road	1	65.6	66.0	64.4
135 Puhinui Road	1	63.5	63.8	62.9
137 Puhinui Road	1	66.9	67.3	65.5
139 Puhinui Road	1	65.4	66.0	64.8
141 Puhinui Road	1	65.8	66.7	65.2

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
143 Puhinui Road	1	58.5	60.5	59.9
145 Puhinui Road	2	64.1	65.9	64.2
147 Puhinui Road	1	64.7	66.5	64.3
151 Puhinui Road	2	60.1	61.9	60.6
2/73 Puhinui Road	2	59.3	59.4	66.0
1/90 Puhinui Road	1	58.6	58.8	56.4
2/90 Puhinui Road	1	57.0	57.1	54.6
3/90 Puhinui Road	1	55.3	55.5	54.3
1/104 Puhinui Road	1	65.9	66.0	65.4
1/118 Puhinui Road	1	65.6	65.5	64.5
1/119 Puhinui Road	1	65.7	65.9	64.9
105A Puhinui Road	1	51.3	51.2	60.2
109A Puhinui Road	1	52.8	52.7	53.0
112A Puhinui Road	1	53.0	52.8	52.6
113A Puhinui Road	1	53.6	53.5	53.8
114A Puhinui Road	2	58.2	58.1	58.2
122A Puhinui Road	1	53.8	53.7	59.9
123A Puhinui Road	2	56.1	56.3	55.9
124B Puhinui Road	2	56.9	56.8	66.4
124C Puhinui Road	1	47.4	47.3	54.3
125A Puhinui Road	1	66.2	66.4	65.0
125B Puhinui Road	1	54.6	54.9	53.0
127A Puhinui Road	2	67.3	67.6	65.7
127B Puhinui Road	1	53.5	53.7	51.9
128A Puhinui Road	2	51.9	51.8	64.5
135A Puhinui Road	2	53.8	54.4	54.8
139A Puhinui Road	2	54.4	55.4	55.5
141A Puhinui Road	2	52.7	54.1	54.1
142A Puhinui Road	1	50.5	50.8	64.7
143A Puhinui Road	2	53.8	54.9	55.1
147A Puhinui Road	2	51.9	54.0	53.4
148A Puhinui Road	1	51.0	51.3	65.8
148B Puhinui Road	1	50.0	50.2	59.9
2/101 Puhinui Road	1	53.6	53.4	65.2

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
2/102 Puhinui Road	1	64.7	64.8	64.5
2/102 Puhinui Road	1	51.9	52.0	52.0
2/103 Puhinui Road	2	53.1	53.0	63.4
2/104 Puhinui Road	2	59.1	59.1	59.3
2/111 Puhinui Road	1	54.2	54.1	53.9
2/118 Puhinui Road	1	58.6	58.4	58.1
3/101 Puhinui Road	1	51.2	51.1	56.5
3/118 Puhinui Road	1	57.7	57.6	57.7
3/150 Puhinui Road	1	48.3	48.7	58.7
3/150 Puhinui Road	1	50.0	50.4	64.3
63A Puhinui Road	2	53.4	53.0	52.2
66A Puhinui Road	1	51.6	51.5	51.5
66B Puhinui Road	1	46.8	46.1	45.8
66C Puhinui Road	1	47.3	46.6	46.3
75B Puhinui Road	1	53.8	53.9	61.0
77A Puhinui Road	2	56.8	56.9	66.5
77B Puhinui Road	2	52.6	52.8	59.9
85A Puhinui Road	2	53.3	53.4	64.6
86A Puhinui Road	2	53.1	52.6	52.8
87A Puhinui Road	1	53.5	53.7	63.9
88A Puhinui Road	2	64.7	64.8	64.4
93B Puhinui Road	2	56.7	56.6	66.0
93C Puhinui Road	2	53.9	53.7	61.1
94A Puhinui Road	2	57.1	57.2	56.2
17 Putney Way	10	58.5	58.8	60.6
3/10 Ranfurly Road	1	48.8	50.5	55.1
13 Rito Place	1	44.4	43.7	44.1
51 Robin Brooke Drive	1	60.0	56.2	60.5
53 Robin Brooke Drive	1	55.6	52.1	53.8
18 Ronwood Avenue	17	65.1	64.1	64.3
16 Sambrooke Crescent	1	51.4	48.1	49.4
18 Sambrooke Crescent	1	52.7	49.1	50.4
20 Sambrooke Crescent	1	51.1	48.4	49.3
22 Sambrooke Crescent	1	54.2	51.3	52.7

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
24 Sambrooke Crescent	1	51.9	49.3	50.2
26 Sambrooke Crescent	1	54.7	51.1	53.0
1 Sandrine Avenue	1	68.6	67.1	68.2
3 Sandrine Avenue	1	58.7	57.1	57.6
3 Sandrine Avenue	1	59.6	58.0	58.9
4 Sandrine Avenue	1	59.7	58.1	58.9
6 Sandrine Avenue	1	56.9	55.4	56.2
8 Sandrine Avenue	1	53.7	52.1	53.0
10 Sandrine Avenue	1	53.6	52.2	53.0
2 Shalimar Place	1	69.2	67.9	67.4
3 Shalimar Place	1	58.4	57.1	56.9
4 Shalimar Place	2	60.7	59.3	59.3
5 Shalimar Place	1	57.2	55.8	56.3
6 Shalimar Place	1	57.0	55.7	55.4
7 Shalimar Place	1	53.1	51.6	51.8
8 Shalimar Place	1	50.3	48.9	49.2
9 Shalimar Place	1	52.0	50.6	52.6
10 Shalimar Place	1	52.6	51.2	51.2
1A Shalimar Place	1	69.6	68.3	67.9
1B Shalimar Place	1	60.0	58.6	58.4
35 Sidey Avenue	1	51.5	49.7	50.5
65 Sikkim Crescent	1	49.6	48.1	48.8
67 Sikkim Crescent	2	51.9	50.4	51.5
68 Sikkim Crescent	1	53.0	51.9	51.3
70 Sikkim Crescent	2	56.6	55.4	55.4
70 Sikkim Crescent	1	53.4	52.0	52.4
71 Sikkim Crescent	1	50.0	48.5	50.6
72 Sikkim Crescent	1	54.4	52.9	53.1
73 Sikkim Crescent	1	50.3	48.8	52.0
74 Sikkim Crescent	1	54.8	53.4	53.5
75 Sikkim Crescent	1	50.7	49.2	52.4
76 Sikkim Crescent	1	55.0	53.6	54.0
78 Sikkim Crescent	1	56.3	54.9	57.0
80 Sikkim Crescent	1	54.4	52.9	55.8

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
82 Sikkim Crescent	2	56.2	54.7	61.5
84 Sikkim Crescent	1	53.3	51.7	58.3
86 Sikkim Crescent	1	54.7	53.1	59.6
88 Sikkim Crescent	2	56.8	55.3	59.4
88 Sikkim Crescent	1	54.7	53.3	53.7
14 Tavistock Street	1	51.8	51.7	55.0
15 Tavistock Street	1	53.2	53.0	57.7
16 Tavistock Street	1	53.5	53.4	60.8
17 Tavistock Road	2	57.4	57.3	63.4
47 Te Irirangi Drive	1	68.5	67.0	66.6
49 Te Irirangi Drive	1	69.3	67.8	67.3
51 Te Irirangi Drive	1	67.8	66.2	66.1
52 Te Irirangi Drive	1	52.2	50.9	54.0
53 Te Irirangi Drive	1	69.4	67.8	67.8
54 Te Irirangi Drive	1	52.9	51.6	54.9
58 Te Irirangi Drive	1	54.1	52.8	55.8
63 Te Irirangi Drive	1	69.3	67.7	68.3
73 Te Irirangi Drive	1	68.8	67.3	67.8
75 Te Irirangi Drive	1	69.1	67.7	68.1
77 Te Irirangi Drive	1	69.0	67.6	67.7
79 Te Irirangi Drive	1	68.8	67.4	67.3
83 Te Irirangi Drive	2	68.7	67.4	67.0
85 Te Irirangi Drive	1	67.9	66.5	66.1
87 Te Irirangi Drive	1	68.2	66.9	66.6
93 Te Irirangi Drive	1	68.9	67.6	67.3
143 Te Irirangi Drive	1	57.4	54.9	64.2
163 Te Irirangi Drive	1	68.9	66.3	67.3
165 Te Irirangi Drive	1	68.9	66.3	67.2
167 Te Irirangi Drive	1	69.0	66.4	67.3
169 Te Irirangi Drive	1	67.4	64.7	65.6
171 Te Irirangi Drive	1	68.9	66.3	67.2
173 Te Irirangi Drive	1	69.0	66.4	67.4
175 Te Irirangi Drive	1	69.4	66.7	67.8
177 Te Irirangi Drive	1	69.0	66.4	67.5

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
179 Te Irirangi Drive	1	69.1	66.5	67.5
181 Te Irirangi Drive	1	69.0	66.3	67.5
183 Te Irirangi Drive	1	69.6	67.0	67.9
185 Te Irirangi Drive	1	69.2	66.5	67.4
187 Te Irirangi Drive	1	69.4	66.7	67.6
189 Te Irirangi Drive	1	69.3	66.7	67.5
191 Te Irirangi Drive	1	69.3	66.6	67.5
193 Te Irirangi Drive	1	69.4	66.8	67.8
195 Te Irirangi Drive	1	69.4	66.7	67.8
197 Te Irirangi Drive	1	69.5	66.7	67.8
198 Te Irirangi Drive	1	68.4	65.9	67.0
200 Te Irirangi Drive	1	68.4	65.8	66.9
202 Te Irirangi Drive	1	68.1	65.5	66.8
203 Te Irirangi Drive	1	70.9	66.6	67.5
204 Te Irirangi Drive	1	68.4	65.8	67.0
205 Te Irirangi Drive	1	70.4	66.0	66.7
206 Te Irirangi Drive	1	68.5	66.0	67.0
208 Te Irirangi Drive	1	68.4	65.9	67.1
212 Te Irirangi Drive	1	68.3	65.8	67.2
216 Te Irirangi Drive	1	68.4	65.8	67.1
222 Te Irirangi Drive	1	68.8	66.2	67.0
224 Te Irirangi Drive	1	59.2	55.9	59.3
226 Te Irirangi Drive	1	57.6	55.0	57.6
228 Te Irirangi Drive	1	67.7	65.2	66.0
1/64 Te Irirangi Drive	1	56.1	54.6	57.1
2/64 Te Irirangi Drive	1	57.2	55.7	58.7
2/66 Te Irirangi Drive	1	56.7	55.1	56.5
2/68 Te Irirangi Drive	1	59.1	57.6	56.1
1/70 Te Irirangi Drive	1	60.3	58.9	60.4
2/70 Te Irirangi Drive	1	58.4	56.9	59.2
2/80 Te Irirangi Drive	1	60.3	58.4	61.9
2/86 Te Irirangi Drive	1	59.0	57.2	62.0
1/97 Te Irirangi Drive	1	69.3	67.9	67.5
1/101 Te Irirangi Drive	1	69.3	67.6	67.3

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
1/102 Te Irirangi Drive	1	59.6	57.8	61.4
1/104 Te Irirangi Drive	1	53.9	52.1	57.0
1/105 Te Irirangi Drive	1	69.0	67.3	67.0
1/116 Te Irirangi Drive	1	54.1	52.4	60.5
1/122 Te Irirangi Drive	1	54.2	52.3	57.2
1/128 Te Irirangi Drive	1	55.5	53.6	56.2
1/136 Te Irirangi Drive	1	53.4	51.8	59.0
1/138 Te Irirangi Drive	1	55.5	53.8	63.3
1/144 Te Irirangi Drive	1	56.3	54.6	64.1
1/145 Te Irirangi Drive	1	54.3	51.7	63.7
1/150 Te Irirangi Drive	1	57.2	55.5	63.2
1/156 Te Irirangi Drive	1	56.1	54.3	64.2
1/162 Te Irirangi Drive	1	57.2	55.4	64.3
1/168 Te Irirangi Drive	1	56.1	54.4	63.0
1/190 Te Irirangi Drive	1	69.6	67.1	67.8
1/192 Te Irirangi Drive	1	65.6	63.0	64.3
114A Te Irirangi Drive	1	53.7	52.1	56.8
114A Te Irirangi Drive	1	53.4	51.5	56.3
143A Te Irirangi Drive	1	51.3	49.0	55.4
190B Te Irirangi Drive	1	65.7	63.2	65.4
2/101 Te Irirangi Drive	1	56.7	54.9	55.0
2/104 Te Irirangi Drive	1	56.1	54.4	59.2
2/105 Te Irirangi Drive	1	59.2	57.5	57.5
2/116 Te Irirangi Drive	1	51.3	49.6	54.1
2/122 Te Irirangi Drive	1	54.5	52.9	57.1
2/128 Te Irirangi Drive	1	53.6	51.7	57.6
2/136 Te Irirangi Drive	1	53.1	51.3	60.0
2/138 Te Irirangi Drive	1	53.6	51.9	62.7
2/144 Te Irirangi Drive	1	56.2	54.5	63.0
2/145 Te Irirangi Drive	1	53.8	51.3	53.6
2/147 Te Irirangi Drive	1	60.0	57.4	65.9
2/150 Te Irirangi Drive	1	58.0	56.3	63.5
2/151 Te Irirangi Drive	1	54.5	52.0	60.3
2/151 Te Irirangi Drive	1	52.5	50.0	60.7

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
2/155 Te Irirangi Drive	1	56.8	54.2	65.6
2/156 Te Irirangi Drive	1	57.0	55.3	64.1
2/162 Te Irirangi Drive	1	58.1	56.2	63.5
2/168 Te Irirangi Drive	1	54.8	53.0	63.0
2/192 Te Irirangi Drive	1	67.4	64.9	66.2
3/101 Te Irirangi Drive	1	68.6	67.0	66.8
3/105 Te Irirangi Drive	1	69.4	67.6	67.3
46A Te Irirangi Drive	1	58.2	56.7	63.6
50A Te Irirangi Drive	1	56.8	55.5	60.7
58B Te Irirangi Drive	1	49.9	48.5	49.9
76C Te Irirangi Drive	1	57.8	56.0	61.4
95A Te Irirangi Drive	1	54.6	53.3	53.4
95B Te Irirangi Drive	1	53.6	51.9	53.0
97B Te Irirangi Drive	1	57.3	55.8	61.1
97C Te Irirangi Drive	1	68.3	66.7	66.5
7 Titchmarsh Crescent	1	50.1	47.4	48.7
8 Titchmarsh Crescent	1	50.6	47.9	49.5
9 Titchmarsh Crescent	1	49.8	47.1	48.4
10 Titchmarsh Crescent	1	50.5	47.7	49.7
11 Titchmarsh Crescent	1	49.9	47.1	48.4
12 Titchmarsh Crescent	1	49.8	47.4	50.0
13 Titchmarsh Crescent	1	49.4	46.7	47.8
14 Titchmarsh Crescent	1	50.7	47.8	51.5
16 Titchmarsh Crescent	1	50.4	47.8	50.9
18 Titchmarsh Crescent	1	53.6	51.1	60.9
20 Titchmarsh Crescent	1	51.5	49.0	59.0
21 Titchmarsh Crescent	1	48.7	46.1	47.1
22 Titchmarsh Crescent	1	52.6	50.1	58.4
23 Titchmarsh Crescent	1	48.8	46.2	47.2
24 Titchmarsh Crescent	1	51.7	49.2	53.4
25 Titchmarsh Crescent	1	50.1	47.6	48.6
26 Titchmarsh Crescent	1	53.0	50.5	55.2
27 Titchmarsh Crescent	1	50.2	47.6	48.5
29 Titchmarsh Crescent	1	49.6	46.8	47.7

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
31 Titchmarsh Crescent	1	51.0	48.1	49.1
33 Titchmarsh Crescent	1	48.8	46.2	47.3
35 Titchmarsh Crescent	1	49.4	46.9	47.9
37 Titchmarsh Crescent	1	49.2	46.7	47.6
39 Titchmarsh Crescent	1	50.8	48.0	49.6
41 Titchmarsh Crescent	1	50.0	47.4	49.7
43 Titchmarsh Crescent	1	50.7	48.1	53.2
11 Townley Place	1	49.1	47.8	48.6
1/13 Townley Place	1	49.5	48.1	50.2
2/13 Townley Place	1	51.5	50.1	54.3
1/14 Townley Place	1	48.7	47.3	48.6
2/14 Townley Place	1	52.9	51.5	53.6
2/4 Townley Place	1	48.4	47.0	47.9
1/6 Townley Place	1	48.6	47.2	48.0
2/6 Townley Place	1	48.8	47.3	49.9
1/8 Townley Place	1	48.5	47.1	48.1
2/8 Townley Place	1	53.9	52.3	56.4
1/10 Townley Place	1	50.5	49.1	49.6
2/10 Townley Place	1	52.5	51.1	50.9
1/12 Townley Place	1	49.5	48.0	48.6
2/12 Townley Place	1	53.5	51.9	52.5
2 Ulay Place	1	54.0	52.5	53.7
3 Ulay Place	1	51.5	50.1	54.7
5 Ulay Place	1	52.3	50.8	54.6
7 Ulay Place	1	50.3	48.9	50.4
9 Ulay Place	1	49.4	48.0	49.7
11 Ulay Place	1	49.5	48.1	49.7
13 Ulay Place	1	48.8	47.5	49.2
4A Ulay Place	1	51.0	49.5	51.2
3 Whetstone Road	1	55.7	52.1	53.0
4 Whetstone Road	1	54.8	52.1	53.7
5 Whetstone Road	1	58.3	54.8	55.6
6 Whetstone Road	1	55.4	52.6	53.6
7 Whetstone Road	1	60.8	57.2	58.3

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
8 Whetstone Road	1	62.7	59.9	60.8
9 Whetstone Road	1	63.0	59.5	62.1
10 Whetstone Road	1	67.1	63.7	64.8
7A Whetstone Road	1	55.3	52.2	53.2
33 York Road	1	51.3	51.3	52.1
35 York Road	1	50.7	50.6	51.2
36 York Road	1	48.8	49.1	49.7
37 York Road	1	45.5	45.6	46.1
37 York Road	1	49.3	49.5	49.9
37 York Road	1	49.3	49.5	49.9
37 York Road	1	48.5	48.6	49.1
39 York Road	1	59.2	59.2	57.9
40 York Road	1	65.5	65.5	63.9
1/36 York Road	1	50.8	51.1	50.9
2/36 York Road	1	48.3	48.3	49.2
40A York Road	1	53.3	53.6	53.3
24 Zelda Avenue	1	48.9	47.0	48.3
26 Zelda Avenue	1	48.8	46.8	49.0
28 Zelda Avenue	1	49.2	47.3	50.8
28 Zelda Avenue	1	50.0	48.1	52.7
30 Zelda Avenue	1	51.7	49.9	55.6
32 Zelda Avenue	1	49.1	47.2	48.6
34 Zelda Avenue	1	50.0	48.1	50.7
36 Zelda Avenue	1	51.3	49.5	52.1
38 Zelda Avenue	1	51.4	49.7	51.2
40 Zelda Avenue	1	51.7	50.0	52.4
42 Zelda Avenue	1	49.6	47.8	49.4
44 Zelda Avenue	1	49.5	47.8	49.8
46 Zelda Avenue	1	48.3	46.5	47.4
46 Zelda Avenue	1	50.0	48.2	51.6
48 Zelda Avenue	1	48.7	47.0	48.3
50 Zelda Avenue	1	49.0	47.2	48.3
52 Zelda Avenue	1	51.0	49.3	52.5
52 Zelda Avenue	1	48.5	46.7	48.2

PPF Address (NoR 2)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
54 Zelda Avenue	1	49.6	47.8	49.8
54 Zelda Avenue	1	52.2	50.5	54.2
56 Zelda Avenue	1	50.2	48.5	50.9
58 Zelda Avenue	1	50.1	48.3	52.1
60 Zelda Avenue	1	50.8	49.1	52.7
62 Zelda Avenue	1	50.1	48.4	50.9
62 Zelda Avenue	1	50.4	48.7	53.1
64 Zelda Avenue	1	50.1	48.4	50.1
66 Zelda Avenue	1	50.8	49.1	50.4
68 Zelda Avenue	1	50.6	48.9	50.6
70 Zelda Avenue	1	49.5	47.8	49.7
74 Zelda Avenue	1	52.5	50.7	52.2
76 Zelda Avenue	1	52.8	51.1	52.0
82 Zelda Avenue	1	51.6	49.8	52.8
84 Zelda Avenue	1	49.7	47.9	48.9
84 Zelda Avenue	1	51.0	49.2	51.4
26A Zelda Avenue	1	48.9	47.0	49.9
84A Zelda Avenue	1	49.6	47.8	48.9

NoR 3

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
2 Bledisloe Street	1	67.1	67.4	65.5
6 Bledisloe Street	1	51.5	51.8	50.4
6A Bledisloe Street	2	51.7	52.1	52.2
8A Bledisloe Street	2	50.3	50.6	51
4 Bridge Street	2	65	66	65.8
6A Bridge Street	2	56.2	56.8	61.3
1 Burrell Avenue	1	49.6	48.2	56
4 Burrell Avenue	1	49.5	47.7	61.5
4 Burrell Avenue	1	47.2	45.6	49.8
6 Burrell Avenue	1	47.2	46.1	49.3

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
8 Burrell Avenue	1	46	45	46.9
8 Burrell Avenue	2	50.7	49.5	53.8
10 Burrell Avenue	1	47.1	45.5	47.5
12 Burrell Avenue	1	50.7	48.8	52.6
12 Burrell Avenue	1	48.3	46.4	50.7
12 Burrell Avenue	1	48.5	46.8	49.7
12 Burrell Avenue	1	46.9	45.5	48.6
12 Burrell Avenue	1	44.8	44	47.4
12 Burrell Avenue	1	46.1	45.1	48.1
2A Burrell Avenue	1	52.3	50.5	58.8
3A Burrell Avenue	2	47.4	46.7	53.1
9 Cambridge Terrace	1	63.9	61.6	64.4
17 Cambridge Terrace	1	65.2	63.1	65.6
19 Cambridge Terrace	1	65.6	63.8	65.9
21 Cambridge Terrace	1	65.7	64.2	65.9
21 Cambridge Terrace	1	52.2	51.4	54.1
23 Cambridge Terrace	1	65.3	64.5	64.8
25 Cambridge Terrace	1	63.1	62.8	62.7
27 Cambridge Terrace	1	52.7	53.2	53.4
28 Cambridge Terrace	1	58.3	58.1	60.9
29 Cambridge Terrace	1	55.2	55.5	56.3
30 Cambridge Terrace	1	55.2	54.6	54.5
32 Cambridge Terrace	2	51.1	51.6	53.8
33 Cambridge Terrace	1	43.9	44.2	44.8
34 Cambridge Terrace	1	48.5	48.1	49.5
1/30 Cambridge Terrace	1	55.5	55.7	56.5
1/31 Cambridge Terrace	1	52.6	52.1	54.6
2/34 Cambridge Terrace	1	45.2	45.8	49.3
2/19 Cambridge Terrace	1	51.8	50.6	52.9
17A Cambridge Terrace	1	53.5	52.9	55.2
23A Cambridge Terrace	1	47.8	48.1	49.1
25B Cambridge Terrace	2	57.5	57.9	57.5
27A Cambridge Terrace	1	59.5	59.2	60.1
31B Cambridge Terrace	1	45	45.4	46.2

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
32A Cambridge Terrace	1	52.1	51.5	52.1
33A Cambridge Terrace	1	47.1	47.4	48.7
9A Cambridge Terrace	1	55.1	56.2	57.1
4 Clendon Avenue	1	56.8	55.7	64.2
5 Clendon Avenue	1	56.6	55.9	59.2
7 Clendon Avenue	1	54.7	53.8	56.5
8 Clendon Avenue	2	55.2	54.2	56.5
9 Clendon Avenue	1	50.8	49.4	52
9 Clendon Avenue	1	48.1	49.1	51.3
11 Clendon Avenue	2	52.7	51.7	54.1
11A Clendon Avenue	2	49.6	48.8	50.7
8A Clendon Avenue	2	53.4	52.5	54.7
1 Fitzroy Street	1	44.5	45.4	46
7 Fitzroy Street	2	45.2	46.6	46.4
7 Fitzroy Street	2	44.8	46	46.2
7 Fitzroy Street	2	46.2	48.1	47.1
7 Fitzroy Street	2	46.7	48.6	47.6
7 Fitzroy Street	2	50.6	52.5	51.2
7 Fitzroy Street	2	45.9	47.7	46.7
9 Fitzroy Street	2	45.1	46.4	46.5
9 Fitzroy Street	2	48.4	50.1	49
9 Fitzroy Street	2	48.1	49.9	48.9
9 Fitzroy Street	2	48.4	50.4	49.4
9 Fitzroy Street	2	47.9	49.7	48.8
13 Fitzroy Street	1	46.1	47.9	47.2
13 Fitzroy Street	1	44.9	46.5	46
15 Fitzroy Street	1	44	45.5	45.1
17 Fitzroy Street	1	48.2	50.1	47.7
19 Fitzroy Street	1	43.6	45.2	44.8
21 Fitzroy Street	1	43.2	44.8	44.4
23 Fitzroy Street	1	42.5	43.8	43.5
25 Fitzroy Street	1	44.7	46.3	45.8
27 Fitzroy Street	1	44.5	45.9	45.7
29 Fitzroy Street	2	45.5	46.8	46.9

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
31 Fitzroy Street	2	46.3	46.6	46.9
33 Fitzroy Street	1	45.5	46.9	46.8
35 Fitzroy Street	1	44.3	45	45.1
37 Fitzroy Street	1	44.2	45	45.1
2/19 Fitzroy Street	1	44.4	46.3	45.6
1/21 Fitzroy Street	1	43.2	44.8	44.3
15A Fitzroy Street	2	50.8	52.8	50.7
17A Fitzroy Street	2	49.8	51.9	49.1
1A Fitzroy Street	1	44.4	45.4	45.7
23A Fitzroy Street	2	45.2	46.7	46.2
29A Fitzroy Street	1	45.3	46.5	46.5
31A Fitzroy Street	2	48.4	48.9	49
33A Fitzroy Street	2	48.9	50.6	50.2
35A Fitzroy Street	1	47	47.6	47.6
37A Fitzroy Street	1	45.5	46.2	46.3
4 Freyberg Avenue	1	44.2	44.8	45.9
6 Freyberg Avenue	1	45.1	46.2	50.4
8 Freyberg Avenue	1	47.5	48.6	55.2
10 Freyberg Avenue	1	45.6	46.4	50.7
12 Freyberg Avenue	1	44.2	44.9	46.4
14 Freyberg Avenue	1	43.5	44.7	47.8
18 Freyberg Avenue	1	47.4	49.2	52.7
20 Freyberg Avenue	1	45.9	47.6	48.9
22 Freyberg Avenue	1	45.1	46.9	47.7
24 Freyberg Avenue	1	46.2	47.9	52.1
26 Freyberg Avenue	1	46.9	48.6	53.6
26 Freyberg Avenue	1	45.2	46.8	50.8
28 Freyberg Avenue	1	46.6	48.4	52.3
30 Freyberg Avenue	1	46.1	47.8	50.9
32 Freyberg Avenue	1	45	46.8	47.4
10A Freyberg Avenue	1	50.2	51.2	55.4
12A Freyberg Avenue	2	49.5	50.5	58.3
14A Freyberg Avenue	2	49	50	57
16A Freyberg Avenue	2	48.2	49.8	53.3

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
16A Freyberg Avenue	1	44.8	46.4	46.6
20A Freyberg Avenue	1	46.7	48.6	57.2
22A Freyberg Avenue	1	48.1	49.9	58.2
32A Freyberg Avenue	2	51.3	53.2	60.2
6A Freyberg Avenue	2	50.5	51.5	58.5
81 Kenderdine Road	1	44.2	44.4	45.5
83 Kenderdine Road	1	48.7	50.3	51.3
85 Kenderdine Road	1	49.8	51.3	52.6
87 Kenderdine Road	1	55.6	56.6	56.8
89 Kenderdine Road	1	50.5	51	51.6
90 Kenderdine Road	2	47.4	47.7	50.6
90 Kenderdine Road	2	48.2	48.5	51.6
90 Kenderdine Road	2	47.7	48	50.8
90 Kenderdine Road	2	47.1	47.4	50.2
90 Kenderdine Road	2	47.6	48.3	49.9
91 Kenderdine Road	1	59.1	60.7	60.5
92 Kenderdine Road	1	50.3	50.4	56
92 Kenderdine Road	1	52.2	52.3	56.9
92 Kenderdine Road	1	49.7	50	49.9
94 Kenderdine Road	2	48.6	49	52.4
98 Kenderdine Road	1	60.6	61.5	63.2
106 Kenderdine Road	2	61	65	65.7
107 Kenderdine Road	1	57.3	61.4	62.8
109 Kenderdine Road	1	60.7	64.4	65.2
111 Kenderdine Road	1	67.9	66	64.9
1/93 Kenderdine Road	1	62.3	64.4	63.3
2/93 Kenderdine Road	1	62.5	65.1	64.9
1/98 Kenderdine Road	1	49.8	51.9	51.6
2/98 Kenderdine Road	1	50.4	52.4	52.1
1/109 Kenderdine Road	1	57.8	55.7	55.1
81A Kenderdine Road	1	43.4	43.7	44.4
83A Kenderdine Road	1	44.7	44.9	45.7
85A Kenderdine Road	1	45.8	46	47.1
3 Milan Road	1	52.8	51.1	54.1

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
4 Milan Road	1	49.9	48	49.2
5 Milan Road	1	51.2	50.1	52.8
6 Milan Road	1	49.1	47.4	48.8
7 Milan Road	1	51	49.9	52.7
49 Milan Road	1	48	46.4	47.5
51 Milan Road	1	46	44.2	45.6
53 Milan Road	2	48.5	48.1	49.9
55 Milan Road	1	48.5	49.9	52
57 Milan Road	1	49.7	48.5	49.2
59 Milan Road	1	50.6	49.3	50.3
59 Milan Road	1	51.1	52.7	53.9
60 Milan Road	1	47.2	48.3	50.2
61 Milan Road	1	54.6	56.5	56.4
62 Milan Road	1	47.8	49.1	50.9
62 Milan Road	1	45.7	45.9	47.3
63 Milan Road	1	54.4	58.5	59.8
63 Milan Road	1	61.7	65.7	66.5
64 Milan Road	1	49.1	51.4	54.1
66 Milan Road	1	51.2	54.6	56.3
3/47 Milan Road	1	46	47.3	49.1
3/47 Milan Road	1	48.6	47	46.5
1/2 Milan Road	1	53.9	51.8	53.5
2A Milan Road	1	50.2	49.2	51.8
53A Milan Road	1	48.8	48	49.5
58A Milan Road	1	44.1	44.2	45.2
58A Milan Road	1	48	48.4	50
58A Milan Road	1	44.9	45.2	46.2
58A Milan Road	1	45.3	45	47.1
5A Milan Road	2	51.2	50.2	52.7
64A Milan Road	1	49.6	52.3	54.2
10 Noel Burnside Road	1	49.8	48.4	61.7
4 Plunket Avenue	1	57.6	59.2	66.7
7 Plunket Avenue	1	53.5	54.8	57.9
8 Plunket Avenue	1	48.2	48.6	57.2

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
9 Plunket Avenue	1	48.8	50.5	52.6
10 Plunket Avenue	1	50.7	52.5	55.6
11 Plunket Avenue	2	49.1	50.5	53.9
12 Plunket Avenue	1	50	51.6	54.7
14 Plunket Avenue	1	49	50.6	53.2
11A Plunket Avenue	2	50	51.3	54.7
6A Plunket Avenue	1	55.1	56.7	59.6
7A Plunket Avenue	1	48.1	49.5	59
8A Plunket Avenue	1	52.2	53.9	56.8
2 Puhinui Road	1	55.8	57	56.2
2 Puhinui Road	1	63.5	64.8	62.8
133 Puhinui Road	1	65.6	66	64.4
135 Puhinui Road	1	63.5	63.8	62.9
137 Puhinui Road	1	66.9	67.3	65.5
139 Puhinui Road	1	65.4	66	64.8
141 Puhinui Road	1	65.8	66.7	65.2
143 Puhinui Road	1	58.5	60.5	59.9
145 Puhinui Road	2	64.1	65.9	64.2
147 Puhinui Road	1	64.7	66.5	64.3
151 Puhinui Road	2	60.1	61.9	60.6
159 Puhinui Road	1	49.7	51.7	48.8
159 Puhinui Road	2	50.5	52.3	51.8
165 Puhinui Road	2	49.2	51.1	51.2
169 Puhinui Road	1	58.1	60.3	55.6
175 Puhinui Road	2	66	68.1	64.7
177 Puhinui Road	1	54.7	56.8	52.7
179 Puhinui Road	1	62.9	65.1	59.2
179 Puhinui Road	1	53.2	55.3	52.4
180 Puhinui Road	1	51.5	53.5	62.5
181 Puhinui Road	1	52.2	54.3	51.5
183 Puhinui Road	2	66.1	68.2	63.7
185 Puhinui Road	1	65.9	68	64.2
191 Puhinui Road	1	65.6	66.9	63
195 Puhinui Road	1	54.7	55.9	55.2

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
195 Puhinui Road	1	61.1	62.2	60.9
197 Puhinui Road	1	49.2	49.7	50.2
197 Puhinui Road	1	49.5	49.4	50.4
197 Puhinui Road	1	48	48.5	49.4
205 Puhinui Road	2	52.9	53.3	56.8
207 Puhinui Road	1	56.8	55	56.4
209 Puhinui Road	1	57.8	56.4	57.9
211 Puhinui Road	1	61.1	64.9	65.7
211 Puhinui Road	1	60.9	63.8	64.7
213 Puhinui Road	1	67.3	65.1	63.5
215 Puhinui Road	1	65.9	63.7	62.2
217 Puhinui Road	1	65.6	63.4	62.1
218 Puhinui Road	1	53.8	53	53.7
219 Puhinui Road	2	53.4	52.3	53.3
219 Puhinui Road	1	65.8	63.7	62.2
221 Puhinui Road	1	65.5	63.3	61.8
223 Puhinui Road	1	50.7	48.6	48.3
223 Puhinui Road	1	66.8	64.6	62.3
224 Puhinui Road	1	52.4	52.8	54
225 Puhinui Road	1	68.3	66.1	63.4
226 Puhinui Road	1	56.3	55.1	56.2
226 Puhinui Road	1	53.6	51.7	56.2
226 Puhinui Road	1	64.3	62.4	64.2
227 Puhinui Road	1	67.8	65.6	63
228 Puhinui Road	1	49.2	47.8	53.7
228 Puhinui Road	1	45.8	44.3	45.4
229 Puhinui Road	1	66.3	64.1	61.5
231 Puhinui Road	1	65.7	63.5	61.1
232 Puhinui Road	1	54.2	52.4	59.9
233 Puhinui Road	1	62.5	60.3	57.7
235 Puhinui Road	1	67.9	65.7	62.4
237 Puhinui Road	1	66.1	64	60.9
239 Puhinui Road	1	66.6	64.5	63.2
241 Puhinui Road	1	66.5	64.3	63.3

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
243 Puhinui Road	1	65.1	62.9	62.2
245 Puhinui Road	1	65.7	63.5	62.8
249 Puhinui Road	1	48.3	46.7	47.9
253 Puhinui Road	1	63.1	60.9	60.4
255 Puhinui Road	1	66.1	63.9	63.1
257 Puhinui Road	2	67.3	65.3	64.2
259 Puhinui Road	1	66.9	64.9	64.2
261 Puhinui Road	1	51.2	50	51.3
263 Puhinui Road	1	49.3	48	49.2
267 Puhinui Road	1	65.9	63.7	63.4
269 Puhinui Road	1	67.3	65.3	64.8
271 Puhinui Road	1	66.2	64.3	64.5
272 Puhinui Road	2	50.7	49.7	55.8
272 Puhinui Road	2	55.7	54.1	62.2
273 Puhinui Road	1	66.8	64.9	66.3
274 Puhinui Road	1	49.7	48	52.7
275 Puhinui Road	1	66.5	64.6	65.9
277 Puhinui Road	1	66.9	65.3	67.1
281 Puhinui Road	1	64.8	66.8	66.5
283 Puhinui Road	1	60.6	62.6	62.6
283 Puhinui Road	1	66.3	68.2	67.4
308 Puhinui Road	1	63.7	65.7	66.7
314 Puhinui Road	1	65.5	67.5	68.6
1/187 Puhinui Road	1	67.9	69.9	66
1/251 Puhinui Road	1	68	65.9	64.6
1/279 Puhinui Road	1	66.2	64.6	66.6
135A Puhinui Road	2	53.8	54.4	54.8
139A Puhinui Road	2	54.4	55.4	55.5
141A Puhinui Road	2	52.7	54.1	54.1
143A Puhinui Road	2	53.8	54.9	55.1
147A Puhinui Road	2	51.9	54	53.4
148A Puhinui Road	1	51	51.3	65.8
148B Puhinui Road	1	50	50.2	59.9
175A Puhinui Road	2	54	56.1	52.7

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
176A Puhinui Road	2	53.4	55.4	63.2
177A Puhinui Road	2	67.4	69.5	65.4
181A Puhinui Road	2	67.1	69.2	64.5
185A Puhinui Road	1	54.6	56.8	54
186A Puhinui Road	2	55.5	57.5	65.4
188A Puhinui Road	2	53.4	54.6	63.8
190A Puhinui Road	2	55.2	56.5	63
2/187 Puhinui Road	1	67.9	70	65.8
2/199 Puhinui Road	1	67.2	68.3	65.4
2/249 Puhinui Road	1	48.2	46.2	48.5
2/251 Puhinui Road	1	53.6	51.4	51.3
2/257 Puhinui Road	2	56.4	54.5	54.8
2/270 Puhinui Road	1	51.6	49.8	60.9
2/270 Puhinui Road	1	51.7	49.6	54.3
200A Puhinui Road	2	52.7	53.5	64.3
205A Puhinui Road	1	52.5	49.8	56.5
209A Puhinui Road	2	51.4	52.7	55.4
221A Puhinui Road	1	52.6	50.5	50.5
225A Puhinui Road	2	55.7	53.6	54.6
227A Puhinui Road	1	54.6	52.5	51.5
229A Puhinui Road	2	55.5	53.4	54.3
233A Puhinui Road	2	54.9	52.8	53.4
243A Puhinui Road	2	55.2	53.1	53.8
255A Puhinui Road	1	49.3	47.5	48.5
264A Puhinui Road	2	56.4	54.5	61.6
275A Puhinui Road	2	55.9	54.8	57.7
276A Puhinui Road	1	53.3	51.5	62.3
278A Puhinui Road	1	52.4	50.7	61.4
283A Puhinui Road	1	54.2	56.2	56.9
290B Puhinui Road	2	57.4	57.1	68.5
292B Puhinui Road	2	54.7	54.7	68.3
294A Puhinui Road	1	56	57.9	69.4
3/150 Puhinui Road	1	48.3	48.7	58.7
3/150 Puhinui Road	1	50	50.4	64.3

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
3/251 Puhinui Road	2	61.9	59.7	59.2
3/298 Puhinui Road	1	54.6	56.4	67.8
300A Puhinui Road	1	56.8	58.7	66
312A Puhinui Road	2	55.5	57.4	62.5
314A Puhinui Road	1	51	53	55.7
4/298 Puhinui Road	1	52.5	54.3	57.5
5/298 Puhinui Road	1	50.9	52.5	55.9
7 Ranfurly Road	1	52.4	54.4	60.5
8 Ranfurly Road	1	49.4	51.4	60.3
12 Ranfurly Road	2	49.4	51.4	53.7
1/10 Ranfurly Road	1	50.4	52.5	54
2/10 Ranfurly Road	1	47.3	48.7	54.7
3/10 Ranfurly Road	1	48.8	50.5	55.1
12A Ranfurly Road	2	48.6	50	53.3
3 Raymond Road	2	57.5	55.3	55.2
4 Raymond Road	1	55.5	53.3	52.3
5 Raymond Road	1	46.4	44.4	45.3
6 Raymond Road	2	50.4	48.4	48.9
7 Raymond Road	1	48.3	46.3	47
8 Raymond Road	2	50.3	48.6	49.9
8 Raymond Road	2	53.7	51.8	52.8
8 Raymond Road	2	52.1	50.3	50
4A Raymond Road	2	53.8	51.8	51.8
5A Raymond Road	2	50.7	48.7	48.9
6A Raymond Road	2	49.3	47.3	47.6
7A Raymond Road	2	47.5	46	47.3
16 Sabi Place	1	54.1	55.6	57
17 Sabi Place	1	52.6	53.9	55
113 Wallace Road	1	44.3	44.6	45.5
118 Wallace Road	2	51.8	53.7	52.2
121 Wallace Road	1	45	45.9	46.4
135 Wallace Road	1	52	53.3	51.5
135 Wallace Road	1	66	67.4	62.7
1/116 Wallace Road	1	51.3	52.7	52.3

PPF Address (NoR 3)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
1/116 Wallace Road	1	53.2	54.6	53.4
1/119 Wallace Road	1	45.2	45.6	46.7
1/129 Wallace Road	1	50.8	52.6	50.9
121A Wallace Road	1	49.5	50.7	50.7
121B Wallace Road	1	48	47.4	49.3
130A Wallace Road	2	58.7	60.3	58.5
130B Wallace Road	2	58.5	60.6	57.6
2/119 Wallace Road	1	45.1	45.4	46.4
2/129 Wallace Road	1	51.5	53.3	51.9
3/119 Wallace Road	1	45.2	45.7	46.5
3/129 Wallace Road	1	54.1	55.8	54.4
4/119 Wallace Road	1	44.4	44.6	45.7
6/127 Wallace Road	1	45.6	46.6	47
6/127 Wallace Road	1	47.3	48.9	48.3
6/127 Wallace Road	1	46.5	47.2	47.9
6/127 Wallace Road	1	46.4	46.5	47.8
6/127 Wallace Road	1	51	52.9	51.6
6/127 Wallace Road	1	48.1	48.9	49.9
144 Wyllie Road	1	46.7	45.2	47.9
145 Wyllie Road	1	53.2	54.2	53.9
146 Wyllie Road	1	53.3	55.1	55.5
148 Wyllie Road	1	53.4	55.2	55.4
149 Wyllie Road	1	48.1	48.4	49.7
150 Wyllie Road	1	55.6	57.5	57.1
151 Wyllie Road	1	57.2	58.2	56.9
152 Wyllie Road	1	55.7	57.6	56.3
154 Wyllie Road	1	68	67.6	67.1
1/147 Wyllie Road	1	47.2	49	50.2
146A Wyllie Road	2	51	50.6	53.4
148A Wyllie Road	1	51.2	49.9	52.9

NoRs 4a and 4b

PPF Address (NoRs 4a and 4b)	Floor	Existing (Existing roads, existing traffic)	Do-Nothing (Existing roads, 2048 traffic)	Do-Minimum (Project, 2048 traffic)
		dB $L_{Aeq(24h)}$		
485 Puhinui Road	1	59.9	62.5	63
485 Puhinui Road	1	67.7	70.7	71
485 Puhinui Road	1	67.1	70.2	70.4
16 Sabi Place	1	54.1	55.6	57
17 Sabi Place	1	52.6	53.9	55

TE TUPU NGĀTAHI
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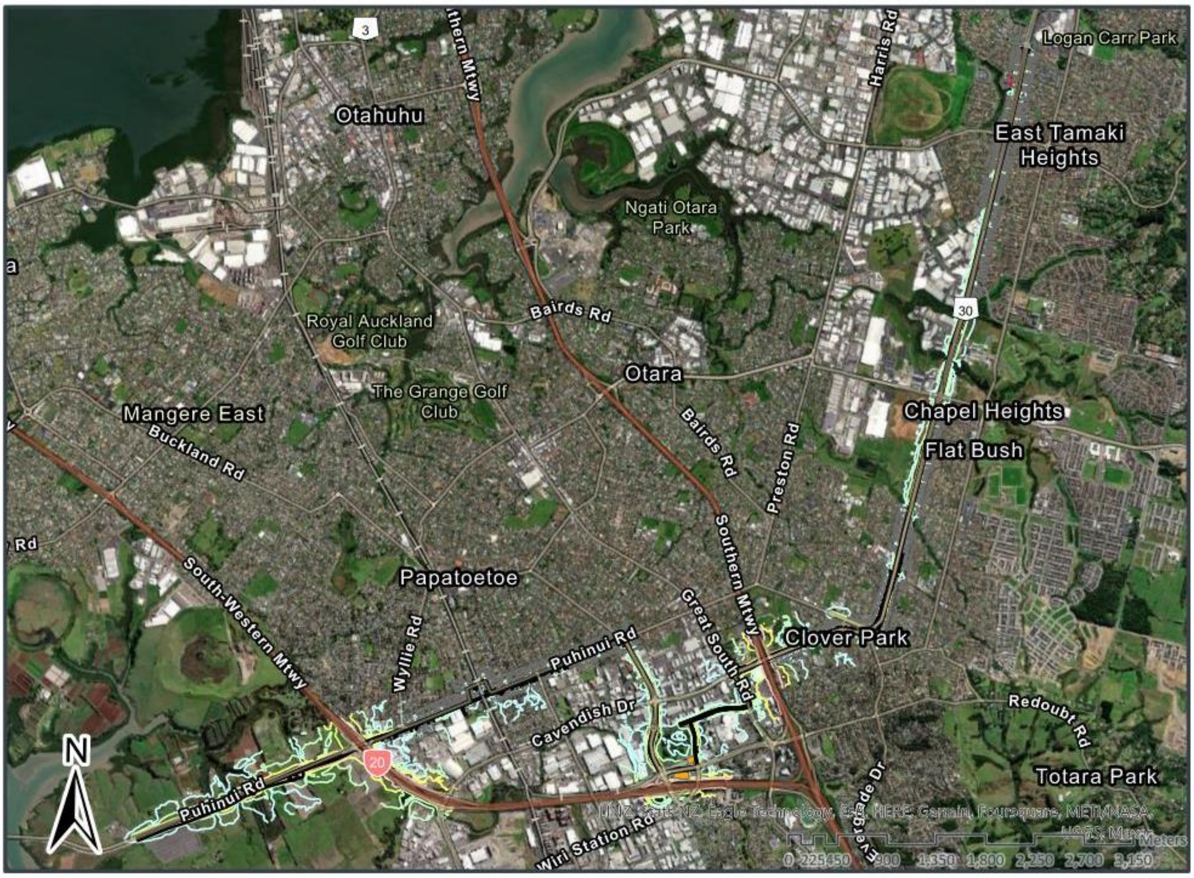
Appendix B

Noise level contours and NZS6806 categories

Appendix B – Noise level contours and NZS6806 Categories

Overview Map



Map Legend

Dwellings (dB $L_{Aeq(24h)}$)

- < 64 Category A
- 64 - 67 Category B
- > 67 Category C
- Buildings to be removed

Contours dB $L_{Aeq(24h)}$

- 55
- 60
- 65
- 70
- Project Roads

NoR 1

A2B NOR1

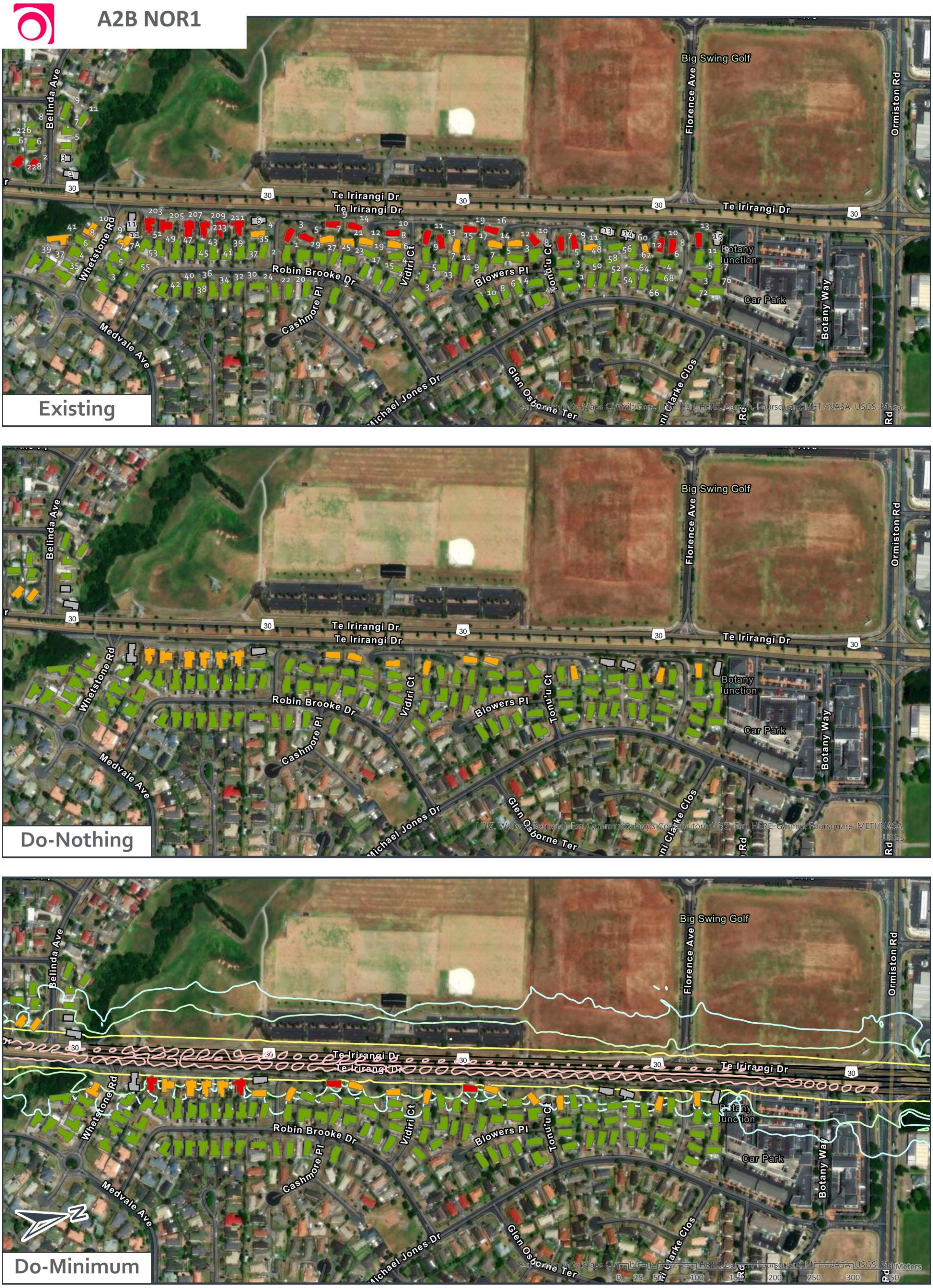

Existing
Redcastle Dr
Kelvin Hart Dr
Matarangi Rd
Liffey Dr
Lissleton Dr
Haven Dr
Oneroa Rd
Leixlep Ln
Te Irirangi Dr
Aaronville Way
Marlon Ln
Franco Ln
Chapeltown Dr
Brittas Pl
Brinlack Dr
Boderg Way
Borris Clos
Aclare Pl
Caltra Pl
Smales Rd
Wayne Francis Dr
Armoy Dr


