

Drury Arterial Network Assessment of Effects on the Environment

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Responsibility	Name
Authors	Kaitlyn Ritchie, Helen Hicks
Reviewer	Amelia Linzey

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Glossary of Defined Terms and Acronyms

Acronym/Term	Description
ABM	Automatic bat monitor
Active transport	Means forms of transport that involve physical exercise, such as walking or cycling, and includes transport that may use a mobility aid such as a wheelchair (definition in the National Policy Statement for Urban Development)
AEE	Assessment of Effects on the Environment
AGRD	Austroroads Guide to Road Design
Altered Road (Traffic Noise and Vibration Assessment)	As defined in NZS 6806:2010 Section 1.5.2: Subject to 1.5.4 in NZS 6806, an altered road means an existing road that is subject to the alterations of the horizontal or vertical alignment where at any assessment position at any one or more PPF meets NZS 6806 criteria 1.5.2 (a) or (b).
AT	Auckland Transport
ATAP	Auckland Transport Alignment Project
AUPOIP	Auckland Unitary Plan Operative in Part
Blue-Green Network	A green infrastructure proposal that combines the Auckland wide policies of Section E3, with specific landscape values of the Drury-Ōpāheke area. Proposed by Auckland Council in the Drury-Ōpāheke Structure Plan to guide future urban growth.
BMP	Bird Management Plan
CEMP	Construction Environmental Management Plan
CHI	[Auckland Council] Cultural Heritage Inventory
CIA	Cultural Impact Assessment
CNVMP	Construction Noise and Vibration Management Plan
CoPTTM	Waka Kotahi code of practice for temporary traffic management
CTMP	Construction Traffic Management Plan
DBC	Detailed Business Case
Design Framework	Supporting Growth Design Framework
DOC	Department of Conservation
DIN	Deutsches Institut Fur Normung E.V. (German Institute for Standardisation)
DP	District Plan
Drury Package	The Drury Arterial Network NoRs
DSIs	Deaths and serious injuries
DTIP	Drury Transport Infrastructure Programme
EIANZ	Environment Institute of Australia and New Zealand
EMP	Ecology Management Plan
FENZ	Fire and Emergency New Zealand
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GPS	Government Policy Statement on land transport
GRPA	Government Rooding Powers Act 1989
HAMP	Heritage and Archaeology Management Plan
HNZPT	Heritage New Zealand Pouhere Taonga
HNZPT Act	Heritage New Zealand Pouhere Taonga Act 2014
IBC	Indicative Business Case

Acronym/Term	Description
ITP	[Auckland Transport] Integrated Transport Programme
KiwiRail	KiwiRail Holdings Limited
LED	Light emitting diode
LGACA	Local Government (Auckland Council) Act 2009
LoS	Level of Service
LTA	Land Transport Act 1998
LTMA	Land Transport Management Act 2003
MCA	Multi Criteria Assessment
MoE	Ministry of Education
MPD	Maximum probable development (for the purposes of flooding assessment): Design case for consideration of future flows allowing for development within a catchment that takes into account the maximum impervious surface limits of the current zone or, if the land is zoned Future Urban in the Auckland Unitary Plan, the probable level of development arising from zone changes.
MSE	Mechanically Stabilised Earth
MV	Medium Voltage
New Road (Traffic Noise and Vibration Assessment)	As defined in NZS 6806:2010 Section 1.6: A new road is any road which is to be constructed where no previously formed legal road existed. A new road excludes any existing road and any altered road but includes the formation of previously unformed legal road.
NIMT	North Island Main Trunk [rail line]
NLTP	National Land Transport Programme
NoR D1	Notice of Requirement D1: Alteration to Waka Kotahi designation 6707 - State Highway 22
NoR D2	Notice of Requirement D2: Jesmond to Waihoehoe West Frequent Transit Network Upgrade
NoR D3	Notice of Requirement D3: Waihoehoe Road East Upgrade
NoR D4	Notice of Requirement D4: Ōpāheke North-South FTN Arterial
NoR D5	Notice of Requirement D5: Ponga Road and Ōpāheke Road Upgrade
NoRs	Notices of Requirement
NPS Freshwater	National Policy Statement for Freshwater Management
NPS-ET	National Policy Statement for Electricity Transmission
NPS-UD	National Policy Statement on Urban Development
NUMP	Network Utility Management Plan
NZCPS	New Zealand Coastal Policy Statement
NZUP	New Zealand Upgrade Programme
ONC	Outstanding Natural Character
ONF	Outstanding Natural Feature
ONL	Outstanding Natural Landscape
PBC	Programme Business Case
PPFs	Protected premises and facilities
Partners	Manawhenua, Auckland Council and KiwiRail
RLTP	Regional Land Transport Plan
RMA	Resource Management Act 1991
RP	Regional Plan
RPS	Regional Policy Statement
RPTP	Auckland Regional Public Transport Plan

Acronym/Term	Description
SAPs	Site Access Points
SCMP	Stakeholder and Communication Management Plan
SEA	Significant Ecological Area
SH1	State Highway 1
SH22	State Highway 22
SHGDM	State Highway Geometric Design Manual
SQEP	Suitably Qualified and Experienced Person
SRPs	Sediment Retention Ponds
TDM	Auckland Transport Design Manual
TfUG	Transport for Future Urban Growth
TMP	Tree Management Plan
ULDMP	Urban Landscape and Design Management Plan
Urban Design Evaluation	Drury Arterial Network Urban Design Evaluation and Framework
vpd	Vehicles per day
Waka Kotahi	Waka Kotahi New Zealand Transport Agency



PART A

Introduction and Background

1 Introduction

This Assessment of Effects on the Environment (AEE) supports the Drury Arterial Network Notices of Requirement (NoRs) (the “Drury Package”) lodged by Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (Waka Kotahi) as requiring authorities under the Resource Management Act 1991 (RMA). The notices of requirement propose to alter an existing designation for State Highway 22 (SH22) in Drury and propose new designations for future strategic transport corridors to support the planned urban growth in the Drury-Ōpāheke area of Auckland. The Projects in the Drury Package are part of the Supporting Growth Programme and are described in Table 1-1 and shown in Figure 1-1.

Table 1-1: Drury Package - Projects and Notice