Do-Nothing
Redcastle Dr
Kelvin Hart Dr
Matarangi Rd
Liffey Dr
Lissleton Dr
Haven Dr
Oneroa Rd
Leixlep Ln
Te Irirangi Dr
Aaronville Way
Marlon Ln
Franco Ln
Chapeltown Dr
Brittas Pl
Brinlack Dr
Boderg Way
Borris Clos
Aclare Pl
Caltra Pl
Smales Rd
Wayne Francis Dr
Armoy Dr


Do-Minimum
Redcastle Dr
Kelvin Hart Dr
Matarangi Rd
Liffey Dr
Lissleton Dr
Haven Dr
Oneroa Rd
Leixlep Ln
Te Irirangi Dr
Aaronville Way
Marlon Ln
Franco Ln
Chapeltown Dr
Brittas Pl
Brinlack Dr
Boderg Way
Borris Clos
Aclare Pl
Caltra Pl
Smales Rd
Armoy Dr


A2B NOR1
Craigavon Dr
Reg Savory Pl
Accent Dr
East Tamaki Rd
Redca
Te Irirangi Dr
Wando Ln
Sheddings Ln
Clavoy Pl
Balrath Rd
Gordal Pl
Strundeen Clos
Wayne Francis Dr
Existing
Do-Nothing
Do-Minimum
Meters
0 25 50 100 150 200 250 300 350


A2B NOR1
Ormiston Rd
Bishop Dunn Pl
Beale Pl
Accent Dr
Te Irirangi Dr
Siedeberg Dr
Existing
Do-Nothing
Do-Minimum
Esri Community Maps Contributors, LINZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar
Meters
0 25 50 100 150 200 250 300 350


A2B NOR1
Existing
Do-Nothing
Do-Minimum
Big Swing Golf
Florence Ave
Ormiston Rd
Belinda Ave
Te Irirangi Dr
Whetstone Rd
Robin Brooke Dr
Vidiri Ct
Blowers Pl
Tonu'u Ct
Botany Junction
Car Park
Botany Way
Cashmore Pl
Medvale Ave
Michael Jones Dr
Glen Osborne Ter
Meters
0 25 50 100 150 200 250 300 350

NoR 2


A2B NOR2
Existing
Do-Nothing
Do-Minimum
Te Irirangi Dr
Dissmeyer Dr
Zelda Ave
Dawson Rd
Penion Dr
Jodie Pl
Belinda Ave
Whetstone Rd
Medvale Ave
Nuneaton Dr
Dillon Cres
30

A2B NOR2


Existing
Te Irirangi Dr
Coty Pl
Ulay Pl
Sikkim Cres
Almay Pl
Shalimar Pl
Leila Pl
Clover Park
Othello Dr
Boundary Rd
Maytime St
Zelda Ave
Charntay Ave
Hollyford Dr
Dissmeyer Dr


Do-Nothing
Te Irirangi Dr
Coty Pl
Ulay Pl
Sikkim Cres
Almay Pl
Shalimar Pl
Leila Pl
Clover Park
Othello Dr
Boundary Rd
Maytime St
Zelda Ave
Charntay Ave
Hollyford Dr
Dissmeyer Dr

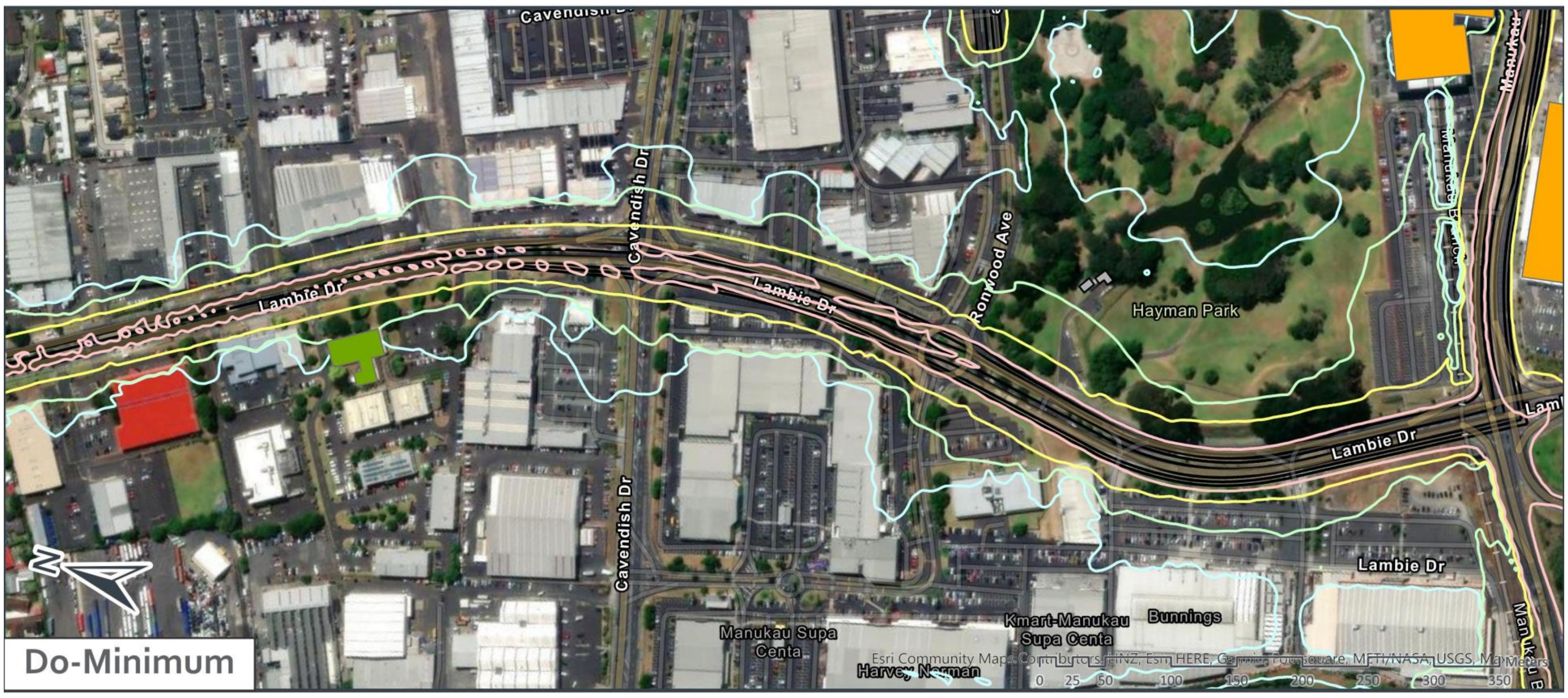

Do-Minimum
Te Irirangi Dr
Coty Pl
Ulay Pl
Sikkim Cres
Almay Pl
Shalimar Pl
Leila Pl
Clover Park
Othello Dr
Boundary Rd
Maytime St
Zelda Ave
Charntay Ave
Hollyford Dr
Dissmeyer Dr
N
0 25 50 100 150 200 250 300 350
Meters


A2B NOR2
Existing
Do-Nothing
Do-Minimum
Manukau
Cavendish Dr
Te Irirangi Dr
Great South Rd
Southern Mtwy
Ronwood Ave
Amersham Way
Sharkey St
Freeman Way
Jack Conway
Farmers-Westfield Manukau City
AUT-Manukau Campus
Sikkim Cres
N
0 25 50 100 150 200 250 300 350 Meters


A2B NOR2
Existing
Do-Nothing
Do-Minimum
Ronwood Ave
Hayman Park
Bunnings
Kmart-Manukau Supa Centa
Lambie Dr
Manukau Branch
Manukau Station Rd
Davies Ave
Osterley Way
Amersham Way
Putney Way
Westfield Manukau City
Farmers-Westfield Manukau City
Manukau Station
Meters
0 25 50 100 150 200 250 300 350


A2B NOR2
Cavendish Dr
Lambie Dr
Ronwood Ave
Hayman Park
Manukau Branch
Manukau
Kmart-Manukau Supa Centa
Bunnings
Manukau Supa Centa
Harvey Norman
Esri Community Maps Contributors, LINZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar
Existing


Cavendish Dr
Lambie Dr
Ronwood Ave
Hayman Park
Manukau Branch
Manukau
Kmart-Manukau Supa Centa
Bunnings
Manukau Supa Centa
Harvey Norman
Esri Community Maps Contributors, LINZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar
Do-Nothing


Cavendish Dr
Lambie Dr
Ronwood Ave
Hayman Park
Kmart-Manukau Supa Centa
Bunnings
Manukau Supa Centa
Harvey Norman
0 25 50 100 150 200 250 300 350
Metres
Do-Minimum


A2B NOR2
Existing
Do-Nothing
Do-Minimum
Fitzroy St
Puhinui Rd
Bledisloe St
York Rd
Tavistock St
Rito Pl
Ihaka Pl
Leith Ct
Ranfurly Rd
Plunket Ave
Grayson Ave
Brett Ave
Norman Spence Dr
N
Meters
0 25 50 100 150 200 250 300 350

NoR 3

A2B NOR3

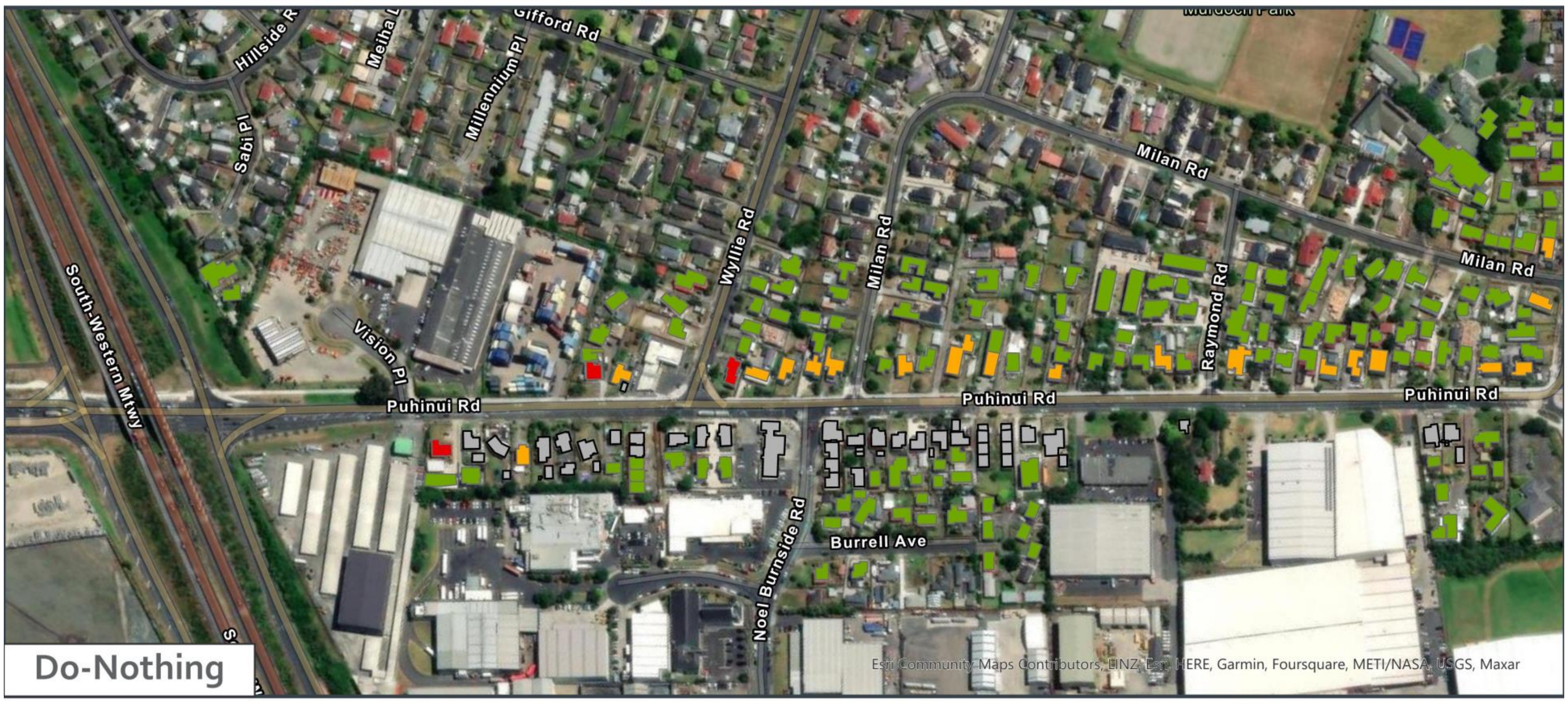

Existing
Milan Rd
Raymond Rd
Kenderdine
Southern Line
Cambridge
Bridge St
Puhinui Station
Puhinui Rd
Wallace Rd
Hayward Rd
Lipscombe Ave
Fitzroy St
Bledisloe St
Ranfurly Rd
Plunket Ave
Freyberg Ave
Brett Ave


Do-Nothing
Murdoch Park
Milan Rd
Raymond Rd
Kenderdine
Southern Line
Cambridge
Bridge St
Puhinui Station
Puhinui Rd
Wallace Rd
Hayward Rd
Lipscombe Ave
Fitzroy St
Bledisloe St
Ranfurly Rd
Plunket Ave
Freyberg Ave
Brett Ave


Do-Minimum
Murdoch Park
Milan Rd
Raymond Rd
Kenderdine
Southern Line
Cambridge
Bridge St
Puhinui Station
Puhinui Rd
Wallace Rd
Hayward Rd
Lipscombe Ave
Fitzroy St
Bledisloe St
Ranfurly Rd
Plunket Ave
Freyberg Ave
Brett Ave
N
0 25 50 100 150 200 250 300 350
Meters

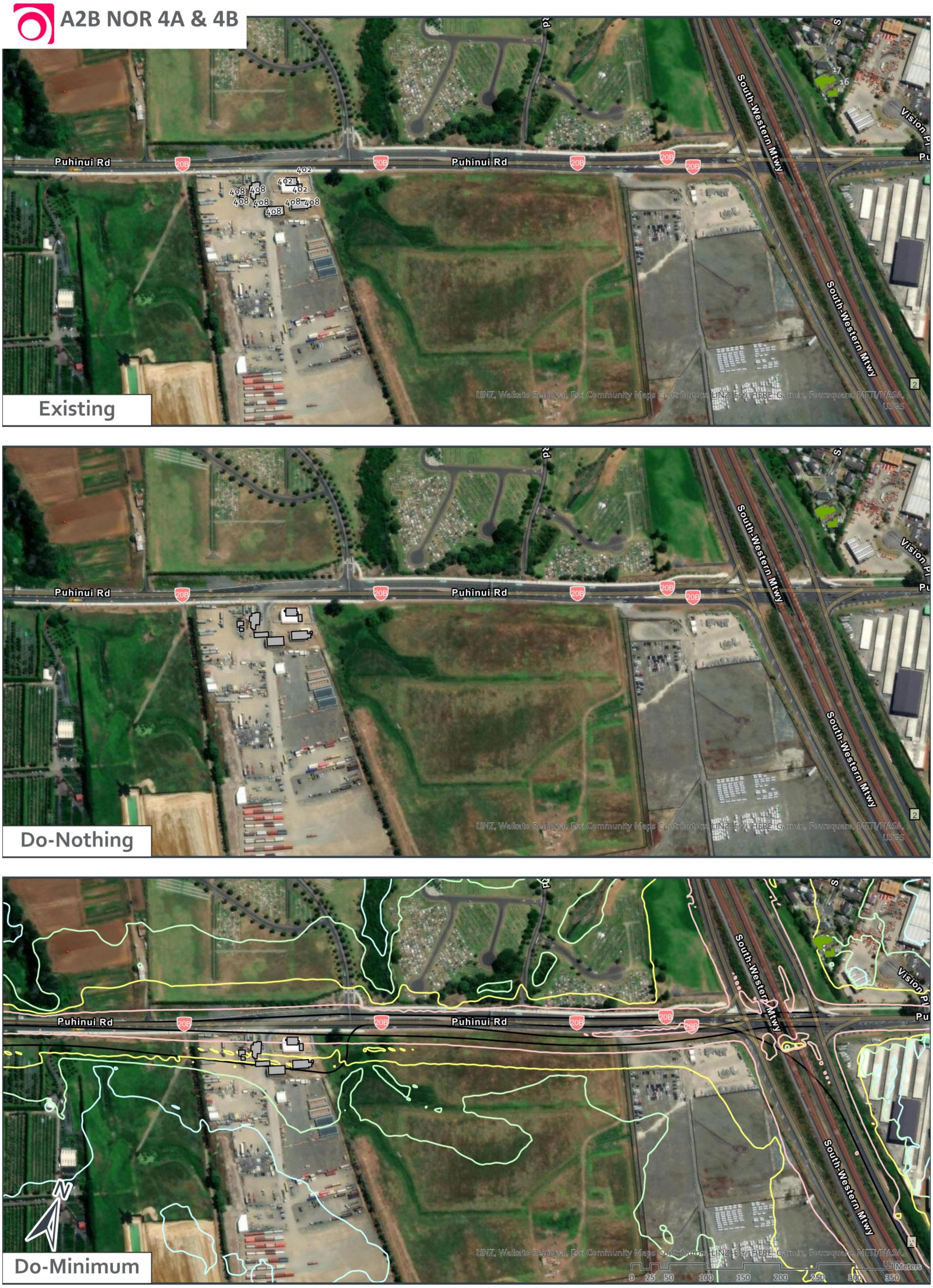
A2B NOR3


Gifford Rd
Millennium Pl
Sabi Pl
Wyllie Rd
Milan Rd
Raymond Rd
Puhinui Rd
South-Western Mtwy
Vision Pl
Noel Burnside Rd
Burrell Ave
Existing
Esri Community Maps Contributors, LINZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar


Gifford Rd
Hillside Rd
Millennium Pl
Sabi Pl
Wyllie Rd
Milan Rd
Raymond Rd
Puhinui Rd
South-Western Mtwy
Vision Pl
Noel Burnside Rd
Burrell Ave
Do-Nothing
Esri Community Maps Contributors, LINZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar


Gifford Rd
Hillside Rd
Millennium Pl
Sabi Pl
Wyllie Rd
Milan Rd
Raymond Rd
Puhinui Rd
South-Western Mtwy
Vision Pl
Noel Burnside Rd
Burrell Ave
N
Do-Minimum
Meters
0 25 50 100 150 200 250 300 350

NoRs 4a and 4b


A2B NOR 4A & 4B
Existing
Do-Nothing
Do-Minimum
Puhinui Rd
20B
South-Western Mtwy
Vision Pl
402
408
17
16
N
LINZ, Waikato Regional, Esri Community Maps Contributors, LINZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS
0 25 50 100 150 200 250 300 350 Meters


A2B NOR 4A & 4B
Orrs Rd
Puhinui Rd
Campana Rd
Prices Rd
485
440
20B
Existing
Do-Nothing
Do-Minimum
LINZ, Waikato Regional, Esri Community Maps Contributors, LINZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS
0 25 50 100 150 200 250 300 350
Meters
N

TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

Airport to Botany Assessment of Ecological Effects

December 2022

Version 1

WAKA KOTAHI NZ TRANSPORT AGENCY

New Zealand Government

Document Status

Responsibility	Name
Author	Kate Feickert
Reviewer	Chris Wedding
Approver	Adam Jellie

Revision Status

Version	Date	Reason for Issue
1.0	9 December 2022	Final for lodgement

Table of Contents

Appendices

Table of Figures

Table of Tables

Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
AUP:OP	Auckland Unitary Plan: Operative in Part
BMP	Bat Management Plan
BRT	Bus Rapid Transit
CVA	Cultural Values Assessments
EcIA	Ecological Impact Assessment
EG	Exotic grassland
EIANZ	Environmental Institute of Australia and New Zealand
MfE	Ministry for the Environment
N/A	Not Applicable
NES:F	National Environmental Standards for Freshwater
NIMT	North Island Main Trunk railway
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Airport to Botany Bus Rapid Transit (Botany Town Centre to Rongomai Park)
NoR 2	Notice of Requirement 2: Airport to Botany Bus Rapid Transit (Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue)
NoR 3	Notice of Requirement 3: Airport to Botany Bus Rapid Transit (Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange)
NoR 4a	Notice of Requirement 4a: Airport to Botany Bus Rapid Transit (SH20/20B Interchange to Orrs Road)
NoR 4b	Notice of Requirement 4b: Alteration to NZ Transport Agency Designation 6717 – State Highway 20B
NPS:FM	National Policy Statement on Freshwater Management
Programme partners	Te Ākitai Waiohua, Auckland Airport, Auckland Transport and Waka Kotahi
RCA	Road Controlling Authority
RHA	Rapid Habitat Assessment
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
SEA	Significant Ecological Area

SH1	State Highway 1
SH20	State Highway 20
SH20B	State Highway 20B
SEA	Significant Ecological Areas
SWGP	Southwest Gateway Programme
TAR	Threatened or At Risk
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
Waka Kotahi	Waka Kotahi NZ Transport Agency
ZOI	Zone of Influence

Executive summary

This Assessment of Ecological Effects report (**Report**) has been prepared to inform the Assessment of Effects on the Environment (**AEE**) for five Notices of Requirement (**NoR**) being sought by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport for the Airport to Botany project (**Project**). This report assesses the ecological effects of the four proposed NoRs.

As the Project relates to proposed designations, this Ecological Impact Assessment (**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 for terrestrial vegetation (Table 1), District plan trees[1] (Table 2), terrestrial fauna (Table 3), streams (Table 4) and wetlands (Table 5).

Table 1. Ecological values of terrestrial vegetation types for each NoR (refer Singers et al. 2017 for ecosystem type and code)

Vegetation Type	Abbrev.	NoR 1	NoR 2, Section A	NoR 2, Section B	NoR 2, Section C	NoR 3	NoR 4
Broadleaved species scrub/forest	VS.5	-	-	-	-	-	High
Exotic Grass	EG	Negligible	Negligible	Negligible	Negligible	Negligible	Low
Exotic Scrub	ES	-	-	-	-	-	Low
Exotic Forest	EF	High	-	-	-	-	High
Planted - Native	PL.1	Riparian margins = High Isolated fragments = Low	High	High	-	Low	Low
Planted - Mixed	PL.2	Low	Low	Low	Low	Cambridge Terrace and 252 Puhinui Road = High Other areas = Low	-
Treeland - Mixed	TL.2	-	Low	Low	-	-	-

[1] Only district plan vegetation (trees >4m in high and or in open space) were included as it is an NoR application.

Treeland - Exotic	TL.3	-	-	-	Low	-	High

Table 2. Ecological values of District Plan trees for each NoR

Vegetation Type	NoR 1	NoR 2, Section A	NoR 2, Section B	NoR 2, Section C	NoR 3	NoR 4
District plan trees	Low	Low	Low	Low	Low	-

Table 3. Ecological values of terrestrial fauna for each NoR

Fauna Type	NoR 1	NoR 2, Section A	NoR 2, Section B	NoR 2, Section C	NoR 3	NoR 4
Bats	Very High	Very High	-	-	-	-
Birds	High	Low	Low	Low	Low	High
Lizards	High	High	High	-	High	High

Table 4. Ecological values of streams and other non-wetland freshwater habitats for each NoR

Stream	NoR 1	NoR 2, Section A	NoR 2, Section B	NoR 2, Section C	NoR 3	NoR 4
Pakuranga Creek Tributary	High					
Taraire Creek Tributary A*	Moderate					
Taraire Creek	High					
Taraire Creek Tributary B	Low					
Ōtara Creek Tributary	Moderate**					
Puhinui Creek Tributary A			Low			
Puhinui A P.2			Negligible			
Puhinui A P.3			Negligible			
University.1			Negligible			
Puhinui Creek Tributary B				Low		
Waokauri Creek Tributary A						Moderate
Waokauri Creek Tributary B						Low
Waokauri Creek Tributary C*						Moderate
Waokauri Creek Tributary D						High

Waokauri Creek Tributary E						Moderate
Waokauri C P.1						Negligible
SH20 B Swales 1 to 4						Negligible

Notes: * = Stream directly impacted by road alignment.

** = Stream straddles designation boundary; but for conciseness has only been assessed within the NoR 1 section of this report

Table 5. Ecological values of wetlands for each NoR

Wetland	NPS-FM	NoR 1	NoR 2, Section A	NoR 2, Section B	NoR 2, Section C	NoR 3	NoR 4
Botany W.1	Artificial	Low					
Pakuranga W.1	Natural Wetland	High					
Taraire A W.1	Natural Wetland	High					
Taraire A W.2	Natural Wetland	High					
Sancta Maria W.1	Artificial	Moderate					
Taraire W.1	Natural wetland	High					
Taraire W.2	Natural wetland	Low					
Ōtara W.1	Natural wetland	High**					
University W.1	Constructed wetland			Low			
Puhinui Station W.1	Constructed wetland					Low	
Puhinui Station W.2	Constructed wetland					Low	
Waokauri A.1	Natural Wetland						Moderate
Waokauri A.2	Induced Wetland						Moderate
Waokauri B.1*	Natural Wetland						Low
Waokauri C.1*	Natural wetland						High

Waokauri C.2	Natural wetland						Low
Waokauri D.1	Natural wetland						High
Waokauri E.1*	Natural Wetland						Moderate

Notes: * = Wetland directly impacted by road alignment.

** = Wetland straddles designation boundary; but for conciseness has only been assessed within the NoR 1 section of this report

Table 6 to Table 9 provide summaries 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[2]. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed. Construction effect mitigation measures will include:

- A Bat Management Plan (**BMP**) for NoR 1 and NoR 2 Section A. Details of the BMP will depend on bat habitat present at the time of construction, 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 bat habitat;
- Bird management will be required for NoR 1, NoR 2 Section A and NoR. 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; and
- The residual (post-mitigation) level of effect for all construction effects are considered Negligible or Low.

Table 6. Summary of ecological effects during construction prior to mitigation for district plan trees

Construction - Terrestrial vegetation (district plan)	
NoR	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees only)
NoR 1	Very Low
NoR 2, Section A	Very Low
NoR 2, Section B	Very Low
NoR 2, Section C	Very Low
NoR 3	Very Low
NoR 4	-

Table 7. Summary of ecological effects during construction prior to mitigation for bats

Construction - Bats

[2] The effects assessment considered the baseline and the likely future environment as the construction of the road will only occur more than 10 years in the future.

NoR	Disturbance and displacement to roosts and individuals (existing) due to construction activities (noise, light, dust etc.)	Loss of foraging habitat due to vegetation removal - District plan only	Kill or injure individual bats due to vegetation removal - District plan only
NoR 1	Moderate	N/A	N/A
NoR 2, Section A	Moderate	N/A	N/A
NoR 2, Section B	-	-	-
NoR 2, Section C	-	-	-
NoR 3	-	-	-
NoR 4	-	-	-

Table 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	Loss of District Plan vegetation which may remove nests and foraging habitat, and injure or kill birds
NoR 1	High	Low
NoR 2, Section A	High	Low
NoR 2, Section B	Low	Low
NoR 2, Section C	Low	Low
NoR 3	Low	Low
NoR 4	High	N/A

Table 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.)
NoR 1	Very Low
NoR 2, Section A	Very Low
NoR 2, Section B	Very Low
NoR 2, Section C	N/A
NoR 3	Very Low
NoR 4	Very Low

Table 10 to Table 12 provide summaries of district plan matter operational effects due to the presence of the road resulting in disturbance or loss in connectivity to bats, birds and lizards. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed.

Operational effects mitigation measures will include a BMP. The BMP will include buffer planting along road corridors associated with stream crossings[3] and lighting design along strategic location of the road (stream crossings).

The residual level of effect for operational effects are considered **Low** or **Very Low**.

Table 10. Summary of ecological effects during operation prior to mitigation for bats

Operation - Bats		
NoR	Loss in habitat connectivity due to presence of the upgraded roadway and associated noise and lighting	Kill or injuring - vehicle strike
NoR 1	Moderate	Low
NoR 2, Section A	Moderate	Low
NoR 2, Section B	N/A	N/A
NoR 2, Section C	N/A	N/A
NoR 3	N/A	N/A
NoR 4	N/A	N/A

Table 11. Summary of ecological effects during operation prior to mitigation for birds

Operation - Birds			
NoR	Disturbance - presence of the road	Loss in connectivity - presence of the road	Kill or injuring - vehicle strike
NoR 1	Low		Very Low
NoR 2, Section A	Very Low		Very Low
NoR 2, Section B	Very Low		Very Low
NoR 2, Section C	Very Low		Very Low
NoR 3	Very Low		Very Low
NoR 4	Low		Very Low

Table 12. Summary of ecological effects during operation prior to mitigation for lizards

Operation - Lizards			
NoR	Disturbance - presence of the road	Loss in connectivity - presence of the road	Kill or injuring - vehicle strike
NoR 1	Low		Very Low
NoR 2, Section A	Low		Very Low
NoR 2, Section B	Low		Very Low
NoR 2, Section C	N/A		N/A

[3] 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).

NoR 3	Low	Very Low
NoR 4	Low	Very Low

1 Introduction

1.1 Purpose and scope of this Report

This Assessment of Ecological Effects report (**Report**) has been prepared to inform the Assessment of Effects on the Environment (**AEE**) for five Notices of Requirement (**NoR**) being sought by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport for the Airport to Botany project (**Project**) under the Resource Management Act 1991 (**RMA**). Specifically, this Report considers the actual and potential effects associated with the construction and operation of the Project on the existing and likely future environment as it relates to terrestrial ecological effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

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 within each NoR, 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 terrestrial and freshwater ecological effects. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this Report for clarity.

1.2 Report structure

To provide a clear assessment of each NoR, this Report follows the structure set out in the AEE. That is, each notice has been separated out into its own section, and each section contains an assessment of the actual and potential effects for the specific NoR. Where appropriate, measures to avoid, remedy or mitigate effects are recommended.

Each section is arranged in geographical order, starting from the westernmost point of the proposed NoR, to the easternmost point. Table 13 below describes the extent of each section, and where the description of effects can be found in this Report.

Table 13 Report structure

Sections	Section number
Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines	4
Identification and description of the existing and likely receiving ecological environment;	7.1, 8.1, 9.1, 10.1
Assessment of general ecological matters for all Airport to Botany Bus Rapid Transit NoRs	6
Assessment of specific ecological matters for Airport to Botany Bus Rapid Transit NoR 1	7.4
Assessment of specific ecological matters for Airport to Botany Bus Rapid Transit NoR 2	8.2.3, 8.3.3, 8.4.3,
Assessment of specific ecological matters for Airport to Botany Bus Rapid Transit NoR 3	9.4
Assessment of specific ecological matters for Airport to Botany Bus Rapid Transit NoRs 4a and 4b	10.4

2 Project Description

The overall Project is proposed to be an 18 km fast, high capacity, reliable, and frequent Bus Rapid Transit (**BRT**) connection with twelve stations. It is part of Auckland's wider Rapid Transit Network (**RTN**) connecting Auckland Airport and its employment areas with major urban centres including Manukau and Botany.

As set out in the AEE, this Report specifically relates to a portion of the overall Project (approximately 14.9 km) which extends from the Botany Town Centre in the vicinity of Leixlep Lane to Orrs Road in the Puhinui peninsula, off SH20B. The Project primarily involves the upgrade and widening of existing transport corridors to provide for a dedicated BRT corridor and high-quality walking and cycling facilities.

Nine BRT stations are proposed as part of the Project. These stations are generally located at signalised intersections and will be staggered on either side of the intersection.

These stations are situated in the following locations:

- Smales Road;
- Accent Drive;
- Ormiston Road – Botany Junction Shopping Centre;
- Dawson Road;
- Diorella Drive;
- Ronwood Avenue (Manukau Central);
- Manukau Station;
- Puhinui Road/Lambie Drive; and
- Puhinui Station.

As part of the Project, two new structures are proposed:

- A BRT bridge crossing the North Island Main Trunk (NIMT) and connecting to the concourse level of the Puhinui Station; and
- A southbound ramp from SH20B to SH20.

Upgrades to existing structures are proposed at the:

- Bridge over Ōtara Creek (NoR 1);
- Bridge over SH1 (NoR 2);
- Bridge over NIMT (NoR 3); and
- Bridge over Waokauri Creek (NoR 4a).

Figure 1: Overview of the Project and NoR packages

Table 14: Overview of NoRs

Notice	Description	Requiring Authority
NoR 1	Bus Rapid Transit corridor and high quality walking and cycling facilities from Botany Town Centre to Rongomai Park	Auckland Transport
NoR 2	Bus Rapid Transit corridor and high quality walking and cycling facilities from Rongomai Park to Puhinui Interchange, in the vicinity of Plunket Avenue	Auckland Transport
NoR 3	Bus Rapid Transit corridor and high quality walking and cycling facilities from Puhinui Interchange, in the vicinity of Plunket Avenue to SH20/SH20B Interchange	Auckland Transport
NoR 4a	Bus Rapid Transit corridor and high quality walking and cycling facilities from SH20B/20 Interchange to Orrs Road	Auckland Transport
NoR 4b	Alteration to designation 6717 to provide for the widening of SH20B, including a southbound on-ramp onto SH20, high quality walking and cycling facilities and enable a Bus Rapid Transit corridor	NZ Transport Agency

3 Assessment approach

3.1 EcIA assessment

This assessment generally follows the EcIA Guidelines for use in New Zealand published by the Environmental Institute of Australia and New Zealand (**EIANZ**) (Roper-Lindsay *et al.*, 2018). The EcIA Guidelines provide a standardised matrix framework that allows ecological effects assessments to be clear, transparent, and consistent. The EcIAG framework is generally used in Ecological Impact Assessments in New Zealand as good practice, and a detailed analysis of this methodology is presented in **Appendix A**.

3.2 Assessment of District Plan matters and approach to Regional Plan matters

Designations are a form of spot zoning in a District Plan. A designation authorises a requiring authority to undertake work and activity without the need for land use consent. A designated area is still subject to Regional Plan matters in the Auckland Unitary Plan (Operative in Part) (**AUP:OP**) and the necessary resource consents will be obtained closer to construction for the Project.

As this Report relates to proposed designations, the ecological effects assessment applies to District Plan matters only. Regional Plan matters will be subject to the aforementioned future consenting phase along with a supporting EcIA. As such Regional Plan matters have not been formally assessed in this Report, however the relevant matters have been screened to inform the designation boundary and are presented in Sections 7.5, 8.2.4, 8.3.4, 8.4.4, 9.5 and 10.5.

For reference, **Appendix B** sets out the split between District and Regional matters in the AUP:OP.

4 Assessment methodology

4.1 Preparation for this Report

4.1.1 Zone of Influence

The zone of influence (**ZOI**) of the Project relates to an area occupied by habitats and species that are adjacent to and may extend 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 Areas (**SEAs**) within 2 km of the Project area has been included in the desktop review, along with their connectivity to the 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 SEAs.

The ZOI of the Project on different species differs depending on how the species uses their environment. For example, mobile species such as birds and long-tailed bats have large home ranges across more diverse habitats 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 Project and was taken into consideration during the desktop review and site investigations. To reflect the likelihood of a species occurring or its potential dispersal ability into each of the Project areas, varying search distances were used depending on the species context.

4.1.2 Desktop review

A desktop review was undertaken to determine locations and extents of protected vegetation (riparian margins, Section E15.4.1 (A18, 19) of the AUP:OP and SEA, Section E15.4.2 of the AUP:OP, and fauna habitats.

Desktop investigations also involved a review of relevant fauna databases, including:

- Department of Conservation *Amphibian and Reptile Distribution Scheme* database (accessed February 2022);
- Department of Conservation bat records (accessed June 2022);
- iNaturalist[4]records within approximately 5km radius from each NoR[5];
- New Zealand Bird Atlas eBird database[6] Bird data is recorded in 10 km^2 grid squares. Squares AC69, AD68 and AD69 were accessed as these squares are positioned over the Project area; and
- New Zealand Freshwater Fish Database records were accessed for affected stream catchments.

Information collated from these sources was used to assess which native fauna species had the potential to be present within the habitat types present within the ZOI of each of the five NoRs. Because of the highly mobile nature of most native fauna (particularly bats and birds) the desktop

[4] https://www.inaturalist.org/

[5] GPS coordinates are 'obscured' for Threatened species which may affect the accuracy of records within the study area;

[6] https://ebird.org/newzealand/home

searches for species records were not split into each NoR but rather completed once for the Project as a whole.

To assist with other aspects of reporting, the following literature was also reviewed:

- An ecological assessment of State Highway 20B Short Term Improvements (Bioresearches, 2019), which reported on the results of fauna surveys (lizards, birds, bats) undertaken over SH20B during the summer of 2018-2019;
- Auckland Council Geomaps[7];
- Department of Conservation Threat Classification Series[8]; and
- Indigenous terrestrial and wetland ecosystems of Auckland (Singers *et al.,* 2017).

4.1.3 Site investigations

4.1.3.1 Terrestrial habitats

A 'walk-through' method was undertaken on 26 January, 4 August and 31 August 2022 to ascertain the desktop review and identify any other significant values not recorded from the review. During the site assessment, notes were recorded regarding the state and type of the vegetation and habitats present within the site, the species present, vegetation type and canopy cover identification and contextual photographs were taken.

4.1.3.2 Freshwater habitats

A site assessment was undertaken on 26 January, 4 August and 31 August 2022 by a qualified freshwater ecologist. During the site assessment, the presence and extent of wetland and associated stream features within the property were noted and the quality of any freshwater habitat was visually assessed. Overland flow paths were ground-truthed and classified under the definitions in the AUP:OP as to their permanent, intermittent or ephemeral status (Table 15).

Table 15. Stream classification criteria

Criteria	Definition
Permanent stream	
1	The continually flowing reaches of any river or stream
Intermittent or ephemeral stream*	
1	Evidence of natural pools
2	Well defined banks and bed
3	Retains surface water present more than 48 hours after a rain event
4	Rooted terrestrial vegetation not established across channel
5	Organic debris from flooding present on floodplain
6	Evidence of substrate sorting, including scour and deposition

[7] https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html

[8] 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/aboutus/science-publications/conservation-publications/nz-threat-classification-system/

*If three or more of the six assessment criteria can be met with confidence, the watercourse is considered intermittent. If at least three criteria cannot be met, the watercourse is considered ephemeral.

Ecological value of the stream was then assigned based upon factors such as:

- The intactness of the riparian zone;
- Permanency of flow and complexity of habitat present within the stream;
- Observable water quality parameters; and
- Modifications to hydrology and catchment of the stream.

To assist in recording this information and scoring, the Rapid Habitat Assessment (**RHA**) Protocol (Clapcott, 2015) was used for streams where Ecological Assessments had not been previously completed. A copy of the scoring sheet used for completing RHAs is provided in **Appendix D**.

4.1.3.3 Wetland habitats

Potential wetland areas were assessed following the Ministry for the Environment's (**MfE**) wetland delineation protocols[9], including vegetation assessments and wetland hydrology to determine whether the areas meet the definition of a 'natural wetland' under the National Policy Statement on Freshwater Management (**NPS:FM**). Assessments were carried out within the Auckland region's 'growing season'[10].

Vegetation was assessed in accordance with the relevant MfE protocol[11]; based on the dominance and prevalence of:

- Obligate wetland vegetation (**OBL**) – almost always a hydrophyte, rarely in uplands;
- Facultative wetland (**FACW**) – usually a hydrophyte but occasionally found in uplands;
- Facultative (**FAC**) – commonly occurs as either a hydrophyte or non-hydrophyte;
- Facultative upland (**FACU**) – occasionally a hydrophyte by usually occurs in uplands; and
- Upland (**UPL**) – rarely a hydrophyte, almost always in uplands.

Where the dominance and/or prevalence tests showed unclear results, hydric soils and hydrology tests were undertaken in accordance with the associated protocol[10,12].

If the area met the definition of a natural wetland, it was classified as to its habitat type as per Singers *et al.* (2017). Its ecological value was then assessed, based upon this classification and the condition of the wetland, considering factors such as damage caused by stock access and weed invasion, and modifications to natural hydrology.

4.1.3.4 Freshwater naming conventions

Streams were named either by their proper names (e.g., Taraire Creek) or, if not formally named, as a Tributary of the main watercourse they formed a part of (e.g., Pakuranga Creek Tributary). If multiple

[9] Ministry for the Environment (2020). *Wetland Delineation Protocols.* Wellington: Ministry for the Environment.

[10] Ministry for the Environment (2021). *Wetland delineation hydrology tool for Aotearoa New Zealand*. Wellington: Ministry for the Environment.

[11] Clarkson, B. (2013). *A vegetation tool for wetland delineation in New Zealand*. Prepared for Meridian Energy Limited. Hamilton: Manaaki Whenua Landcare Research.

[12] Fraser *et al.* (2018). *Hydric soils – field identification guide.* Report LC3223 prepared for Tasman District Council. Hamilton: Manaaki Whenua – Landcare Research.

tributaries of the same watercourse were identified, these were denoted with ‘A’, ‘B’, ‘C’ etc. (e.g., Waokauri Creek Tributary A; Waokauri Creek Tributary B etc.).

Wetlands and ponds were named based upon the watercourse with which they were associated and denoted with a ‘W’ for wetland and a ‘P’ for pond. Where there was more than one wetland associated with a watercourse, wetlands were also numbered sequentially (e.g., two wetlands on the banks of the Pakuranga Creek would be labelled ‘Pakuranga W.1’ and ‘Pakuranga W.2’).

If a wetland or pond was present with no connection to a watercourse, it was labelled according to a nearby geographical location or feature, e.g., for a pond and a wetland located within the Auckland University of Technology Campus, the naming convention was ‘University P.1’ for the pond, and ‘University W.1’ for the wetland.

4.1.3.5 Fauna

No specific fauna surveys were undertaken, however any opportunistic sightings of fauna (or bird calls heard) during the site visits were recorded.

Opportunistic searches for lizards were not undertaken as it was considered that the only NoR with suitable habitat for native lizard species was NoR 4a and 4b. In these areas, lizard surveys and bat surveys had already been undertaken by Bioresearches (2019), and it was considered that lizard or bat presence/ absence would not have changed greatly in the time since these surveys.

4.1.4 Other methodologies

A Specialists Workshop was attended on 8 March 2022, during which Project specialists shared initial findings and discussed potential constraints and opportunities for restoration planting.

5 Area wide ecological desktop review – All NoRs

This section presents the findings of an area wide desktop study. The study covers 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 the 'Existing Environment' subsection for each NoR.

5.1 Historical ecological context

The Project is located within two Ecological Districts. The northern end of NoR 1, and the entirety of NoR 2 Section B and Section C, NoR 3 and NoR 4a and 4b are located within the Tāmaki Ecological District, whilst the southern end of NoR 1, and the majority of NoR 2 Section A are located within the Manukau Ecological District (Figure 2). The sections below give a brief overview of the historic ecological conditions within these districts.

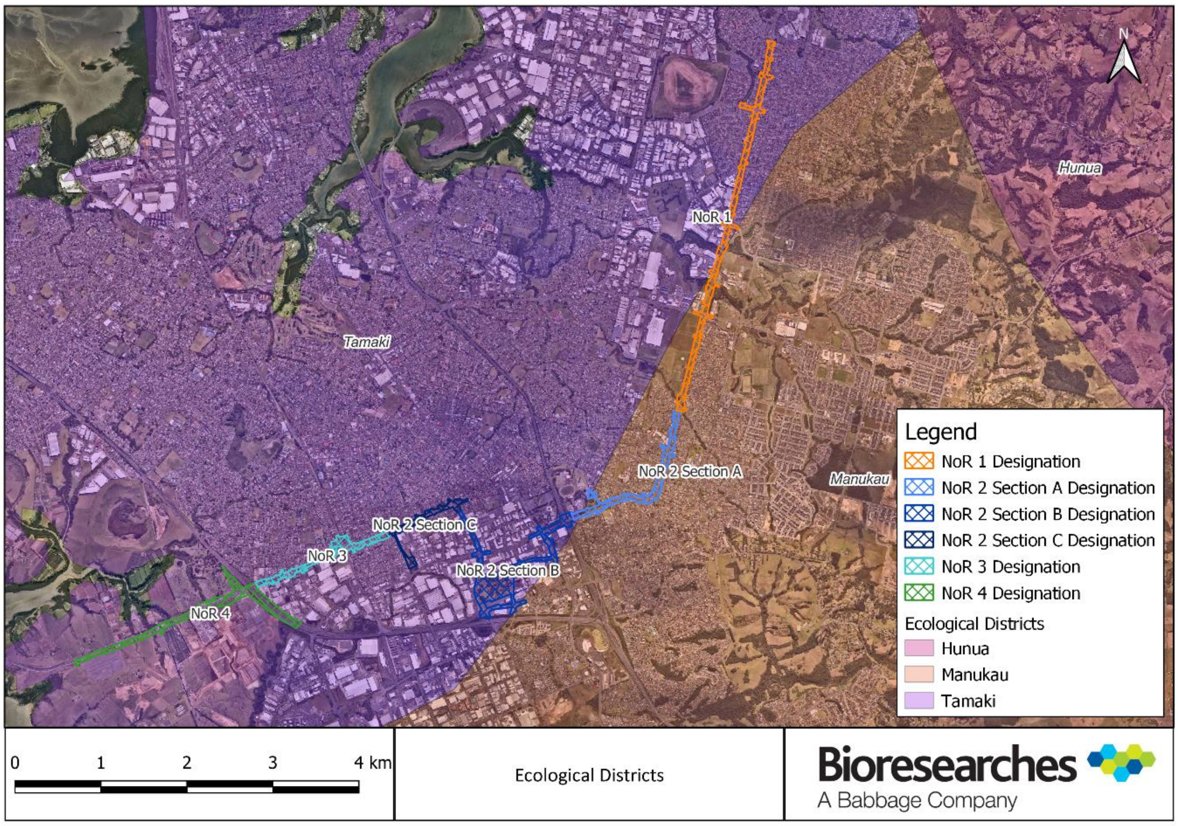


Figure 2. Ecological district boundaries in relation to the four NoRs

5.1.1 Tāmaki Ecological District

The Tāmaki Ecological District, which comprises the Auckland Isthmus, Waitematā Harbour, Takapuna and the East Coast Bays and the north-eastern edge of the Manukau Harbour. The climate of the district is warm and humid with mild winters. Soils are mainly derived from sedimentary volcanic ashes, however locally there are areas of volcanic soils on basaltic lava cones and flows (McEwan, 1987).

Much of the district was originally vegetated with taraire (*Beilschmiedia tarairi*) and pūriri (*Vitex lucens*) forest, with some kauri (*Agathis australis*) forest also present. Mangroves (*Avicennia marina* subsp. *australasica*) and saltmarsh areas were also present within the Waitematā Harbour.

As of 2009, only 6.9% of the Tamaki Ecological District remained in indigenous cover (Lindsay *et al.* 2009), with only 1% of kauri, podocarp and broadleaved forest; 2% of coastal forest; and 1% of indigenous freshwater wetland remaining. Reductions in indigenous cover below 5% are considered to be severe (Walker *et al.,* 2008). Consequently, any remaining indigenous wetland or forest vegetation; or vegetation which is regenerating into an indigenous vegetation type within the ecological district should be considered as important.

5.1.2 Manukau Ecological District

The Manukau Ecological District encompasses the Manukau Harbour and the low-lying land between it and the Waikato River. The district's climate brings warm, humid summers and mild winters. Much of the district was originally forested, with pūriri and taraire forests in upland areas and kahikatea and pukatea forests in lowland areas. Wetlands within the coastal areas were dominated by mangroves.

As of 2009, only 3% of the Manukau Ecological District remained in indigenous cover (Lindsay *et al.* 2009), with only 2% of kauri, podocarp and broadleaved forest; 4% of coastal forest; and 0.4% of indigenous freshwater wetland remaining. Reductions in indigenous cover below 5% are considered to be severe (Walker *et al*., 2008). Consequently, and like the Tāmaki District, any remaining indigenous wetland or forest vegetation; or vegetation which is regenerating into an indigenous vegetation type within the ecological district should be considered as important.

5.2 Terrestrial habitat and fauna

5.2.1 Terrestrial habitat

Where indigenous habitat remains within Auckland, it has been often been classified and mapped as a terrestrial or marine SEA in the AUP:OP. SEAs that occur within 2 km of the Project area are presented in Table 16 and shown in Figure 3. No SEAs are located directly within the Project footprint.

Table 16. SEAs located within 2 km of the Project area

Significant Ecological Area	Distance from Project area (km)	Criteria met for classification as SEA*	NoR(s) within 2 km
SEA_T_1191	1.6	1, 2, 4	NoR 1; NoR 2, Section A
SEA_T_1197	1.9	1, 2	NoR 1
SEA_T_1198	1.6	1, 2, 4	NoR 1
SEA_T_1199	1.5	2, 3	NoR 1
SEA_T_4346	1.3	2	NoR 2, Section C; NoR 3 and NoR 4
SEA_T_4347	1.5	4	NoR 1
SEA_T_4352	1.9	2	NoR 4
SEA_T_4353	1.9	2, 3, 4	NoR 4

SEA_T_5282	1.6	1, 2	NoR 1 and NoR 2, Section A
SEA_T_535	1.8	1, 2	NoR 2, Section A and Section B
SEA_T_538	1.1	1, 2	NoR 2, Section B
SEA_T_538a	0.8	1, 2, 4	NoR 1 and NoR 2, Section A and Section B
SEA_T_538b	1	1, 2, 4	NoR 1 and NoR 2, Section A and Section B
SEA_T_538c	0.8	1, 2, 4	NoR 1 and NoR 2, Section A and Section B
SEA_T_539	1.9	1, 2	NoR 2, Section B
SEA_T_5476	1.5	2, 4	NoR 4
SEA_T_607	2	4	NoR 4
SEA_T_612	0.03	2, 4	NoR 2, Section B and Section C; NoR 3 and NoR 4
SEA_T_613	0.3	2	NoR 1
SEA_T_8437	1.6	2	NoR 2, Section A, and Section B
SEA_T_8438	1.8	2	NoR 2, Section A
SEA_T_9065	1	2	NoR 3 and NoR 4
SEA-M1-27b	1.5	Artificial roost constructed which provides roosting for coastal birds. Also, a major roost for wading birds	NoR 4
SEA-M1-27c	1.9	Hight tide roost for many birds. Also has At-risk wetland bird habitat and threatened plants present.	NoR 4
SEA-M1-27w1	1.5	Wading bird habitat	NoR 4
SEA-M2-27a	0.013	An intertidal shellbank, sand flats and mangrove habitat which provides habitat for migratory birds, waders and threatened wetland birds.	NoR 3 and NoR 4
SEA-M2-45b	1.2	Best example of mangrove habitat in the Tamaki Estuary	NoR 1

* Classification codes are as follows:
1 = Representativeness
2 = Threat status and rarity
3 = Diversity
4 = Stepping-stones, migration pathways and buffers
5 = Unique or distinctiveness
Full classification criteria are provided in Appendix C

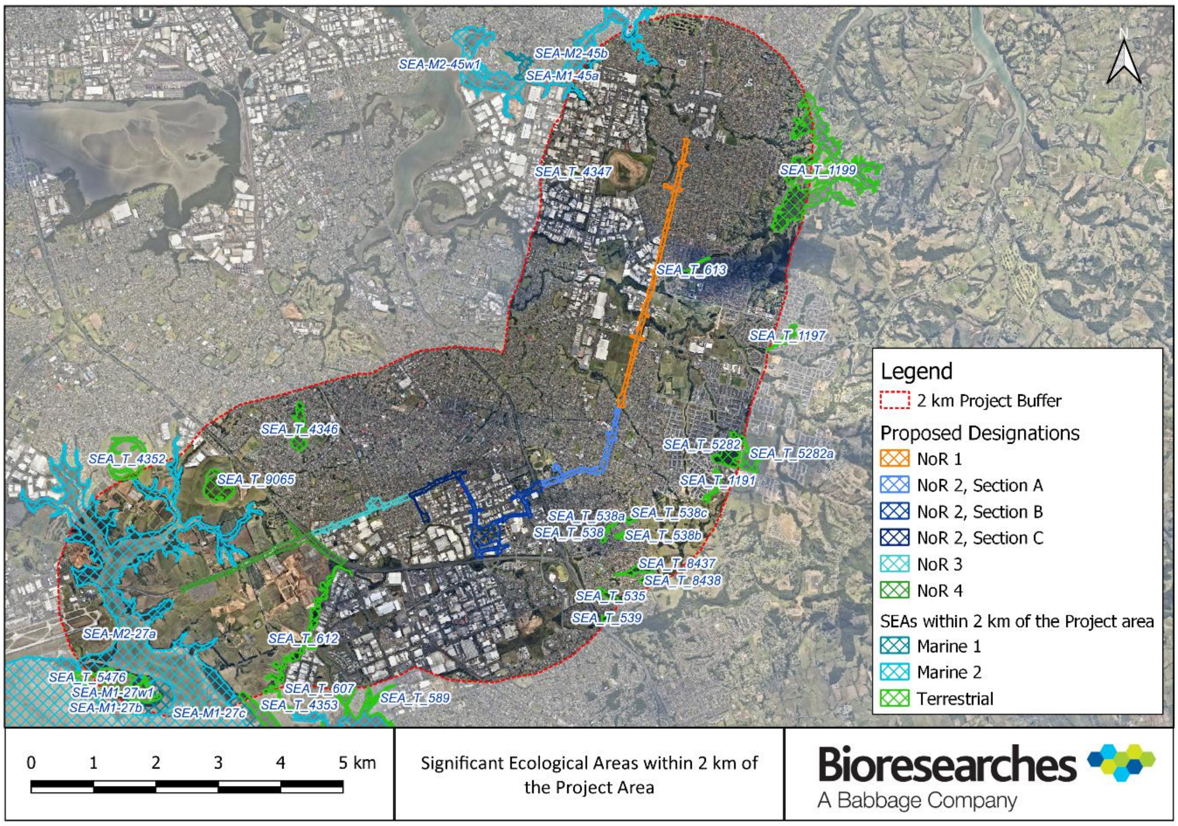


Figure 3. Significant Ecological Areas within 2 km of the Project area

5.2.2 Bats

Department of Conservation (**DOC**) records, and records from Bioresearches (2019) were accessed to complete the desktop study. This identified two bat records within 10 km of the Project (Figure 4):

- An 'unknown bat species' record located 2.1 km east of NoR 1; and
- A long-tailed bat (*Chalinolobus tuberculatus*; Threatened - Nationally Critical[13]) record 2.85 km southeast of NoR 2 Section A.

With regard to the 'unknown bat species' record, this is likely to be a long-tailed bat record. The closest records of short-tailed bats (*Mystacina tuberculata*; the other bat species present within New Zealand) are near Thames, 80 km southwest of the Project area. This species has far more specific habitat requirements than long-tailed bats (requiring mature forest with minimal introduced predators) and is far less mobile. Consequently, it is highly unlikely to be present within the Project area, and therefore this record can be considered to be a long-tailed bat.

Further than 10 km from the Project area, there are multiple long-tailed bat records in the Hunua Ranges, Waitakere Ranges and in the Pukekohe/Paerata area.

[13] Threat classification from O'Donnell *et al.* (2017).

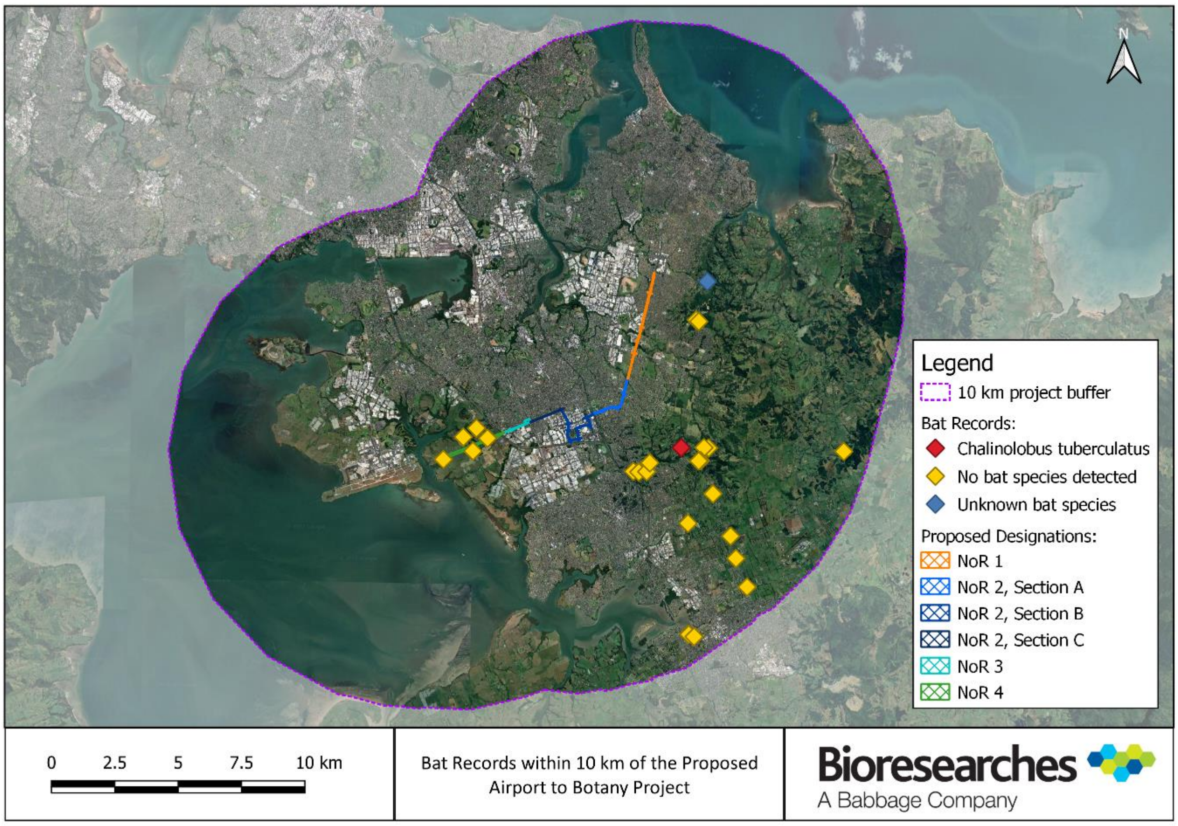


Figure 4. Bat records within 10 km of the Project area.

Analysis of potential bat habitats within the Project area both via desktop study and in the field showed that there is limited potential for bat presence due to both the urbanised nature of the Projct area within NoRs 1, 2 and 3. Despite this, the vegetation-lined stream corridors present within NoR 1 may have some potential to be used by foraging or commuting bats, however a lack of mature trees in this area removes the possibility for roosting to occur. Without a comprehensive bat survey within this area, it cannot be ruled out that bats do not use these stream corridors.

NoRs 4a and 4b have some potential for bat habitat present, in the form of vegetated stream corridors and mature trees. However, this rural environment is buffered by extensive urbanised areas which greatly reduce connectivity to other areas of known bat habitat. In addition, bat surveys conducted by Bioresearches (2019) using Automatic Bat Detectors in this area did not record bats. Consequently, the potential for bat presence within this area has been considered to be highly unlikely.

5.2.3 Birds

Records of 66 native bird species recorded within 5 km of the Project area, or within relevant grid squares of the New Zealand bird atlas data are collated in Table 87 in **Appendix B**. This included 34 Threatened or At Risk species, and exotic species were excluded. As many of these records do not include a specific location, maps were not produced.

It is accepted that common, non-threatened native species may use much of the available potential habitats present throughout the Project area, at least sporadically. However, there is limited potential habitat within the Project area which may be used by Threatened or At Risk species. Table 88 in **Appendix B** describes where suitable potential habitat may be present for these species within the

ZOI of the Project. This identified the possibility for the following birds to be present within the ZOI of the Project:

- Pāteke, banded rail, spotless crake and fernbird within NoRs 4a and 4b wetlands;
- Little black shag and pied shag to utilise larger streams within NoR 1 and 4 for foraging; and
- Pipit to use open areas within NoRs 4a and 4b.

5.2.4 Herpetofauna

A review of the DOC Bioweb database and Bioresearches (2019) found five indigenous lizard records within a 10 km radius of the NoR boundaries (Table 17). All indigenous lizard species identified in the DOC Bioweb search have a threat status of 'At Risk' (Hitchmough *et al*., 2016).

Copper skink (At Risk – Declining) is widespread and frequently recorded within highly modified habitats such as exotic scrub and rank grassland. The closest record is within the NoRs 4a and 4b. Copper skinks are also likely to be present in other NoRs if suitable vegetation is present.

Table 17. Indigenous lizard species records within a 10 km radius of the NoR boundaries

Common name	Scientific name	Threat classification (Hitchmough *et al.* 2021)
Copper skink	*Oligosoma aeneum*	At Risk – Declining
Forest gecko	*Mokopirirakau granulatus*	At Risk – Declining
Moko skink	*Oligosoma moco*	At Risk – Relict
Ornate skink	*Oligosoma ornatum*	At Risk – Declining
Shore skink	*Oligosoma smithi*	At Risk - Declining

5.3 Freshwater habitat and fauna

5.3.1 Streams

Auckland Council Geomaps' 'Rivers and Permanent Streams' layer indicates that there are 13 streams which are intersected by, or flow immediately adjacent to the Project area. These are listed in Table 18, and depicted in Figure 5 to Figure 10.

Fish surveys were not carried out during site investigations, however two 'At Risk – Declining' species, īnanga and/or longfin eel have been recorded in three of the stream catchments (Table 6).

The freshwater habitats within the NoRs were assessed for their potential to support indigenous fish during the RHA. Potential habitat, such as undercut banks, overhanging vegetation and macrophytes were observed at the time of survey.

Table 18. Streams identified within the ZOI of the Project using Auckland Council Geomaps 'Rivers and Permanent Streams' layer.

Stream[14]	Abbreviated stream name used to identify in Figure 5 to Figure 10.

[14] Naming conventions for each stream or waterbody are described in Section 4.1.3.4.

Pakuranga Creek Tributary A	PC A
Pakuranga Creek Tributary B Note: this stream is entirely piped beneath Te Irirangi Drive within the designation boundary and is considered to have no open sections within the ZOI. It has been included here for completeness but the small section present within the works area was consequently assessed as part of 'Pakuranga Creek Tributary A'.	PC B
Taraire Creek Tributary A	TC A
Taraire Creek	TC
Taraire Creek Tributary B	TC B
Ōtara Creek Tributary	OC
Puhinui Creek Tributary A	PC A
Puhinui Creek Tributary B	PC B
Waokauri Creek Tributary A	WC A
Waokauri Creek Tributary B	WC B
Waokauri Creek Tributary C	WC C
Waokauri Creek Tributary D	WC D
Waokauri Creek Tributary E	WC E
Waokauri Creek Tributary F	WC F

Figure 5. Auckland Council Geomaps 'Rivers and Permanent Streams' layer, with approximate alignment location (yellow line) and stream name codes added, within the NoR 1 section of the Project.

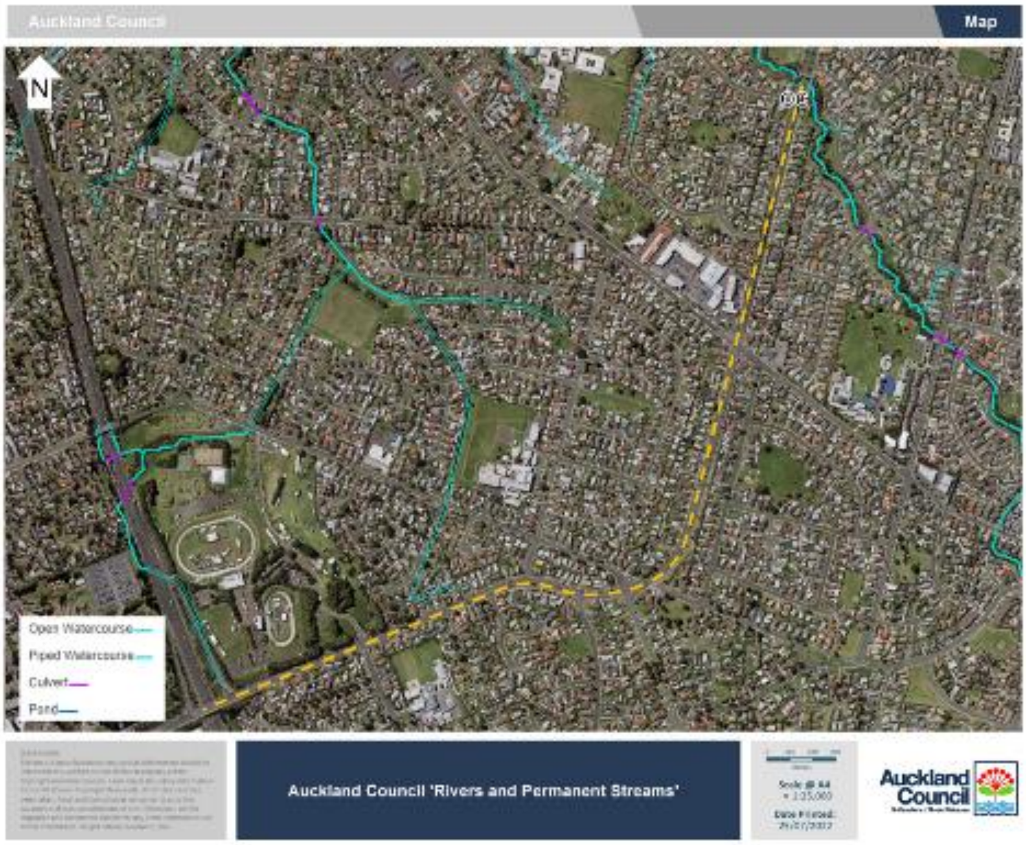


Figure 6. Auckland Council Geomaps 'Rivers and Permanent Streams' layer, with approximate alignment location (yellow line) and stream name codes added, within the NoR 2 Section A section of the Project.

Figure 7. Auckland Council Geomaps 'Rivers and Permanent Streams' layer, with approximate alignment location (yellow line) and stream name codes added, within the NoR 2 Section B section of the Project.

Figure 8. Auckland Council Geomaps 'Rivers and Permanent Streams' layer, with approximate alignment location (yellow line), within the NoR 2 Section C section of the Project.

Figure 9. Auckland Council Geomaps 'Rivers and Permanent Streams' layer, with approximate alignment location (yellow line), within the NoR 3 section of the Project.

Figure 10. Auckland Council Geomaps 'Rivers and Permanent Streams' layer, with approximate alignment location (yellow line) and stream name codes added, within the NoR 4a and 4b section of the Project.

5.3.2 Fish

The NIWA freshwater fish database and Bioresearches (2019) were reviewed for fish records within stream catchments affected by the four NoRs. Of the fish recorded, two species – īnanga (*Galaxias maculatus*) and longfin eel (*Anguilla dieffenbachii*), are classed as At Risk – Declining (Dunn *et al.,* 2017). Also included for completeness are freshwater invertebrate results where they were included within the database. This includes records of the At Risk – Declining kākahi. The desktop review results are presented in Table 19.

Table 19. Freshwater fish recorded within streams present within the ZoI of each NoR

			Watercourse and relevant NoRs				
			1	1	1, 2	2	4
Scientific Name	**Common Name**	**Threat Classification**	Pakuranga creek	Taraire Creek	Ōtara Creek	Puhinui Stream	Pukaki and Waokauri Creek
Ameiurus nebulosus	Brown bullhead catfish	Introduced and Naturalised		x			
Anguilla australis	Shortfin eel	Not Threatened	x	x	x	x	x
Anguilla dieffenbachii	Longfin eel	At Risk - Declining		x	x	x	
Anguilla spp.	Unidentified eel	N/A	x				x
Carassius auratus	Goldfish	Introduced and Naturalised			x		
Ctenopharyngodon idella	Grass carp	Not Assessed	x	x	x	x	
Cyprinus carpio	Koi carp	Introduced and Naturalised			x		
Galaxias fasciatus	Banded kōkopu	Not Threatened		x	x	x	x
Galaxias maculatus	Īnanga	At Risk - Declining			x	x	x
Galaxias spp.	Unidentified galaxiid	N/A		x		x	
Gambusia affinis	Gambusia	Introduced and Naturalised		x	x		x
Gobiomorphus basalis	Cran's bully	Not Threatened		x		x	
Gobiomorphus cotidianus	Common bully	Not Threatened			x	x	
Hyridella menziesi	Kākahi, Freshwater mussel	At Risk - Declining		x		x	x
Paranephrops spp.	Kōura	Not Threatened		x		x	x

Paratya curvirostris	Freshwater shrimp	Not Threatened	x	x		x	x

5.4 Wetland habitat

Wetlands present within NoRs 4a and 4b had previously been assessed by Bioresearches (2019). However, as these assessments predated the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (**NES:F**), they were not undertaken using the most recent wetland delineation criteria. Wetlands within NoRs 4a and 4b were identified as either exotic freshwater wetlands, mosaics of native and non-native wetland plants, or mangrove forests.

No assessments were identified for wetlands within other NoRs.

6 Positive ecology effects of the Airport to Botany project

Positive terrestrial ecology effects could be achieved through mitigation enhancement or restoration of terrestrial and wetland habitats where ecological integrity is currently compromised through weed infestation. In addition, native restoration planting will occur on roadsides which will in time provide habitat for native fauna and assist in providing a native plant seed source in the local area which will eventually lead to the growth of native plants in other areas. Furthermore, exotic street trees to be removed often provide very little ecological function, such as the Washingtonia Palms that line Te Irirangi Drive. These will be replaced with native species that would provide indigenous resources for native fauna and contribute to local native seed sources.

Streams within the Project area are frequently affected by stormwater inputs, and the Project would allow for an increase in the number of ‘green infrastructure’ features such as stormwater wetlands, which will improve water quality of stormwater generated by the existing roadway before it enters the waterways. In addition, stream crossings where culverts are to be upgraded or lengthened will be improved so that fish passage is provided.

Opportunities within the immediate landscape of the Project include enhancing indigenous biodiversity values within the riparian margins of Waokauri Creek and at the Manukau Memorial Gardens; as well as Rongomai Park and where the Project crosses tributaries of Ōtara Creek, Taraire Creek and its tributaries, and the Pakuranga Creek Tributary (feed into the Waitematā Harbour). Of note, these opportunities have potential to strengthen and enhance wildlife corridor connectivity between the Manukau Harbour to west of the Project, and Waitematā Harbour to the north-east of the Project, as well as provide potential flood protection benefits.

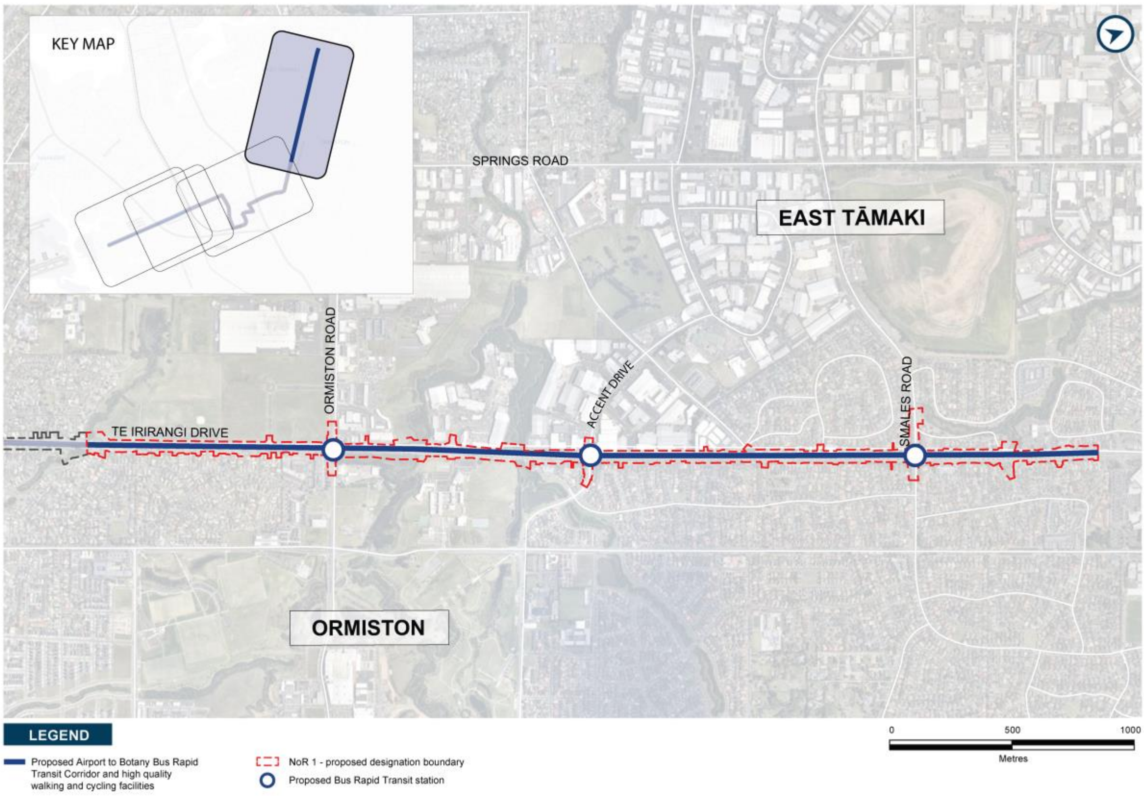
7 Airport to Botany Bus Rapid Transit – NoR 1

This section assesses specific ecological matters relating to NoR 1 – the Project corridor between Botany Town Centre and Rongomai Park.

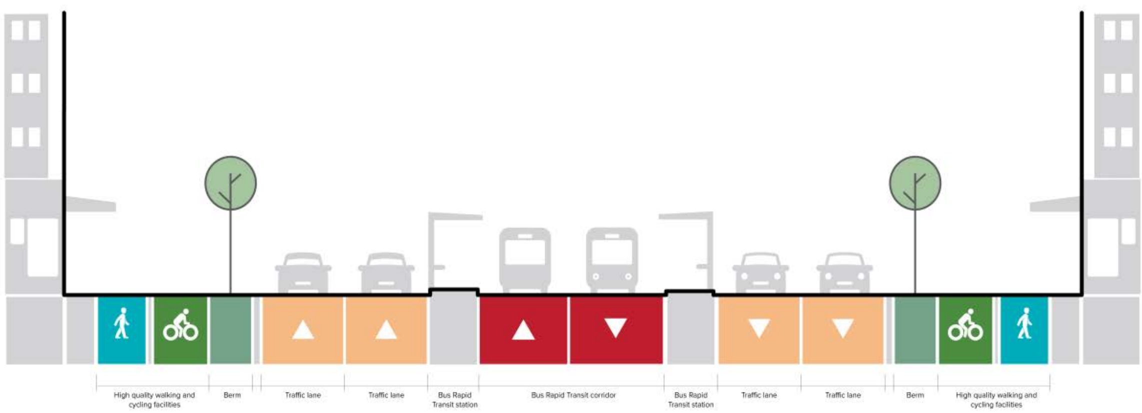
7.1 Overview and description of works

As set out in Table 20 below, the proposed works in NoR 1 include the widening of existing Te Irirangi Drive to accommodate a centre-running BRT corridor, two vehicle lanes in each direction and high quality walking and cycling facilities.

Table 20: Overview of NoR 1

NoR 1 – Botany Town Centre to Rongomai Park	
	
Key features	
BRT Corridor	Centre-running along Te Irirangi Drive
BRT Stations	• Smales Road Station; • Accent Drive Station; and • Ormiston Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	Two lanes in each direction (existing)

Access	There is an existing central median along the majority of Te Irirangi Drive which restricts right-turn access
Speed environment	50km/h
Signalised intersections	• Te Irirangi Drive and Smales Road; • Te Irirangi Drive and Accent Drive; • Te Irirangi Drive and Bishop Dunn Avenue; and • Te Irirangi Drive and Ormiston Road.
Stormwater infrastructure	• Swales; and • Wetlands.
NoR 1 typical cross section	



7.2 Ecological baseline

7.2.1 Terrestrial habitats and fauna

NoR 1 (Botany to Rongomai Park) transitions through light industry, mixed use, business and residential zones (AUP:OP), as well as a few open space recreation zones, and a special purpose zone in which the full school campus of the Sancta Maria College is located. Present day habitats are therefore largely limited to amenity plantings/gardens within the ZOI, with the exception of:

- The open grassland/lawn areas of Rongomai Park, Sancta Maria College and some undeveloped land to the west of the proposed alignment between Ormiston Road and Bishop Dunn Place, classified as exotic grassland (EG) using Singers *et al*., 2017;
- Planted exotic amenity trees, classified as exotic planted vegetation (PL.2); and
- Riparian margins of a Pakuranga Creek tributary, two tributaries of the Taraire Creek and a tributary of the Ōtara Stream, classified as native planted vegetation (PL.1).

These areas are further described in Table 21, and depicted in Figure 11, Figure 12 and Figure 13.

Table 21. Vegetation types present within and directly adjacent to the Project Area (NoR 1), classified according to Singers *et al.* (2017).

Vegetation type	Alpha-numeric code*	Regional IUCN Conservation Status*	Description of habitat
Planted Vegetation – native	PL.1	N/A	These areas of PL.1 habitat have been divided into two types: those that line the creeks which cross or flow parallel with Te Irirangi Drive and form larger areas of continuous habitat; and the isolated stands or narrow strips of planted vegetation which have no connection with other habitats. The planting mixtures are very similar throughout these areas and given their similar height (approx. 6 m tall), they all appear to have been planted around 20 years ago. These plant mixtures comprise kānuka (*Kunzea robusta*), kowhai (*Sophora microphylla*), karo (*Pittosporum crassifolium*), māhoe (*Melicytus ramiflorus*) and tī kōuka (*Cordyline australis*). A few native seedlings are coming through an otherwise bare ground cover, including māhoe, koromiko/hebe (*Veronica stricta*) and a few tōtara (*Podocarpus totara*), as well as weeds such as moth plant (*Araujia sericifera*). These areas are classified using the Singers *et al.* (2017) classification system as PL.1 (planted native scrub and forest <20 years old or wetland <10 years old.). The peripheries of these habitats which are adjacent to the streams were often weedy and contained overgrown pasture and weed species which would provide habitat for copper skink (*Oligosoma aeneum*), and were planted along stream banks, this vegetation may provide sufficient cover to allow streams to be used as a flight path for long-tailed bats, however the isolated stands are not expected to provide habitat for these species.
Planted Vegetation – amenity plantings	PL.2	N/A	Exotic amenity trees planted within the road corridor. Most of these are Washingtonia palm (*Washingtonia robusta*) or pōhutukawa. Exotic-dominated gardens such as those within residential sections. These habitats are not likely to provide habitat for native fauna species.
Exotic grassland	EG	N/A	Grassland dominated by exotic species. This includes pasture, sport pitches, gardens and parks. These habitats are not likely to provide habitat for native fauna species.
Exotic forest	EF	N/A	Pine canopy with limited understory. The understory which is present is a mix of common, native species such as those regenerating in the PL.2 habitat, and pest plant and weed species. Groundcover is unsuitable for copper skink, but the trees may provide some nesting or roosting habitat for common native bird species.

* = Information from Singers *et al.* (2017).

Fauna identified during the desktop study which may be present within the ZOI of the NoR include:

- Long-tailed bats;
- Copper skink;
- Common, non-threatened native bird species; and

- Wetland bird species such as pāteke (At Risk – Recovering; presence confirmed during site visits) and fernbird (At Risk – Declining).

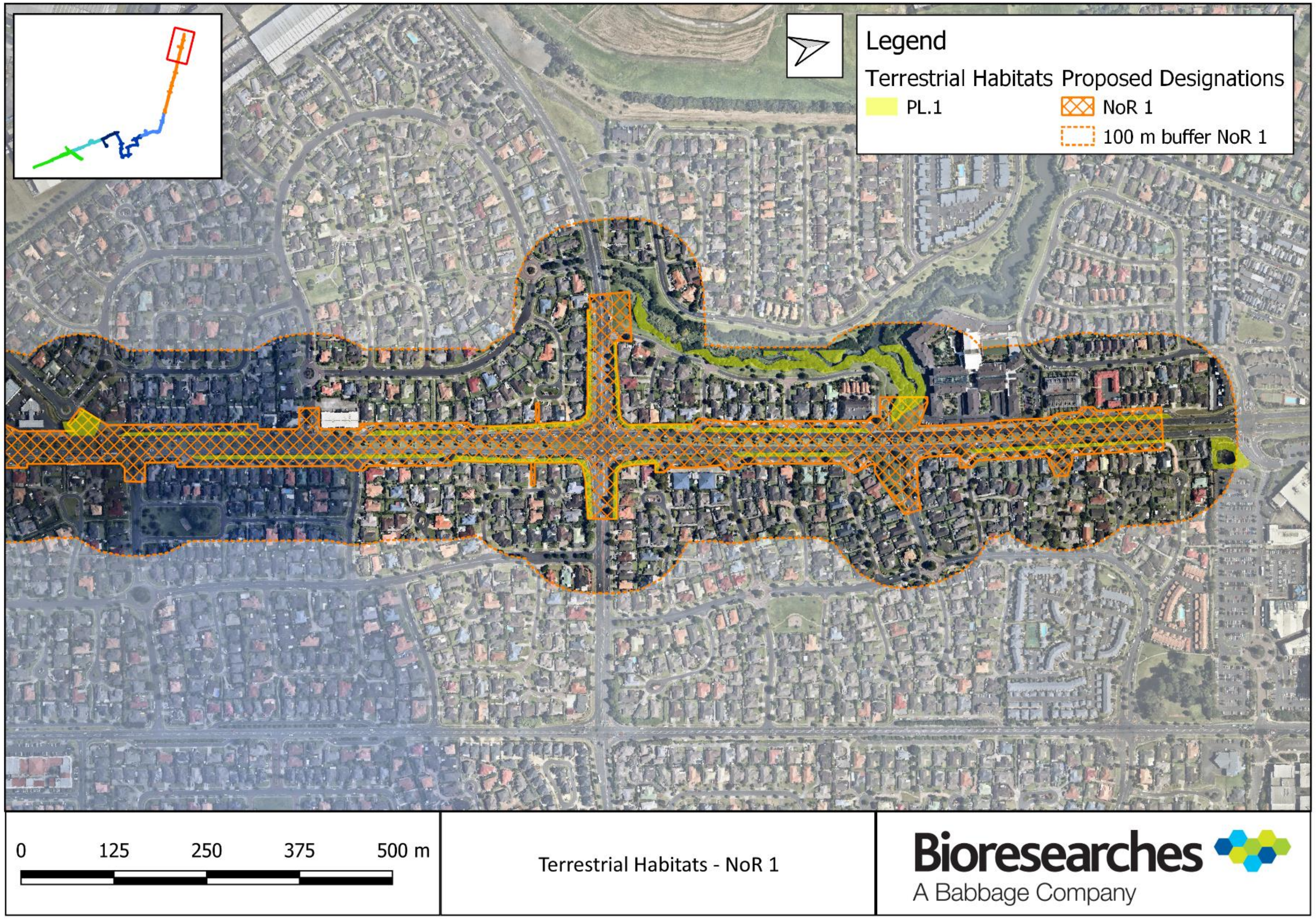


Figure 11. Terrestrial Habitats within the ZOI of the northern portion of NoR 1

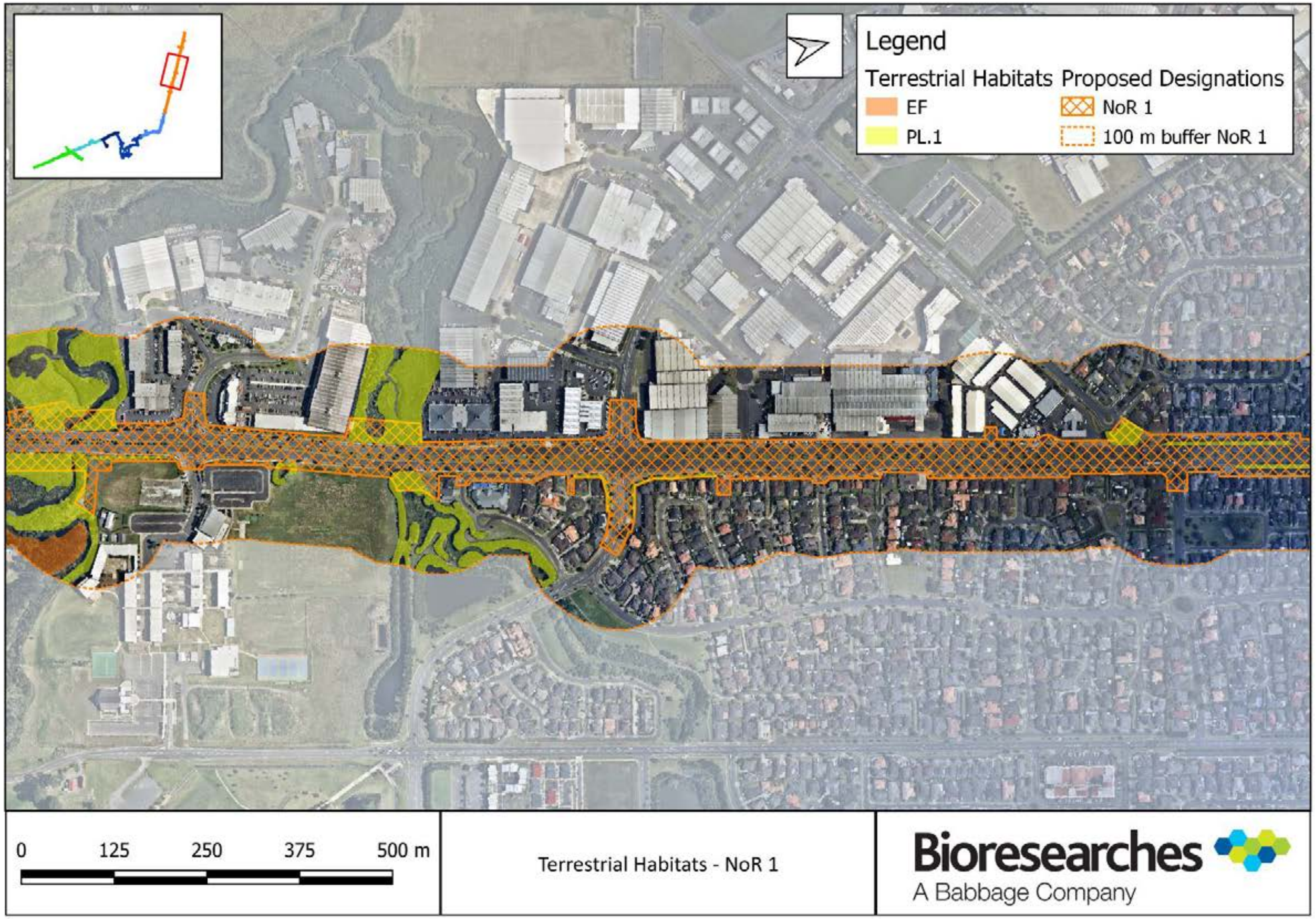


Figure 12. Terrestrial Habitats within the ZOI of the central portion of NoR 1

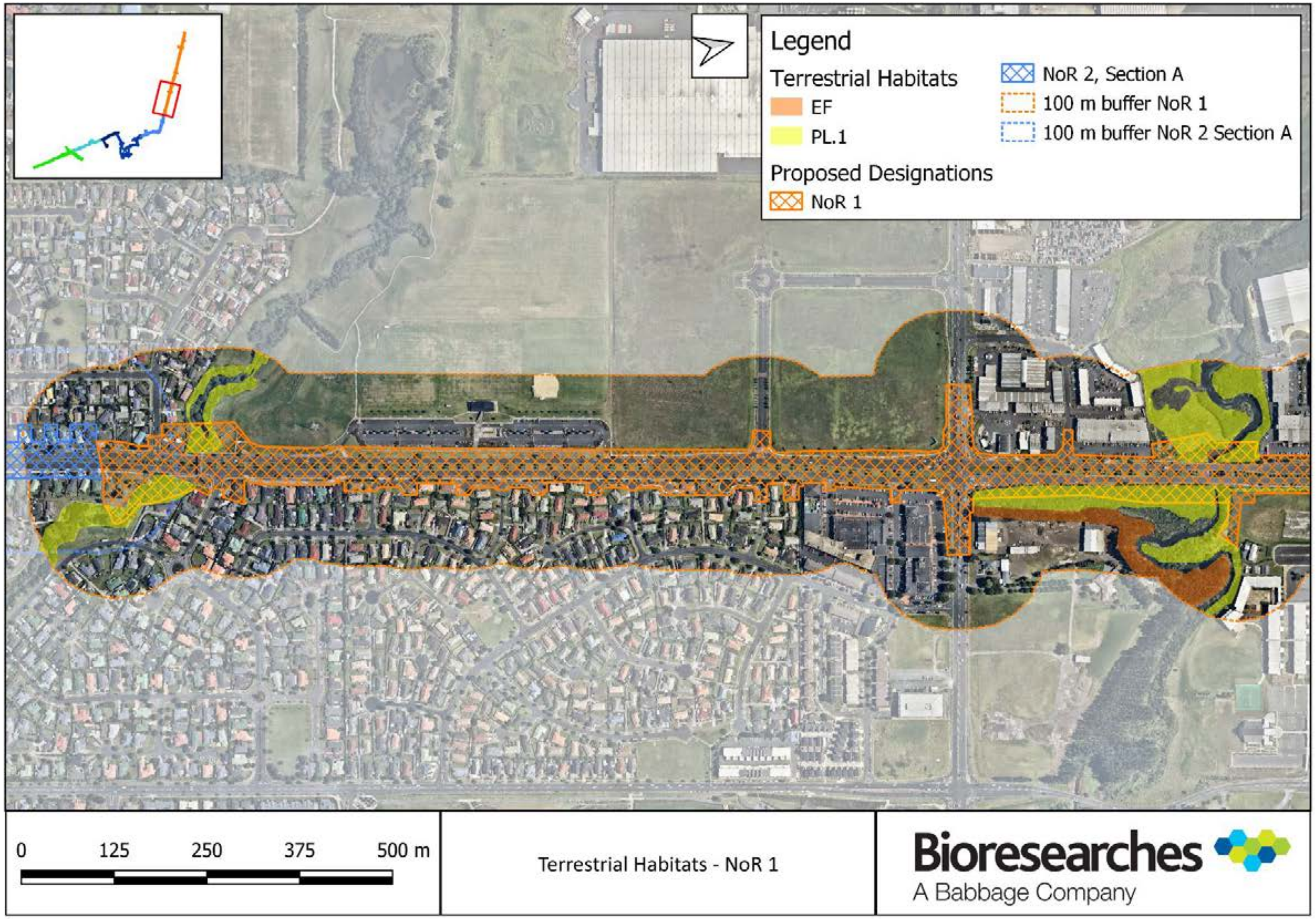


Figure 13. Terrestrial Habitats within the ZOI of the southern portion of NoR 1

7.2.2 Terrestrial ecological value

Table 22 presents the ecological value for the terrestrial habitats identified within NoR 1. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 22. Ecological values of terrestrial habitats within the ZOI of NoR 1

Habitat unit	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
PL.1 – riparian margins	Moderate – although highly modified, there is so little natural vegetation left in the surrounding area that these areas can be considered important.	High – copper skink (At Risk - Declining) are likely present, and there is potential that the streams and riparian margins are used as long-tailed bat flight paths.	Low - while indigenous species dominate these planted compositions, they lack the diversity and structure expected of a naturally occurring ecosystem.	High - these vegetated margins provide some of the very few areas of biodiversity within a landscape that is largely devoid of indigenous vegetation and habitat.	High
PL.1 – isolated fragments	Moderate – although highly modified, there is so little natural vegetation left in the surrounding area that these areas can be considered important.	Low – not likely to support any Threatened or At Risk species.	Low – while indigenous species dominate these planted compositions, they lack the diversity and structure expected of a naturally occurring ecosystem.	Low - Whilst these areas may provide some foraging habitat for common, non-threatened bird species, due to their small, fragmented nature they are unlikely to support copper skink. Are much more susceptible to edge effects and weed incursion.	Low
PL.2	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too manicured or isolated to offer much variation in habitat or to be used for completion of lifecycles. Species are of a highly modified assemblage.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	Low

EG	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – habitat has very low diversity.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	Negligible
EF	Low – this habitat is highly modified with low indigenous representation.	High – not likely to support any Threatened or At Risk species bird or lizard species, there is potential that the vegetation margins are used as long-tailed bat flight paths.	Low – habitat has very low diversity.	Low - Whilst these areas may provide some foraging habitat for common, non-threatened bird species, due to their small, fragmented nature they are unlikely to support copper skink. Are much more susceptible to edge effects and weed incursion.	High

Table 23 presents the ecological values for the fauna identified within the ZOI of NoR 1.

Table 23. Ecological values of fauna within the ZOI of NoR 1

Fauna	Habitat units utilised	Conservation Status*	Ecological value
Bats – long tailed bat	PL.1 – riparian margins	Threatened - Nationally Critical	Very High
Lizards – copper skink	PL.1 – riparian margins	At Risk - Declining	High
Birds – pāteke and potentially others such as fernbird	Wetland habitats	Confirmed At Risk – Recovering and potentially At Risk – Declining species.	High
Birds – common, Not Threatened species only	Pl.1 and PL.2 habitats	Not Threatened	Low

* Retrieved from relevant New Zealand Threat Classification Series documents, available from https://www.doc.govt.nz/about-us/science-publications/series/new-zealand-threat-classification-series/

7.2.3 Freshwater habitats and fauna

Six stream branches were identified within 100 m of the designation boundary, however, only two of these were within the NoR 1 footprint. These streams are mapped in Figure 14, Figure 15 and Figure 16; and described in Table 24.

Table 24. Summary of NoR 1 streams

<table>
<tr><th>Stream</th><th>Classification</th><th>Brief description</th></tr>
<tr><td>Pakuranga Creek Tributary</td><td>Permanent</td><td>This habitat includes a larger tributary of the Pakuranga Creek which flows in a northern direction approximately 90 m west of NoR 1, and a smaller tributary stream to it which outflows from a culvert approximately 10 m west of Te Irirangi Drive and flows westward into the larger tributary. Because of their similarities and short lengths, they have been assessed as one habitat unit.
Both branches have associated wetland vegetation on their peripheries (mapped as Pakuranga W.1).
The smaller stream is entirely culverted upstream of the open extent within the Project area. The larger stream has approximately 400 m of channel upstream of the confluence of the two tributaries, above that it is entirely piped. Both streams receive all water from stormwater inflows and consequently can be expected to have highly modified hydrological regimes with flashy responses to rainfall, and likely receive contaminants from roads. Banks of both streams are lined with habitat unit PL.1 described above.
Instream habitats were observed to be degraded, with thick sediment layers and low clarity. A dam is present approximately 400 m below the confluence of the two tributaries which has artificially raised the water level within the lower reaches of the creek, forming a stormwater pond, and as such the hydraulic heterogeneity is low. The dam (and other culverts below it) likely act as at least partial barriers to fish passage.
Short fin eels (Not Threatened) were observed within the creeks. Grass carp have also been recorded in this dam, presumably introduced for control of aquatic weeds, but are likely exacerbating the poor water quality. It is likely they are still present, as the lower portions of the stream flooded by the dam were completely denuded of aquatic vegetation.
No records are held for At Risk or Threatened fish species.
Rapid habitat assessment scores were low to moderate:
<table>
<tr><th>Deposited Sediment</th><th>Invertebrate habitat diversity</th><th>Invertebrate habitat abundance</th><th>Fish cover diversity</th><th>Fish cover abundance</th><th>Hydraulic heterogeneity</th><th>Bank erosion</th><th>Bank vegetation</th><th>Riparian width</th><th>Riparian Shade</th><th>Total</th></tr>
<tr><td>1</td><td>3</td><td>1</td><td>3</td><td>4</td><td>2</td><td>5</td><td>7</td><td>8</td><td>6</td><td>40</td></tr>
</table>
</td></tr>
</table>

<table>
<tr>
<td>Taraire Creek Tributary A</td>
<td>Permanent</td>
<td>
Taraire Creek Tributary A is a third-order tributary stream which originates east of NoR 1. Along its peripheries are natural wetlands which generally extend approximately 2 - 3 m from the stream banks, however on the eastern side of the proposed Project there is a larger area of wetland present on the south side of the stream (mapped as Taraire A W.1).
Two stormwater ponds also flow into this wetland area; one is wholly artificial, whilst the other is a modified stream which has been dammed. Taraire Creek Tributary A outflows from the wetland approximately 20 m to the east of Te Irirangi Drive. It then flows through a culvert beneath Te Irirangi Drive. This culvert was observed to be acting as a partial barrier to fish passage, with a c. 10 cm drop in water level at its outlet. On the southern side of Tributary A, to the west of Te Irirangi Drive is an additional wetland (Taraire A W.2).
Kākahi (At Risk – Declining) have been recorded within the wider catchment, however, due to the poor habitat quality and thick sediment layer it is unlikely that they are present within the stream. Longfin eel (At Risk - Declining) have also been recorded, and likely pass through the Project to reach the upper reaches of the stream.
Sections of the stream were choked with the invasive weeds Egeria densa and hornwort (Ceratophyllum demersum), and exotic parrot’s feather (Myriophyllum aquaticum) was also present.
The stream receives a large volume of water from stormwater inflows and consequently can be expected to have a highly modified hydrological regime with flashy responses to rainfall.
Rapid habitat assessment scores were low to moderate:
<table>
<tr><th>Deposited Sediment</th><th>Invertebrate habitat diversity</th><th>Invertebrate habitat abundance</th><th>Fish cover diversity</th><th>Fish cover abundance</th><th>Hydraulic heterogeneity</th><th>Bank erosion</th><th>Bank vegetation</th><th>Riparian width</th><th>Riparian Shade</th><th>Total</th></tr>
<tr><td>1</td><td>3</td><td>3</td><td>2</td><td>7</td><td>2</td><td>4</td><td>7</td><td>10</td><td>4</td><td>43</td></tr>
</table>
</td>
</tr>
<tr>
<td>Taraire Creek</td>
<td>Permanent</td>
<td>
Taraire Creek flows in a western direction beneath a Te Irirangi Road bridge. It is a fourth-order stream with permanent flow.
The pest plant Egeria was present in thick mats within the creek, as well as large amounts of rubbish. Water clarity was too poor for the stream bed to be observed, however it is assumed that, like other nearby streams, the bed would have been smothered in fine sediment. Hydrological heterogeneity was limited to a slow run and a pool. Kākahi (At Risk – Declining) have been recorded within the wider catchment, however, due to the poor habitat quality and thick sediment layer it is unlikely that they are present within the stream. Longfin eel (At Risk - Declining) have also been recorded, and likely pass through the Project to reach the upper reaches of the stream.
The stream has wetland habitat present on both sides (Taraire W.1 and Taraire W.2, described below). Banks of the stream/wetland habitat are lined with habitat unit PL.1 described above.
Rapid habitat assessment scores were low:
<table>
<tr><th>Deposited Sediment</th><th>Invertebrate habitat diversity</th><th>Invertebrate habitat abundance</th><th>Fish cover diversity</th><th>Fish cover abundance</th><th>Hydraulic heterogeneity</th><th>Bank erosion</th><th>Bank vegetation</th><th>Riparian width</th><th>Riparian Shade</th><th>Total</th></tr>
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<tr><td></td><td></td><td><table><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>2</td><td>5</td><td>7</td><td>8</td><td>4</td><td>31</td></tr></table></td></tr>
<tr><td>Taraire Creek Tributary B</td><td>Permanent</td><td>
Taraire Creek Tributary B is a first order stream which flows in a northern direction on the eastern side of Te Irirangi Drive, outflowing into Taraire Creek via a wetland (Taraire.2, described below). The western stream bank is lined with habitat unit PL.1 described above, whilst the eastern bank is planted in pine.
It is approximately 200 m in length and is fed via a stormwater outlet, with no open stream above the culvert outlet. It is well shaded by overhead trees. No macrophytes were present in the stream, and substrate was clay with various sized cobbles present. Hydraulic heterogeneity was low, with the entire length being either run or riffle sections. No fish were observed within the stream. The creek outflows into a wetland which is positioned alongside the Taraire Creek.
Rapid habitat assessment scores were moderate:
<table>
<tr><th>Deposited Sediment</th><th>Invertebrate habitat diversity</th><th>Invertebrate habitat abundance</th><th>Fish cover diversity</th><th>Fish cover abundance</th><th>Hydraulic heterogeneity</th><th>Bank erosion</th><th>Bank vegetation</th><th>Riparian width</th><th>Riparian Shade</th><th>Total</th></tr>
<tr><td>6</td><td>6</td><td>4</td><td>3</td><td>4</td><td>2</td><td>4</td><td>7</td><td>8</td><td>10</td><td>54</td></tr>
</table>
</td></tr>
<tr><td>Ōtara Creek Tributary</td><td>Permanent</td><td>
The Ōtara Creek Tributary flows in a northwest direction beneath Te Irirangi Drive. At its point of crossing the road it is within the ZOI of both NoR 1 and NoR 2.
Water clarity within the stream at the time of the site visit was observed to be clear, however thick sediment coated everything in the stream including aquatic plants. The pest plant Egeria (Egeria densa) was observed within the creek, as well as large amounts of rubbish.
Banks of the stream are lined with habitat unit PL.1 described above.
Kākahi (At Risk – Declining) have been recorded within the wider catchment. However, due to the poor habitat quality and thick sediment layer it is unlikely that they are present within the stream. Both longfin eel and īnanga (At Risk – Declining) have been recorded within the wider stream catchment, and shortfin eels were observed in the creek during the site visit.
Rapid habitat assessment scores were moderate:
<table>
<tr><th>Deposited Sediment</th><th>Invertebrate habitat diversity</th><th>Invertebrate habitat abundance</th><th>Fish cover diversity</th><th>Fish cover abundance</th><th>Hydraulic heterogeneity</th><th>Bank erosion</th><th>Bank vegetation</th><th>Riparian width</th><th>Riparian Shade</th><th>Total</th></tr>
<tr><td>1</td><td>3</td><td>1</td><td>3</td><td>4</td><td>2</td><td>5</td><td>7</td><td>8</td><td>8</td><td>42</td></tr>
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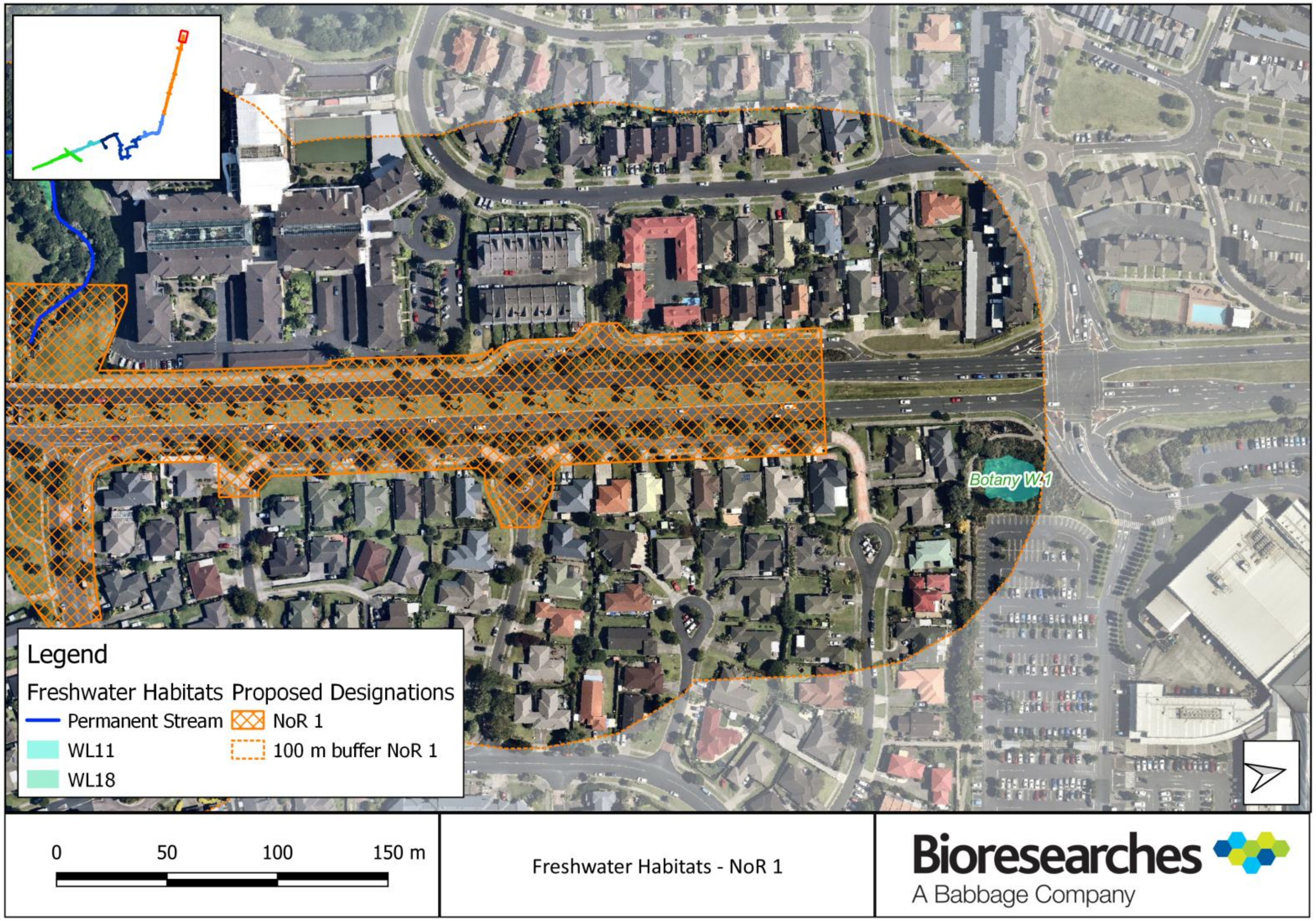


Figure 14. Freshwater habitats within the ZOI of the northern end of NoR 1

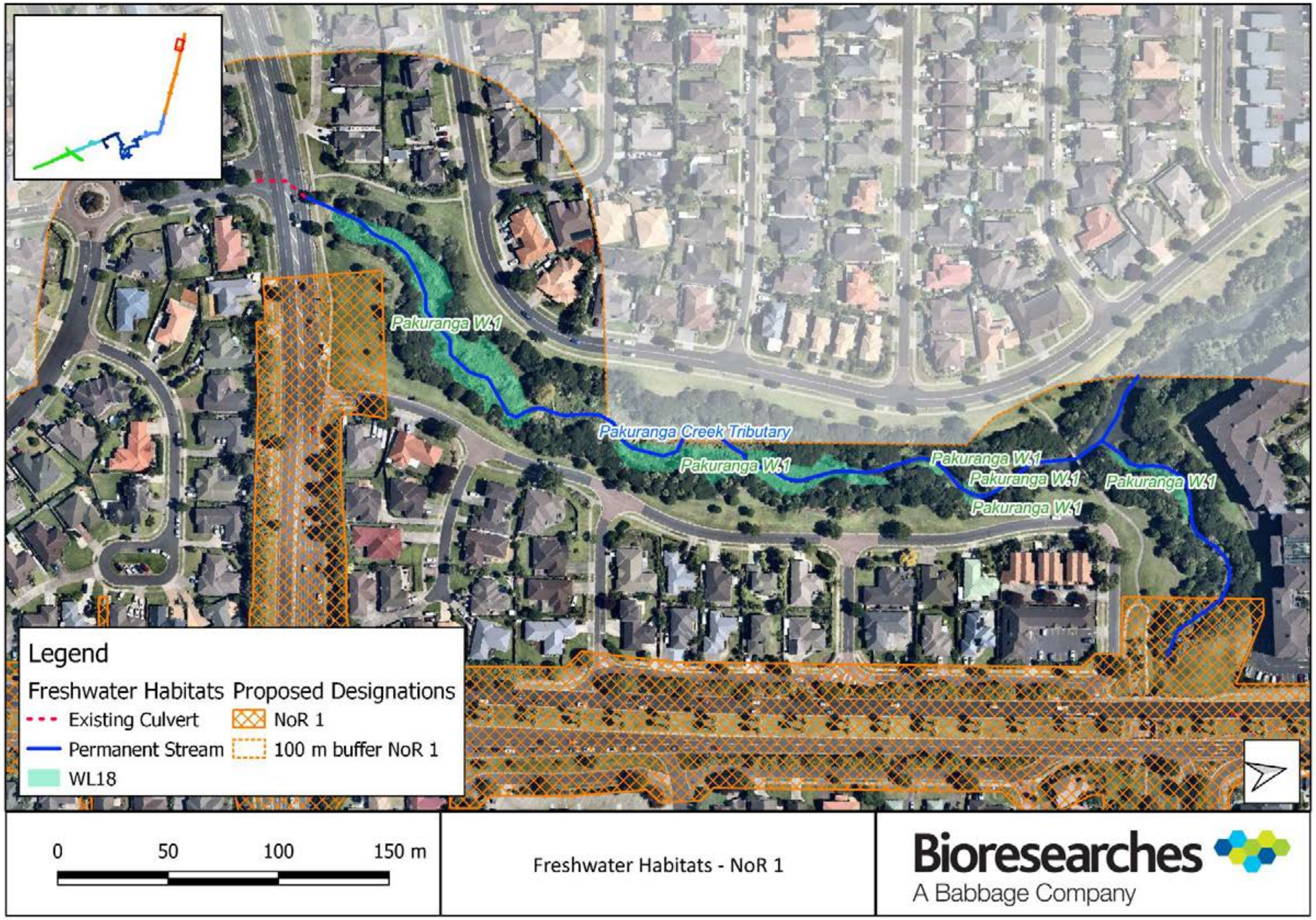


Figure 15. Freshwater habitats of the Pakuranga Creek Tributary within the ZOI of NoR 1

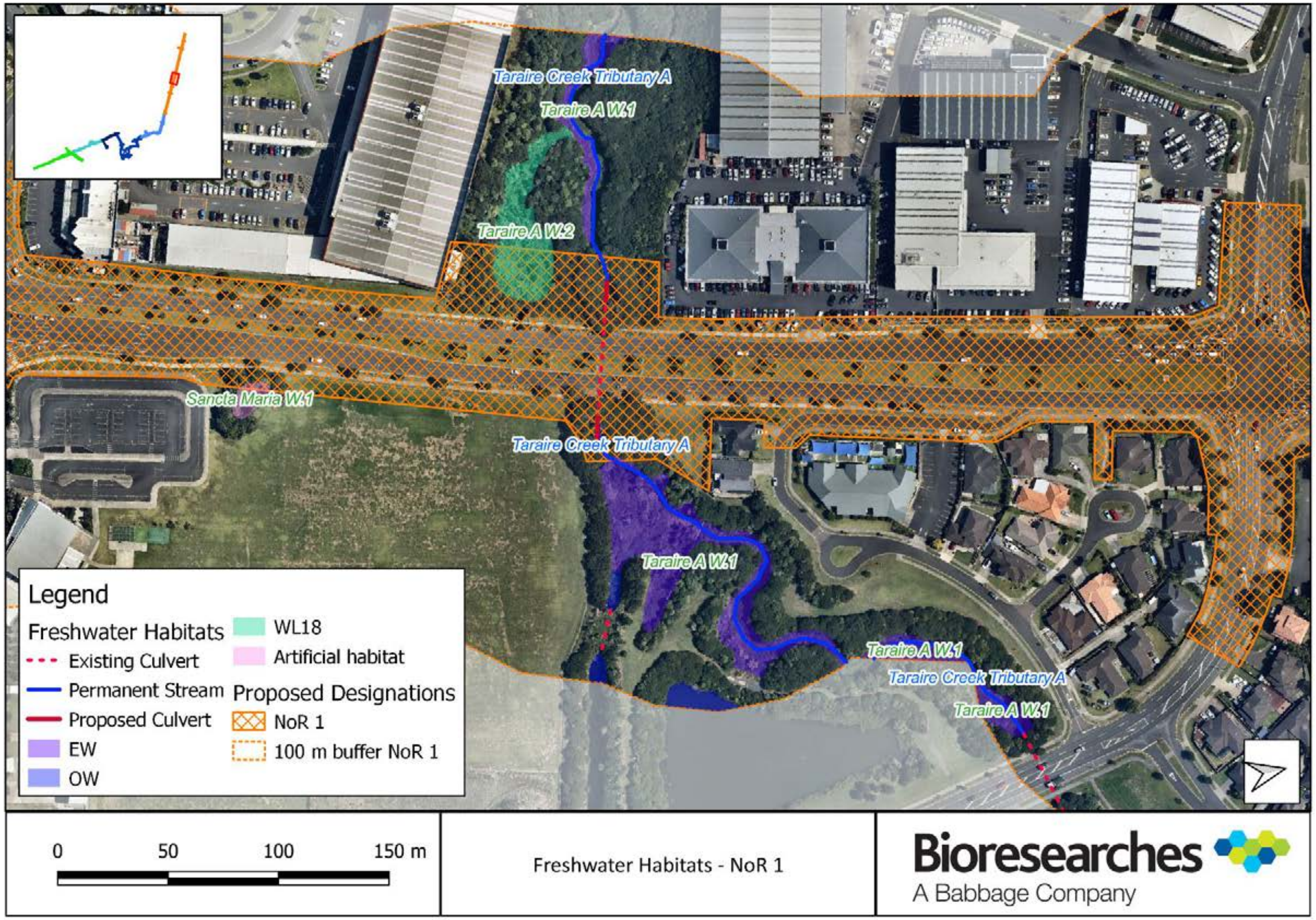


Figure 16. Freshwater habitats of Taraire Creek Tributary A, within the ZOI of the southern end of NoR 1

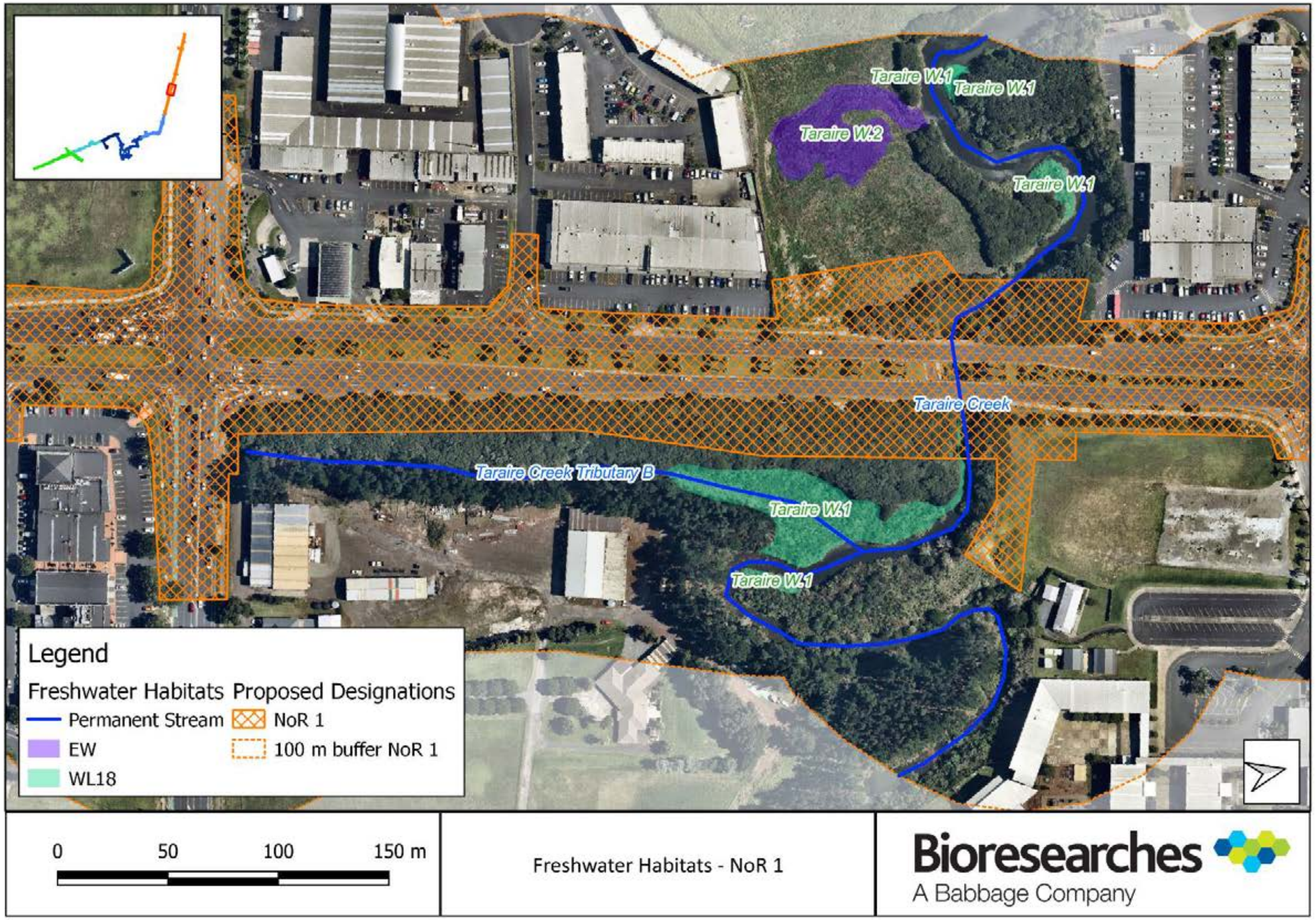


Figure 17. Freshwater habitats of Taraire Creek and Taraire Creek Tributary B, within the ZOI of the southern end of NoR 1

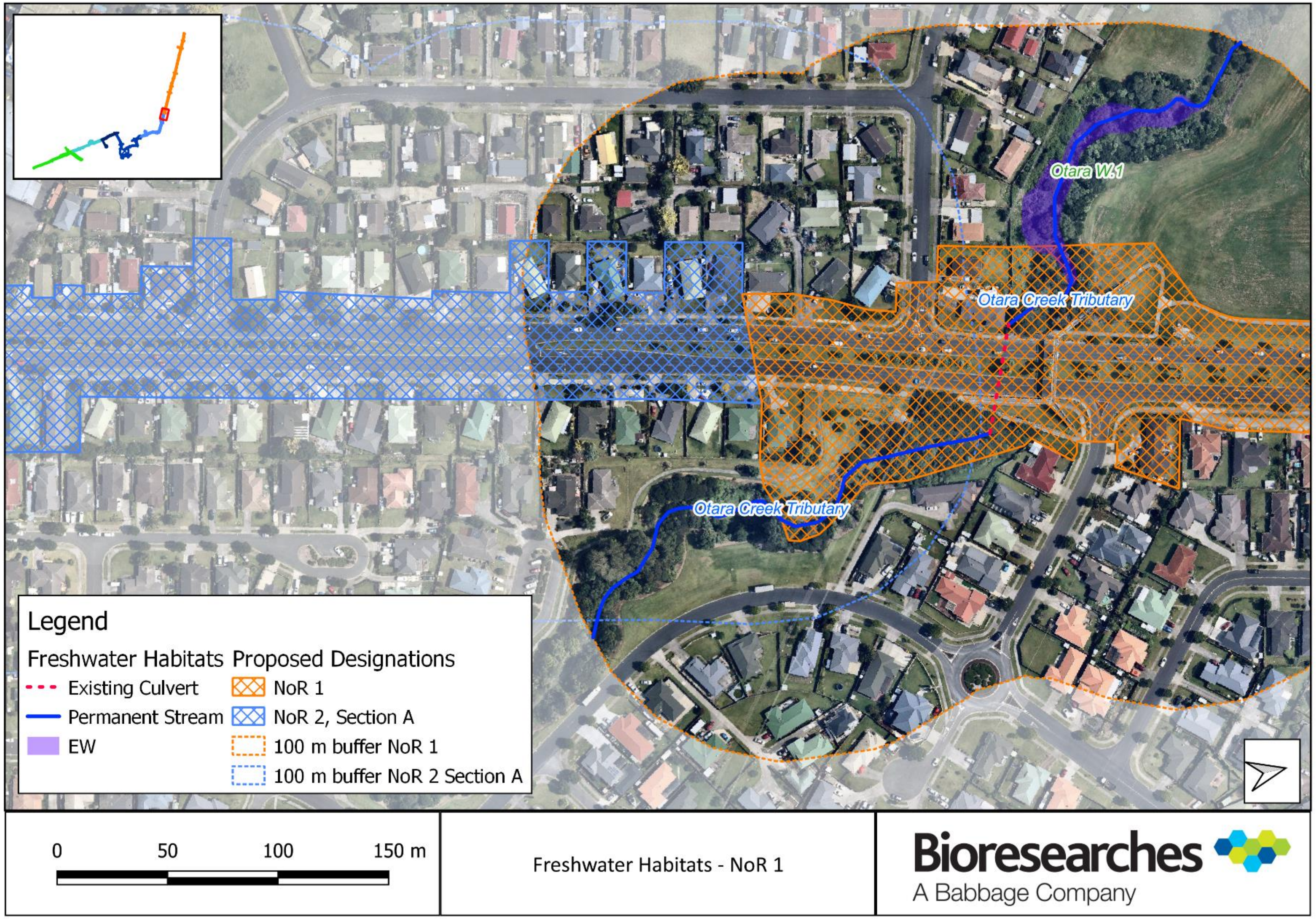


Figure 18. Freshwater Habitats of Taraire Creek Tributary A, within the ZOI of the southern end of NoR 1

7.2.4 Freshwater ecological value

Table 25 presents the ecological value for the freshwater habitats identified within NoR 1. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 25. Ecological values of streams within the ZOI of NoR 4

Stream	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
Pakuranga Creek Tributary	Moderate - Riparian zone has been highly modified by human activities. However the planted margins are regenerating and recovering. The instream habitat is now degraded from nutrient and contaminant inputs, as well as the altered flow regime from stormwater inputs and the stormwater dam below.	High – At Risk Recovering Pāteke present and likely breeding.	High – the stream, associated wetland and riparian margins collectively form a habitat gradient which is uncommon within the local urban environment. The stream is modified by the presence of dams.	Moderate – permanently flowing second order stream	High
Taraire Creek Tributary A	Moderate - Riparian zone has been highly modified by human activities. However the planted margins are regenerating and recovering. The instream habitat is now degraded from nutrient and contaminant inputs, as well as the altered flow regime from stormwater inputs.	Moderate – At risk declining longfin eel present within the catchment, also pāteke are potentially present.	High – the stream, associated wetland and riparian margins collectively form a habitat gradient which is uncommon within the local urban environment.	Moderate – permanently flowing second order stream	Moderate
Taraire Creek	Moderate - Riparian zone has been highly modified by human activities. However the planted margins are regenerating and recovering. The instream habitat is now degraded from nutrient and contaminant inputs, as well as the altered flow regime from stormwater inputs.	High – At risk declining longfin eel present within the upper stream reaches, also pāteke are potentially present.	High – the stream, associated wetland and riparian margins collectively form a habitat gradient which is uncommon within the local urban environment.	High – permanently flowing third order stream	High
Taraire Creek Tributary B	Low - Riparian zone has been highly modified by human activities.However some of this is regenerating. The instream habitat is now	Low – Although longfin eel are present within the catchment, they are unlikely to be present	Low – Highly modified stream with no connectivity to upstream habitats.	Moderate – permanently flowing stream	Low

	degraded from nutrient and contaminant inputs, as well as the altered flow regime from stormwater inputs. There is also no upstream habitat as this is all culverted.	within this stream.			
Ōtara Creek Tributary	Moderate - Riparian zone has been highly modified by human activities. However the planted margins are regenerating and recovering. The instream habitat is now degraded from nutrient and contaminant inputs, as well as the altered flow regime from stormwater inputs.	Moderate – At risk declining longfin eel and īnanga are present within the catchment, also pāteke are potentially present.	High – the stream, associated wetland and riparian margins collectively form a habitat gradient which is uncommon within the local urban environment.	Moderate – permanently flowing second order stream	Moderate

7.2.5 Wetland habitat

Nine potential wetlands were identified during the desktop study and visited during the site investigations. Two of the potential wetlands are artificial swales with no wetland habitat, one wetland is artificial and the remaining wetlands were considered to be natural wetlands under the NES:F. Wetlands are described in Table 26 and depicted in Figure 35. As the artificial swales contained no wetland habitat, they have not been assessed further.

Table 26. Wetlands within 100 m of NoR 4

Wetland	NES:F Classification	Classification process	Description
Botany W.1	Artificial	N/A	Artificial stormwater pond/wetland. Vegetation included *Machaerina articulata* and raupō. Edges were planted predominantly with native species.
Pakuranga W.1	Natural Wetland	Rapid test	Riverine wetland system positioned on the floodplains of the Pakuranga Creek Tributary. Planted with harakeke, *Carex* spp., and tī kōuka, which has created a flaxland (WL18). Other vegetation included *Persicaria decipiens*, buttercup (*Ranunculus repens*), bedstraw (*Galium* sp.), and water celery (*Apium nodiflorum*). During the site visit, two pāteke (brown teal; At Risk - Recovering) were observed in the creek and adjacent wetland. One was observed to be exhibiting breeding behaviour (showing territorial behaviour and holding a wing to appear broken) and as the site visit was conducted during the breeding season, it is therefore assumed that the creek and associated wetland habitat on the peripheries are utilised by this species for breeding.

Taraire A W.1	Natural Wetland	Rapid test	Riverine wetland system positioned on the floodplains of Taraire Creek Tributary A. Patches of this have been planted with harakeke, tī kōuka and kahikatea, however these have been heavily invaded by blackberry so that they are now predominantly exotic and classed as exotic wetlands.
Taraire A W.2	Natural Wetland	Rapid test	Depression wetland which drains to Taraire Creek Tributary A. Planted with harakeke, *Carex* spp., kahikatea and tī kōuka, which has created a flaxland (WL18). Other vegetation included *Persicaria hydropiper*, buttercup, water celery, black nightshade (*Solanum nigra*), pampas (*Cortaderia selloana*) and blackberry.
Sancta Maria W.1	Artificial	N/A	Artificial swale. Grassed in the centre, with native plantings on margins.
Taraire W.1	Natural wetland	Rapid test	Riverine wetland system positioned on the floodplains of the Taraire Creek. Planted with harakeke, *Carex* spp., and tī kōuka, which has created a flaxland (WL18). Some incursion of exotic weeds is occurring.
Taraire W.2	Natural wetland	Rapid test	Floodplain wetland system adjacent to the Taraire Creek. Recently has been planted with native species including *Carex* spp., harakeke, wīwī (*Juncus edgariae*) and tī kōuka. However these specimens are still small and do not dominate the wetland, which is still predominantly exotic, with species such as mercer grass (*Paspalum distichum*) and buttercup present.
Ōtara W.1	Natural wetland	Rapid test	Riverine wetland system positioned on the floodplains of the Ōtara Creek Tributary. Planted with harakeke, *Carex* spp., and tī kōuka, which has created a flaxland (WL18). Some incursion of exotic weeds is occurring, such as willow (*Salix* spp.) and arum lily (*Zantedeschia aethiopica*).

7.2.6 Wetland ecological value

Table 27 presents the ecological value for the wetland habitats identified within NoR 1. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 27. Ecological values of wetlands within the ZOI of NoR 1

Wetland	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
Botany W.1	Low – highly modified catchment and likely to support only common, non-native biota.	Low - not suitable habitat for any species of conservation significance. Is present in an environment where wetland habitats are uncommon but its lack of connectivity to other ecologically functional	Low - low diversity in habitat type.	Moderate – does provide some filtering of nutrients and flow regulation.	Low

		habitats greatly reduces the value.			
Pakuranga W.1	High – the wetland retains most of its hydrological functioning and composition of flora and fauna.	High – wetlands of this size are very uncommon in the ecological district. Although achieved via planting, is a rare habitat type. Also is a known habitat for At Risk bird species.	High – forms a continuum in habitats from terrestrial to freshwater.	Moderate – slightly reduced due to highly modified catchment.	High
Taraire A W.1	Moderate – the wetland retains most of its hydrological functioning, but the composition of flora and fauna is greatly modified.	High – wetland habitat is uncommon in the ecological district, although exotic wetlands are the most common type. Also is a potential habitat for At Risk bird species.	High – forms a continuum in habitats from terrestrial to freshwater.	Moderate – slightly reduced due to highly modified catchment.	High
Taraire A W.2	High – the wetland retains most of its hydrological functioning and composition of flora and fauna.	High – wetlands of this size are very uncommon in the ecological district. Although achieved via planting, is a rare habitat type. Also is a potential habitat for At Risk bird species.	High – forms a continuum in habitats from terrestrial to freshwater.	Moderate – slightly reduced due to highly modified catchment.	High
Taraire W.1	High – the wetland retains most of its hydrological functioning and composition of flora and fauna.	High – wetlands of this size are very uncommon in the ecological district. Although achieved via planting, is a rare habitat type. Also is a potential habitat for At Risk bird species.	High – forms a continuum in habitats from terrestrial to freshwater.	Moderate – slightly reduced due to highly modified catchment.	High
Taraire W.2	Low - the wetland retains little of its hydrological functioning and composition of flora and fauna.	Moderate – wetland habitat is uncommon in the ecological district, although exotic wetlands are the most common type.	Moderate – is connected to a functional freshwater ecosystem	Moderate – slightly reduced due to highly modified catchment.	Moderate
Ōtara W.1	High – the wetland retains most of its hydrological functioning and composition of flora and fauna.	High – wetlands of this size are very uncommon in the ecological district. Although achieved via planting, is a rare habitat type. Also is a potential habitat for At Risk bird species.	High – forms a continuum in habitats from terrestrial to freshwater.	Moderate – slightly reduced due to highly modified catchment.	High

7.3 Future environment

Over the next 15 years, existing moderate ecological value vegetation and habitats will mature and diversify within their current extents. These areas are constrained in extent by the surrounding land uses and are unlikely to increase in area. While fauna habitats are likely to support greater capacity for resource provision (nesting habitat, food resources), with maturity, fauna diversity is likely to remain stable and reflective of the surrounding urban environment.

The NoR 1 Project area is almost entirely developed to its limit under the current zoning, with the exception of land north of Rongomai Park which is currently under development. Intensification of the immediate urban area may occur, (e.g., in accordance with the Medium Density Residential Standards and the National Policy Statement on Urban Development), however this is not expected to impact the existing extents of this vegetation, and is unlikely to significantly increase pressure on these habitats, which are already subject to intensive edge effects.

Ecological values are likely to remain consistent. Low value vegetation and habitats beyond protected riparian margins have similar capacity to mature, as well as to expand or contract, given that they are unprotected. These areas area likely to remain low in ecological value. Higher value habitats may mature further but will be limited by impacts from edge effects, pests and a lack of seed sources to diversify vegetation without supplementary planting.

7.4 Assessment of ecological effects and measures to avoid, remedy or mitigate actual or potential adverse effects

This section assesses the ecological effects of activities which relate to District Plan matters under the AUP:OP. Refer to the ‘Future Environment’ Section for a discussion regarding the assumptions made for the effects assessment as it relates to permitted activities and likely future environment.

As per the matrix presented in **Appendix A**, Table 86, ecological features with a ‘negligible’ ecological value, even if combined with a ‘very high’ magnitude of effect, will not have a level of effect greater than ‘low’ and consequently would not typically require effects management. Therefore, ecological features with a negligible ecological value are not assessed within this section, unless there is the potential to contravene the Wildlife Act 1953.

7.4.1 Construction effects – terrestrial ecology

The potential ecological effects to terrestrial habitats and fauna, which may be encountered during the construction phase of the Project (as they relate to District Plan matters) have been identified:

- Removal of vegetation which is subject to District Plan controls (refer to **Appendix B** for a breakdown of Regional Plan versus District Plan vegetation); and
- Disturbance and displacement of birds, bats and lizards due to construction-related activities.

The following sections detail the magnitude of effect and level of effect of construction effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

7.4.1.1 Terrestrial vegetation

Vegetation to be removed which is subject to District Plan controls includes vegetation within existing road corridors (in this case, the PL.2 habitat, with low ecological value) and grassland (EG, negligible ecological value).

The effects of the removal of this vegetation are assessed below in Table 28.

Table 28. Assessment of ecological effects of the removal of terrestrial District Plan vegetation

Effect	**Permanent removal of vegetation/habitat and introduction of edge effects to remaining habitat.**	
Habitat	PL.2	
Time scale	Baseline	Future environment
Magnitude of effect	The permanent removal of this vegetation, which is already highly fragmented will not introduce additional edge effects. Consequently, the magnitude is assessed as Low.	This habitat is not expected to change by the time of development, consequently the magnitude of effect remains the same.
Level of effect prior to impact management	Very low	Very low
Impact management and residual level of effect	Not required	Not required
Management of residual effects	N/A	N/A

7.4.1.2 Bats

Long-tailed bats (very high ecological value) may utilise the stream corridors for foraging or as flight paths, which means they may fly over the NoR at the stream crossing locations at night (although bats have not been recorded from survey and are considered unlikely to be present). Vegetation within the road corridor is not considered likely to provide roosting or foraging habitat.

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 or moving along the stream corridors. There are no trees suitable for bats to roost in within the ZOI of the Project and consequently noise and vibration is not considered to be an issue, and mortality or injury to bats or loss of foraging habitat has not been considered.

The effects of the works upon bats are described below in Table 29.

Table 29. Assessment of ecological effects encountered during construction for bats

Effect	**Disturbance and displacement of bats crossing the NoR as they use streams as a flight corridor**	
Time scale	Baseline	Future environment
Magnitude of effect	As the Project is situated in a residential area, night-time work and subsequent	As urbanisation intensifies east of the alignment on the current outskirts of Flat

	noise generated by the Project is likely to occur infrequently. As the Project area is already lit with street lighting and lighting from nearby commercial buildings, and the area is subject to residential noise, the night-time noises and lighting generated from the Project area are not expected to have more than a Low magnitude of effect on bats; if present.	Bush and Chapel Heights, the likelihood of bats utilising the Project area will likely reduce as their range contracts, however as the habitat they are utilising will remain, conservatively it is considered that effects will remain the same as baseline.
Level of effect prior to impact management	**Moderate**	
Impact management and residual level of effect	Surveys should be completed prior to construction commencing to confirm bat presence. If bats are identified to be present, then a Bat Management Plan should be implemented. This plan incorporates mitigation measures such as reduction of light spill and works at night near bat habitats, and siting of compounds and laydown areas away from bat habitats. The post mitigation level of effect can be reduced to **Negligible**.	
Management of residual effects	Not required	

7.4.1.3 Birds

Indigenous birds including both the Not Threatened bird species and the At Risk wetland bird species may be displaced from nearby habitats due to construction activities. In addition, Not Threatened birds may lose roosting/foraging habitat, abandon or lose nests and also be at risk of mortality or injury during tree felling when the District Plan vegetation is removed.

The effects of the works upon birds are described below in Table 30.

Table 30. Assessment of ecological effects encountered during construction for birds

Effect	**Disturbance and displacement of birds due to construction activities (pāteke/ At Risk wetland birds; and Not Threatened birds)**		**Loss of District Plan vegetation which may remove nests and foraging habitat, and injure or kill birds (Not threatened birds only)**	
Time scale	Baseline	Future environment	Baseline	Future environment
Magnitude of effect	Adjacent habitats are definitely periodically used by birds. Although the pāteke, and any other birds present are likely habituated to a level of disturbance already due to the urban environment in which they are found, the	These trees are expected to still be present and utilised by birds in the same manner as they are currently. Consequently, the magnitude of effect is expected to be the same.	There is a reasonable probability that native birds utilise these trees for nesting. The magnitude of effect is expected to be **Moderate**.	This effect is expected to be the same as baseline.

	magnitude of effect is expected to be **High**, especially as nest abandonment could result in the death of birds.			
Level of effect prior to impact management	**High** for pāteke and other wetland birds, **Low** for other Not Threatened bird species.		**Low**	
Impact management and residual level of effect	Pre-construction bird surveys should be undertaken to determine if pāteke and other wetland bird species are present. If At risk or Threatened wetland birds are present, a Wetland Bird Management Plan should be developed which could include the following management controls: Where practicable, construction works should commence prior to the breeding season/s of the wetland birds identified as present; in order to discourage bird nesting. Prior to any works beginning a nesting bird survey should be undertaken of wetland areas within a 50 m radius of the works footprint. If nesting birds are detected, then a 20 m buffer surrounding the nest should be clearly demarcated and works should not be completed within this buffer until birds have fledged. Where practicable, works should be set back from wetland edges by at least a 10 m buffer. Light spillage from construction areas should be minimised as far as practicable.		Under the Wildlife Act 1953, impact management measures will be required to prevent killing or injuring native birds during tree felling. This should include scheduling tree felling and vegetation removal activities outside of the bird nesting season (which is September to February, inclusive), or undertaking pre-clearance inspections to ensure nesting birds are not present.	
Management of residual effects	Not required		Not required	

7.4.1.4 Lizards

Lizards are not expected to be present within any of the District Plan vegetation to be removed. Consequently, effects are limited to the potential displacement of lizards from adjacent habitats.

The effects of the works upon lizards is described below in Table 31.

Table 31. Assessment of ecological effects encountered during construction for lizards

Effect	**Disturbance and displacement of lizards due to construction activities**	
Time scale	Baseline	Future environment

Magnitude of effect	The magnitude of effect is assessed as **Negligible** due to unlikelihood of lizard disturbance due to construction related noise and vibration.	This effect is expected to be the same as baseline.
Level of effect prior to impact management	Very low	
Impact management and residual level of effect	Not required	
Management of residual effects	Not required	

7.4.2 Operational effects – terrestrial ecology

The Project involves the addition of bus lanes to an existing road in an urban landscape. The future environment is also urban, however the few remaining undeveloped properties along the NoR will likely have been developed into mixed use or light industry. The stream corridors and existing habitats associated with these will remain.

Many of the potential operational effects of the Project such as habitat fragmentation, noise and light pollution are pre-existing. Potential operational effects include reductions in habitat connectivity and impacts from noise, light and vibration upon indigenous fauna, as well as potential mortality from vehicle strike.

The following sections detail the magnitude of effect and level of effect of operational effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

7.4.2.1 Bats

Potential operational impacts to bats include:

- Loss of habitat connectivity through the presence of the upgraded roadway, and impacts of lighting spillage which may impact behaviour of both bats and insects (their prey). This is considered to have a moderate magnitude of effect and consequently a high level of effect and therefore is discussed further in Table 32; and
- Vehicle strike causing injury or mortality. This is considered to have a very low likelihood of occurring, as bats are not considered likely to be using potential habitats within the NoR. Consequently, the magnitude of effect is considered to be negligible, and therefore has a low level of effect. Effects management is not required.

As the habitats adjacent to the Project area do not provide roosting habitat for bats and are not expected to develop to provide this within 15 years (when the Project is expected to begin), impacts on roosting bats have not been considered.

Table 32. Assessment of ecological effects encountered during operation for bats

Effect	**Loss in habitat connectivity due to presence of the upgraded roadway and associated noise and lighting**

Time scale	Baseline	Future environment
Magnitude of effect	The habitat is already fragmented by the presence of the existing road, which is lit at night, and already generates vehicle noise. In addition, bats are unlikely to frequently visit the Project area. Consequently, the magnitude of effects is considered to be **Low**, and therefore the level of effect is **Moderate**.	As urbanisation intensifies east of the alignment on the current outskirts of Flat Bush and Chapel Heights, the likelihood of bats utilising the Project area will likely reduce as their range contracts, however as the habitat they are utilising will remain, conservatively it is considered that effects will remain the same as baseline.
Level of effect prior to impact management	**Moderate**	
Impact management and residual level of effect	If bats are identified to be present during pre-construction surveys, then a Bat Management Plan should be implemented. This plan incorporate mitigation measures such as reduction of light spill near bat habitats, and planting of supplementary trees within the riparian corridors which will in time increase the canopy height of the plantings and aim to retain connectivity as the local area intensifies further. The post mitigation level of effect can be reduced to **Negligible**.	
Management of residual effects	Not required	

7.4.2.2 Birds

Indigenous birds may be displaced from nearby habitats due to noise, lighting and vibration generated from the Project. However as the birds present within the Project area are likely already habituated to these effects, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and consequently the level of effect is considered to be **Very Low** for Not Threatened birds and **Low** for pāteke.

Birds may also be affected by vehicle strike; however, this is only likely to occur infrequently. Consequently, the magnitude of effect of this is considered to be **Low**, and the level of effect is considered to be **Very Low** for Not Threatened birds and **Low** for pāteke.

Impact management is therefore not required for operational effects to birds.

7.4.2.3 Lizards

The Project works are not expected to increase limitations on lizard dispersal or increase disturbance to lizards. Consequently, the magnitude of this effect is considered to be **low** for both the baseline and future environment, and the level of effect is considered to be **Low**.

Lizards may also be affected by vehicle strike, however there is a very low probability of this occurring, and it would likely only occur at a very low frequency. Consequently, the magnitude of effect of this is considered to be **Negligible**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to lizards.

7.4.3 Conclusions

Ecological effects assessed as moderate or greater include:

- Moderate level of effect to bats during construction for both the ecological baseline and future ecological environment may occur due to disturbance to bats utilising the streams which the NoR crosses as flight corridors;
- Moderate level of effect to pāteke during construction for both the ecological baseline and future ecological environment may occur due to disturbance to birds nesting in adjacent habitats; and
- Moderate level of effect to bats during operation for both the ecological baseline and future ecological environment may occur due to fragmentation of habitat and impacts of lighting and noise.

Effects management (implementation of a Bat Management Plan and a Bird Management Plan) reduces these effects to **Negligible** for disturbance to bats, and **Low** for disturbance to pāteke and habitat fragmentation for bats.

7.5 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 following sections to inform design and alignment options for the NoR.

7.5.1 Terrestrial ecology

Construction of the Project will result in both temporary and permanent losses in terrestrial habitat within the NoR, including habitat which is being used by native fauna.

Table 33 details the types and area (m^2) of terrestrial habitats which will be lost during construction, as well as the total area of each habitat present within the designation boundary. This includes vegetation which is subject to District Plan and Regional Plan controls as well as vegetation not subject to plan controls. As the PL.2 habitat is comprised of specimen trees planted in the roadway, this has not been mapped by area and is instead recorded as the number of trees to be removed (692 trees).

Terrestrial habitats which will be lost are currently of **High** or **Low** ecological value and may provide habitat for native fauna. Exotic grassland habitat is of **Negligible** ecological value and therefore is not considered here.

Table 33. Terrestrial habitat types and the areas of these both within the Project footprint (which will be permanently lost) and within the designation boundary.

Habitat type	Classification (Singers *et al.* 2017)	Area within Footprint (m^2)	Area within Designation (m^2)
Planted Vegetation – native	PL.1	TBC	32,489
Exotic forest	EF	0	0

7.5.2 Bats

The stream corridors and associated PL.1 vegetation may act as flight corridors for commuting and foraging bats. The presence of bats should be assessed prior to obtaining any regional consents for removal of vegetation within 10 m of riparian zones, or any of the PL.1 vegetation lining the creek edges.

7.5.3 Birds

Non-threatened indigenous birds are present within the designation boundary and will be impacted by vegetation removal. This should therefore occur outside of the bird nesting season to reduce impacts to these birds.

At Risk bird species (pāteke) are present within at least one of the wetlands located within the designation. These birds could be impacted by construction activities and therefore a Wetland Bird Management Plan is recommended to reduce the magnitude of effect of these works.

7.5.4 Lizards

Copper skinks are potentially present within the vegetation to be cleared, and there is potential that during this clearance they could be injured or killed. Consequently, the works should be completed in accordance with the Wildlife Act 1953, and a Lizard Management Plan should be implemented.

7.5.5 Freshwater ecology

The proposed designation crosses two streams. One crossing will involve culvert extensions (Taraire Creek Tributary A), and one crossing no stream works will occur because the Project crosses an existing bridge (Taraire Creek Tributary B). As the crossing for the Ōtara Creek Tributary is located within NoR 2, Section A, the impacts of this crossing have not been assessed in this section.

The culvert extensions will result in stream loss, for which mitigation will be required. Erosion and sediment control plan/s will likely also be required to prevent sediment entering streams during the works, and a Fish Management Plan should be implemented to reduce the likelihood of injury or killing of native freshwater fish during the works.

All new culverts and culvert extensions should be installed in accordance with fish passage guidance and where practicable, fish passage structures should be implemented in the existing culvert sections where culverts are being lengthened.

Much of the riparian zones within the designation are already planted in native restoration plantings, and consequently stream length available for restoration via replanting is limited to the Taraire Creek Tributary B (190 m), which is planted in exotic forest and could be replaced or underplanted with native forest.

Table 34 details the stream loss expected to be incurred within the designation.

Table 34. Potential stream loss within the NoR 1 designation boundary.

Stream	Hydroperiod	Approximate active channel width (m)	Approximate length to be lost (m)	Loss (m^2)

Taraire Creek Tributary A	Permanent	2	19.3 m (8.4 m on the western side of the Project area, and 10.9 m on the eastern side).	38.6

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.

7.5.6 Wetland ecology

Construction of the NoR will not result in the loss of extent of any wetland, however as works are to be carried out within 100 m of wetlands associated with the Ōtara Creek, Taraire Creek tributaries and the Pakuranga Creek Tributary, consent for the works under the NES:F will be required. This will require mitigation in the form of erosion and sediment control plans.

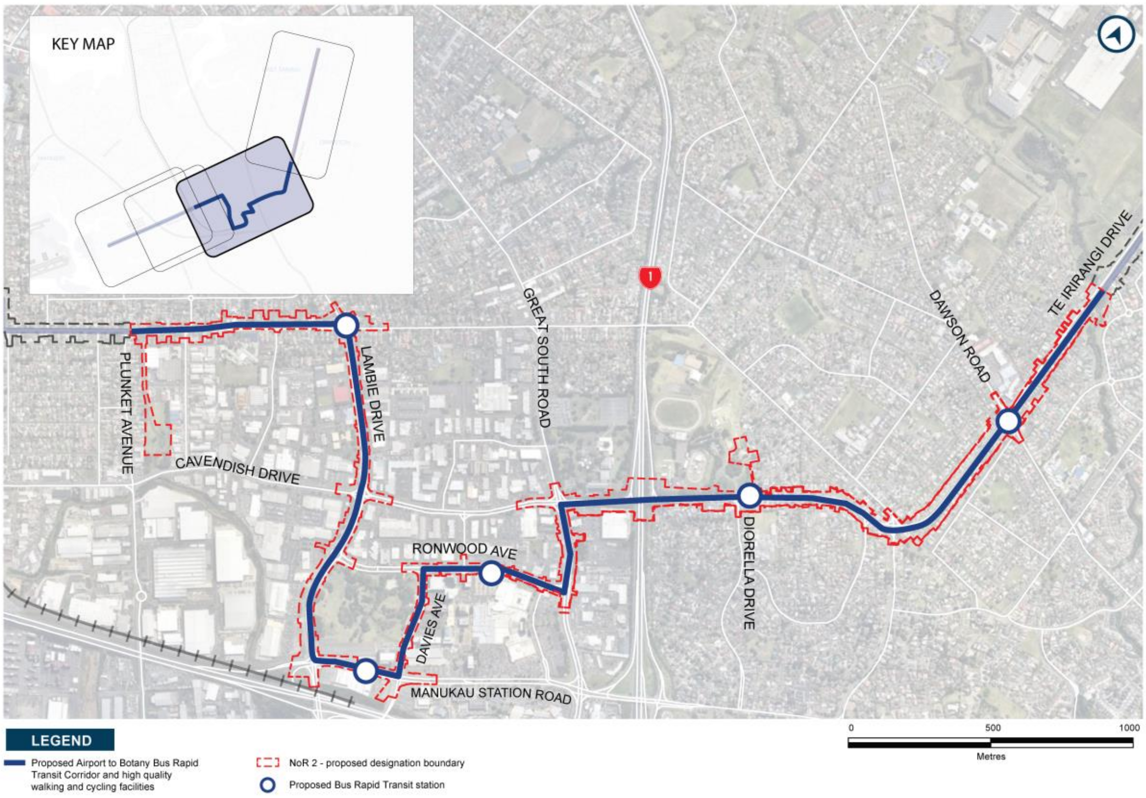
8 Airport to Botany Bus Rapid Transit – NoR 2

This section assesses specific ecology matters relating to NoR 2 – the Project corridor between Rongomai Park and Puhinui Station, in the vicinity of Plunket Avenue and Rongomai Park.

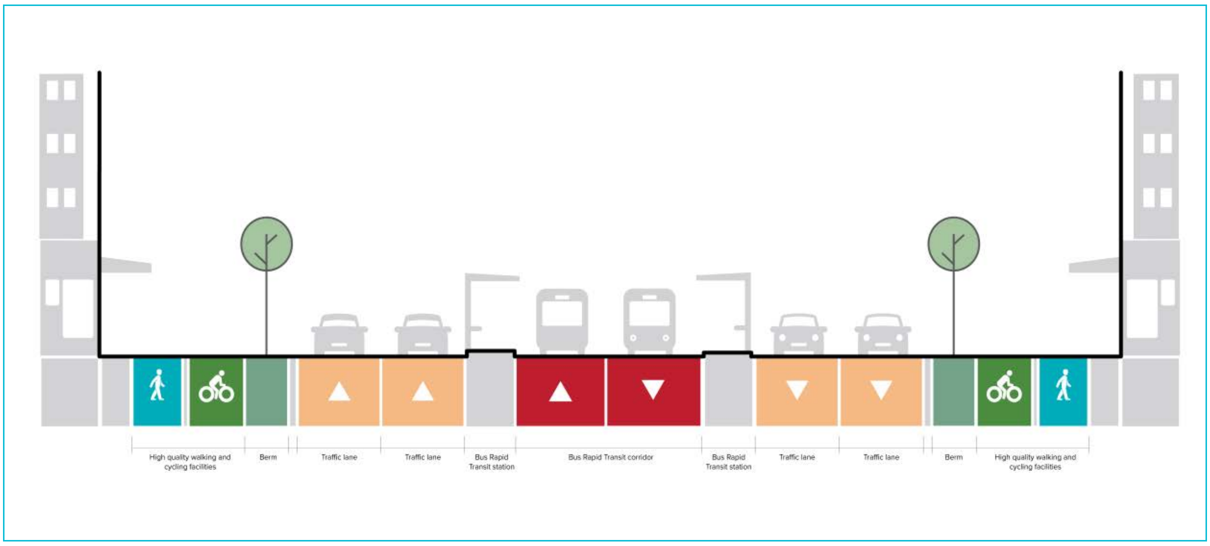
8.1 Overview and description of works

As set out in Table 35 below, the proposed works in NoR 2 include the widening of several existing roads to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities.

Table 35: Overview of NoR 2

NoR 2 – Rongomai Park to Puhinui Station, in the vicinity of Plunket Avenue	
	
Key features	
BRT Corridor	Centre-running for the majority of the corridor along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, Lambie Drive, and Puhinui Road West-running on Davies Avenue along the edge of Hayman Park
BRT stations	• Dawson Road Station; • Diorella Drive Station; • Ronwood Avenue Station; • Manukau Station; and

	• Corner of Lambie Drive and Puhinui Road Station.
Walking and cycling facilities	Walking and cycling facilities on both sides of the corridor
General traffic	• Two lanes in each direction along Te Irirangi Drive, Great South Road, Ronwood Avenue, Manukau Station Road, and Lambie Drive; • One-way single lane along Davies Avenue; and • One lane in each direction along Puhinui Road.
Access	Existing central medians limit right turn access on Te Irirangi Drive, Great South Road, Ronwood Avenue, and Lambie Drive. New signalised intersection at Mitre 10 and Bunnings Warehouse on Lambie Drive. Priority access for fire engine movements across the BRT corridor at Papatoetoe Fire Station.
Speed environment	• 30 km/h on Ronwood Avenue and Davies Avenue; and • 50 km/h on Te Irirangi Drive, Great South Road, Manukau Station Road, Lambie Drive and Puhinui Road.
Signalised intersections (**new intersections in bold**)	• Te Irirangi Drive and Dawson Road; • Te Irirangi Drive, Boundary Road and Hollyford Drive; • Te Irirangi Drive and Diorella Drive; • Te Irirangi Drive, Great South Road and Cavendish Drive; • Great South Road and Ronwood Avenue; • Ronwood Avenue and Davies Avenue; • Davies Avenue, Wiri Station Road and Manukau Station Road; • Manukau Station Road and Lambie Drive; • **Mitre 10 and Bunnings Warehouse;** • **Lambie Drive and Ronwood Avenue;** • Lambie Drive and Cavendish Drive; • Lambie Drive and Puhinui Road; and • **Puhinui Road and Plunket Avenue.**
Stormwater infrastructure	• Swales; and • Wetlands.
NoR 2 typical cross section	



For assessment purposes, NoR 2 has been split into three sections as shown in Figure 19 below:

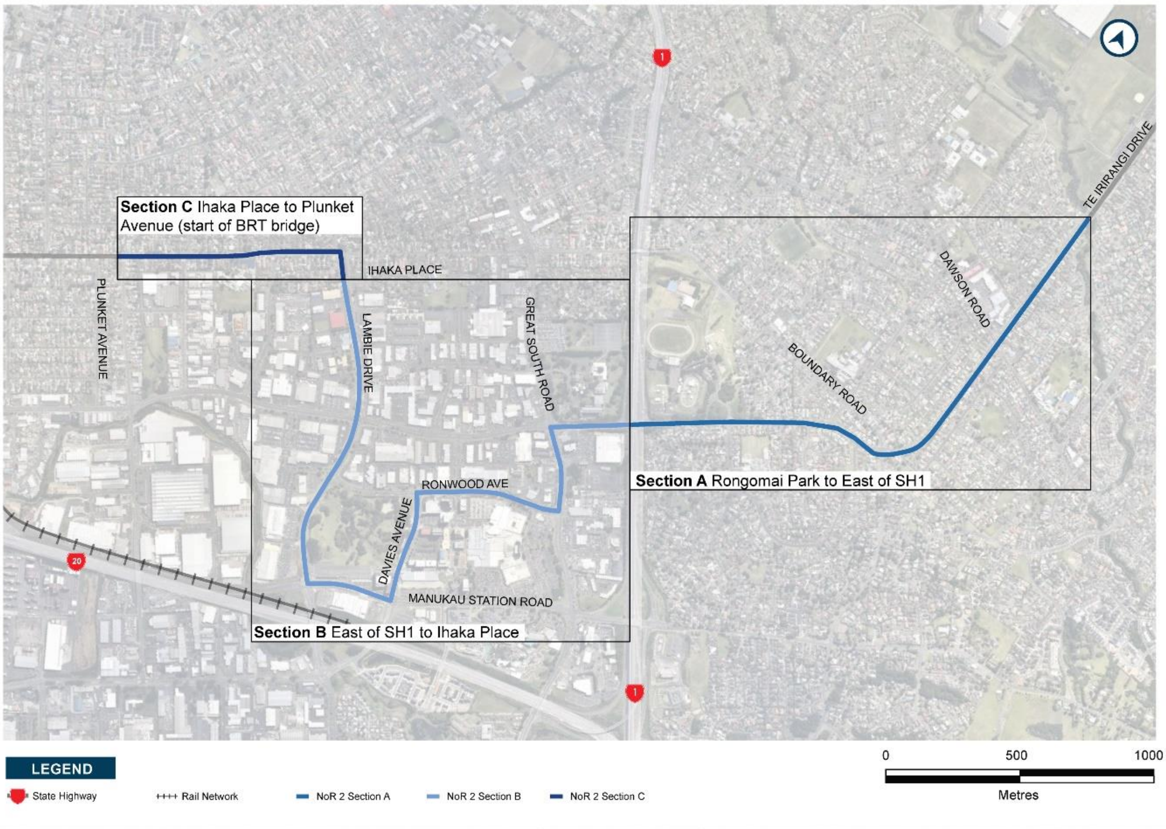


Figure 19 Sections of NoR 2

8.2 Section A: Rongomai Park to East of SH1

8.2.1 Ecological baseline

8.2.1.1 Terrestrial habitats and fauna

Desktop Review

NoR 2 Section A transitions through light industry, business, metropolitan centre and residential zones in the AUP:OP, as well as a few open space recreation zones.

Present day habitats are therefore largely limited to:

- Mown lawns, classified using Singers *et al.* (2017) as Exotic Grassland (**EG**);
- Amenity plantings/gardens such as street trees within the road corridor and in residential sections, classified as amenity planted vegetation (PL.2);
- Two areas of native restoration planting; one adjacent to the Ōtara Creek tributary at the northern end of the NoR Section, and one adjacent to the SH1 bridge crossing at the western end, classified as native Planted Vegetation (PL.1); and
- A row of mixed native and exotic trees adjacent to the Manukau velodrome, classified as mixed exotic and native treeland (TL.2).

These areas are further described in Table 36, and depicted in Figure 20.

Table 36. Vegetation types present within and directly adjacent to the Project Area (NoR 2, Section A), classified according to Singers *et al.* (2017).

Vegetation type	Alphanumeric code*	Regional IUCN Conservation Status*	Description of habitat
Planted Vegetation – native	PL.1	N/A	This habitat is located adjacent to the Ōtara Creek, and at the SH1 bridge crossing. These plant mixtures comprise kānuka, kowhai, karo, māhoe and tī kōuka. A few native seedlings are coming through an otherwise bare ground cover, including māhoe, koromiko/hebe and a few tōtara, as well as weeds such as moth plant. These areas are classified using the Singers *et al.* (2017) classification system as PL.1 (planted native scrub and forest <20 years old or wetland <10 years old.). The peripheries of these habitats were often weedy and contained overgrown pasture and weed species which would provide habitat for copper skink.
Planted Vegetation – amenity plantings	PL.2	N/A	Exotic amenity trees planted within the road corridor. Many of these are Washingtonia palm, but also included are pūriri, pōhutukawa, titoki and oak. Exotic-dominated gardens such as those within residential sections.
Exotic grassland	EG	N/A	Grassland dominated by exotic species. This includes gardens, road verges and parks.

Treeland – mixed exotic and native	TL.2	N/A	Mixed, semi-mature stands of native and exotic trees planted adjacent to the Manukau Velodrome.

* = Information from Singers *et al.* (2017).

Fauna identified during the desktop study which may be present within the ZOI of the NoR include:

- Long-tailed bats;
- Copper skink; and
- Common, non-threatened native bird species.

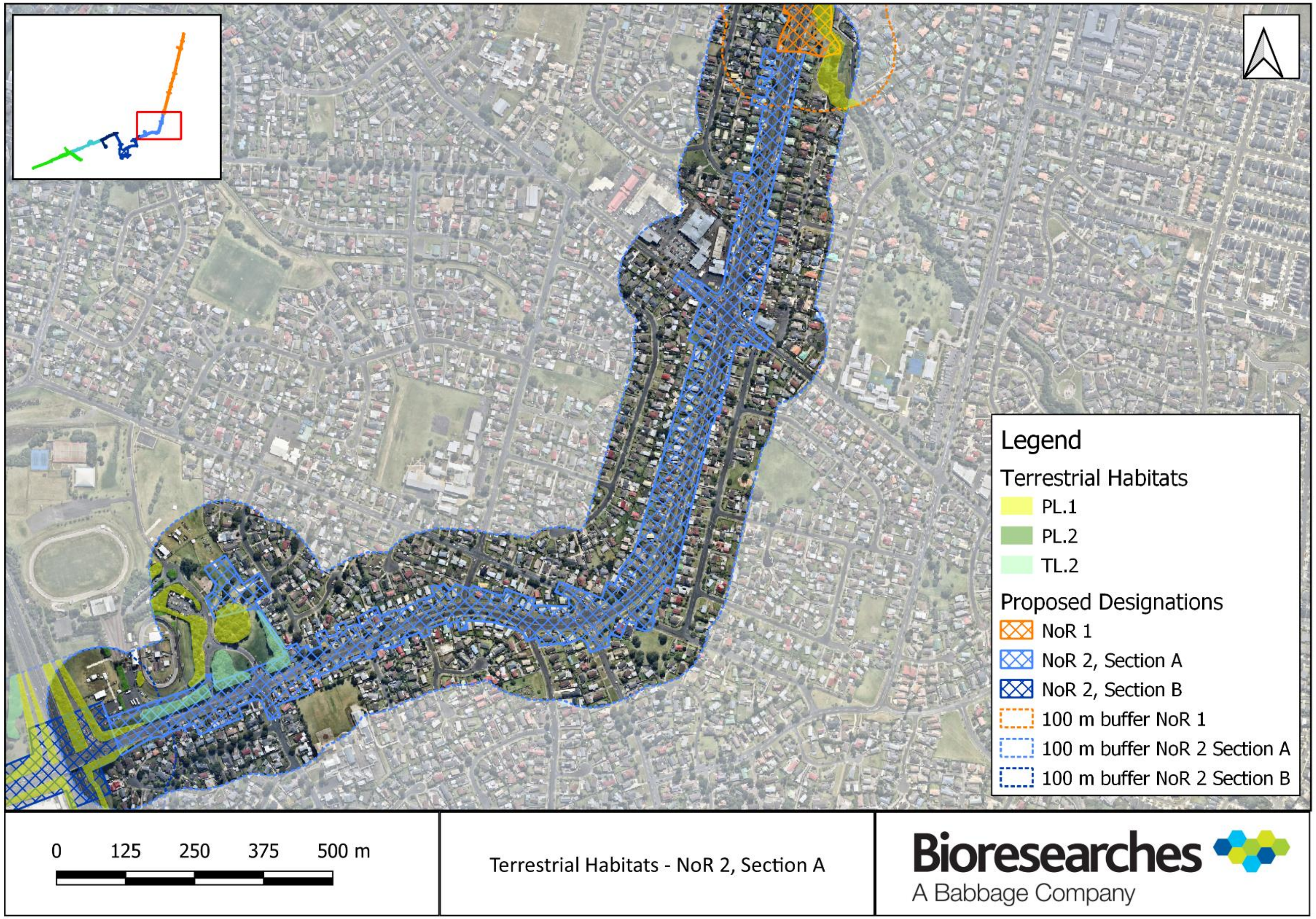


Figure 20. Terrestrial Habitats within the ZOI of NoR 2, Section A

8.2.1.2 Terrestrial Ecological Value

Table 22 presents the ecological value for the terrestrial habitats and fauna identified within NoR 2, Section A. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 37. Ecological values of terrestrial habitats within the ZOI of NoR 2, Section A

Habitat unit	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
PL.1 – riparian margin of Ōtara Creek and adjacent to the SH1 bridge crossing.	Moderate – although highly modified, there is so little natural vegetation left in the surrounding are that these areas can be considered important.	High – copper skink (At Risk - Declining) are likely present, and there is potential that the streams and riparian margins are used as long-tailed bat flight paths.	Low - while indigenous species dominate these planted compositions, they lack the diversity and structure expected of a naturally occurring ecosystem.	High - these vegetated margins provide some of the very few areas of biodiversity within a landscape that is largely devoid of indigenous vegetation and habitat.	**High**
PL.2	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too manicured or isolated to offer much variation in habitat or to be used for completion of lifecycles. Species are of a highly modified assemblage.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Low**
TL.2	Moderate – this habitat is planted and semi mature, but within the local area native plantings of this size are less common.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too manicured or isolated to offer much variation in habitat or to be used for completion of lifecycles. Species are of a highly modified assemblage.	Low – habitat is not connected to any other habitats, provides no buffering, no sensitive receptors remain and does not provide a linkage.	**Low**
EG	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – habitat has very low diversity.	Low – habitat provides no buffering; no sensitive receptors	**Negligible**

				remain and does not provide a linkage.	

Table 38 presents the ecological values for the fauna identified within the ZOI of NoR 2, Section A.

Table 38. Ecological values of fauna within the ZOI of NoR 2, Section A

Fauna	Habitat units utilised	Conservation Status*	Ecological value
Bats – long tailed bat	PL.1 – riparian margins	Threatened - Nationally Critical	Very High
Lizards – copper skink	PL.1 – riparian margins	At Risk - Declining	High
Birds – common, Not Threatened species only	Pl.1 and PL.2 habitats	Not Threatened	Low

* Retrieved from relevant New Zealand Threat Classification Series documents, available from https://www.doc.govt.nz/about-us/science-publications/series/new-zealand-threat-classification-series/

8.2.1.3 Freshwater habitats and fauna

One stream was identified within 100 m of the proposed designation boundary, the Ōtara Creek Tributary. As this stream was also assessed within the NoR 1 section (as the stream is located adjacent to the boundary of the two NoRs) the assessment is not repeated here (see NoR 1 Freshwater Habitats Section). No other streams were identified within 100 m of the proposed designation boundary.

8.2.1.4 Freshwater ecological value

Ōtara Creek Tributary was assessed to have **High** ecological value (see NoR 1 Freshwater Ecological Value Section). No other streams or non-wetland freshwater habitats were identified within 100 m of the designation boundary.

8.2.1.5 Wetland habitat

One wetland (Ōtara W.1) was identified within 100 m of the designation boundary. As the wetland is also within 100 m of the NoR 1 designation boundary, it was assessed within the NoR 1 Wetland Habitats Section.

8.2.1.6 Wetland ecological value

Wetland Ōtara W.1 was assessed to have ecological **High** value (see NoR 1 Wetland Ecological Value Section).

8.2.2 Future environment

Over the next 15 years, existing vegetation and habitats will mature and diversify within their current extents. These areas are constrained in extent by the surrounding land uses and are unlikely to increase in area. While fauna habitats are likely to support greater capacity for resource provision (nesting habitat, food resources), with maturity, fauna diversity is likely to remain stable and reflective of the surrounding urban environment.

The area is largely developed, although intensification of the immediate urban area may occur as a result of recent changes in national policy direction and changes to the RMA.

Ecological values are likely to remain stable in value. **Low** value vegetation and habitats beyond protected riparian margins have capacity to mature, as well as to expand or contract, given that they are unprotected. These areas area likely to remain low in value.

8.2.3 Assessment of ecological effects and measures to avoid, remedy or mitigate actual or potential adverse effects

This section assesses the ecological effects of activities which relate to District Plan matters under the AUP:OP. Refer to the ‘Future Environment’ Section for a discussion regarding the assumptions made for the effects assessment as it relates to permitted activities and likely future environment.

As per the matrix presented in **Appendix A**, Table 86, ecological features with a ‘negligible’ ecological value, even if combined with a ‘very high’ magnitude of effect, will never have a level of effect greater than ‘low’ and consequently will never require effects management. Therefore, ecological features with a negligible ecological value are not assessed within this section, unless there is the potential to contravene the Wildlife Act 1953.

8.2.3.1 Construction effects – terrestrial ecology

The potential ecological effects to terrestrial habitats and fauna, which may be encountered during the construction phase of the Project (as they relate to District Plan matters) have been identified:

- Removal of vegetation which is subject to District Plan controls (refer to **Appendix B** for a breakdown of Regional Plan versus District Plan vegetation); and
- Disturbance and displacement of bats, birds and lizards due to construction-related activities.

The following sections detail the magnitude of effect and level of effect of construction effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

Terrestrial vegetation

Vegetation to be removed which is subject to District Plan controls includes vegetation within existing road corridors (in this case, the PL.2 habitat, with low ecological value) and grassland (EG, negligible ecological value).

The effects of the removal of this vegetation are the same as for NoR 1 and are assessed in Table 28. This identified a **Very Low** level of effect associated with the removal of PL.2 vegetation, and consequently no impact management measures are required.

Bats

Long-tailed bats may utilise the Ōtara Creek corridor for foraging or as flight paths, which means they may fly over the NoR at the stream crossing locations at night. Vegetation within the road corridor is not considered to provide roosting or foraging habitat.

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 or moving along the stream corridors. There are no trees suitable for bats to roost in within the ZOI of the Project and consequently noise and vibration is not considered to be an issue, and mortality or injury to bats or loss of foraging habitat has not been considered.

The effects of the works upon bats are the same as for NoR 1 and are described Table 29. In summary, disturbance and displacement of bats crossing the NoR as they use streams as a flight corridor is determined to have a **Moderate** magnitude of effect and consequently a **Moderate** level of effect. Effects management in the form of a Bat Management Plan is recommended, which would reduce the level of effect to **Negligible.**

Birds

Indigenous birds may be displaced from nearby habitats due to construction activities. In addition, birds may lose roosting/foraging habitat, abandon or lose nests and also be at risk of mortality or injury during tree felling when the District Plan vegetation is removed.

The effects of the works upon birds are the same as for NoR 1 and are described in Table 30. No level of effect greater than **Low** was identified and consequently no impact management for birds is required.

Lizards

Lizards are not expected to be present within any of the District Plan vegetation to be removed but may be present within the vegetation which lines the Ōtara Creek, adjacent to the Project area. Consequently, effects are limited to the potential displacement of lizards from adjacent habitats.

The effects of the works upon lizards are the same for NoR 1 and are described in Table 31. No level of effect greater than **Very Low** was identified and consequently no impact management for lizards is required.

8.2.3.2 Operational effects – terrestrial ecology

The Project involves the addition of bus lanes to an existing road in an urban landscape. The future environment is also urban, and consequently limited change is expected within the surrounding landscape. The Ōtara Creek corridor and existing habitats associated with this waterway will remain.

Many of the potential operational effects of the Project such as habitat fragmentation, noise and light pollution are pre-existing. Potential operational effects include reductions in habitat connectivity and impacts from noise, light and vibration upon indigenous fauna, as well as potential mortality from vehicle strike.

The following sections detail the magnitude of effect and level of effect of operational effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

Bats

Potential operational impacts to bats are the same as for NoR 1. They include:

- Loss of habitat connectivity through the presence of the upgraded roadway, and impacts of lighting spillage which may impact behaviour of both bats and insects (their prey). This is considered to have a Moderate magnitude of effect and consequently a High level of effect and therefore is discussed in Table 29.
- As discussed for NoR 1, if bats are identified to be present during pre-construction surveys, then a Bat Management Plan should be implemented. This plan will incorporate mitigation measures such as reduction of light spill near bat habitats, and planting of supplementary trees within the riparian corridors which will in time increase the canopy height of the plantings and aim to retain connectivity. This would reduce the level of effect to Negligible.
- Vehicle strike causing injury or mortality. This is considered to have a very low likelihood of occurring. Consequently, the magnitude of effect is considered to be **Negligible**, and therefore has a **Low** level of effect. Effects management is not required.

As the habitats adjacent to the Project area do not provide roosting habitat for bats and are not expected to develop to provide this within 15 years (when the Project is expected to begin), impacts on roosting bats have not been considered.

Birds

Indigenous birds may be displaced from nearby habitats due to noise, lighting and vibration generated from the Project works. However as the birds present within the Project area are likely already habituated to these effects, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and consequently the level of effect is considered to be **Very Low**.

Birds may also be affected by vehicle strike; however, this is only likely to occur infrequently. Consequently, the magnitude of effect of this is considered to be **Low**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to birds.

Lizards

The Project works is not expected to increase limitations on lizard dispersal or increase disturbance to lizards. Consequently, the magnitude of this effect is considered to be **low** for both the baseline and future environment, and the level of effect is considered to be **Low**.

Lizards may also be affected by vehicle strike, however there is a very low probability of this occurring, and it would likely only occur at a very low frequency. Consequently, the magnitude of effect of this is considered to be **Negligible**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to lizards.

8.2.3.3 Conclusions

Ecological effects assessed as moderate or greater include:

- Moderate level of effect to bats during construction for both the ecological baseline and future ecological environment may occur due to disturbance to bats utilising the streams which the NoR crosses as flight corridors; and
- Moderate level of effect to bats during operation for both the ecological baseline and future ecological environment may occur due to fragmentation of habitat and impacts of lighting and noise.

Effects management (implementation of a Bat Management Plan) reduces these effects to **Negligible** and **Low**, respectively.

8.2.4 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 following sections to inform design and alignment options for the NoR.

8.2.4.1 Terrestrial ecology

Construction of the Project will result in both temporary and permanent losses in terrestrial habitat within the NoR, including habitat which is being used by native fauna.

Table 39 details the types and area (m^2) of terrestrial habitats which will be lost during construction, as well as the total area of each habitat present within the proposed designation boundary. This includes vegetation which is subject to District Plan and Regional Plan controls as well as vegetation not subject to plan controls. As the PL.2 habitat is comprised of specimen trees planted in the roadway, this has not been mapped by area and is instead recorded as the number of trees to be removed (160 trees).

Terrestrial habitats which will be lost are currently of high or low ecological value and may provide habitat for native fauna. Exotic grassland habitat is of **Negligible** ecological value and therefore is not considered here.

Table 39. Terrestrial habitat types and the areas of these both within the Project footprint (which will be permanently lost) and within the designation boundary.

Habitat type	Classification (Singers *et al.* 2017)	Area within Footprint (m^2)	Area within Designation (m^2)
Planted Vegetation – native	PL.1	TBC	1623
Treeland – mixed exotic and native	TL.2	TBC	5,333

8.2.4.2 Birds

Non-threatened indigenous birds are present within the proposed designation boundary and will be impacted by vegetation removal. This should therefore occur outside of the bird nesting season to reduce impacts to these birds.

At Risk bird species (pāteke) may be present within the wetland Ōtara W.1 located adjacent to the proposed designation. These birds could be impacted by construction activities and therefore a Bird Management Plan is recommended to reduce the magnitude of effect of these works.

8.2.4.3 Lizards

Copper skinks are potentially present within the vegetation to be cleared, and there is potential that during this clearance they could be injured or killed. Consequently, the works should be completed in accordance with the Wildlife Act 1953, and a Lizard Management Plan should be implemented.

8.2.4.4 Freshwater ecology

The proposed designation crosses one stream, however no stream loss is expected as the existing culvert will be unchanged.

Erosion and sediment control plan/s will likely also be required to prevent sediment entering streams during the works. Fish passage structures should be implemented in existing culvert sections if fish passage is not already available.

8.2.4.5 Wetland ecology

Construction of the NoR will result not result in the loss of extent of any wetland. However as works are to be carried out within 100 m of wetlands associated with the Ōtara Creek, consent for the works under the NES:F will be required. This will require mitigation in the form of erosion and sediment control plans.

8.3 Section B: East of SH1 to Ihaka Place

8.3.1 Ecological baseline

8.3.1.1 Terrestrial habitats and fauna

Desktop review

NoR 2 Section B transitions through light industry, business, metropolitan centre and residential zones in the AUP:OP, as well as a few open space recreation zones.

Present day habitats are therefore largely limited to:

- Mown lawns classified using Singers *et al.* (2017) as Exotic Grassland (EG);
- Amenity plantings/gardens such as street trees within the road corridor (e.g., along Manukau Station Road and Lambie Drive) and in residential sections, classified as planted amenity trees and gardens (PL.2);
- Areas of native restoration planting; one on the north and south side of Te Irirangi Drive where it passes the Auckland University of Technology grounds, and one bordering the Wiri Substation, classified as planted native vegetation (PL.1); and
- Planted treeland vegetation, comprised of a mix of exotic and native trees is present within Hayman Park (TL.2).

These areas are further described in Table 40, and depicted in Figure 21.

Table 40. Vegetation types present within and directly adjacent to the Project Area (NoR 2, Section B), classified according to Singers *et al.* (2017).

Vegetation type	Alphanumeric code*	Regional IUCN Conservation Status*	Description of habitat
Planted Vegetation – native	PL.1	N/A	This habitat is located on either side of Te Irirangi Drive immediately west of the SH1 bridge crossing, and outside the Wiri Substation. The plant mixtures comprise karo, taupata (*Coprosma repens*), mānuka (*Leptospermum scoparium*), kānuka, pōhutukawa (*Metrosideros excelsum*), harakeke (*Phormium tenax*), māhoe and tī kōuka and occasional exotic trees such as magnolia (*Magnolia grandiflora*). A few native seedlings are coming through an otherwise bare ground cover, including māhoe and tōtara, as well as weeds such as moth plant (*Araujia sericifera*). These areas are classified using the Singers *et al.* (2017) classification system as PL.1 (planted native scrub and forest <20 years old or wetland <10 years old.). The peripheries of these habitats were often weedy and contained overgrown pasture and weed species which would provide habitat for copper skink (*Oligosoma aeneum*).
Planted Vegetation – amenity plantings	PL.2	N/A	Amenity trees planted within the road corridor. Species include oaks (*Quercus* sp.), Norfolk pine (*Araucaria heterophylla*), magnolia, pōhutukawa and *Eucalyptus* spp. Exotic-dominated gardens such as those outside 22 Manukau Station Road and within residential sections.
Exotic grassland	EG	N/A	Grassland dominated by exotic species. This includes gardens, road verges and parks.
Treeland – mixed exotic and native	TL.2	N/A	Mixed, semi-mature stands of native and exotic trees planted within Hayman Park.

* = Information from Singers *et al.* (2017).

Fauna identified during the desktop study which may be present within the ZOI of the NoR include:

- Copper skink; and
- Common, non-threatened native and exotic bird species.

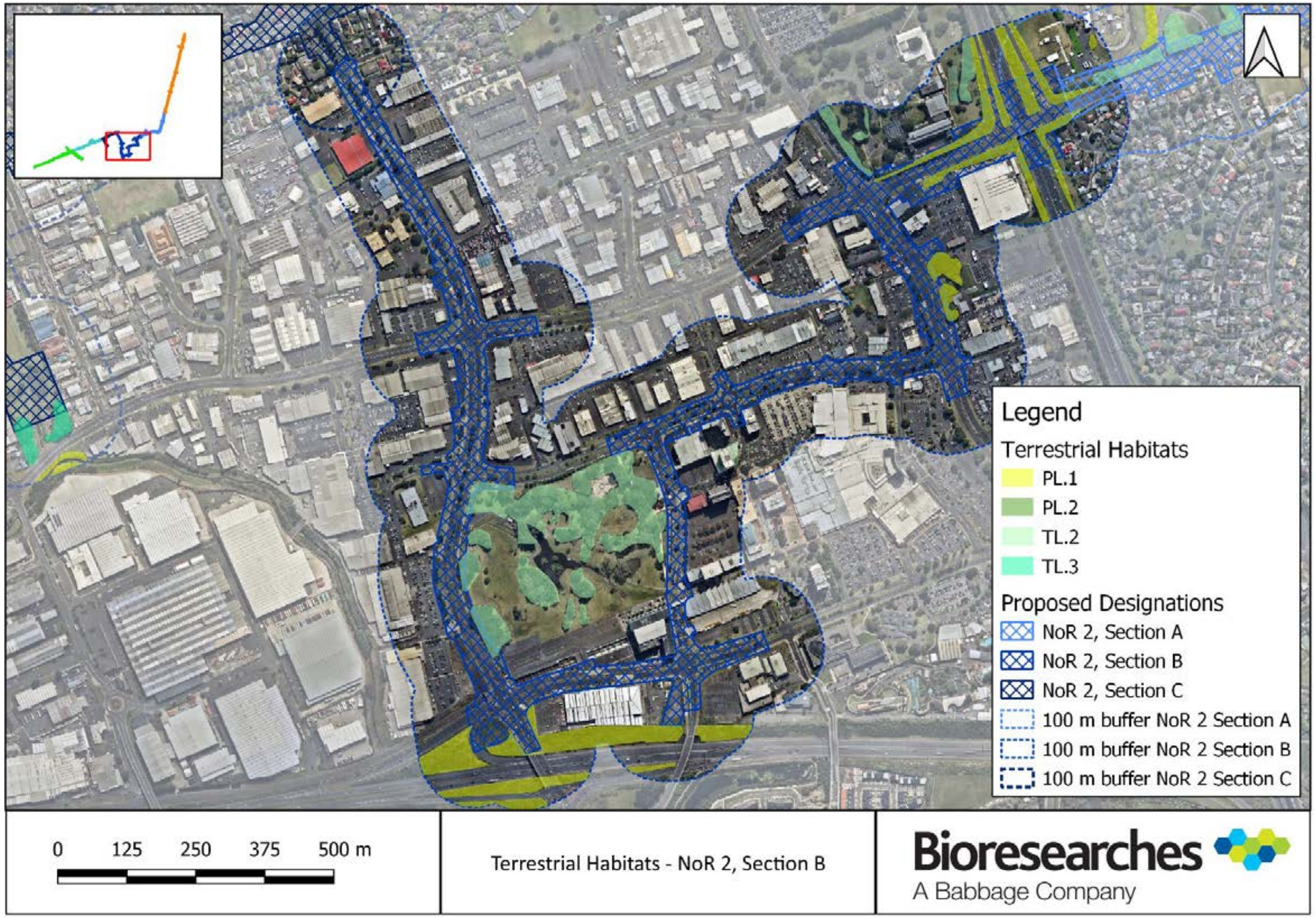


Figure 21. Terrestrial habitats within the ZOI of NoR 2, Section B

8.3.1.2 Terrestrial ecological value

Table 41 presents the ecological value for the terrestrial habitats and fauna identified within NoR 2, Section B. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 41. Ecological values of terrestrial habitats within the ZOI of NoR 2, Section B

Habitat unit	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
PL.1	Moderate – this habitat is planted and semi mature, but within the local area native plantings of this size are less common.	High – copper skink (At Risk - Declining) are potentially present	Low - while indigenous species dominate these planted compositions, they lack the diversity and structure expected of a naturally occurring ecosystem.	Low – habitat is not connected to any other habitats, provides no buffering, no sensitive receptors remain and does not provide a linkage.	High
PL.2	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too manicured or isolated to offer much variation in habitat or to be used for completion of lifecycles. Species are of a highly modified assemblage.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	Low
TL.2	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too manicured or isolated to offer much variation in habitat or to be used for completion of lifecycles. Species are of a highly modified assemblage.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	Low
EG	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – habitat has very low diversity.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	Negligible

Table 42 presents the ecological values for the fauna identified within the ZOI of NoR 2, Section B.

Table 42. Ecological values of fauna within the ZOI of NoR 2, Section B

Fauna	Habitat units utilised	Conservation Status*	Ecological value
Lizards – copper skink	PL.1	At Risk - Declining	High
Birds – common, Not Threatened species only	Pl.1, TL.2 and PL.2 habitats	Not Threatened	Low

* Retrieved from relevant New Zealand Threat Classification Series documents, available from https://www.doc.govt.nz/about-us/science-publications/series/new-zealand-threat-classification-series/

8.3.1.3 Freshwater habitats and fauna

One stream branch was identified within NoR 2, Section B. Three stormwater/amenity ponds were also identified. The stream and ponds are mapped in Figure 24 and Figure 25; and described in Table 43.

Table 43. Summary of NoR 2 Section B streams

Stream/habitat	Classification	Description
Puhinui Creek Tributary A	Intermittent	The headwaters of Puhinui Creek Tributary A originate from a culvert outlet in the Hayman Park's south-east corner. This outlet immediately forms an intermittent stream, which flows in a north-west direction into a large stormwater pond (Puhinui A.3). An additional, smaller stormwater pond (Puhinui A.2) is present to the east of the larger pond, this also discharges into the larger pond via a culvert. The pond outflows via a culvert into a second reach of Puhinui Creek Tributary A, which flows in a north-west direction for 80 m where it meets a second channel (c. 20 m in length) dug to convey surface water from the north-eastern corner of Hayman Park. After the confluence of these two watercourses, the stream flows in a south-west direction into a culvert which flows beneath Lambie Drive and Bunnings warehouse and discharges into the Puhinui Creek. It is not known if the stream is natural in origin or not. The earliest historic aerial imagery available (Figure 22) shows that a watercourse in the rough location of the existing tributary has been present since at least the 1930's. However in the historic imagery the stream has an unnaturally straight and uniform channel, suggesting that if it was a natural stream, it had already been realigned by this point.

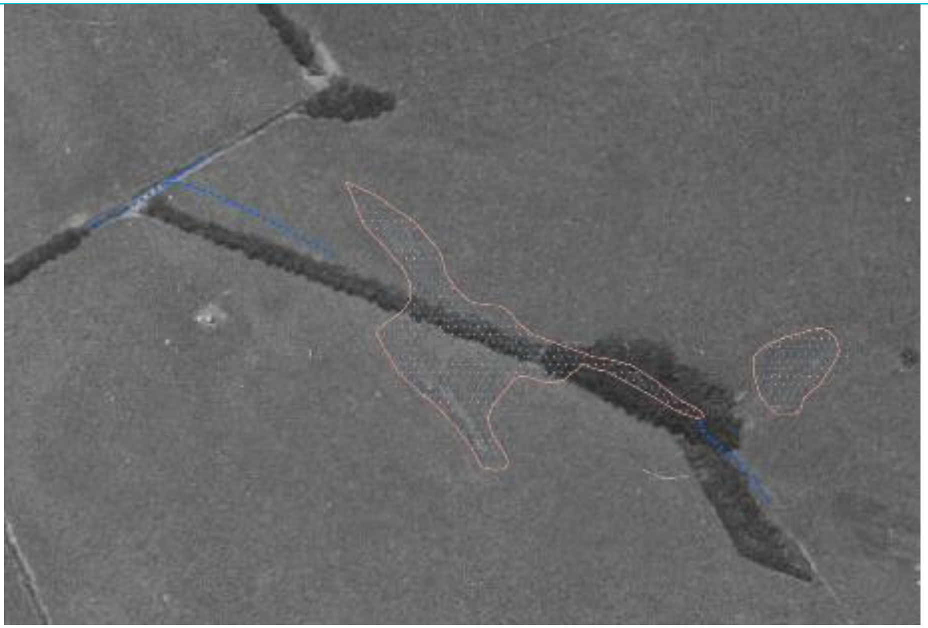


Figure 22. 1930's aerial imagery of the current location of Tributary B. Blue dashed lines indicate present-day stream sections and peach polygons indicate the stormwater ponds. Imagery from Retrolens.

Both the upper and lower reaches of stream have very low hydrological heterogeneity and fish and invertebrate habitat is limited to sparse macrophytes.

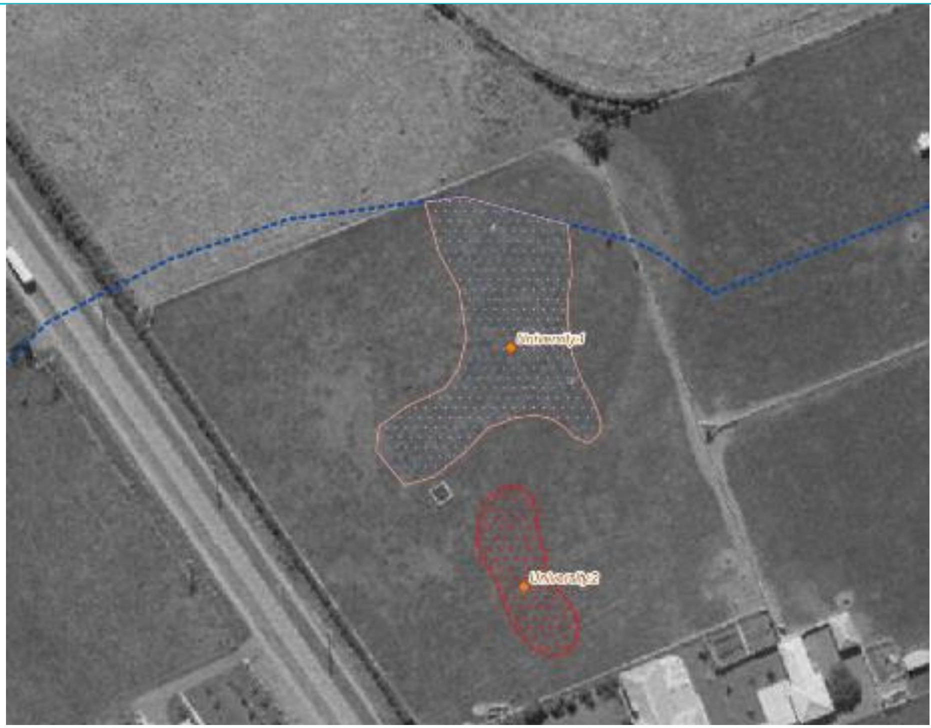
The outlet of the Lambie Drive culvert was not able to be viewed, so it is not known if it prohibits fish passage. However its length would prevent īnanga from reaching the stream reach, and long-fin eel would not find the habitats suitable, so it is likely that any fish species present would be limited to common, non-threatened species, and gambusia which were observed during the site visits.

The stream reaches have limited shading and riparian cover is mostly closely mown lawn.

Rapid habitat assessment results were indicative of low-quality habitat:

Deposited Sediment	Invertebrate habitat diversity	Invertebrate habitat abundance	Fish cover diversity	Fish cover abundance	Hydraulic heterogeneity	Bank erosion	Bank vegetation	Riparian width	Riparian Shade	Total
6	1	9	1	9	1	5	1	1	1	35

Puhinui A P.2	Artificial pond	Artificially constructed pond. This pond contained no vegetation and water quality appeared poor, with algae present in large quantities and very poor clarity. It lacks any connection to a natural watercourse other than the culvert connecting it to Puhinui A.3 and very limited habitat for native fauna. No macrophytes or hydrophytic vegetation was present in or around the pond and it is not considered to meet the definition of a Wetland under the NES:F.
Puhinui A P.3	Artificial pond	Artificially constructed pond. This pond contained no vegetation and water quality appeared poor, with algae present in large quantities. Large numbers of the pest fish Gambusia were observed. The pond is poorly connected to other watercourses, and very limited habitat for native fauna. In Figure 22, there is no evidence of wetland habitat in the vicinity of either pond and therefore this pond (and also pond Puhinui A.2) can be considered wholly artificial and not modified natural wetlands. Small patches of emergent macrophytes were present on the pond edges, however these are not considered to meet the definition of 'natural wetlands' under the NES:F as they have formed incidentally around this artificial waterbody.
University.1	Artificial pond	Artificially constructed pond. Partially shaded with mixed exotic and native trees on edges. Edges are lined with rock walls, and the base is concrete lined. Some plants (*Machaerina articulata* and papyrus (*Cyperus papyrus*)) were present within the pond, however these were potted and not rooted in sediment. Two shortfin eels were observed within the pond. This pond is very disconnected from surrounding natural habitats and only connected to other waterbodies via the stormwater system. As such it is considered highly unlikely to provide habitat for At Risk or Threatened native species.

		 **Figure 23: 1930's aerial imagery of the current location of University.** 1 artificial pond (pink) and University. 2 constructed wetland (red; assessed below). Blue dashed line indicates a 100 m buffer from the designation boundary, note the artificial pond is not mapped beyond (north of) this point. Imagery from Retrolens.

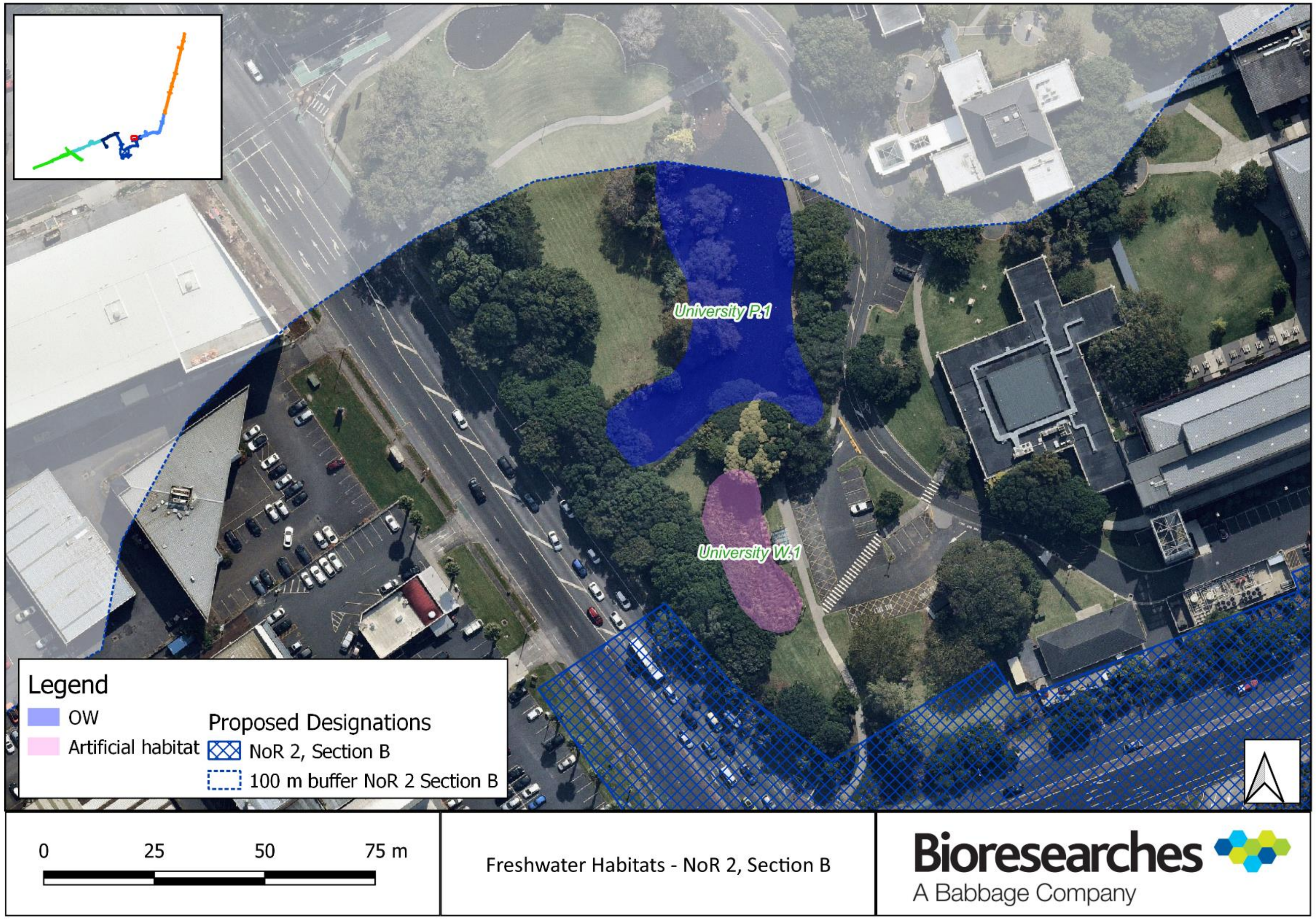


Figure 24. Freshwater Habitats within the northern portion of the ZOI of NoR 2, Section B.

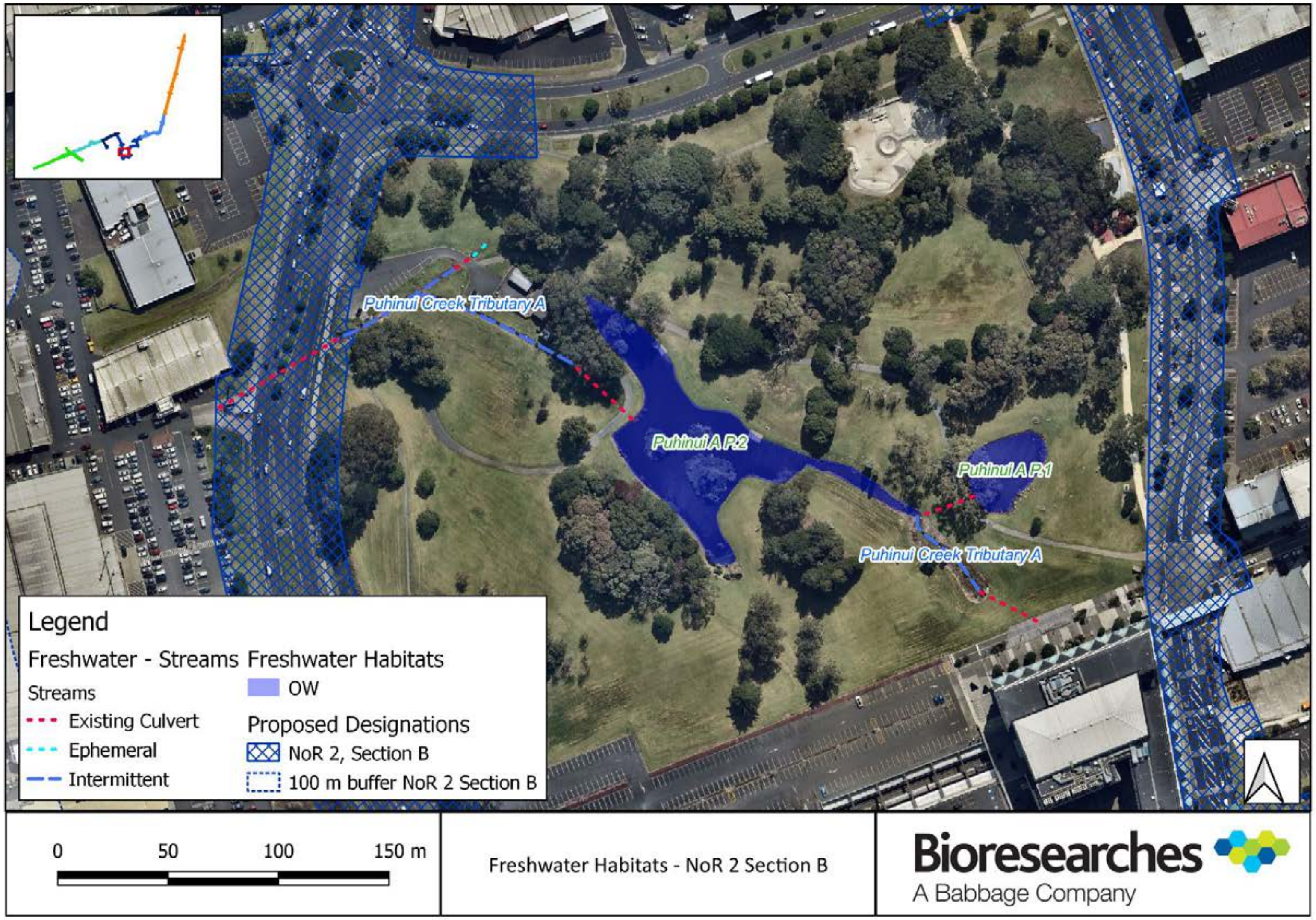


Figure 25. Freshwater Habitats within the southern portion of the ZOI of NoR 2, Section B

8.3.1.4 Freshwater ecological value

Table 44 presents the ecological value for the freshwater habitats identified within NoR 2 Section B. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 44. Ecological values of streams and ponds within the ZOI of NoR 2, Section B

Stream/pond	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
Puhinui Creek Tributary A	Low – highly modified instream habitat and riparian zone	Low – no 'At Risk' or 'Threatened' species present	Low – highly modified	Low – First order stream	**Low**
Puhinui A P.2	Low – wholly artificial habitat which almost no natural habitat has developed within.	Low – no 'At Risk' or 'Threatened' species present	Very low – only one hydrological unit	Very low – highly modified artificial environment within a highly modified catchment.	**Negligible**
Puhinui A P.3	Low – wholly artificial habitat which almost no natural habitat has developed within.	Low – no 'At Risk' or 'Threatened' species present	Very low – only one hydrological unit	Very low – highly modified artificial environment within a highly modified catchment.	**Negligible**
University P.1	Low – wholly artificial habitat which almost no natural habitat has developed within.	Low – no 'At Risk' or 'Threatened' species present	Very low – only one hydrological unit	Very low – highly modified artificial environment within a highly modified catchment.	**Negligible**

8.3.1.5 Wetland habitat

One wetland was identified within 100m of NoR 2, a constructed wetland within the Auckland University of Technology grounds. It is described in Table 45, and depicted in Figure 24.

Table 45. Wetlands within 100 m of NoR 2

Wetland	NES:F Classification	Classification process	Description
University W.1	Constructed wetland	Rapid test	Wetland constructed in 2017 (Figure 26), and planted with oioi and *Carex* sp. This wetland is only connected to other natural freshwater habitats via stormwater culverts which eventually link it to the Ōtara Creek. As such it is considered highly unlikely to provide habitat for At Risk or Threatened native species. During the site visit the wetland held no standing water so it is considered highly unlikely to provide fish habitat, and unlikely to provide habitat for wetland birds because of its small size.  **Figure 26. 2015/16 aerial imagery on left showing the university grounds pre-construction of 'University.2' wetland, and in 2017 on right during construction. Imagery from Auckland Council Geomaps.**

8.3.1.6 Wetland ecological value

Table 46 presents the ecological value for the wetland habitat identified within NoR 2 Section B. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 46. Ecological value of wetlands within the ZOI of NoR 2 Section B.

Wetland	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
University.2	Low – highly modified catchment and likely to support only common, non-native biota.	Low - not suitable habitat for any species of conservation significance. Is present in an environment where wetland habitats are uncommon but it’s lack of connectivity to other ecologically functional habitats greatly reduces the value.	Low - low diversity in habitat type.	Moderate – does provide some filtering of nutrients and flow regulation.	**Low**

8.3.2 Future environment

Over the next 15 years, existing vegetation and habitats will mature and diversify within their current extents. These areas are constrained in extent by the surrounding land uses and are unlikely to increase in area. While fauna habitats are likely to support greater capacity for resource provision (nesting habitat, food resources), with maturity, fauna diversity is likely to remain stable and reflective of the surrounding urban environment.

The area is almost entirely developed, although some intensification of the immediate urban area may occur. Ecological values are likely to remain consistent in value.

8.3.3 Assessment of ecological effects and measures to avoid, remedy or mitigate actual or potential adverse effects

8.3.3.1 Construction effects – terrestrial ecology

The potential ecological effects to terrestrial habitats and fauna, which may be encountered during the construction phase of the Project (as they relate to district matters) have been identified:

- Removal of vegetation which is subject to District Plan controls (refer to **Appendix B** for a breakdown of Regional versus District Plan vegetation); and
- Disturbance and displacement of birds and lizards due to construction-related activities.

The following sections detail the magnitude of effect and level of effect of construction effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

Terrestrial vegetation

Vegetation to be removed which is subject to District Plan controls includes vegetation within existing road corridors (in this case, the PL.2 habitat, with low ecological value) and grassland (EG, negligible ecological value).

The effects of the removal of this vegetation are the same as for NoR 1 and are assessed in Table 28. This identified a **Very Low** level of effect associated with the removal of PL.2 vegetation, and consequently no impact management measures are required.

Birds

Indigenous birds may be displaced from nearby habitats due to construction activities. In addition, birds may lose roosting/foraging habitat, abandon or lose nests and also be at risk of mortality or injury during tree felling when the District Plan vegetation is removed.

The effects of the works upon birds are described below in Table 47.

Table 47. Assessment of ecological effects encountered during construction for birds

Effect	Disturbance and displacement of birds due to construction activities	Loss of District Plan vegetation which may remove nests and foraging habitat, and injure or kill birds

Time scale	Baseline	Future environment	Baseline	Future environment
Magnitude of effect	Adjacent habitats are definitely periodically used by birds. The magnitude of effect is expected to be **Moderate**.	These trees are expected to still be present and utilised by birds in the same manner as they are currently. Consequently, the magnitude of effect is expected to be the same.	There is a reasonable probability that native birds utilise these trees for nesting. The magnitude of effect is expected to be **Moderate**.	This effect is expected to be the same as baseline.
Level of effect prior to impact management	**Low** for other bird species.		**Low**	
Impact management and residual level of effect	Not required		Under the Wildlife Act 1953, impact management measures will be required to prevent killing or injuring native birds during tree felling. This should include scheduling tree felling and vegetation removal activities outside of the bird nesting season (which is September to February, inclusive), or undertaking pre-clearance inspections to ensure nesting birds are not present.	
Management of residual effects	Not required		Not required	

Lizards

Lizards are not expected to be present within any of the District Plan vegetation to be removed but may be present within the vegetation which lines the Ōtara Creek, adjacent to the Project area. Consequently, effects are limited to the potential displacement of lizards from adjacent habitats.

The effects of the works upon lizards are the same for NoR 1 and are described in Table 31. No level of effect greater than **Very Low** was identified and consequently no impact management for lizards is required.

8.3.3.2 Operational effects – terrestrial ecology

The Project involves the addition of dedicated BRT lanes and high quality walking and cycling facilities to an existing road in an urban landscape. The future environment is also urban, and consequently limited change is expected within the surrounding landscape. The Ōtara Creek corridor and existing habitats associated with this waterway will remain.

Many of the potential operational effects of the project such as habitat fragmentation, noise and light pollution are pre-existing. Potential operational effects include reductions in habitat connectivity and impacts from noise, light and vibration upon indigenous fauna, as well as potential mortality from vehicle strike.

The following sections detail the magnitude of effect and level of effect of operational effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

Birds

Indigenous birds may be displaced from nearby habitats due to noise, lighting and vibration generated from the Project Works. However as the birds present within the Project area are likely already habituated to these effects, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and consequently the level of effect is considered to be **Very Low**.

Birds may also be affected by vehicle strike. However, this is only likely to occur infrequently. Consequently, the magnitude of effect of this is considered to be **Low**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to birds.

Lizards

The Project is not expected to increase limitations on lizard dispersal or increase disturbance to lizards. Consequently, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and the level of effect is considered to be **Low**.

Lizards may also be affected by vehicle strike, however there is a very low probability of this occurring, and it would likely only occur at a very low frequency. Consequently, the magnitude of effect of this is considered to be **Negligible**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to lizards.

8.3.3.3 Conclusions

No effects with a level of effect greater than **Low** were identified. Consequently, no effects management is required.

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 following sections to inform design and alignment options for the NoR.

8.3.4.1 Terrestrial ecology

Construction of the Project will result in both temporary and permanent losses in terrestrial habitat within the NoR, including habitat which is being used by native fauna.

Table 48 details the types and area (m^2) of terrestrial habitats which will be lost during construction, as well as the total area of each habitat present within the designation boundary. This includes vegetation which is subject to District Plan and Regional Plan controls as well as vegetation not subject to plan controls. As the PL.2 habitat is comprised of specimen trees planted in the roadway, this has not been mapped by area and is instead recorded as the number of trees to be removed (180 trees).

Terrestrial habitats which will be lost are currently of **Moderate** or **Low** ecological value and may provide habitat for native fauna. Exotic grassland habitat is of **Negligible** ecological value and therefore is not considered here.

Table 48. Terrestrial habitat types and the areas of these both within the Project footprint (which will be permanently lost) and within the designation boundary.

Habitat type	Classification (Singers *et al.* 2017)	Area within Footprint (m^2)	Area within Designation (m^2)
Planted Vegetation – native	PL.1	TBC	13,475
Treeland – mixed exotic and native	TL.2	TBC	45,668

8.3.4.2 Birds

Non-threatened indigenous birds are present within the designation boundary and will be impacted by vegetation removal. This should therefore occur outside of the bird nesting season to reduce impacts to these birds.

8.3.4.3 Lizards

Copper skinks are potentially present within the vegetation to be cleared, and there is potential that during this clearance they could be injured or killed. Consequently, the works should be completed in accordance with the Wildlife Act 1953, and a Lizard Management Plan should be implemented.

8.3.4.4 Freshwater ecology

One stream, Puhinui Stream Tributary A (and two stormwater ponds) are positioned directly adjacent to two additional stormwater ponds proposed to be constructed. Whilst there are no instream works proposed, and no stream loss, under a future regional consent for instream works, earthworks and vegetation removal, impact management would also be required for sediment control and management of the riparian condition.

8.3.4.5 Wetland ecology

Construction of the NoR will occur within 100 m of one wetland. No direct loss wetland loss will occur, but assessment of the effects of these works will be required under the NES:F. Effects management likely be limited to implementation of erosion and sediment control measures.

8.4 Section C: Ihaka Place to Puhinui Station

8.4.1 Ecological baseline

8.4.1.1 Terrestrial habitats and fauna

NoR 2 Section C is placed within residential zones.

Present day habitats are therefore largely limited to amenity plantings/gardens in residential sections and on roadsides, classified using Singers *et al.* (2017) as amenity planted vegetation (PL.2), exotic-dominated treeland (TL.3) and mown lawns, classified as Exotic Grassland (EG).

These areas are further described in Table 49, and depicted in Figure 27.

Table 49. Vegetation types present within and directly adjacent to the Project Area (NoR 2, Section C), classified according to Singers *et al.* (2017).

Vegetation type	Alphanumeric code*	Regional IUCN Conservation Status*	Description of habitat
Planted Vegetation – amenity plantings	PL.2	N/A	Amenity trees planted within the road corridor. Species include bottlebrush (*Callistemon* sp.), pōhutukawa and titoki (*Alectryon excelsum*). Exotic-dominated gardens such as those outside 22 Manukau Station Road and within residential sections.
Treeland – Exotic dominated	TL.3	N/A	*Eucalyptus* spp. planted within Puhinui Domain
Exotic grassland	EG	N/A	Grassland dominated by exotic species. This includes gardens and road verges.

* = Information from Singers *et al.* (2017).

Fauna identified during the desktop study which may be present within the ZOI of the NoR include:

- Common, non-threatened native bird species.

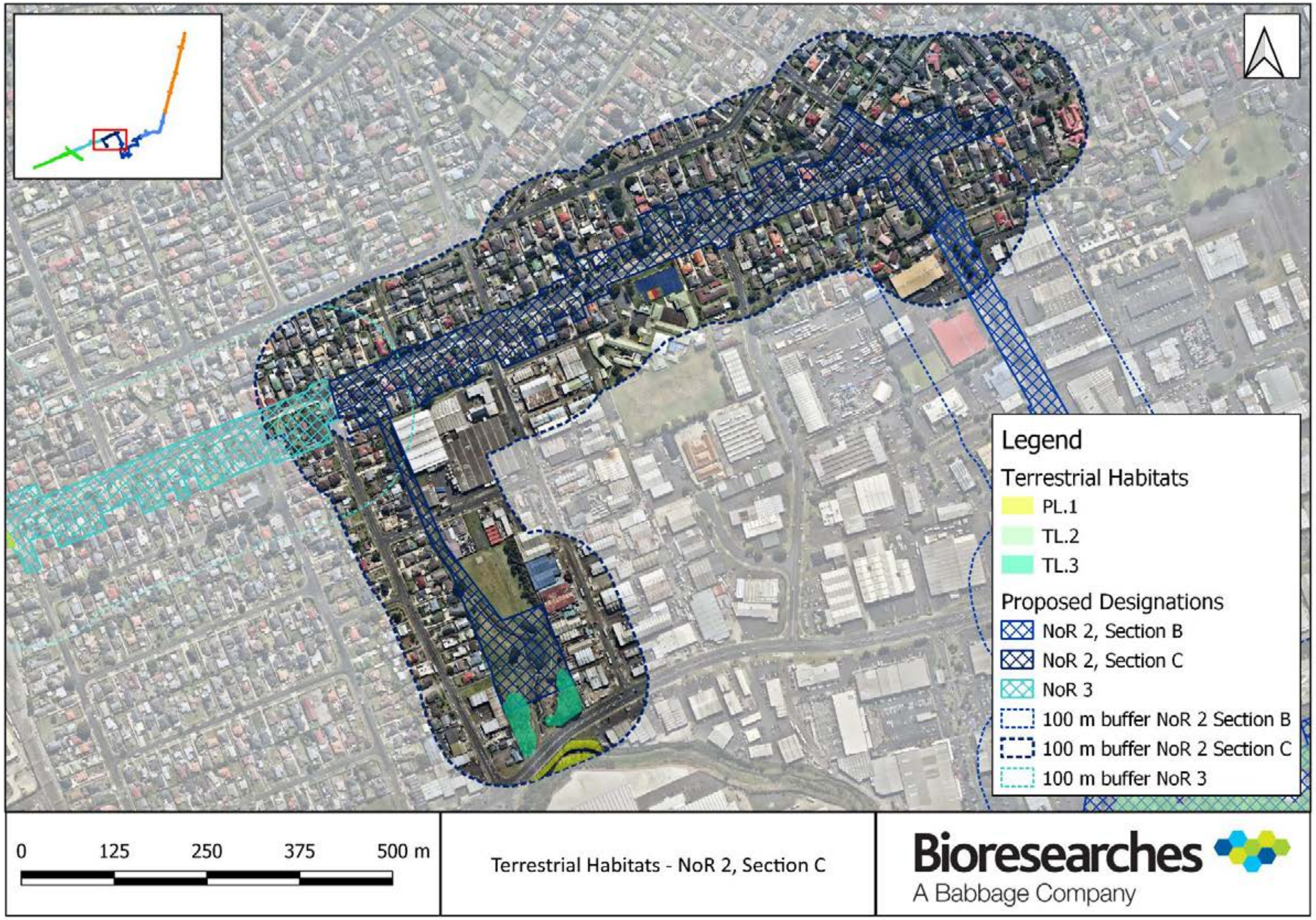


Figure 27. Terrestrial Habitats within the ZOI of NoR 2, Section C.

8.4.1.2 Terrestrial ecological value

Table 50 presents the ecological value for the terrestrial habitats and fauna identified within NoR 2, Section C. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 50. Ecological values of terrestrial habitats within the ZOI of NoR 2, Section C

Habitat unit	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
PL.2	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too manicured or isolated to offer much variation in habitat or to be used for completion of lifecycles. Species are of a highly modified assemblage.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Low**
TL.3	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – habitat has low diversity and other than copper skink does not provide habitat for other sensitive species.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Low**
EG	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – habitat has very low diversity.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Negligible**

Table 51 presents the ecological values for the fauna identified within the ZOI of NoR 2, Section C.

Table 51. Ecological values of fauna within the ZOI of NoR 2, Section C

Fauna	Habitat units utilised	Conservation Status*	Ecological value
Birds – common, Not Threatened species only	Pl.1 and PL.2 habitats	Not Threatened	**Low**

* Retrieved from relevant New Zealand Threat Classification Series documents, available from https://www.doc.govt.nz/about-us/science-publications/series/new-zealand-threat-classification-series/

8.4.1.3 Freshwater habitats and fauna

One stream was identified within the NoR, Puhinui Creek Tributary B. It is mapped in Figure 28 and described in Table 52.

Table 52. Summary of NoR 2 Section C streams

Stream	Classification	Brief Description
Puhinui Creek Tributary B	Permanent	Puhinui Creek Tributary B is fed via stormwater discharges. Its headwaters are located approximately 40 m south of Puhinui Road, at a culvert outflow. It flows for approximately 370 m before discharging into a stormwater pond. It then discharges from the pond, flows beneath Cavendish Drive via a culvert and discharges into Puhinui Creek. As the stream receives all water from stormwater inflows, consequently it can be expected to have a highly modified hydrological regime, with flashy responses to rainfall, and likely receives contaminants via these pathways. Historic aerial imagery shows that a watercourse has been present since at least the 1930's in that location. owever the stream has an unnaturally straight and uniform channel, much of which is concrete lined. It has no riparian cover and the vegetation within the riparian zone consists of short mown grass. Shortfin eels (seven in total) were observed within the stream during the site visit. Macrophytes were present in low numbers within the stream and included starwort (*Callitriche stagnalis*), swamp lily (O*ttelia ovalifolia*), *Persicaria hydropiper* and curly pondweed (*Potamogeton crispus*). Despite the presence of freshwater fish records for longfin eel and īnanga within the wider catchment, the habitat quality is considered too poor to support these species and the lack of upstream habitat means they are highly unlikely to pass through the site. Rapid habitat assessment scores were low:

Deposited Sediment	Invertebrate habitat diversity	Invertebrate habitat abundance	Fish cover diversity	Fish cover abundance	Hydraulic heterogeneity	Bank erosion	Bank vegetation	Riparian width	Riparian Shade	Total
4	2	1	2	1	1	7	1	1	1	22

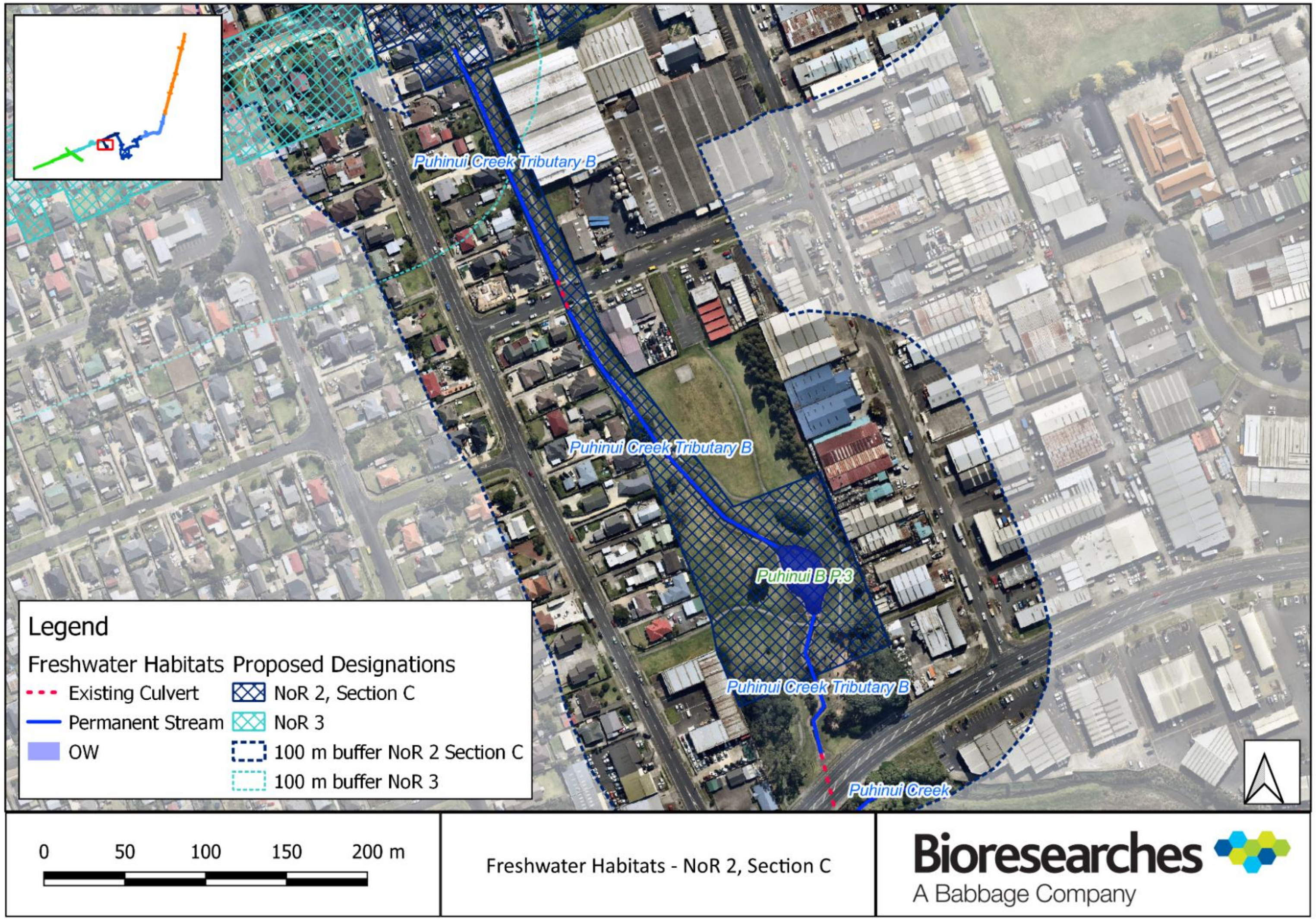


Figure 28. Freshwater Habitats within the ZOI of NoR 2 Section C.

8.4.1.4 Freshwater ecological value

Table 53 presents the ecological value for the freshwater habitats identified within NoR 2 Section C. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 53. Ecological values of streams within the ZOI of NoR 2

Stream	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
Puhinui Tributary B	Low - highly modified instream habitat and riparian zone	Low – no 'At Risk' or 'Threatened' species present	Low – highly modified, near-uniform habitat	Low – first order stream	**Low**

8.4.1.5 Wetland habitat

No wetland habitat was identified within NoR 2, Section C.

8.4.2 Future environment

Over the next 15 years, existing vegetation and habitats will mature and diversify within their current extents. These areas are constrained in extent by the surrounding land uses and are unlikely to increase in area. While fauna habitats are likely to support greater capacity for resource provision (nesting habitat, food resources), with maturity, fauna diversity is likely to remain stable and reflective of the surrounding urban environment.

The area is almost entirely developed, although some intensification of the immediate urban area may occur as a result of changes to national policy direction and the RMA. Ecological values are likely to remain consistent in value.

8.4.3 Assessment of ecological effects and measures to avoid, remedy or mitigate actual or potential adverse effects

8.4.3.1 Construction effects – terrestrial ecology

The potential ecological effects to terrestrial habitats and fauna, which may be encountered during the construction phase of the Project (as they relate to district matters) have been identified:

- Removal of vegetation which is subject to District Plan controls (refer to **Appendix B** for a breakdown of Regional versus District Plan vegetation); and
- Disturbance and displacement of birds due to construction-related activities.

The following sections detail the magnitude of effect and level of effect of construction effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

Terrestrial vegetation

Vegetation to be removed which is subject to District Plan controls includes vegetation within existing road corridors (in this case, the PL.2 habitat, with low ecological value) and grassland (EG, negligible ecological value).

The effects of the removal of this vegetation are the same as for NoR 1 and are assessed in Table 28. This identified a **Very Low** level of effect associated with the removal of PL.2 vegetation, and consequently no impact management measures are required.

Birds

Indigenous birds may be displaced from nearby habitats due to construction activities. In addition, birds may lose roosting/foraging habitat, abandon or lose nests and also be at risk of mortality or injury during tree felling when the District Plan vegetation is removed.

The effects of the works upon birds are the same as for NoR 2, Section B and are described in Table 47. No level of effect greater than **Low** was identified and consequently no impact management for birds is required.

8.4.3.2 Operational effects – terrestrial ecology

The Project involves the addition of BRT lanes and high quality walking and cycling facilities to an existing road in an urban landscape. The future environment is also urban, and consequently limited change is expected within the surrounding landscape. The Ōtara Creek corridor and existing habitats associated with this waterway will remain.

Many of the potential operational effects of the Project such as habitat fragmentation, noise and light pollution are pre-existing. Potential operational effects include reductions in habitat connectivity and impacts from noise, light and vibration upon indigenous fauna, as well as potential mortality from vehicle strike.

The following sections detail the magnitude of effect and level of effect of operational effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

Birds

Indigenous birds may be displaced from nearby habitats due to noise, lighting and vibration generated from the Project works. However as the birds present within the Project area are likely already habituated to these effects, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and consequently the level of effect is considered to be **Very Low**.

Birds may also be affected by vehicle strike. However, this is only likely to occur infrequently. Consequently, the magnitude of effect of this is considered to be **Low**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to birds.

8.4.3.3 Conclusions

No effects with a level of effect greater than '**Low**' were identified. Consequently, no effects management is required.

8.4.4 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 following sections to inform design and alignment options for the NoR.

8.4.4.1 Terrestrial ecology

Construction of the Project will result in both temporary and permanent losses in terrestrial habitat within the NoR, including habitat which is being used by native fauna.

Table 54 details the types and area (m^2) of terrestrial habitats which will be lost during construction, as well as the total area of each habitat present within the designation boundary. This includes vegetation which is subject to District Plan and Regional Plan controls as well as vegetation not subject to plan controls. As the PL.2 habitat is comprised of specimen trees planted in the roadway, this has not been mapped by area and is instead recorded as the number of trees to be removed.

Terrestrial habitats which will be lost are currently of low or negligible ecological value and may provide habitat for native fauna. Exotic grassland habitat is of **Negligible** ecological value and therefore is not considered here.

Table 54. Terrestrial habitat types and the areas of these both within the Project footprint (which will be permanently lost) and within the designation boundary.

Habitat type	Classification (Singers *et al.* 2017)	Area within Footprint (m^2)	Area within Designation (m^2)
Planted Vegetation – amenity plantings	PL.2		

8.4.4.2 Birds

Non-threatened indigenous birds are present within the designation boundary and will be impacted by vegetation removal. This should therefore occur outside of the bird nesting season to reduce impacts to these birds.

8.4.4.3 Freshwater ecology

The designation includes one stream. No stream loss is expected, as the stream is culverted within the works footprint.

The total stream length available for restoration within the designation boundary is 391, and restoration is already proposed for the entirety of this section of stream.

Under a future regional consent for instream works, earthworks and vegetation removal, impact management would also be required for sediment control and management of the riparian condition.

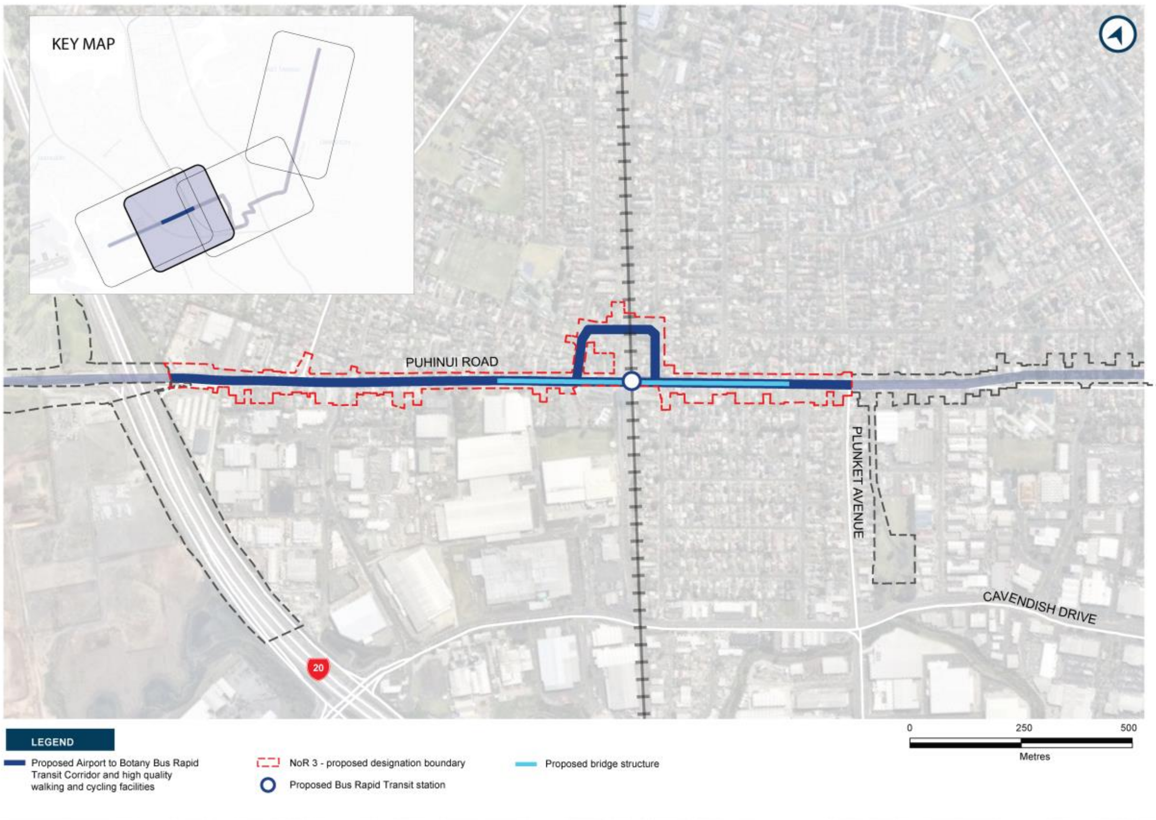
9 Airport to Botany Bus Rapid Transit – NoR 3

This section assesses specific ecological matters relating to NoR 3 – the Project corridor between Puhinui Station (in the vicinity of Plunket Avenue) to the SH20/20B Interchange.

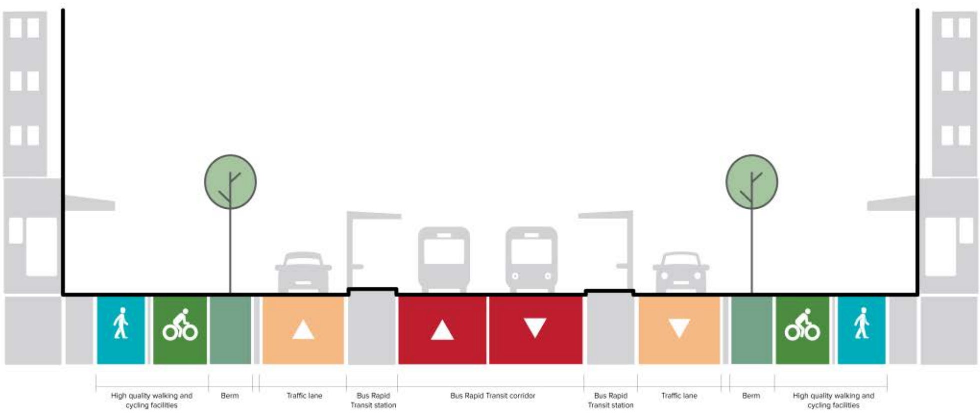
9.1 Overview and description of works

As set out in Table 55 below, the proposed works in NoR 3 include the widening of the existing Puhinui Road to accommodate a centre-running BRT corridor, vehicle lanes and high quality walking and cycling facilities. As part of the proposed works, a BRT bridge over the NIMT is proposed to connect to the Puhinui Station.

Table 55: Overview of NoR 3

NoR 3 – Puhinui Station, in the vicinity of Plunket Avenue to SH20/20B Interchange	
	
Key features	
BRT Corridor	Centre-running along Puhinui Road connecting to the Puhinui Station concourse via a new BRT bridge structure
BRT Stations	Puhinui Station
Walking and cycling facilities	• Walking and cycling facilities on both sides of the corridor; and • Walking and cycling facilities will be provided along Cambridge Terrace, Bridge Street and Kenderdine Road.

General traffic	One lane in each direction on Puhinui Road
Access	Limited right turn access
Speed environment	50 km/h
Signalised intersections	• Puhinui Road and Noel Burnside Road; and • Puhinui Road and Wyllie Road.
Stormwater infrastructure	Wetland
NoR 3 typical cross section	



9.2 Ecological baseline

9.2.1 Terrestrial habitats and fauna

NoR 3 (Plunket Avenue to the SH20B/20 Interchange passes through a predominantly residential environment. Present day habitats are therefore largely limited to:

- Planted native vegetation associated with the SH20 underpass and Puhinui Station, classified using Singers *et al.* (2017) as planted amenity vegetation (PL.1);
- Amenity plantings/gardens in residential sections and on roadsides, classified using Singers *et al.* (2017) as planted amenity vegetation (PL.2); and
- Mown lawns classified as exotic grassland (EG).

These areas are further described in Table 56, and depicted in Figure 29.

Table 56. Vegetation types present within and directly adjacent to the Project Area (NoR 3), classified according to Singers *et al.* (2017).

Vegetation type	Alphanumeric code*	Regional IUCN Conservation Status*	Description of habitat

Planted Vegetation – amenity plantings	PL.2	N/A	This habitat can be split into three subtypes within the NoR: Standalone trees planted for their amenity value within the road corridor. Whilst predominantly exotic, pōhutukawa and tītoki are also included, although these trees are relatively immature (<5 m in height). Private exotic-dominated gardens (excluding 22 Cambridge Terrace and 252 Puhinui Road) may provide some foraging habitat for common, non-threatened and disturbance-tolerant native bird species, but due to their lack of connectivity with other, more established habitats, they are not expected to provide habitat for species such as copper skink. 22 Cambridge Terrace, and 252 Puhinui Road which contain semi-mature native and exotic tree species. This area has potential to provide habitat for copper skink and common, non-threatened native bird species.
Planted vegetation – native plantings	PL.1	N/A	Plantings adjacent to the SH20 underpass and Puhinui Station, which are less than 15 years old and comprised of *Coprosma* spp., harakeke, tī kōuka, small-leaved pōhuehue (*Muehlenbeckia complexa* var. *complexa*), karo, and *Carex* spp., as well as other common native species. Overall, while indigenous species dominate these planted compositions, they lack the diversity and structure expected of a naturally occurring ecosystem.
Exotic grassland	EG	N/A	Grassland dominated by exotic species. This includes gardens and road verges.

* = Information from Singers *et al.* (2017).

Fauna identified during the desktop study which may be present within the ZOI of the NoR include:

- Copper skink; and
- Common, non-threatened native bird species.

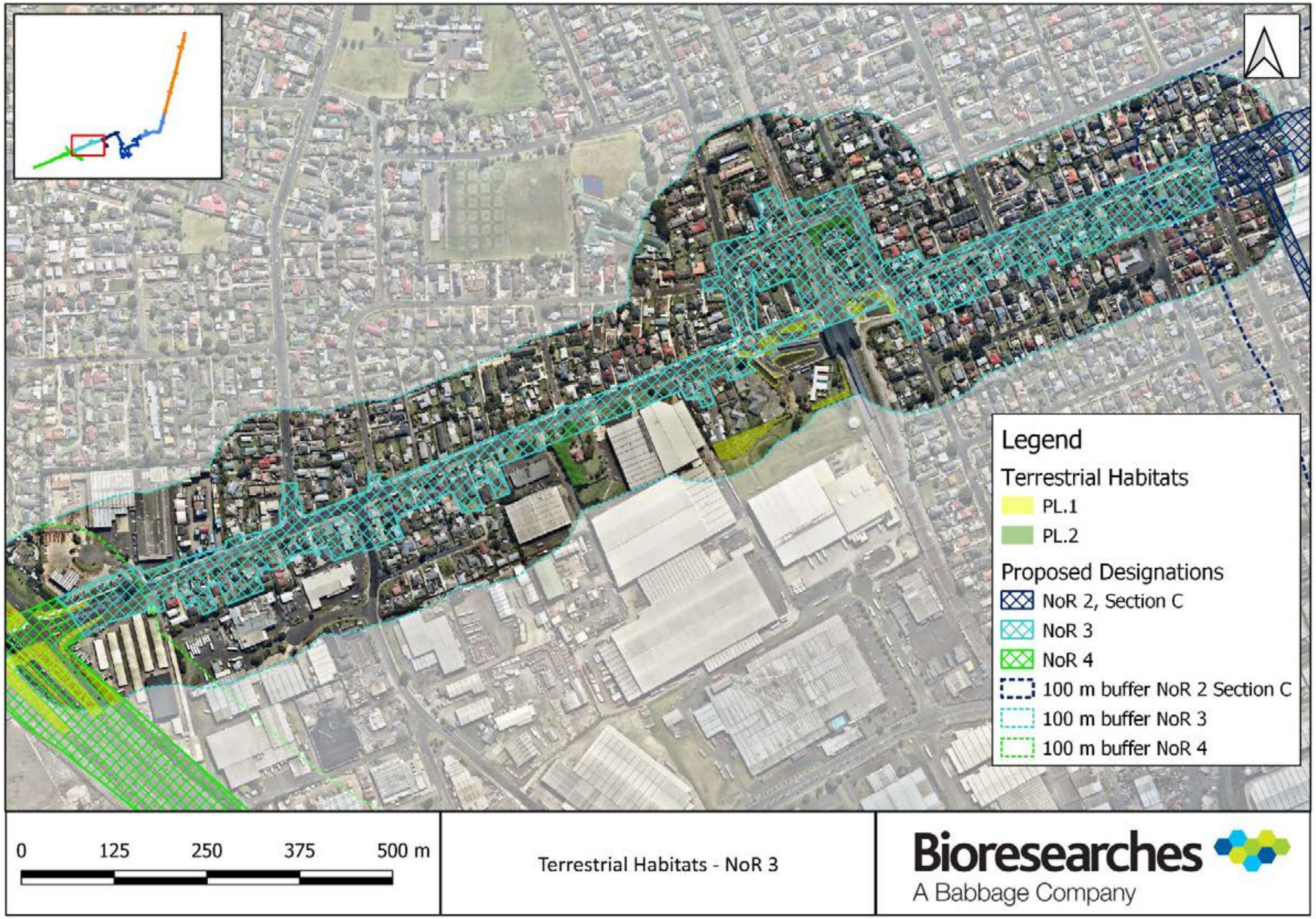


Figure 29. Terrestrial Habitats within the ZOI of NoR 3

9.2.2 Terrestrial ecological value

Table 57 presents the ecological value for the terrestrial habitats and fauna identified within NoR 3. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 57. Ecological values of terrestrial habitats within the ZOI of NoR 3

Habitat unit	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
PL.2 – Amenity trees and private gardens	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too young to offer much variation in habitat or to be used for completion of lifecycles. Species are of a common assemblage.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Low**
PL.2 – 22 Cambridge Terrace and 252 Puhinui Road	Low – this habitat is highly modified with low indigenous representation.	High – precautionary rating unless copper skink (At Risk - Declining) are found not to be present.	Moderate – some diversity in species, however habitat is reasonably homogenous and other than copper skink does not provide habitat for other sensitive species.	Low – habitat has no linkages to any other habitats.	**High**
PL.1 – Planted native vegetation	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too young to offer much variation in habitat or to be used for completion of lifecycles. Species are of a common assemblage.	Low – habitat is too immature to provide significant buffering and does not yet provide a linkage.	**Low**
EG	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – habitat has very low diversity.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Negligible**

Table 58 presents the ecological values for the fauna identified within the ZOI of NoR 3.

Table 58. Ecological values of fauna within the ZOI of NoR 3

Fauna	Habitat units utilised	Conservation Status*	Ecological value
Lizards – copper skink	PL.2 – 22 Cambridge Terrace	At Risk - Declining	High
Birds – common, Not Threatened species only	PL.1 and PL.3 habitats	Not Threatened	Low

* Retrieved from relevant New Zealand Threat Classification Series documents, available from https://www.doc.govt.nz/about-us/science-publications/series/new-zealand-threat-classification-series/

9.2.3 Freshwater habitat

No streams were identified within the ZOI of the NoR 3 alignment during the desktop study or site investigations.

9.2.4 Wetland habitat

Two constructed wetlands were identified within 100 m of NoR 3, both adjacent to the Puhinui Station. The wetlands are described in Table 59, and depicted in Figure 31.

Table 59. Wetlands within 100 m of NoR 3

Wetland	NES:F Classification	Classification process	Description
Puhinui Station W.1	Constructed wetland	Rapid test	Wetland constructed between 2017 and 2022 (Figure 30), and planted with oioi, *Juncus* sp. and *Carex* sp. This wetland is only connected to other natural freshwater habitats via stormwater culverts which eventually link it to the Puhinui Creek. As such it is considered highly unlikely to provide habitat for At Risk or Threatened native species. During the site visit the wetland held no standing water so it is considered highly unlikely to provide fish habitat, and unlikely to provide habitat for wetland birds because of its small size.

			 Figure 30. 2017 aerial imagery on left showing the Puhinui Station pre-construction of ‘Puhinui Station W.1’ and ‘Puhinui Station W.2’ wetlands, and in 2022 on right post-construction. Imagery on left from Auckland Council Geomaps, and on right from Nearmap.
Puhinui Station W.2	Constructed wetland	Rapid test	Wetland constructed between 2017 and 2022 (Figure 30), and planted with oioi, *Juncus* sp. and *Carex* sp. This wetland is only connected to other natural freshwater habitats via stormwater culverts which eventually link it to the Puhinui Creek. As such it is considered highly unlikely to provide habitat for At Risk or Threatened native species.

			During the site visit the wetland held no standing water so it is considered highly unlikely to provide fish habitat, and unlikely to provide habitat for wetland birds because of its small size.

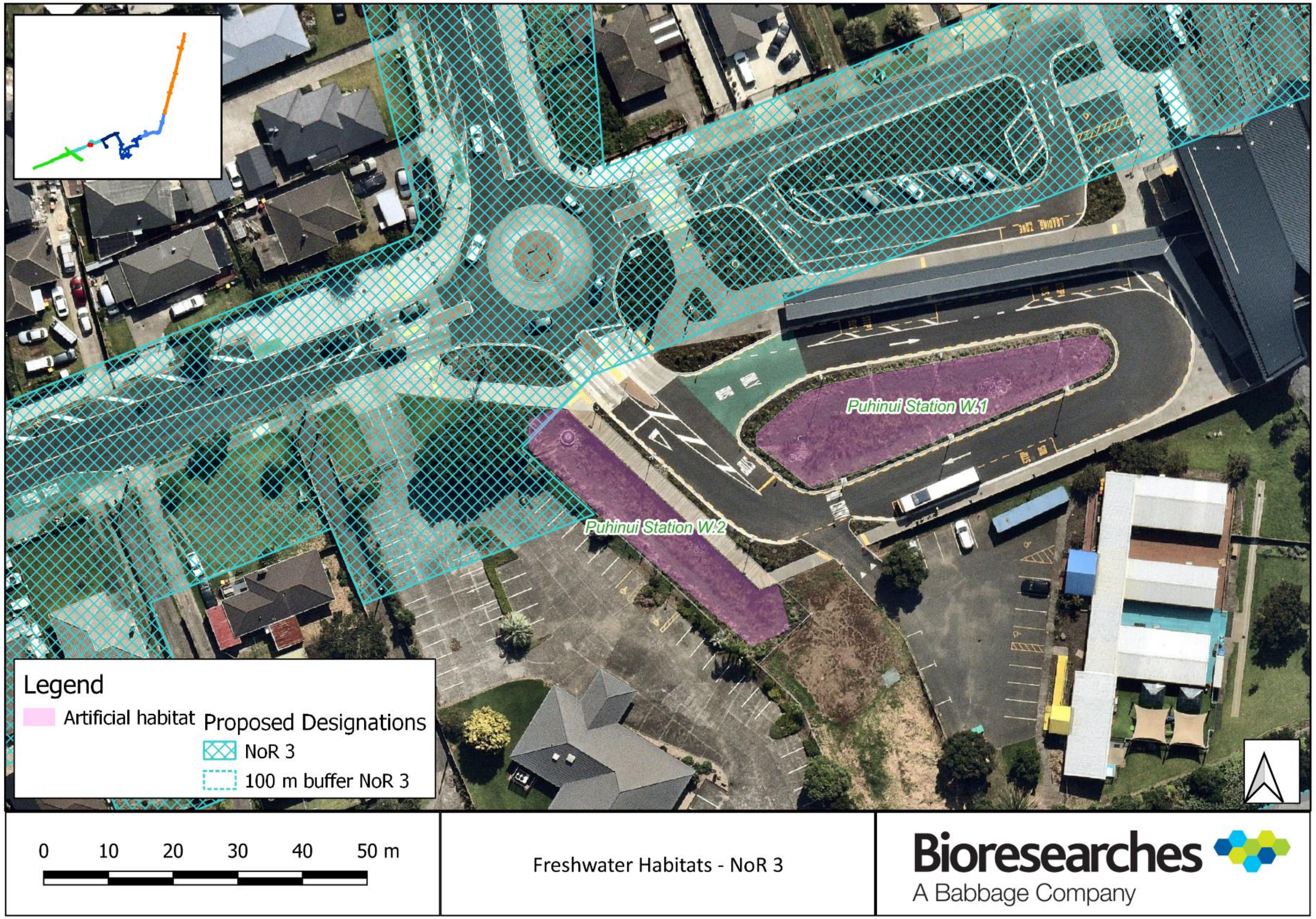


Figure 31. Freshwater habitats within the ZOI of NoR 3.

9.2.4.1 Wetland ecological value

Table 60 presents the ecological value for the wetland habitat identified within NoR 3. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 60. Ecological value of wetlands within the ZOI of NoR 2 Section B.

Wetland	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
Puhinui Station W.1	Low – highly modified catchment and likely to support only common, non-native biota.	Low - not suitable habitat for any species of conservation significance. Is present in an environment where wetland habitats are uncommon but it's lack of connectivity to other ecologically functional habitats greatly reduces the value.	Low - low diversity in habitat type.	Moderate – does provide some filtering of nutrients and flow regulation.	Low
Puhinui Station W.2	Low – highly modified catchment and likely to support only common, non-native biota.	Low - not suitable habitat for any species of conservation significance. Is present in an environment where wetland habitats are uncommon but it's lack of connectivity to other ecologically functional habitats greatly reduces the value.	Low - low diversity in habitat type.	Moderate – does provide some filtering of nutrients and flow regulation.	Low

9.3 Future environment

The area is almost entirely developed, although some intensification of the immediate urban area may occur. Over the next 15 years, ecological values are likely to remain consistent in their ecological values, given the limited current extents within an urban environment.

9.4 Assessment of ecological effects and measures to avoid, remedy or mitigate actual or potential adverse effects

This section assesses the ecological effects of activities which relate to District Plan matters under the AUP:OP. Refer to the 'Future Environment' Section for a discussion regarding the assumptions made for the effects assessment as it relates to permitted activities and likely future environment.

9.4.1 Construction effects – terrestrial ecology

The potential ecological effects to terrestrial habitats and fauna, which may be encountered during the construction phase of the Project (as they relate to district matters) have been identified:

- Removal of vegetation which is subject to District Plan controls (refer to **Appendix B** for a breakdown of Regional versus District Plan vegetation); and
- Disturbance and displacement of birds and lizards due to construction-related activities.

The following sections detail the magnitude of effect and level of effect of construction effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

9.4.1.1 Terrestrial vegetation

Vegetation to be removed which is subject to District Plan controls includes vegetation within existing road corridors (in this case, the PL.2 habitat within the road corridor (excluding that within private property), with low ecological value) and grassland (EG, negligible ecological value).

The effects of the removal of this vegetation are the same as for NoR 1 and are assessed in Table 28. This identified a **Very Low** level of effect associated with the removal of PL.2 vegetation, and consequently, no impact management measures are required.

9.4.1.2 Birds

Indigenous birds may be displaced from nearby habitats due to construction activities. In addition, birds may lose roosting/foraging habitat, abandon or lose nests and also be at risk of mortality or injury during tree felling when the District Plan vegetation is removed.

The effects of the works upon birds are the same as for NoR 2, Section B and are described in Table 47. No level of effect greater than **Low** was identified and consequently no impact management for birds is required.

9.4.1.3 Lizards

Lizards are not expected to be present within any of the District Plan vegetation to be removed but may be present within the vegetation at 22 Cambridge Terrace, adjacent to the Project area. Consequently, effects are limited to the potential displacement of lizards from adjacent habitats. As the vegetation is unprotected and on private property, there is some chance it may be removed prior to works commencing however it is conservatively assumed for the likely future environment that the vegetation would still be present.

The effects of the works upon lizards are the same for NoR 1 and are described in Table 31. No level of effect greater than **Very Low** was identified and consequently no impact management for lizards is required.

9.4.2 Operational effects – terrestrial ecology

The Project involves the addition of BRT lanes and high quality walking and cycling facilities to an existing road in an urban landscape. The future environment is also urban, and consequently limited change is expected within the surrounding landscape. The Ōtara Creek corridor and existing habitats associated with this waterway will remain.

Many of the potential operational effects of the Project such as habitat fragmentation, noise and light pollution are pre-existing. Potential operational effects include reductions in habitat connectivity and impacts from noise, light and vibration upon indigenous fauna, as well as potential mortality from vehicle strike.

The following sections detail the magnitude of effect and level of effect of operational effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

9.4.2.1 Birds

Indigenous birds may be displaced from nearby habitats due to noise, lighting and vibration generated from the upgraded roadway. However as the birds present within the Project area are likely already habituated to these effects, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and consequently the level of effect is considered to be **Very Low**.

Birds may also be affected by vehicle strike. However, this is only likely to occur infrequently. Consequently, the magnitude of effect of this is considered to be **Low**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to birds.

9.4.2.2 Lizards

The upgraded roadway is not expected to increase limitations on lizard dispersal or increase disturbance to lizards. Consequently, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and the level of effect is considered to be **Low**.

Lizards may also be affected by vehicle strike, however there is a very low probability of this occurring, and it would likely only occur at a very low frequency. Consequently, the magnitude of effect of this is considered to be **Negligible**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to lizards.

9.4.3 Conclusions

No effects with a level of effect greater than **Low** were identified. Consequently, no effects management is required.

9.5 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 following sections to inform design and alignment options for the NoR.

9.5.1 Terrestrial ecology

Construction of the Project will result in both temporary and permanent losses in terrestrial habitat within the NoR, including habitat which is being used by native fauna.

Table 61 details the types and area (m^2) of terrestrial habitats which will be lost during construction, as well as the total area of each habitat present within the designation boundary. This includes vegetation which is subject to District Plan and Regional Plan controls as well as vegetation not subject to plan controls. The PL.2 habitat type which is comprised of specimen trees planted in the roadway has not been mapped by area and is instead recorded as the number of trees to be removed (21 trees).

Terrestrial habitats which will be lost are currently of **Low** or **Negligible** ecological value and may provide habitat for native fauna. Exotic grassland habitat is of **Negligible** ecological value and therefore is not considered here.

Table 61. Terrestrial habitat types and the areas of these both within the Project footprint (which will be permanently lost) and within the designation boundary.

Habitat type	**Classification (Singers *et al.* 2017)**	**Area within Footprint (m^2)**	**Area within Designation (m^2)**
Planted Vegetation – amenity plantings in 22 Cambridge Terrace and 252 Puhinui Road	PL.2	TBC	1,271
Planted Vegetation – native plantings	PL.1	TBC	1,708

9.5.2 Birds

Non-threatened indigenous birds are present within the proposed designation boundary and will be impacted by vegetation removal. This should therefore occur outside of the bird nesting season to reduce impacts to these birds.

9.5.3 Lizards

Copper skinks are potentially present within the vegetation to be cleared, and there is potential that during this clearance they could be injured or killed. Consequently, the works should be completed in accordance with the Wildlife Act 1953, and a Lizard Management Plan should be implemented.

9.5.4 Wetland ecology

Construction of the NoR will occur within 100 m of two wetlands. No direct loss wetland loss will occur, but assessment of the effects of these works will be required under the NES:F. Effects management likely be limited to implementation of erosion and sediment control measures.

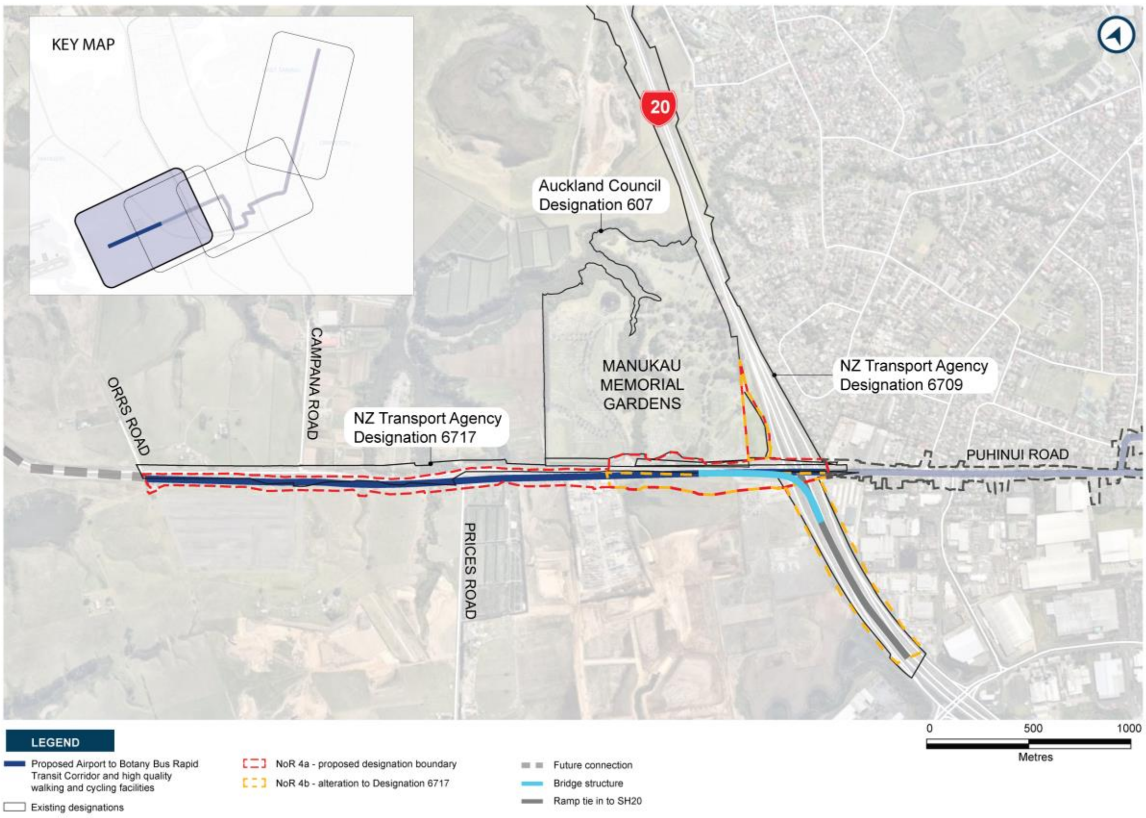
10 Airport to Botany Bus Rapid Transit NoRs 4a and 4b

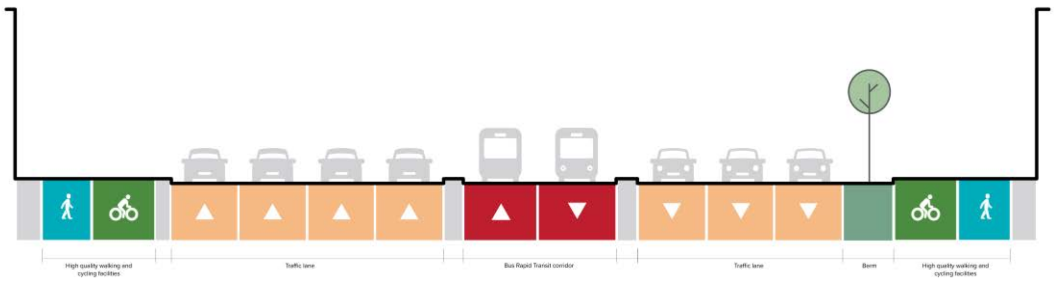
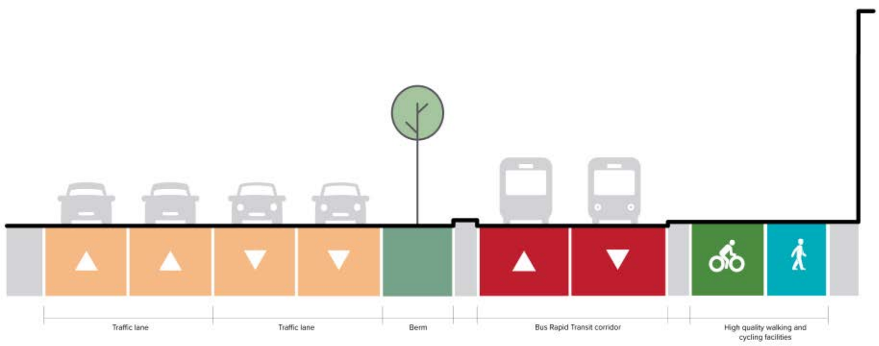
This section assesses specific terrestrial ecology matters relating to NoR 4a and NoR 4b – the Project corridor between the SH20/20B Interchange and Orrs Road.

10.1 Overview and description of works

As set out in Table 62 below, the proposed works in NoRs 4a and 4b include the widening of SH20B to accommodate a centre-running BRT corridor until the Manukau Memorial Gardens. From this point, the BRT corridor shifts south of SH20B until Orrs Road. Proposed works also include high quality walking and cycling facilities, eastbound lanes to Auckland Airport and a ramp from SH20B onto SH20 for southbound traffic.

Table 62: Overview of NoR 4a and 4b

<table>
<tr><th colspan="2">NoRs 4a and 4b – SH20/20B Interchange to Orrs Road</th></tr>
<tr><td colspan="2">
</td></tr>
<tr><th colspan="2">Key features</th></tr>
<tr><td>BRT corridor</td><td>• Centre-running on Puhinui Road through to the Manukau Memorial Gardens intersection (approx. 600 m west of SH20/20B Interchange); and
• South running to Orrs Road.</td></tr>
</table>

Walking and cycling facilities	Walking and cycling facilities on southern side of the corridor
General traffic	• Two lanes in each direction; and • New southbound ramp from SH20B onto SH20.
Access	• Limited access; and • Access maintained via signals at Manukau Memorial Gardens and Campana Road.
Speed environment	60 km/h
Signalised intersections	• SH20/SH20B Interchange; • Puhinui Road and Manukau Memorial Gardens; and • Puhinui Road and Campana Road.
Stormwater infrastructure	Swales
NoR 4b typical cross section	
	
NoR 4a typical cross section	
	

10.2 Ecological baseline

Ecological features within NoRs 4a and 4bb include riparian vegetation associated with the Waokauri Creek tributaries, and riparian vegetation associated with these tributaries. This vegetation is protected (E15.4.1(A19), AUP:OP).

10.2.1 Terrestrial habitats and fauna

Zoning within the ZOI of NoRs 4a and 4b is predominantly Light Industry Zone and Future Urban Zone, however the majority of the area is currently utilised for agricultural and horticultural purposes.

Much of the vegetation which was present on the northern side of NoR 4a and NoR 4b in 2018 has been removed for consented SH20B Improvements works (e.g., Figure 32), and these areas are now bare, or have been replanted with native vegetation. Remaining vegetation consists of predominantly isolated, **Low** botanical value pockets of planted and regenerating native and exotic species. Some plantings have been undertaken for remediation of SH20B upgrade works.

Figure 32. Large parts of the northern side of SH20B within NoR1a and NoR1b have been earth-worked and do not currently support indigenous vegetation or associated habitats.

Present day habitats include:

- Mixed exotic and native vegetation growing along the road frontage of the Manukau Memorial Gardens for approximately 200 m east of the entrance to the gardens and on either side of the Waokauri Creek tributary streams labelled WC A and WC B within the 'Freshwater and Wetland Habitats' section below. This is recorded on the Auckland Council Geomaps 'Ecosystems Current Extent' layer as VS5 (Broadleaved species scrub/forest). Vegetation growing along tributary streams. Riparian margins of the tributaries of Waokauri Creek marked as WC C, WC D and WC E within the 'Freshwater and Wetland Habitats' section below are also classified as VS5.
- Planted vegetation classified as native Planted Vegetation (PL.1), including:
  - Recently planted native vegetation adjacent to Puhinui Road, which has been planted since 2019; and

  - Older planted native vegetation adjacent to SH20 and on the northern side of Puhinui Road extending toward the Manukau Memorial Gardens, which appears to have been planted between 2003 and 2006.
- Treeland habitat comprised of poplar (*Populus* sp.) and London plane (*Platanus x acerifolia*) trees alongside Puhinui Road, classified as Exotic Treeland (TL.3).
- Exotic Scrub (ES), comprised of weedy exotic species.
- Grassland used for pasture and lawns, classified using Singers *et al.* (2017) as Exotic Grassland (EG).
- Wetland vegetation which is recorded on the Auckland Council Geomaps 'Ecosystems Current Extent' layer as SA1.2 (Mangrove forest and scrub) vegetation; and other areas of wetland habitat including exotic wetlands (EW) and raupō reedland (WL17). This habitat is assessed in the 'Wetland Habitats' section below.

These areas are further described in Table 63, and depicted in Figure 33 and Figure 34.

Table 63. Vegetation types present within and directly adjacent to the Project Area (NoR 4), classified according to Singers et al. (2017).

Vegetation type	Alphanumeric code*	Regional IUCN Conservation Status*	Description of habitat
Broadleaved scrub/forest	VS5	Least Concern	Vegetation along the road frontage of the Manukau Memorial gardens which is classified as VS5 by Auckland Council has a species assemblage which includes mature ngaio (*Myoporum laetum*) in parts, and mamaku (*Cyathea medullaris*) with other species such as planted pōhutukawa, māhoe and karaka (*Corynocarpus laevigatus*) present in the sub-canopy (Photo 19). A number of ground ferns including rosy maidenhair (*Adiantum hispidulum*), shining spleenwort (*Asplenium oblongifolium*) and hound's tongue (*Microsorum pustulatum* subsp. *pustulatum*) are present on the forest floor. There is also incursion of weed species, particularly tree privet and crack willow (*Salix* Xfragilis). With distance north, away from the designation boundary, this vegetation grades into a tangle of Chinese privet, *Muehlenbeckia complexa* var. *grandifolia* and karamu (*Coprosma robusta*). This habitat unit also includes vegetation on three other Waokauri Creek tributaries which is comprised of a similar mix of native and exotic species. This vegetation type is known to support copper skink (Bioresearches, 2019).
Planted vegetation – Native	PL.1	N/A	Overall, while indigenous species dominate these planted compositions, they lack the diversity and structure expected of a naturally occurring ecosystem. These areas of PL.1 habitat have been divided into two types: Those adjacent to the SH20 underpass, which are approximately 15 years old and comprised of *Coprosma* spp., harakeke, tī kōuka, small-leaved

			pōhuehue (*Muehlenbeckia complexa* var. *complexa*), karo, and *Carex* spp. Those which have been planted more recently with the SH20B upgrades. These are of a similar species assemblage but are smaller with less continuous cover. There are also some areas which are vegetated with swards of native sedges and rushes-like' species – e.g., *Carex* spp. and oioi (*Apodasmia similis*).
Treeland – Exotic dominated	TL.3	N/A	London plane and poplar trees planted in a shelterbelt. These have no sub-canopy, but the groundcover is comprised of rough grasses.
Exotic Forest	EF	N/A	Vegetation growing alongside Waokauri Tributary C, Waokauri Tributary D and Waokauri Tributary E, within the riparian zones. This vegetation is heavily dominated by tree privet, with Chinese privet, gorse, woolly nightshade and moth plant also present in high numbers. Sporadic common native trees and shrubs such as māhoe and karamū are also present.
Exotic Scrub	ES	N/A	This habitat comprises an area south of the NoR which is comprised almost entirely of gorse, and also the edges of one of the Waokauri tributary streams on the South Side of Puhinui Road which is comprised of gorse, tobacco weed, pampas, and occasional exotic trees.
Exotic grassland	EG	N/A	Grassland dominated by exotic species. This includes lawn areas (e.g., within the ManukauMemorial Gardens) which not likely to be utilised by any native species. This also includes open areas of pasture. These are grazed or mown frequently enough that they are not expected to provide habitat for copper skink but may be used as foraging habitat by pipit (At Risk – Declining).
Croplands	None applied	N/A	Horticultural cropping areas

* = Information from Singers *et al.* (2017).

Fauna identified during the desktop study which may be present within the ZOI of the NoR include:

- Copper skink;
- Common, non-threatened native bird species; and
- High value New Zealand pipit (At Risk- declining).

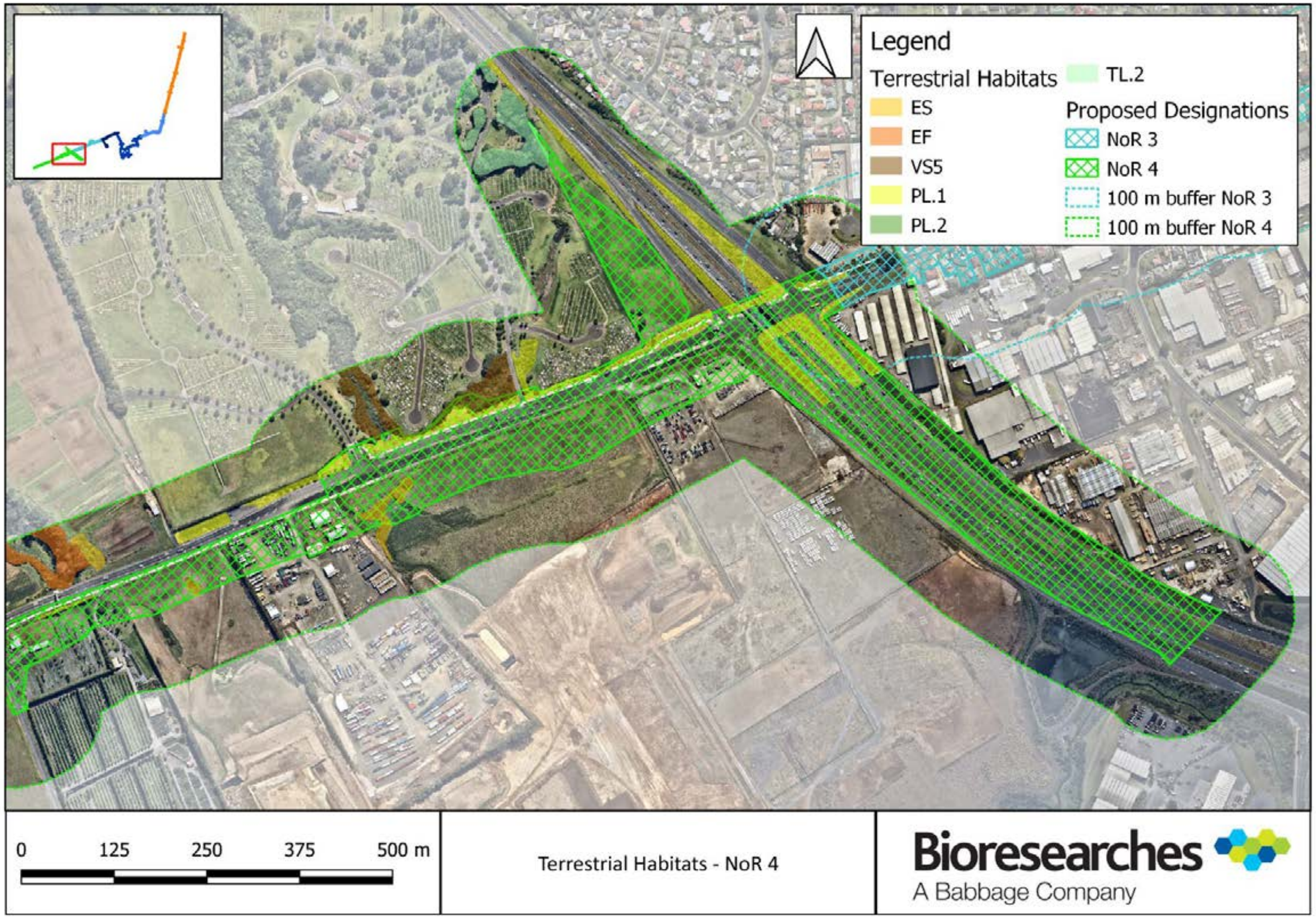


Figure 33. Terrestrial Habitats within the ZOI of the eastern end of NoR 4

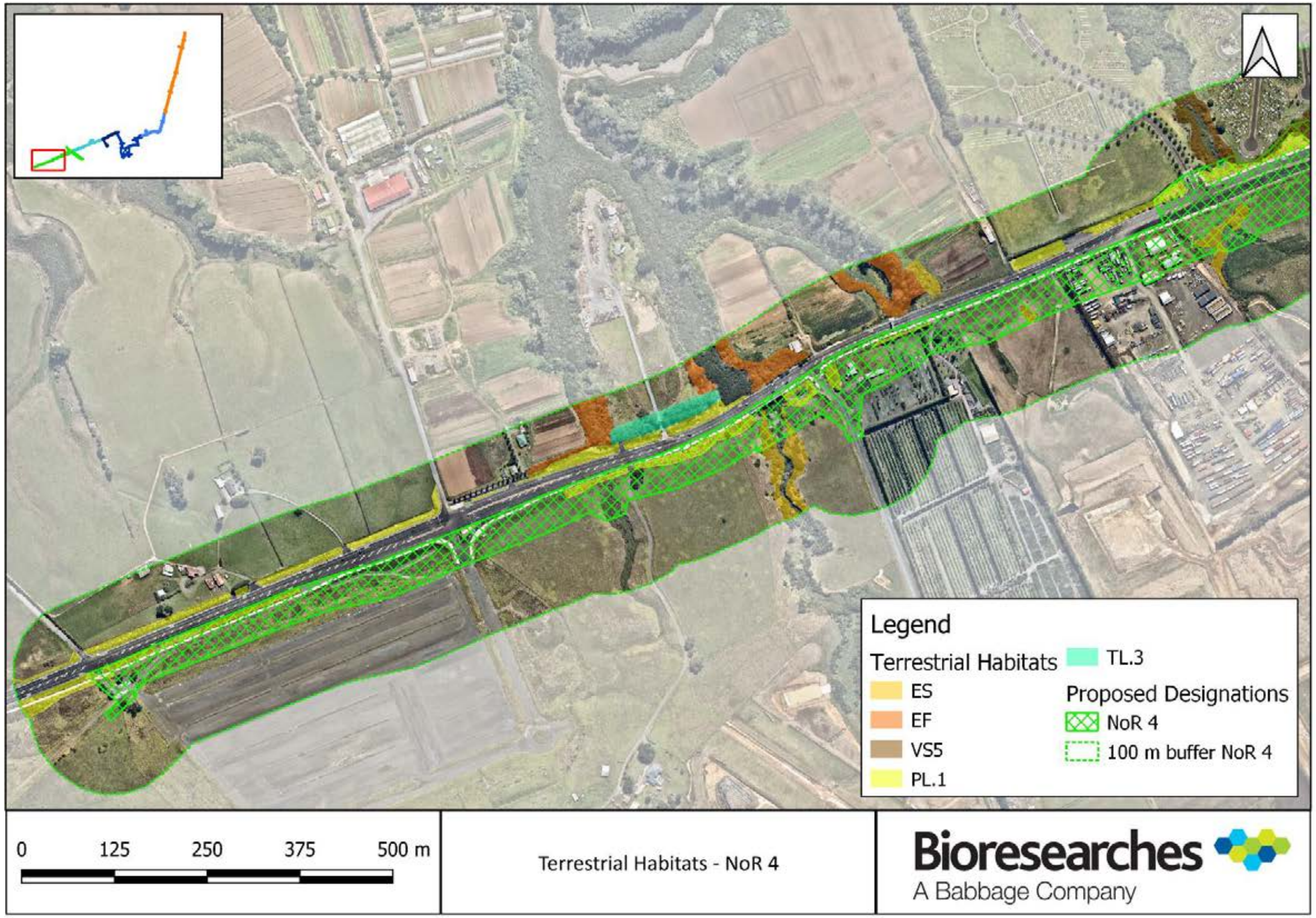


Figure 34. Terrestrial Habitats within the ZOI of the western end of NoR 4.

10.2.2 Terrestrial ecological value

Table 64 presents the ecological value for the terrestrial habitats and fauna identified within NoRs 4a and 4b. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 64. Ecological values of terrestrial habitats within the ZOI of NoRs 4a and 4b

Habitat unit	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
VS.5	Moderate – 'True' VS5 habitat is rare within the ecological district. However this habitat is highly impacted by weeds.	High – copper skink (At Risk - Declining) are present.	Moderate – some diversity in species, however habitat is reasonably homogenous and other than copper skink does not provide habitat for other sensitive species.	High – provides the Waokauri tributaries with a level of buffering which is uncommon in the ecological district. They also provide a network between the terrestrial and freshwater/wetland habitats.	**High**
PL.1	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – plantings are too young to offer much variation in habitat or to be used for completion of lifecycles. Species are of a common assemblage.	Low – habitat is too immature to provide significant buffering and does not yet provide a linkage.	**Low**
TL.3	Low – this habitat is highly modified with low indigenous representation.	High – copper skink is potentially present beneath.	Low – habitat has low diversity and other than copper skink does not provide habitat for other sensitive species.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**High**
EF	Low – this habitat is highly modified with low indigenous representation.	High – copper skink is potentially present beneath.	Low – habitat has low diversity and other than copper skink does not provide habitat for other	Moderate – provides the Waokauri tributaries with a level of buffering which is uncommon in the ecological district. They also provide a network between the	**High**

			sensitive species.	terrestrial and freshwater/wetland habitats.	
ES	Low – this habitat is highly modified with low indigenous representation.	Low – not likely to support any Threatened or At Risk species.	Low – habitat has very low diversity.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Low**
EG	Low – this habitat is highly modified with low indigenous representation.	High – may support pipit (At Risk - Declining)	Low – habitat has very low diversity.	Low – habitat provides no buffering; no sensitive receptors remain and does not provide a linkage.	**Low**

Table 65 presents the ecological values for the fauna identified within the ZOI of NoR 4.

Table 65. Ecological values of fauna within the ZOI of NoRs 4a and 4b

Fauna	**Habitat units utilised**	**Conservation Status***	**Ecological value**
Lizards – copper skink	VS5, and TL.3 understory	At Risk – Declining	**High**
Birds – common, Not Threatened species only	VS5, PL.1 and TL.3	Not Threatened	**Low**
Birds – pipit	EG – pastoral areas	At Risk – Declining	**High**
Wetland birds – banded rail, spotless crake, fernbird, little black shag, pied shag	Wetland habitats (described below in 'Wetland Habitat' Section).	At Risk – Declining – Fernbird, banded rail, spotless crake, At Risk – Naturally Uncommon – little black shag. At Risk – Recovering – Pied shag	**High**

* Retrieved from relevant New Zealand Threat Classification Series documents, available from https://www.doc.govt.nz/about-us/science-publications/series/new-zealand-threat-classification-series/

10.2.3 Freshwater habitats and fauna

Seven stream branches were identified within 100 m of the designation boundary, however, only 5 of these were within the NoR. These streams are mapped in Figure 35 to Figure 40; and described in Table 66. As these streams had already been recently extensively assessed by Bioresearches (2019), rapid habitat assessments were not completed for these streams.

Table 66. Summary of NoRs 4a and 4b streams

Stream	**Classification**	**Brief Description**

Waokauri Creek Tributary A	Permanent	The upstream end of Tributary A originates to the north of SH20B and flows in a southwest direction. It then flows into a culvert which travels under SH20B, with the outlet of the culvert also on the northern side of SH20B. Waokauri Creek Tributary B, which originates south of SH20B, is culverted underneath SH20B converges with Tributary A at the outlet of the Tributary A culvert. From the outlet of these culverts, the stream then flows north ward and eventually into the Waokauri Creek. The transition to the marine environment is located approximately 500 m downstream of the designation boundary. This also marks the edge of the marine SEA 'SEA-M2-27a'. Within the upstream end of Tributary A, adjacent to the culvert inlet, the shading over the stream was high and the woody debris provided habitat to a moderate population of shortfin eel. Six eels were observed ranging between 800mm and 450mm, the majority being large juveniles 500 mm or less (Bioresearches, 2019). Both the upstream reach and the downstream reach of the stream contain macrophytes and riparian vegetation which meets the definition of a Natural Wetland under the NES:F (wetlands Waokauri A.2 and Waokauri A.1, respectively). Water quality measurements showed very poor habitat quality, with adequate temperature control because of the high shading, but critically low dissolved oxygen levels, 10% saturation in the upstream region, and poor levels within the downstream region (66%). Hydrocarbon sheens were present within the area which would have contributed to the poor water quality (Bioresearches, 2019). In both the upstream and downstream portions of the stream, MCI scores were indicative of 'poor' quality habitat (Bioresearches, 2019).
Waokauri Creek Tributary B	Intermittent	This stream originates on the south side of SH20B, and flows north under SH20B though a culvert, discharging into Waokauri Creek Tributary A. The stream is in poor ecological condition; it is largely unshaded, and was observed to have poor water quality, with an abundance of iron-oxidising bacteria and floc present. Water clarity was poor, due to this and high levels of suspended sediment in the water. Two sediment retention ponds discharge into the stream, and the outlet of a culvert which presumably conveys stormwater also is present and discharging to the stream. Due to the low level of flow within the stream at the time of survey (August 2022), the stream is presumed to have intermittent flow.
Waokauri Creek Tributary C	Intermittent	Tributary C flows (generally) in a northern direction from south to north. The upstream section, south of the NoR, contains a stream with some wetland habitat (see information below on Wetland 'Waokauri C.2'). The stream discharges into a culvert which flows beneath SH20B. . The inlet to the culvert is via a manhole, which acts as at-least a partial barrier to fish passage. Also flowing into the manhole is the discharge from an artificial amenity pond (Waokauri C P.1). The stream upstream of the culvert is almost entirely clogged with macrophytes (mercer grass (*Paspalum distichum*) and willow weed (*Persicaria* sp.)) which meant it also met the definition of a natural wetland (Waokauri C.2). The manhole is at least a partial barrier to fish passage and the stream upstream of the pond was of low quality ecologically, with no effective shading, no hydrological variation and no suitable substrate for sensitive macroinvertebrate taxa which contributed to the stream's low ecological value. The pond which discharges into the stream is located at the bottom of the driveway for the tree nursery at 436 Puhinui Road south of SH20B. The small open-water area is bordered on the road and driveway edges with a mix of native and non-native species. The pond itself has a small established

		population of common water lily (*Nymphaea alba)*. These plants may be providing some filtration for the open water. South of SH20B, water quality in August 2022 was observed to be poor, with a high volume of iron flocculants and low water quality. Flow rates were low, and consequently it is assumed that the stream does not flow in dry periods and consequently has intermittent flow. North of SH20B, Bioresearches (2019) described the water quality of the stream as low, with a high volume of iron flocculants, bacterial and hydrocarbon films and low water clarity throughout. Wetland vegetation was present on the stream margins and on the floodplain. The outflow of the culvert under SH20B contained deep, stagnant water. The stream and floodplain appeared degraded. The channel varied in size; nearer the culvert it was well-defined and narrower with steeper banks, while toward the CMA the banks flattened, the channel widened and the stream become less defined, with multiple backwaters. At this point it was considered more of a wetland habitat than a stream habitat and is assessed as such (see wetland assessment for Waokauri C.1).
Waokauri Creek Tributary D	Permanent	The watercourse with which Tributary D is associated is a complex of stream and wetland habitats (for a description of wetland portions see Waokauri D.1), which flows in a northern direction from south to north and flows beneath a SH20B bridge. The majority of the portion of the watercourse within the ZOI of the NoR is wetland, however the upstream extent also includes stream habitat, which is flanked on either side with a mosaic of raupō reedland and exotic wetland habitat. The banks of the stream are vegetated with exotic scrub, predominantly gorse and woolly nightshade, which provide some shade to the stream. The watercourse is unfenced, and stock access is evident. Bioresearches (2019) observed short fin eels (not threatened), īnanga (At Risk – Declining) and the pest fish *Gambusia affinis* within the stream; and noted that stream and wetland area provide good-quality īnanga spawning habitat, with overhanging vegetation and shading from riparian vegetation and wetland plants. Bioresearches (2019) also undertook macroinvertebrate sampling, which resulted in a Macroinvertebrate Community Index (MCI) score of 93.8, showed low diversity in taxa and did not detect any sensitive (EPT) taxa. They concluded that this, along with the presence of īnanga, suitable native fish spawning habitat and good connectivity to the ocean indicates the site is of moderate freshwater ecological quality. The CMA transitions to freshwater in the vicinity of the southern abutment of the SH20B bridge. In this location, vegetation transitions from marine (mangroves, bachelor's buttons (*Cotula coronopfoila*) to freshwater wetland (dominated by raupō (*Typha orientalis*), mercer grass and sharp spike sedge (*Eleocharis acuta*)). East of Tributary D and immediately south of SH20B is a stormwater device which collects water from the road. This is entirely artificial and is lined with coarse gravel. Presently, it contains no plants or ecological habitat for fish or invertebrates.
Waokauri Creek Tributary E	Permanent	Tributary E flows in a northern direction from south to north and flows beneath SH20B via a culvert. The upstream section, south of the NoR, is predominantly a wetland habitat (see information below on wetland 'Waokauri E.2') and consequently has not been assessed as stream. The downstream section of Tributary E, north of the NoR, contains both stream and wetland features and consequently has been assessed as both (see information below for wetland 'Waokauri E.1').

		At the outlet of the SH20B culvert water was stagnant, with high iron floc and a hydrocarbon film on the surface. Riparian vegetation was dense and often overhanging into the stream. The quality of the aquatic habitat was low, with silt substrate dominant, no flow and anaerobic processes apparent. Shortfin eels may be found utilising the stream (Bioresearches, 2019). Approximately 100 m downstream of the designation boundary, the watercourse transitions into a coastal SA1.2 ecosystem, which is dominated by mangrove forest. This also marks the edge of the marine SEA 'SEA-M2-27a'.
Waokauri Creek Tributary F	Ephemeral	This watercourse flows in a southern direction through pasture. South of SH20B is a swale designed to collect stormwater, which is culverted under SH20B and forms the headwaters of this flow path. This watercourse is contained within a tile drain, which was installed in the early 1900's (personal communication with landowner). The tile drain is functional and flows ephemerally, however if it were to block, it is possible that this area may develop into a wetland habitat, as the topography of the area is a relatively flat-bottomed small gully. The vegetation within the vicinity of the tile drain in August 2022 however was maintained as high-quality, weed free pasture (heavily dominated by rye grass (*Lolium perenne*; FACU) and white clover (*Trifolium repens*; FACU)) and consequently would not have met the definition of a wetland and vegetation tests were not performed.
Waokauri C P.1	Artificial Pond	Artificial pond which drains into Waokauri Creek Tributary C. This pond has sparse amounts of macrophytes present on the periphery (*Persicaria* sp.) and dries out in drier months.
SH20 B Swales 1 to 4	Artificial swales	Artificial swales constructed to slow the flow of stormwater collected by SH20B. These habitats are currently lined with rip-rap, and are devoid of vegetation, however this may change with time.

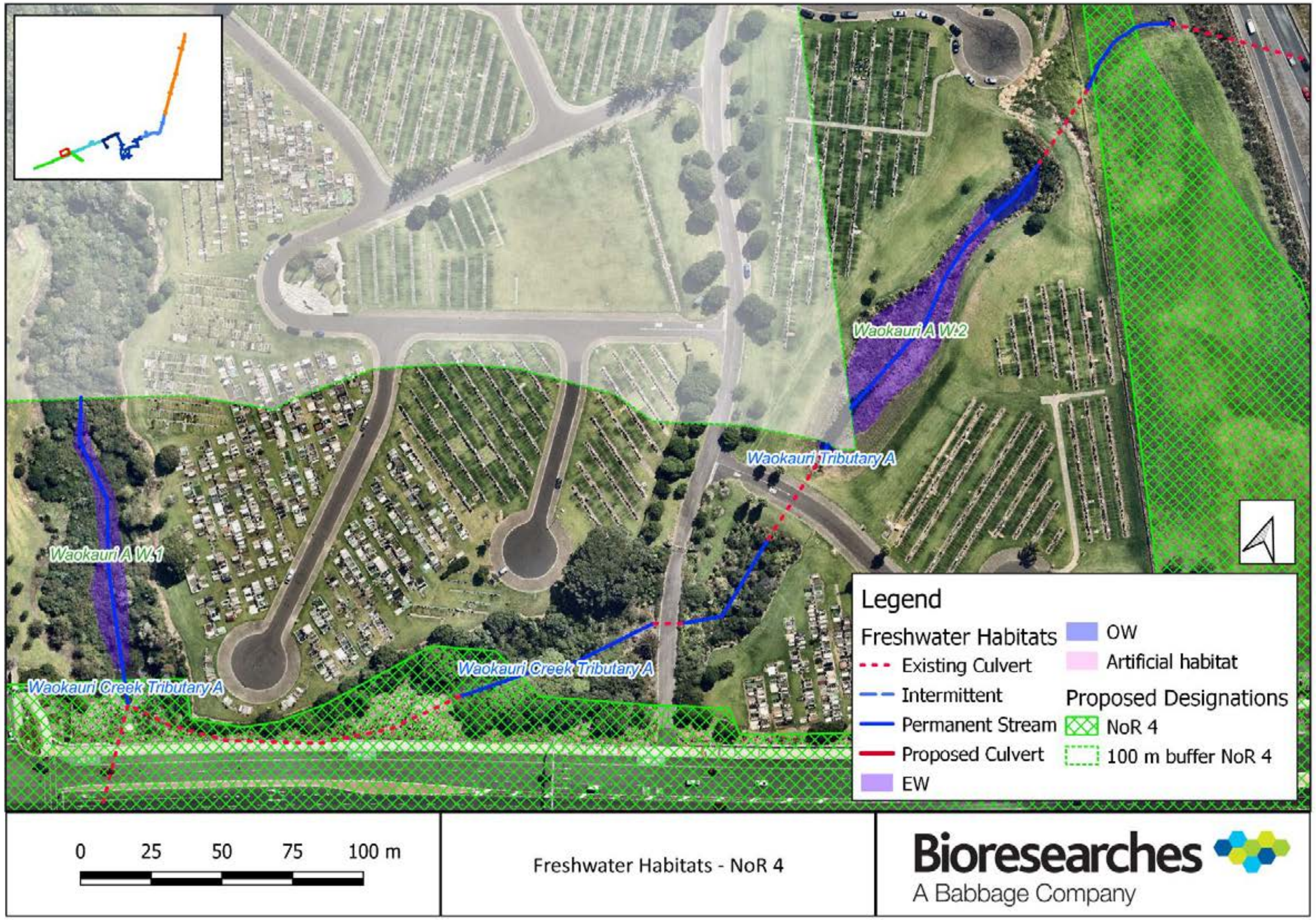


Figure 35. Freshwater Habitats vicinity of Waokauri Creek Tributary A, within the ZOI of NoR 4.

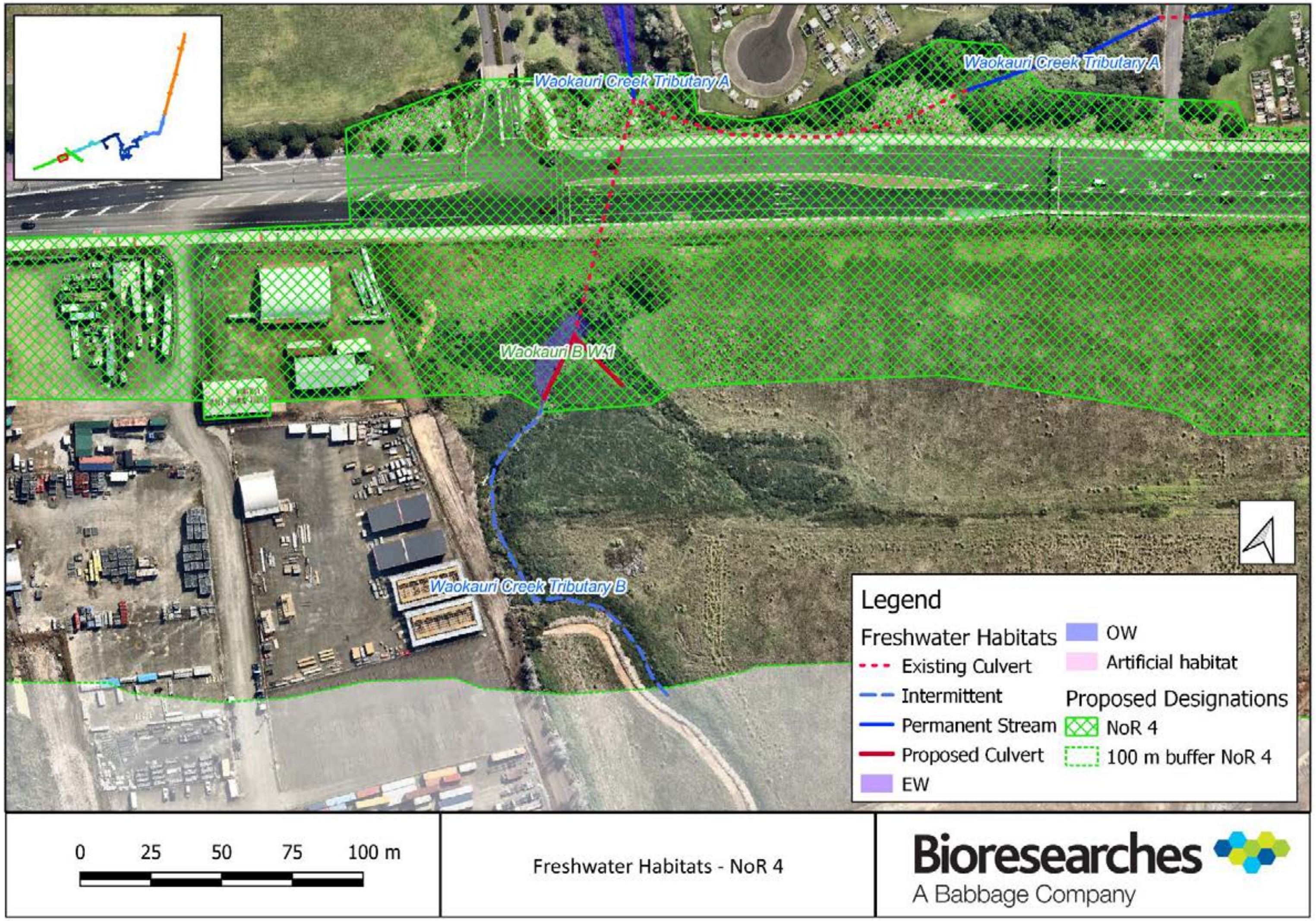


Figure 36. Freshwater Habitats vicinity of Waokauri Creek Tributary B, within the ZOI of NoR 4.

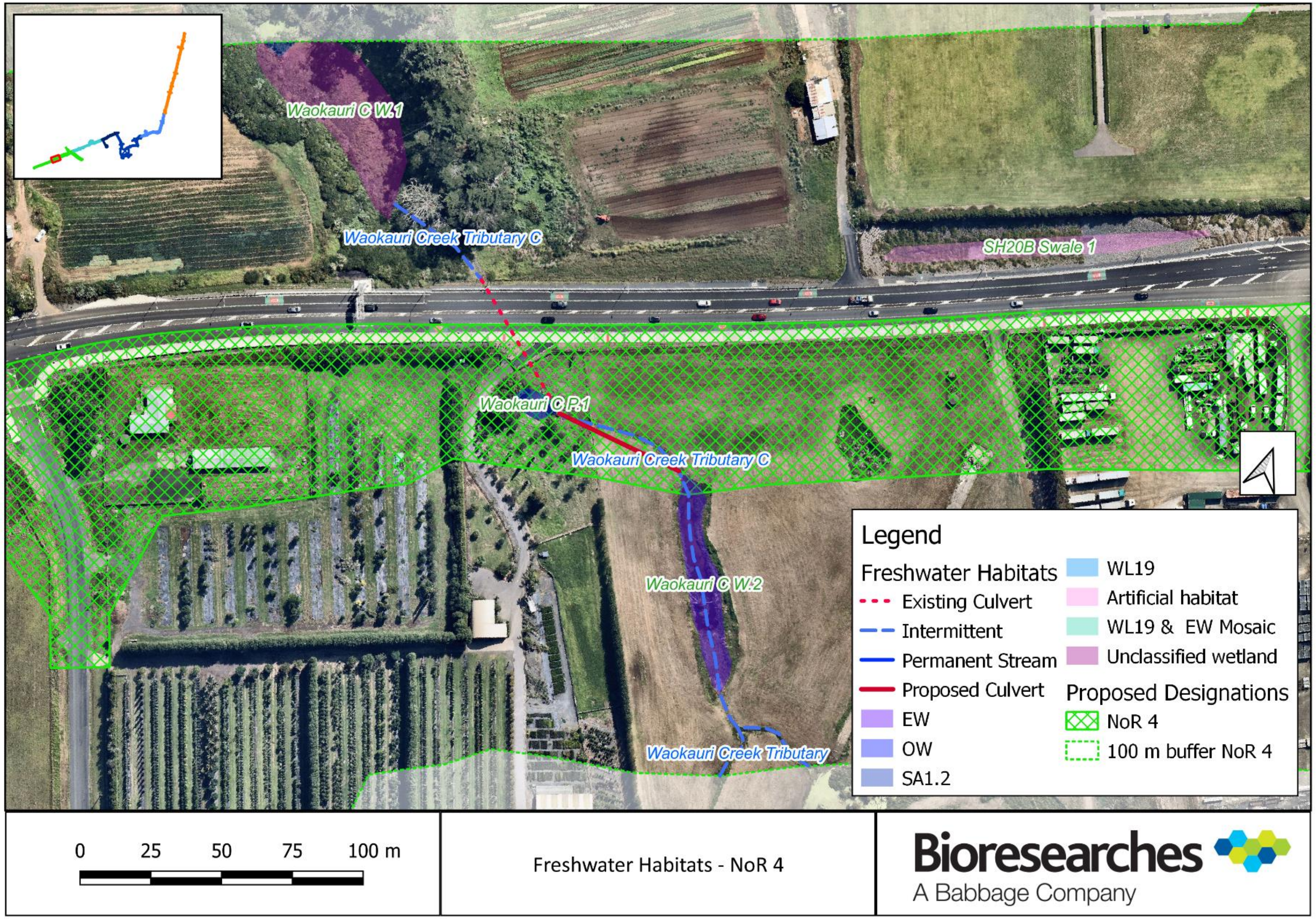


Figure 37. Freshwater Habitats vicinity of Waokauri Creek Tributary C, within the ZOI of NoR 4.

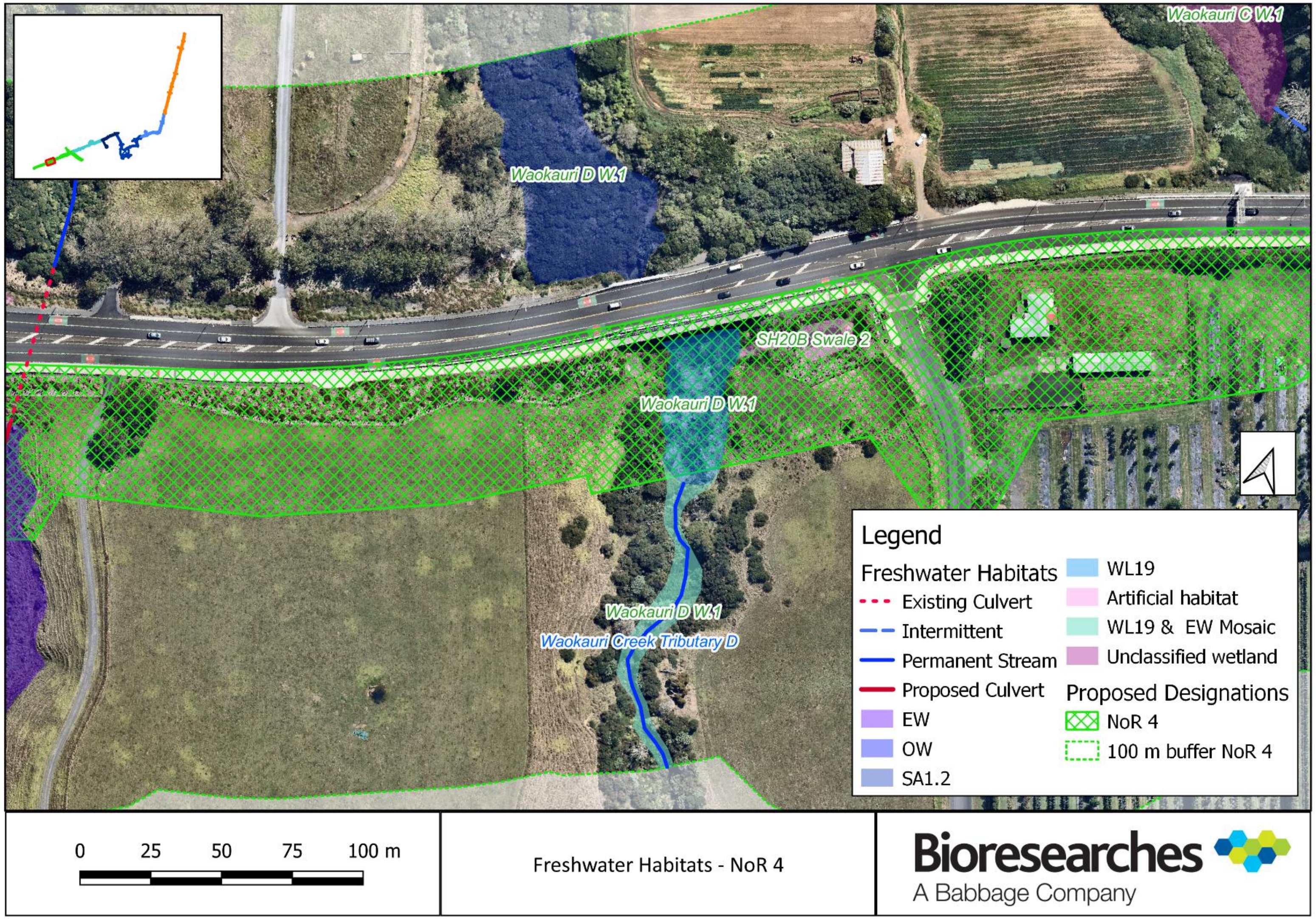


Figure 38. Freshwater Habitats vicinity of Waokauri Creek Tributary D, within the ZOI of NoR 4.

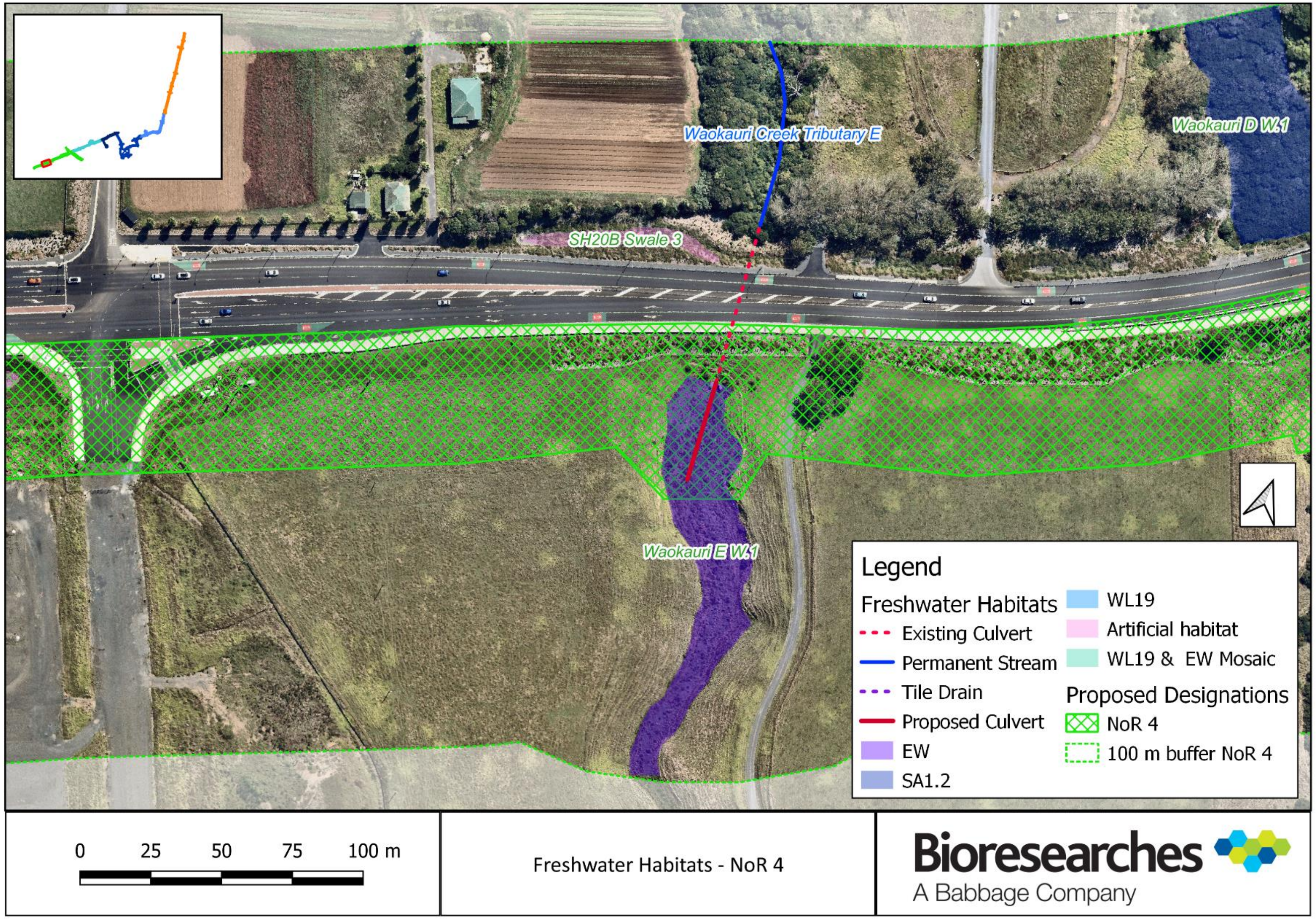


Figure 39. Freshwater Habitats vicinity of Waokauri Creek Tributary E, within the ZOI of NoR 4.

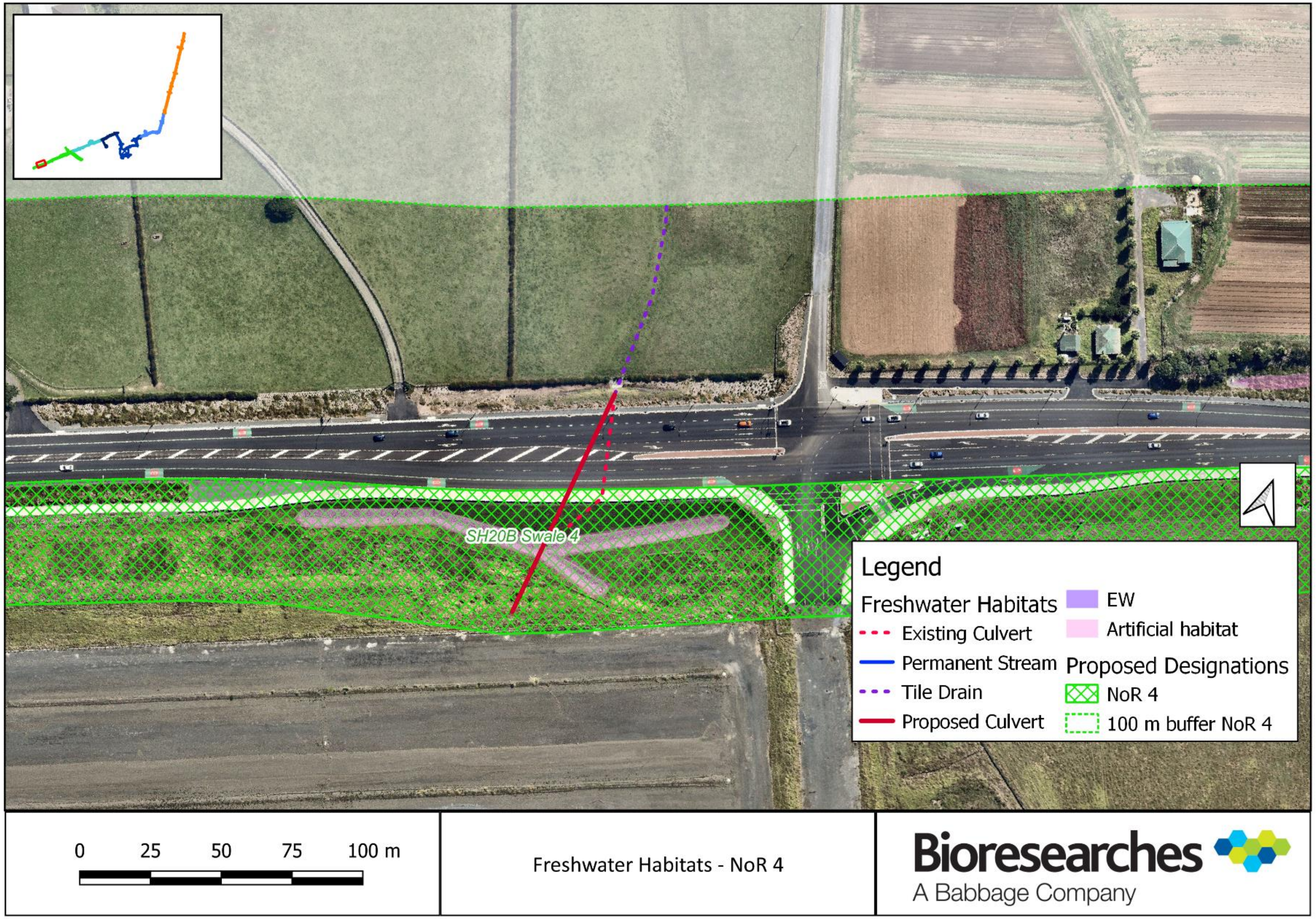


Figure 40. Freshwater Habitats vicinity of Waokauri Creek Tributary F, within the ZOI of NoR 4.

10.2.4 Freshwater ecological value

Table 67 presents the ecological value for the freshwater habitats identified within NoRs 4a and 4b. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 67. Ecological values of streams within the ZOI of NoRs 4a and 4b

Stream	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
Waokauri Creek Tributary A	Moderate -instream habitat highly modified, with moderately modified riparian zone.	Low – no 'At Risk' or 'Threatened' species present.	Moderate – some hydrological variation.	Moderate – second order stream, with permanent flow.	**Moderate**
Waokauri Creek Tributary B	Low – highly modified instream habitat and riparian zone	Low – no 'At Risk' or 'Threatened' species present	Low – highly modified	Low – First order stream	**Low**
Waokauri Creek Tributary C	Moderate -instream habitat highly modified, with moderately modified riparian zone.	Low – no 'At Risk' or 'Threatened' species present	Moderate – some hydrological variation.	Moderate - second order stream, with permanent flow.	**Moderate**
Waokauri Creek Tributary D	Moderate -instream habitat highly modified, with moderately modified riparian zone.	High – īnanga present.	Moderate – some hydrological variation.	Moderate - first order stream, with permanent flow.	**High**
Waokauri Creek Tributary E	Moderate -instream habitat highly modified, with moderately modified riparian zone.	Low – no 'At Risk' or 'Threatened' species present	Moderate – some hydrological variation.	Moderate - first order stream, with permanent flow.	**Moderate**
Waokauri C P.1	Low – artificial habitat which is unnatural and not representative of a natural habitat.	Low – no 'At Risk' or 'Threatened' species present	Very low – highly modified	Very low – only seasonally wet, very limited connectivity to any other habitat.	**Negligible**
SH20 B Swales 1 to 4	Low – artificial habitat which is unnatural and not representative of a natural habitat.	Low – no 'At Risk' or 'Threatened' species present	Very low – highly modified	Very low – only seasonally wet, very limited connectivity to any other habitat.	**Negligible**

10.2.5 Wetland habitat

Seventeen potential wetlands were identified during the desktop study. Of these, two were not surveyed as although they are within 100 m of the proposed designation, they were not within 100 m of any proposed works[15], and two were only able to be assessed via a desktop assessment. In total, seven natural wetlands, four artificially constructed swales and one artificial pond were identified.

Wetlands are depicted in Figure 35and described in Table 68.

Table 68. Wetlands within 100 m of NoRs 4a and 4b

Wetland	NES:F Classification	Classification process	Description
Waokauri A.1	Natural Wetland	Rapid test	Exotic wetland. A willow canopy is present, under which are patches of water purslane (*Ludwigia palustris*) and sporadic *Carex* sp. The water table was high, and ground was very boggy. Due to the steep sides of the small gully in which the stream and wetland are present, it was not able to be fully delineated on site and delineations were undertaken predominantly via desktop. In areas where the wetland was able to be viewed, water quality was observed to be poor; there was low clarity, high levels of iron oxidising bacteria and large amounts of rubbish within the water.
Waokauri A.2	Induced Wetland	Rapid test	Exotic wetland. Vegetation present includes mercer grass, water pepper, water purslane, *Juncus* spp., and planted natives such as flax, oioi, and multiple *Carex* species. The wetland is unshaded, and water quality within it was observed to be poor, with large volumes of filamentous algae (indicative of high nutrient loading) and iron oxidising bacteria present. Upstream of the wetland is a culvert which the Waokauri Creek Tributary A stream flows through and then discharges into an open water area. This open water area then grades into wetland habitat. At the downstream end of the wetland is another open water area, which drains into a second culvert. Historic aerial imagery from 1983 does not show this wetland as being present, and consequently it is presumed that it is an induced wetland created from the addition of culverts and possible deepening of the original Waokauri Creek Tributary A streambed (Figure 41).
Waokauri B.1	Natural Wetland	Rapid test	Exotic wetland, which was entirely vegetated with mercer grass. The stream Waokauri Tributary B discharges into the wetland. The water quality of the stream is poor (see Table 66) and consequently, the water quality within the wetland was also poor.
Waokauri C.1*	Natural wetland	Rapid test	This wetland was assessed via desktop assessment only. Waokauri Creek Tributary C inflows into the wetland at its southern end, and the wetland drains to the north, grading into a mangrove forest (SA1.2) habitat approximately 100 m north of the designation boundary. The vegetation composition of the southern end of the wetland nearest to the Project area is unknown consequently and this portion of the wetland is not

[15] This was two stormwater ponds located south and east of the portion of the designation which extends south along SH20.

			able to be classified. Water quality within the wetland was not able to be assessed.
Waokauri C.2*	Natural wetland	Rapid test	Wetland was assessed from desktop and from the roadside. The portion able to be viewed from the roadside consisted of exotic wetland which appeared to be dominated by mercer grass. This has been mapped as such. Water quality within the wetland is not known, however it is presumed to be low and impacted by stock access, as the wetland is unfenced. When viewed on aerial imagery during different times of year, a section of open water present within the wetland dries out in periods of low rainfall, and is subject to periodic algal blooms, suggesting the wetland is subject to high nutrient loads.
Waokauri D.1	Natural wetland	Rapid test	Whilst other wetlands within this NoR are split into northern and southern halves by the presence of culverts beneath SH20B, this watercourse is bridged and consequently the associated wetland habitats have been described as one unit. The southern portion of the wetland has been observed in the field. This, combined with information from Bioresearches (2019) has been used to form the following wetland description. The northern end of the wetland is saline, and forms part of the CMA. It is also mapped as SEA-M2-27A. The transition between the marine and freshwater environments occurs in the vicinity of the southern abutment of the SH20B bridge. In this location, vegetation transitions from marine (mangroves, bachelor's buttons (*Cotula coronopfoila*) to freshwater wetland, forming a transition zone which also acts as a pathway for migratory fish, i.e., eels and whitebait. North of the bridge, vegetation is typical of SA1.2 mangrove forest and was dominated by mangroves. Within the transitional environment, the estuarine mud crab was common under the bridge abutments and bachelor's button formed extensive mats below and under the bridge abutments. Vegetation then transitioned to a band of mercer grass with small patches of the sea rush *(Juncus kraussii* subsp. *australiensis)* near the edges, and occasional specimens of salt marsh ribbon wood (*Plagianthus divaricatus*), before transitioning into the freshwater raupō wetland habitat, which contained species such as raupō, harakeke, swamp sedge (*Carex virgata*), *Deparia petersenii* subsp. *congrua*, and watercress (*Nasturtium officinale*), baumea (*Machaerina rubiginosa*), Mercer grass and sharp spike sedge. Crack willow was also present. Further upstream, the freshwater system narrowed and formed a channel which was also assessed as a stream (Waokauri Creek Tributary D). Within this area, wetland vegetation was found to be patchy, and where present, was a mosaic of raupō reedland and exotic wetland areas. Due to access limitations (dense gorse) these vegetation units were not able to be mapped separately, and consequently this portion of the wetland was mapped as a 'mosaic' habitat. Bioresearches (2019) identified banded rail (At risk - Declining) footprints within the wetland, and also considered the

			freshwater portion of the wetland to provide īnanga spawning habitat.
Waokauri E.1	Natural Wetland	Rapid test	The wetland has been observed from aerial imagery and from the roadside of SH20B. This, combined with information from Bioresearches (2019) has been used to form the following wetland description. The wetland has been mapped from desktop observations. Wetland E.2 is best classified as a mosaic habitat, containing both raupō reedland (WL19) and exotic wetland (EW). It is bordered by pasture on three sides and Puhinui Road at its northern boundary. This wetland is dominated by raupō, native Persicaria (*Persicaria decipiens*), and exotic Mercer grass. Also present are gorse and soft rush, Yorkshire fog, buttercup and lotus. The high proportion of native vegetation gives this site a moderate botanical value. In localised areas, standing water was contained within a small channel and provided low quality aquatic habitat.

* = wetland not able to be accessed for assessment, and therefore was only assessed via a desktop study.

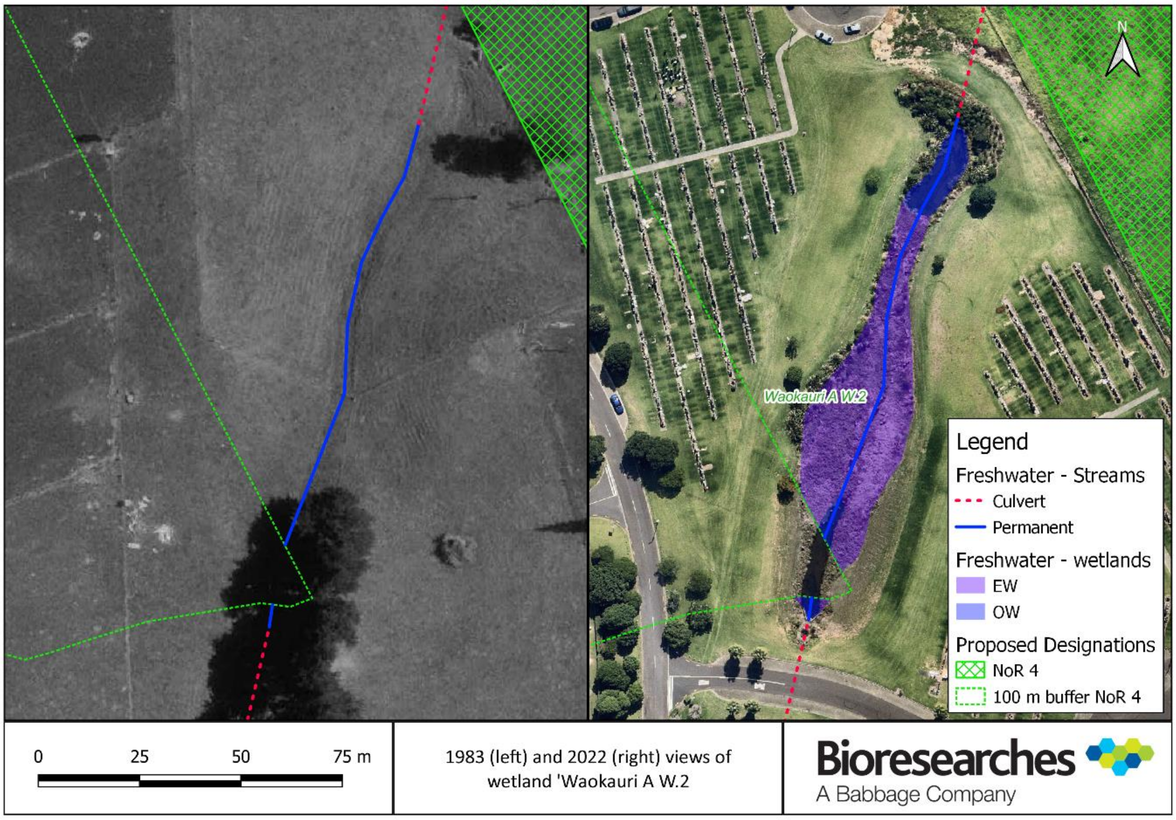


Figure 41. 1983 and 2022 views of Waokauri Creek Tributary A and wetland Waokauri A W.2. 1983 imagery from Retrolens.

10.2.6 Wetland ecological value

Table 69 presents the ecological value for the wetland habitats identified within NoRs 4a and 4b. Information obtained for the ecological baseline (refer Section 6.1) was used to assist in scoring where necessary, such as assessing how common a habitat type is within the wider area.

Table 69. Ecological values of wetlands within the ZOI of NoRs 4a and 4b

Wetland	Representativeness	Rarity / Distinctiveness	Diversity and pattern	Ecological context	Ecological value
Waokauri A.1	Moderate – the wetland retains most of its hydrological functioning but does not retain much of its natural composition of flora and fauna.	Moderate – At-risk species identified (īnanga and banded rail), but habitat is not distinct or rare.	High – forms the upper portion of a wetland where there is a variety in habitat types from freshwater to saline.	Moderate – slightly reduced due to highly modified catchment.	**Moderate**
Waokauri A.2	Moderate – the wetland retains most of its hydrological functioning but does not retain much of its natural composition of flora and fauna.	Low - Unlikely to contain habitat for anything other than common, non-threatened species.	Moderate – this wetland contains both shallow and open water areas.	Low – induced (non-natural) wetland in a highly modified catchment.	**Moderate**
Waokauri B.1	Low - the watercourse/wetland is highly modified, and consequently the wetland flora is too. The wetland also is choked with sediment and consequently has limited hydrological functionality.	Low - Unlikely to contain habitat for anything other than common, non-threatened species.	Low – largely uniform habitat	Low – highly modified wetland in a local environment with multiple wetlands which have retained their features.	**Low**
Waokauri C.1	High – conservatively assessed via desktop as though it contains native vegetation and retains a high degree of hydrological function.	High – is a transitional wetland which includes both freshwater and marine components. Has potential to contain At-risk fauna species.	High – there is a variety in habitat types from freshwater to saline.	Moderate – slightly reduced due to highly modified catchment.	**High**
Waokauri C.2	Low – appears from desktop to be a wetland formed in a highly modified watercourse.	Low - Unlikely to contain habitat for anything other than common, non-threatened species.	Low – largely uniform habitat	Low – highly modified wetland in a local environment with multiple wetlands which have retained their features.	**Low**
Waokauri D.1	High – the wetland retains most of its hydrological functioning and composition of flora and fauna.	High – a transitional wetland such is this is uncommon within the ecological district. At-risk species identified (īnanga and	High – there is a variety in habitat types from	Moderate – slightly reduced due to highly modified catchment.	**High**

		banded rail). Also contains endangered raupō reedland habitat.	freshwater to saline.		
Waokauri E.1	Moderate – whilst the wetland retains most of its hydrological functioning, its flora has been modified.	Moderate – the raupō reedland is an endangered habitat, however this is interspersed with large pockets of exotic wetland.	Moderate – the wetland retains some of its original diversity.	Moderate – reduced due to the highly modified catchment.	**Moderate**

10.3 Future environment

Zoning within the ZOI of NoRs 4a and 4b is predominantly Light Industry Zone. The largest areas of the Light Industry zoning include the areas south of Puhinui Road, and areas north of Puhinui Road but west of Orrs Road. Most of this land is largely undeveloped, and therefore it is expected that these areas will be developed into light industry over the next 15 years. North of Puhinui Road, between Orrs Road and Prices Road is an area of Future Urban Zone which will likely be developed into an industrial land use. The final zoning is a Special Purpose Zone, used for the Manukau Memorial Gardens. This landuse is not expected to change.

The future urban and light industry land will largely undergo a significant change from rural to urban over the next few decades. However, it is assumed that in a future urbanised scenario, permanent stream corridors and areas of indigenous vegetation will generally be retained. It is likely that ecological features of value such as the vegetated stream corridors will remain and also may be enhanced, particularly along the edges of the streams, where in places the existing vegetation does not form a 10 m buffer. Within these corridors, over the next 15 years, indigenous vegetation will mature and diversify. Moderate value fauna habitats are likely to increase in habitat value in terms of resource provision (nesting habitat, food resources). However fauna diversity is likely to remain stable and reflective of the surrounding and expanding urban environment. Ecological values are likely to remain **Moderate** in value.

Low value vegetation and habitats beyond protected riparian margins have similar capacity to mature, as well as to expand or contract, given that they are unprotected. These areas area likely to remain low in value. Wetlands located within the ZOI of the corridor will be protected from reclamation and will likely benefit from stock exclusion and grazing as the landuse of the area changes. If these are also provided riparian planting on the margins as development occurs, which is reasonably likely, the ecological value of these habitats will likely increase.

10.4 Assessment of ecological effects and measures to avoid, remedy or mitigate actual or potential adverse effects

This section assesses the ecological effects of activities which relate to District Plan matters under the AUP:OP. Refer to the ‘Future Environment’ Section for a discussion regarding the assumptions made for the effects assessment as it relates to permitted activities and likely future environment.

10.4.1 Construction effects – terrestrial ecology

The potential ecological effects to terrestrial habitats and fauna, which may be encountered during the construction phase of the Project (as they relate to district matters) have been identified:

- Removal of vegetation which is subject to District Plan controls (refer to **Appendix B** for a breakdown of Regional versus District Plan vegetation); and
- Disturbance and displacement of birds and lizards due to construction-related activities.

The following sections detail the magnitude of effect and level of effect of construction effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

10.4.1.1 Terrestrial vegetation

Vegetation to be removed which is subject to District Plan controls includes vegetation within existing road corridors (in this case, the PL.1 habitat within the road corridor (excluding that within private property), with low ecological value and grassland (EG, negligible ecological value).

Although the habitat type is different (PL.1 instead of PL.2), the effects of the removal of this vegetation are the same as for NoR 1 and are assessed in Table 28. This identified a **Very Low** level of effect associated with the removal of PL.1 vegetation, and consequently, no impact management measures are required.

10.4.1.2 Birds

Indigenous birds may be displaced from nearby habitats due to construction activities. This would affect both At Risk – Declining wetland bird species (high ecological value) and Not Threatened birds (low ecological value).

In addition, birds may lose roosting/foraging habitat, abandon or lose nests and also be at risk of mortality or injury during tree felling when the District Plan vegetation is removed. This effect is limited to Not Threatened birds only, as the At – Risk wetland bird species do not utilise the District Plan vegetation which is scheduled to be removed.

The effects of the works upon birds are described below in Table 30.

Table 70. Assessment of ecological effects encountered during construction for birds

Effect	**Disturbance and displacement of birds due to construction activities**		**Loss of District Plan vegetation which may remove nests and foraging habitat, and injure or kill birds**	
Affected birds	At Risk – Declining wetland bird species and pipit (High ecological value), , and Not Threatened birds (Low ecological value).		Non-threatened birds only (Low ecological value).	
Time scale	Baseline	Future environment	Baseline	Future environment
Magnitude of effect	Adjacent habitats are definitely periodically used by birds. The magnitude of effect is expected to be Moderate.	The habitats are expected to still be present and utilised by birds in a similar manner as they are currently. There is a chance that development of the area may result in these birds no longer being present at the time of construction, however conservatively it is considered they will be. Consequently, the magnitude of	There is a reasonable probability that native birds utilise these trees for nesting. The magnitude of effect is expected to be Moderate.	This effect is expected to be the same as baseline.

<table>
<tr><td></td><td></td><td>effect is expected to be the same.</td><td></td><td></td></tr>
<tr><td>Level of effect prior to impact management</td><td colspan="2">High for At Risk wetland birds and Pipit, Low for Not Threatened species.</td><td colspan="2">Low</td></tr>
<tr><td>Impact management and residual level of effect</td><td colspan="2">Pre-construction bird surveys should be undertaken to determine which Threatened or At Risk bird species are present.
If wetland birds are present, a Wetland Bird Management Plan should be developed which could include the following management controls:
• Where practicable, construction works should commence prior to the breeding season/s of the wetland birds identified as present; in order to discourage bird nesting.
• Prior to any works beginning a nesting bird survey should be undertaken of wetland areas within a 50 m radius of the works footprint. If nesting birds are detected, then a 20 m buffer surrounding the nest should be clearly demarcated and works should not be completed within this buffer until birds have fledged.
• Where practicable, works should be set back from wetland edges by at least a 10 m buffer.
• Light spillage from construction areas should be minimised as far as practicable.

If these measures are undertaken, it is considered that the impacts to wetland birds could be reduced to Low.
If pipit are present within the nearby grassland habitats, these should be mown outside of the pipit breeding season (August to February inclusive (Beauchamp, 2022)) and managed as short grass thereafter to prevent pipits nesting adjacent to the Project area.
If this measure is undertaken, it is considered that the impacts to pipit would be reduced to Low.</td><td colspan="2">Under the Wildlife Act 1953, impact management measures will be required to prevent killing or injuring native birds during tree felling.
This should include scheduling tree felling and vegetation removal activities outside of the bird nesting season (which is September to February, inclusive), or undertaking pre-clearance inspections to ensure nesting birds are not present.</td></tr>
<tr><td>Management of residual effects</td><td colspan="2">Not required</td><td colspan="2">Not required</td></tr>
</table>

10.4.1.3 Lizards

Under the current ecological baseline, lizards are not expected to be present within any of the District Plan vegetation to be removed. However, in the likely future environment, as the PL.1 habitat within the NoR develops, it will likely become suitable for copper skink to utilise. As copper skink are present in adjacent habitats (VS5 vegetation), it is likely that they would move into the PL.1 habitats, which are District Plan vegetation.

The effects of the works upon lizards are described below in Table 71.

Table 71. Assessment of ecological effects encountered during construction for lizards

Effect	**Disturbance and displacement of lizards due to construction activities**		**Loss of District Plan vegetation which may injure or kill native lizards**	
Time scale	Baseline	Future environment	Baseline	Future environment
Magnitude of effect	The magnitude of effect is assessed as Negligible due to unlikely probability of lizard disturbance due to construction related noise and vibration.	This effect is expected to be the same as baseline.	Lizards are not currently expected to occupy these habitats. The magnitude of effect is **Negligible**.	There is a reasonable probability that lizards will utilise these PL.1 habitats in the future. The magnitude of effect is expected to be **High**.
Level of effect prior to impact management	**Very Low**		**Very Low**	**Very High**
Impact management and residual level of effect	Not required		Not required	As part of future regional consenting processes, a survey should be undertaken to ascertain if native lizards are present within this vegetation. If confirmed, a Lizard Management Plan should be prepared in accordance with the Wildlife Act 1953. which should include: • Appointment of a herpetologist with who holds or can obtain appropriate Wildlife Authorisations. • Identification of lizard habitat which needs to be cleared.

			• Lizard salvage procedures to be completed prior to and/or during clearance works to reduce likelihood of injury or killing of lizards. • Offset planting for habitat loss and enhancement measures for the lizard release site. If such a plan is implemented, it is considered that the level of effect would be reduced to **Low.**
Management of residual effects	Not required	Not required	Not required

10.4.2 Operational effects – terrestrial ecology

The Project involves the addition of BRT lanes and high quality walking and cycling facilities south of SH20B. The future environment will be urban, and consequently there will be a transition from a rural landscape to an urban environment. The Ōtara Creek corridor and existing habitats associated with this waterway will remain.

Many of the potential operational effects of the Project such as habitat fragmentation, noise and light pollution are pre-existing. Potential operational effects include reductions in habitat connectivity and impacts from noise, light and vibration upon indigenous fauna, as well as potential mortality from vehicle strike.

The following sections detail the magnitude of effect and level of effect of operational effects on these ecological features. **Appendix A** provides additional detail on how these were calculated. Impact management measures and residual effects are also described where the level of effect is expected to be moderate or greater.

10.4.2.1 Birds

Indigenous birds may be displaced from nearby habitats due to noise, lighting and vibration generated from the upgraded roadway, however as the birds present within the Project area are likely already habituated to these effects, the magnitude of this effect is considered to be **Low** for both the baseline and future environment, and consequently the level of effect is considered to be **Very Low**.

Birds may also be affected by vehicle strike; however, this is only likely to occur infrequently. Consequently, the magnitude of effect of this is considered to be **Low**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to birds.

10.4.2.2 Lizards

The Project works are not expected to increase limitations on lizard dispersal or increase disturbance to lizards. Consequently, the magnitude of this effect is considered to be **low** for both the baseline and future environment, and the level of effect is considered to be **Low**.

Lizards may also be affected by vehicle strike, however there is a very low probability of this occurring, and it would likely only occur at a very low frequency. Consequently, the magnitude of effect of this is considered to be **Negligible**, and the level of effect is considered to be **Very Low**.

Impact management is therefore not required for operational effects to lizards.

10.4.3 Conclusions

Ecological effects assessed as moderate or greater include:

- High level of effect to wetland birds during construction for both the ecological baseline and future ecological environment may occur due to disturbance to birds within wetlands adjacent to the project area; and
- Very high level of effect to lizards during construction in the likely future ecological environment may occur due to the potential for injury or killing of lizards.

Effects management (implementation of a Wetland Bird Management Plan and a Lizard Management Plan) reduces these effects to **Low**.

10.5 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 following sections to inform design and alignment options for the NoR.

10.5.1 Terrestrial ecology

Construction of the Project will result in both temporary and permanent losses in terrestrial habitat within the NoR, including habitat which is being used by native fauna.

Table 72 details the types and area (m^2) of terrestrial habitats which will be lost during construction, as well as the total area of each habitat present within the designation boundary. This includes vegetation which is subject to District Plan and Regional Plan controls as well as vegetation not subject to plan controls.

Terrestrial habitats which will be lost are currently of **High** or **Low** ecological value and may provide habitat for native fauna. Exotic grassland habitat is of **Negligible** ecological value and therefore is not considered here.

Table 72. Terrestrial habitat types and the areas of these both within the Project footprint (which will be permanently lost) and within the designation boundary.

Habitat type	Classification (Singers *et al.* 2017)	Area within Footprint (m^2)	Area within Designation (m^2)
Broadleaf forest and scrub	VS.5	TBC	1495
Native planted vegetation	PL.1	TBC	19,789
Treeland	TL.3	TBC	119
Exotic scrub	ES	TBC	2,663

10.5.2 Birds

Non-threatened indigenous birds are present within the proposed designation boundary and will be impacted by vegetation removal. This should therefore occur outside of the bird nesting season to reduce impacts to these birds.

At Risk wetland bird species are present within at least one of the wetlands present within the designation. Wetland loss will occur, and bridges will be constructed over wetlands which will impact these species. A Wetland Bird Management Plan is recommended to reduce the magnitude of effect of these works.

10.5.3 Lizards

Copper skinks are potentially present within the vegetation to be cleared, and there is potential that during this clearance they could be injured or killed. Consequently, the works should be completed in accordance with the Wildlife Act 1953, and a Lizard Management Plan should be implemented.

10.5.4 Freshwater ecology

The proposed designation crosses two intermittent and two permanent streams. Three of these crossings will involve culvert extensions or replacements, and one crossing will involve the construction of a new bridge. One of the culvert extensions will result in stream loss, and the remaining two will result in wetland loss, both of which mitigation will be required. Erosion and sediment control plan/s will likely also be required to prevent sediment entering streams during the works, and a Fish Management Plan should be implemented to reduce the likelihood of injury or killing of native freshwater fish during the works.

All new culverts and culvert extensions should be installed in accordance with fish passage guidance and where practicable, fish passage structures should be implemented in existing culvert sections where culverts are being lengthened.

The total stream length available for restoration within the designation boundary is 24 m.

Table 73 details the stream loss expected to be incurred within the designation.

Table 73. Potential stream loss within the NoR 4 designation boundary.

Stream	Hydroperiod	Approximate active channel width (m)	Approximate length to be lost (m)	Loss (m^2)
Waokauri Creek Tributary C	Intermittent	1.2	48.5	58.2

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.

10.5.5 Wetland ecology

Construction of the NoR will result in loss of extent for one wetland. The area of loss for each wetland is detailed in Table 74. This loss has been largely unavoidable as the wetland locations and orientations relative to the existing road mean they must be crossed. However, it could be reduced with the use of bridges rather than culverts.

In addition to the direct loss in area, wetlands can also be impacted by construction and operational activities such as nearby earthworks, stormwater diversions, increases in impermeable area in their catchments and introduction of contaminants from roads.

It is expected that details regarding the offset/ compensation requirements will be addressed during the future regional resource consent application. The total extent of wetland within thev NoRs 4a and 4b designation boundary available for restoration is approximately 248 m^2.

Table 74 details the wetland loss expected to be incurred within the designation.

Table 74. Potential wetland loss within the NoR 4 designation boundary.

Wetland	NES:F Classification	Total size (m^2)	Area lost (m^2)
Waokauri B W.1	Natural wetland	262	256
Waokauri E W.1	Natural wetland	3100	739

11 Conclusions

Table 75 to Table 78 provide 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[16]. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed. Construction effect mitigation measures will include:

- A BMP for NoR 1 and NoR 2 Section A. Details of the BMP will depend on bat habitat present at the time of construction 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 bat habitat.
- Bird management will be required for NoR 1, NoR 2 Section A and NoR. Considerations for bird management will include a bird survey prior to construction to confirm 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.
- The residual (post-mitigation) level of effect for all construction effects are considered **Negligible** or **Low**.

Table 75. Summary of ecological effects during construction prior to mitigation for District Plan trees

Construction - Terrestrial vegetation (district plan)	
	Permanent loss of habitat/ecosystem, fragmentation, and edge effects due to vegetation removal (district plan trees
NoR 1	Very Low
NoR 2, Section A	Very Low
NoR 2, Section B	Very Low
NoR 2, Section C	Very Low
NoR 3	Very Low
NoR 4	-

Table 76. Summary of ecological effects during construction prior to mitigation for bats

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 vegetation removal - District plan only	Kill or injure individual bats due to vegetation removal - District plan only
NoR 1	Moderate	N/A	N/A
NoR 2, Section A	Moderate	N/A	N/A
NoR 2, Section B	-	-	-

[16] The effects assessment considered the baseline and the likely future environment as the construction of the road will only occur more than 10 years in the future.

NoR 2, Section C	-	-	-
NoR 3	-	-	-
NoR 4	-	-	-

Table 77. 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	Loss of District Plan vegetation which may remove nests and foraging habitat, and injure or kill birds
NoR 1	High	Low
NoR 2, Section A	High	Low
NoR 2, Section B	Low	Low
NoR 2, Section C	Low	Low
NoR 3	Low	Low
NoR 4	High	N/A

Table 78. 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.)
NoR 1	Very Low
NoR 2, Section A	Very Low
NoR 2, Section B	Very Low
NoR 2, Section C	N/A
NoR 3	Very Low
NoR 4	Very Low

Table 79 to Table 81 provide summaries of district plan matter operational effects due to the presence of the road resulting in disturbance or loss in connectivity to bats, birds and lizards. Where the level of effect was assessed to be **Moderate** or higher, then mitigation has been developed.

Operational effects mitigation measures will include a BMP. The BMP will include buffer planting along road corridors associated with stream crossings[17], lighting design along strategic location of the road (stream crossings) and retention of large, mature trees (specifically TL.3 stands) where practicable.

The residual level of effect for operational effects are considered **Low** or **Very Low**.

[17] 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).

Table 79. Summary of ecological effects during operation prior to mitigation for bats

Bats - Operation		
NoR	Loss in habitat connectivity due to presence of the upgraded roadway and associated noise and lighting	Kill or injuring - vehicle strike
NoR 1	Moderate	Low
NoR 2, Section A	Moderate	Low
NoR 2, Section B	N/A	N/A
NoR 2, Section C	N/A	N/A
NoR 3	N/A	N/A
NoR 4	N/A	N/A

Table 80. Summary of ecological effects during operation prior to mitigation for birds

Operation - Birds			
NoR	Disturbance - presence of the road	Loss in connectivity - presence of the road	Kill or injuring - vehicle strike
NoR 1	Low		Very Low
NoR 2, Section A	Very Low		Very Low
NoR 2, Section B	Very Low		Very Low
NoR 2, Section C	Very Low		Very Low
NoR 3	Very Low		Very Low
NoR 4	Low		Very Low

Table 81. Summary of ecological effects during operation prior to mitigation for lizards

Operation - Lizards			
NoR	Disturbance - presence of the road	Loss in connectivity - presence of the road	Kill or injuring - vehicle strike
NoR 1	Low		Very Low
NoR 2, Section A	Low		Very Low
NoR 2, Section B	Low		Very Low
NoR 2, Section C	N/A		N/A
NoR 3	Low		Very Low
NoR 4	Low		Very Low

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Appendix A

Assessment standards

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Appendix A – Assessment standards

The ecological assessments undertaken for the Airport to Botany Notices of Requirement generally follow Ecological Impact Assessment guidelines for use in New Zealand (**EcIAG**) published by EIANZ[18] (Roper-Lindsay et al. 2018[19]). The EcIAGs provide a standardised matrix framework that allows ecological effects assessments to be clear, transparent and consistent. The EcIAG framework is generally used in impact assessments in New Zealand as good practice.

The EcIAGs provide a three-step process for undertaking terrestrial assessments as follows:

Step 1: Assess the **value** of the area, taking into consideration species (Table 66) and other attributes of importance for vegetation or habitats to assign an overall ecological value (Table 83).

Step 2: Determine the **magnitude** of effect (). This step also includes consideration of the timescale and permanence of the effect, whereby temporary (< 25 years) and long-term (substantial improvement after 25 years) effects are distinguished from permanent (beyond the span of a human generation) effects.

Step 3: Evaluate the overall severity or **level of effect** using a matrix (Table 84) of the ecological value and magnitude of effect.

That analysis then leads to an effects management regime comparable to the level of adverse ecological effect using the mitigation hierarchy to end with an overall outcome for ecological values that demonstrably results in no greater than minor, or preferably, a net improvement (Net Environmental Gain).

Fauna considered in this report include all those that are protected by the Wildlife Act (1953), including lizards, birds and long-tailed bats. Particular consideration was given where species with a conservation status of nationally 'At Risk' or higher have the potential to be present.

Table 82. Factors to be considered in assigning value to species (Roper-Lindsay et al. 2018)

Determining factors	Value
Nationally threatened species, found in the ZOI either permanently or seasonally	Very High
Species listed as 'At Risk' – declining, found in the ZOI, either permanently or seasonally	High
Species listed as any other category of 'At Risk' found in the ZOI (Zone of Interest) either permanently or seasonally	Moderate
Locally (ED) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Negligible

[18] Environmental Institute of Australia and New Zealand
[19] Roper-Lindsay, J.; Fuller, SA.; Hooson, S.; Sanders, MD.; Ussher, GT. 2018. Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

Table 83. Attributes to be considered when assigning ecological value or importance to a site or area of vegetation / habitat / community (as per Table 4 of Roper-Lindsay et al. 2018).

Matters	Attributes to be considered
Representativeness	*Criteria for representative vegetation:* • Typical structure and composition; • Indigenous species dominate; and • Expected species and tiers are present. *Criteria for representative vegetation:* • Species assemblages that are typical of the habitat; and • Indigenous species that occur in most of the guilds expected for the habitat type.
Rarity/ distinctiveness	*Criteria for rare/distinctive vegetation and habitats:* • Naturally uncommon or induced scarcity; • Amount of habitat or vegetation remaining; • Distinctive ecological features; and • National Priority for Protection. *Criteria for rare/distinctive species of species assemblages:* • Habitat supporting nationally threatened or At-Risk species, or locally uncommon species; • Regional or national distribution limits of species or communities; • Unusual species or assemblages; and • Endemism.
Diversity and Pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity; • Biogeographical considerations- pattern, complexity; and • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation.
Ecological context	• Site history and local environment conditions which have influenced the development of habitats and communities; • The essential characteristics that determine an ecosystems integrity, form, functioning and resilience (from 'intrinsic value' as defined in RMA); • Size, shape and buffering; • Condition and sensitivity to change; • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material; and • Species role in ecosystem functioning - high level, key species identification, habitat as proxy.

Table 84. Assigning ecological value (Roper-Lindsay et al. 2018)

Value	Description
Very High	Area rates High for three or all of the four assessment matters. Likely to be nationally important 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 one of the assessment maters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	Area rates High for one matter. Moderate and Low for the remainder, or area rates Moderate for two 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 majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates Very Low for three matters and Moderate, Low or Very Low for remainder.

Table 85. Criteria matrix for describing magnitude of effects (Roper-Lindsay et al. 2018)

Magnitude	Description
Very High	Total loss of, or very major alteration, to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element / feature.
High	Major loss or major alteration to key elements/ features of the existing baseline conditions 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 conditions, such that 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 baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances/patterns; AND/OR Having a minor effect on the known population or range of the element / feature.
Negligible	Very slight change from existing baseline condition. Change barely distinguishable, approximating to the “no change” situation; AND/OR Having a negligible effect on the known population or range of the element / feature.

Table 86. Criteria matrix for describing level of effects (Roper-Lindsay et al. 2018)

Ecological Value → **Magnitude ↓**	**Very High**	**High**	**Moderate**	**Low**	**Negligible**
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	Net gain	Net gain	Net gain	Net gain	Net gain

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Appendix B

Regional and District consenting matters

Appendix B – Regional and District consenting 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: a) a rural zone b) riparian margins c) coastal areas d) SEAs This also includes other terrestrial habitat of value identified in the EcIA.	Permanent loss of habitat/ecosystem, fragmentation and edge effects		X	
	Vegetation removal (including trees) in: a) Roads b) Public spaces c) ONFs d) ONLs e) HNCs 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		X	
Bats	Vegetation removal	Roost loss		X	X
	Vegetation removal	Kill or injure individual			X
	Vegetation removal	Loss of foraging habitat		X	
	Construction activities (Noise, light, dust etc.)	Disturbance and displacement to roosts and to individuals (existing)	✓		X
Birds (native)	Vegetation removal	Nest loss		X	X
	Vegetation removal	Kill or injure individual			X
	Vegetation removal	Loss of foraging habitat		X	
	Construction activities (Noise, light, dust etc.)	Disturbance and displacement of roosts and individuals (existing)	✓		X
Herpetofauna (native)	Vegetation removal	Lizard habitat loss		X	
	Vegetation removal	Kill or injure individual			X

	Construction activities (Noise, light, dust etc.)	Disturbance and displacement of individuals (existing)	✓		X
	Reclamation/ culverting/other structures e.g., bank armouring	Permanent loss/modification of habitat/ecosystem		X	
Freshwater habitat – wetland or stream (including riparian margins)	Vegetation removal	Permanent loss of habitat/ecosystem, fragmentation and edge effects		X	
	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		X	
	Diversion, abstraction or bunding of watercourses and water level/ flow/ periodicity changes.	Detrimental effects on habitats including plant composition and fauna		X	
Fish (native)	Reclamation/diversion/other structures e.g., bank armouring	Loss of aquatic habitat		X	
	Reclamation/diversion/ culverting/other structures e.g., bank armouring	Kill or injure individual			X
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		X	
	Road maintenance – Increased use of herbicides	Increased weed incursion, unintentional spray of indigenous vegetation		X	
Bats	Vehicle movement	Kill or injure individual			X
	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	✓		X
	Lighting and noise/vibration	Disturbance and displacement of (new and existing) roosts and individuals	✓		X

Birds (native)	Vehicle movement	Kill or injure individual			X
	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.	✓		X
	Lighting and noise/vibration	Disturbance and displacement of (new and existing) nests and individuals	✓		X
Herpetofauna (native)	Vehicle movement	Kill or injure individual			X
	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	✓		X
	Lighting	Disturbance of nocturnal lizard behaviour	✓		X
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		X	
	Presence of bridge	Shading leading to change in ecosystem structure		X	
	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)		X	
	Stormwater discharges – pollutants (such as heavy metals and herbicides).	Permanent degradation of wetland or instream habitat and water quality		X	
Fish (native)	Presence of culvert	Loss of connectivity due to culvert preventing fish passage up and downstream		X	

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Appendix C

Bird desktop study results

Appendix C – Bird desktop study results

Table 87. Desktop records of native bird species for which there is suitable habitat types within the Project area.

Common name	**Scientific name**	**Threat classification (Robertson *et al.*, 2021)**	**Observation source**
kōtuku / white heron	*Ardea modesta*	Threatened - Nationally Critical	New Zealand Bird Atlas, iNaturalist
shore plover	*Thinornis novaeseelandiae*	Threatened - Nationally Critical	New Zealand Bird Atlas
reef heron	*Egretta sacra sacra*	Threatened - Nationally Endangered	New Zealand Bird Atlas
Caspian tern	*Hydroprogne caspia*	Threatened - Nationally Vulnerable	New Zealand Bird Atlas, iNaturalist
long-tailed cuckoo	*Eudynamys taitensis*	Threatened - Nationally Vulnerable	iNaturalist
pārera / grey duck	*Anas superciliosa*	Threatened - Nationally Vulnerable	New Zealand Bird Atlas
New Zealand dabchick	*Poliocephalus rufopectus*	Threatened - Nationally Increasing	New Zealand Bird Atlas, iNaturalist
northern New Zealand dotterel	*Charadrius obscurus aquilonius*	Threatened - Nationally Increasing	New Zealand Bird Atlas, iNaturalist
pāteke / brown teal	*Anas chlorotis*	Threatened - Nationally Increasing	New Zealand Bird Atlas, iNaturalist
wrybill	*Anarhynchus frontalis*	Threatened - Nationally Increasing	New Zealand Bird Atlas, iNaturalist
banded dotterel	*Charadrius bicinctus bicinctus*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist
banded rail	*Gallirallus philippensis assimilis*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
black-billed gull	*Larus bulleri*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist
eastern bar-tailed godwit	*Limosa lapponica baueri*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist
lesser knot	*Calidris canutus rogersi*	At Risk - Declining	New Zealand Bird Atlas
New Zealand pipit	*Anthus novaeseelandiae novaeseelandiae*	At Risk - Declining	New Zealand Bird Atlas
North Island fernbird	*Bowdleria punctata vealeae*	At Risk - Declining	New Zealand Bird Atlas
northern blue penguin	*Eudyptula minor iredalei*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist
red-billed gull	*Larus novaehollandiae scopulinus*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist

South Island pied oystercatcher	*Haematopus finschi*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist
spotless crake	*Porzana tabuensis tabuensis*	At Risk - Declining	New Zealand Bird Atlas
white-fronted tern	*Sterna striata striata*	At Risk - Declining	New Zealand Bird Atlas, iNaturalist
black shag	*Phalacrocorax carbo novaehollandiae*	At Risk - Relict	New Zealand Bird Atlas, iNaturalist
Cook's petrel	*Pterodroma cookii*	At Risk - Relict	iNaturalist
fairy prion	*Pachyptila turtur*	At Risk - Relict	iNaturalist
fluttering shearwater	*Puffinus gavia*	At Risk - Relict	iNaturalist
Australian coot	*Fulica atra australis*	At Risk - Naturally Uncommon	New Zealand Bird Atlas
black-fronted dotterel	*Elseyornis melanops*	At Risk - Naturally Uncommon	New Zealand Bird Atlas, iNaturalist
little black shag	*Phalacrocorax sulcirostris*	At Risk - Naturally Uncommon	New Zealand Bird Atlas, iNaturalist
royal spoonbill	*Platalea regia*	At Risk - Naturally Uncommon	New Zealand Bird Atlas, iNaturalist
kākā / North Island kākā	*Nestor meridionalis septentrionalis*	At Risk - Recovering	New Zealand Bird Atlas, iNaturalist
northern giant petrel	*Macronectes halli*	At Risk - Recovering	iNaturalist
pied shag	*Phalacrocorax varius varius*	At Risk - Recovering	New Zealand Bird Atlas, iNaturalist
variable oystercatcher	*Haematopus unicolor*	At Risk - Recovering	New Zealand Bird Atlas, iNaturalist
Australasian shoveler	*Anas rhynchotis*	Not Threatened	New Zealand Bird Atlas, iNaturalist
black swan	*Cygnus atratus*	Not Threatened	New Zealand Bird Atlas, iNaturalist
grey teal	*Anas gracilis*	Not Threatened	New Zealand Bird Atlas, iNaturalist
kāhu / Australasian harrier	*Circus approximans*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
karoro / southern black-backed gull	*Larus dominicanus dominicanus*	Not Threatened	New Zealand Bird Atlas, iNaturalist
kererū / New Zealand pigeon	*Hemiphaga novaeseelandiae*	Not Threatened	New Zealand Bird Atlas, iNaturalist
kōtare / New Zealand kingfisher	*Todiramphus sanctus vagans*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
North Island fantail	*Rhipidura fuliginosa placabilis*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)

pāpango / New Zealand scaup	*Aythya novaeseelandiae*	Not Threatened	New Zealand Bird Atlas, iNaturalist
pīpīwharauroa / shining cuckoo	*Chrysococcyx lucidus lucidus*	Not Threatened	New Zealand Bird Atlas, iNaturalist
poaka / pied stilt	*Himantopus himantopus leucocephalus*	Not Threatened	New Zealand Bird Atlas, iNaturalist
pūkeko	*Porphyrio melanotus melanotus*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
pūtangitangi / paradise shelduck	*Tadorna variegata*	Not Threatened	New Zealand Bird Atlas, iNaturalist
riroriro / grey warbler	*Gerygone igata*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
ruru / morepork	*Ninox novaeseelandiae novaeseelandiae*	Not Threatened	New Zealand Bird Atlas
spur-winged plover	*Vanellus miles novaehollandiae*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
tākapu / Australasian gannet	*Morus serrator*	Not Threatened	New Zealand Bird Atlas
tauhou / silvereye	*Zosterops lateralis lateralis*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
tūī	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
welcome swallow	*Hirundo neoxena neoxena*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
white-faced heron	*Egretta novaehollandiae*	Not Threatened	New Zealand Bird Atlas, iNaturalist, Bioresearches (2019)
Arctic skua	*Stercorarius parasiticus*	Non-resident Native - Migrant	iNaturalist
ruddy turnstone	*Arenaria interpres*	Non-resident Native - Migrant	New Zealand Bird Atlas
Asiatic black-tailed godwit	*Limosa limosa melanuroides*	Non-resident Native - Vagrant	New Zealand Bird Atlas
chestnut-breasted shelduck	*Tadorna tadornoides*	Non-resident Native - Vagrant	iNaturalist
eastern curlew	*Numenius madagascariensis*	Non-resident Native - Vagrant	iNaturalist
little egret	*Egretta garzetta immaculata*	Non-resident Native - Vagrant	New Zealand Bird Atlas, iNaturalist

little pied shag	*Phalacrocorax melanoleucos melanoleucos*	Non-resident Native - Vagrant	New Zealand Bird Atlas, iNaturalist
pectoral sandpiper	*Calidris melanotos*	Non-resident Native - Vagrant	iNaturalist
western sandpiper	*Calidris mauri*	Non-resident Native - Vagrant	New Zealand Bird Atlas, iNaturalist
whiskered tern	*Chlidonias hybridus javanicus*	Non-resident Native - Vagrant	iNaturalist

Table 88. Habitat assessment for threatened or at-risk bird species.

Common name	**Threat classification (Robertson *et al.*, 2021)**	**Potential habitat**
kōtuku / white heron	Threatened - Nationally Critical	Kōtuku occasionally visit freshwater wetlands (Adams, 2013), however they are rare visitors to the Manukau Harbour and highly unlikely to utilis the wetlands within the project area due to their small size. Consequently, they have not been considered further.
long-tailed cuckoo	Threatened - Nationally Vulnerable	Long-tailed cuckoo require extensive forest habitat, which is not present within the project area. Birds are occasionally seen in rural or urban areas whilst on passage and therefore are highly unlikely to be present within the project area and have not been considered further.
pārera / grey duck	Threatened - Nationally Vulnerable	Individuals of this species within urban environments are almost always hybrids with introduced mallard ducks (*Anas superciliosa*), which are not a threatened species (Williams, 2013) Consequently, pārera are highly unlikely to be present within the project area and have not been considered further.
New Zealand dabchick	Threatened - Nationally Increasing	Dabchick generally require areas of open water with wetland habitats on the periphery (Szabo, 2022). This habitat is not considered to be present within the ZOI of the Project and consequently dabchick have not been considered further.
pāteke / brown teal	Threatened - Nationally Increasing	Pāteke utilise estuaries and wetlands, including forested wetlands. They are greatly impacted by introduced pests however (Williams, 2013). There is a small chance that they could utilise streams and wetlands within NoR 4 as cover.
banded rail	At Risk - Declining	Banded rail footprints were recorded within NoR 4 wetlands by Bioresearches (2019). It is highly unlikely they are present in other NoRs due to unsuitability of the habitat.
black-billed gull	At Risk - Declining	Black-billed gull are highly mobile and do occasionally spend time foraging in more urbanised areas, however this is likely to occur very sporadically at best within the Project area. Records of them have been uncommon and generally in the Manukau Harbour. Consequently, their potential for presence is very low.
New Zealand pipit	At Risk - Declining	Pipit often are present within rural areas, such as the environment where NoR 4 is located. It is possible therefore that they are present within the ZOI of NoR 4.
North Island fernbird	At Risk - Declining	Occur and breed in dense freshwater and coastal wetland vegetation throughout New Zealand (Miskelly, 2013). It is possible that fernbird may

		utilise wetland habitat in NoR 4. It is unlikely that they would utilise habitat within other NoRs as the wetland habitats are generally smaller and less connected to other areas of wetland habitat.
red-billed gull	At Risk - Declining	Red-billed gull are highly mobile and do occasionally spend time foraging in more urbanised areas, either for food scraps, or in large open areas such as sports pitches (Mills, 2013). They may be sporadically present within any NoR but are highly mobile and disturbance tolerant and consequently are not assessed further.
spotless crake	At Risk - Declining	Spotless crakes occur and breed in freshwater wetland dominated by dense emergent vegetation (particularly raupō) throughout the North Island (Fitzgerald, 2013). It is possible they may utilise the wetlands/streams within NoR 4.
Australian coot	At Risk - Naturally Uncommon	Australian coots prefer large areas of open water with reedy or grassy edges (Mason, 2013). Such habitats are not present within the ZOI of the Project Area.
little black shag	At Risk - Naturally Uncommon	May frequent streams and wetlands for foraging, such as those in NoR 1 and 4.
kākā / North Island kākā	At Risk - Recovering	Kākā are rare to uncommon in native forest on the mainland, with strongholds on pest free offshore island. Kākā however disperse widely during winter and regularly visit forest fragments and pine plantations in the Auckland area (Moorhouse, 2013). At best they may use the project area as a movement corridor but due to a lack of foraging habitat are unlikely to utilise the project area for more.
pied shag	At Risk - Recovering	May frequent streams and wetlands for foraging, such as those in NoR 1 and 4.

Appendix D – Rapid habitat assessment scoring sheet

Habitat parameter	Condition category										SCORE
1. Deposited sediment	*The percentage of the stream bed covered by fine sediment.*										
	0	*5*	*10*	*15*	*20*	*30*	*40*	*50*	*60*	*≥ 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
2. Invertebrate habitat diversity	*The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
3. Invertebrate habitat abundance	*The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.*										
	95	*75*	*70*	*60*	*50*	*40*	*30*	*25*	*15*	*5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
4. Fish cover diversity	*The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
5. Fish cover abundance	*The percentage of fish cover available.*										
	95	*75*	*60*	*50*	*40*	*30*	*20*	*10*	*5*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
6. Hydraulic heterogeneity	*The number of of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulance, backwater. Presence of deep pools score higher.*										
	≥ 5	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
7. Bank erosion	*The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.*										
Left bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
Right bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
8. Bank vegetation	*The maturity, diversity and naturalness of bank vegetation.*										
Left bank AND Right bank	*Mature native trees with diverse and intact understorey*		*Regenerating native or flaxes/sedges/tussock > dense exotic*			*Mature shrubs, sparse tree cover > young exotic, long grass*			*Heavily grazed or mown grass > bare/impervious ground.*		
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
9. Riparian width	*The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s).*										
Left bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
Right bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
10. Riparian shade	*The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).*										
	≥ 90	*80*	*70*	*60*	*50*	*40*	*25*	*15*	*10*	*≤ 5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
TOTAL	(Sum of parameters 1-10)										

Appendix E – Terrestrial SEA classification criteria

Below are the four factors used when assessing if terrestrial vegetation meets the criteria for classification as an SEA. These criteria are from Schedule 3 of the AUP OP.

Factors:

1) REPRESENTATIVENESS
   Sub-factor:
   (a) It is an example of an indigenous ecosystem (including both mature and successional stages), that contributes to the inclusion of at least 10% of the natural extent[20] of each of Auckland's original ecosystem types[21] in each ecological district of Auckland (starting with the largest, most natural and intact, most geographically spread) and reflecting the environmental gradients of the region, and is characteristic or typical of the natural ecosystem diversity of the ecological district and/or Auckland.
2) THREAT STATUS AND RARITY
   Sub-factors:
   (a) It is an indigenous habitat, community or ecosystem that occurs naturally in Auckland and has been assessed (using the IUCN threat classification system) to be threatened, based on evidence and expert advice (including Holdaway *et al*. Status assessment of NZ naturally uncommon ecosystems[22]).
   (b) It is a habitat that supports occurrences of a plant, animal or fungi that has been assessed by the Department of Conservation and determined to have a national conservation status of threatened or at risk;
      i. or it is assessed as having a regional threatened conservation status including Regionally Critical, Endangered and Vulnerable and Serious and Gradual Decline.
   (c) It is indigenous vegetation that occurs in Land Environments New Zealand Category IV where less than 20% remains.
   (d) It is any indigenous vegetation or habitat of indigenous fauna that occurs within an indigenous wetland or dune ecosystem.
   (e) It is a habitat that supports an occurrence of a plant, animal or fungi that is locally rare; or
      i. it has been assessed by the Department of Conservation and determined to have a national conservation status of Naturally Uncommon, Range Restricted or Relict.
3) DIVERSITY
   Sub-factors:
   (a) It is any indigenous vegetation that extends across at least one environmental gradient resulting in a sequence that supports more than one indigenous habitat, community or ecosystem type e.g., an indigenous estuary to an indigenous freshwater wetland.
   (b) It supports the expected indigenous ecosystem diversity for the habitat(s).
   (c) It is an indigenous habitat type that supports a typical species richness or species assemblage for its type.
4) STEPPING-STONES, MIGRATION PATHWAYS AND BUFFERS
   Sub-factors:

[20] "Natural extent" is intended to mean a combination of our understanding of the historic pre-human diversity, distribution and extent of ecosystems in Auckland and what we would expect this to be given past and current environmental drivers.

[21] The Department of Conservation's ecosystem classification system described over 135 ecosystems in New Zealand (Singers and Rogers in press). Of these 35 ecosystems are known to have occurred in Auckland and these are what is meant by original ecosystems. They include the more recent indigenous dominated shrub and scrublands that have evolved as a result of human modification of the landscape.

[22] Status Assessment of New Zealand's Naturally Uncommon Ecosystems, ROBERT J. HOLDAWAY, SUSAN K. WISER and PETER A. WILLIAMS. Conservation Biology. Volume 26, Issue 4, pages 619–629, August 2012

(a) It is an example of an indigenous ecosystem, or habitat of indigenous fauna that is used by any native species permanently or intermittently for an essential part of their life cycle (e.g., known to facilitate the movement of indigenous species across the landscape, haul-out site for marine mammals) and therefore makes an important contribution to the resilience and ecological integrity of surrounding areas.

(b) It is an example of an ecosystem, indigenous vegetation or habitat of indigenous fauna, that is immediately adjacent to, and provides protection for, indigenous biodiversity in an existing protected natural area (established for the purposes of biodiversity protection); or

   i. it is an area identified as significant under the 'threat status and rarity' or 'uniqueness' factor. This includes areas of vegetation (that may be native or exotic) that buffer a known significant site. It does not include buffers to the buffers.

c) It is part of a network of sites that cumulatively provide important habitat for indigenous fauna or when aggregated make an important contribution to the provision of a particular ecosystem in the landscape.

d) It is a site which makes an important contribution to the resilience and ecological integrity of surrounding areas.

5) UNIQUENESS OR DISTINCTIVENESS

Sub-factors:

(a) It is habitat for a plant, animal or fungi that is endemic to the Auckland region (i.e., not found anywhere else).

(b) It is an indigenous ecosystem that is endemic to the Auckland region or supports ecological assemblages, structural forms or unusual combinations of species that are endemic to the Auckland region.

(c) It is an indigenous ecosystem or a habitat that supports occurrences of a plant, animal or fungi that are near-endemic (i.e., where the only other occurrence(s) is within 100 km of the council boundary).

(d) It is a habitat that supports occurrences of a plant, animal or fungi that is the type locality for that taxon.

(e) It is important as an intact sequence or outstanding condition in the region.

(f) It is a habitat that supports occurrences of a plant, animal or fungi that is the largest specimen or largest population of the indigenous species in Auckland or New Zealand.

(g) It is a habitat that supports occurrences of a plant, animal or fungi that are at (or near) their national distributional limit.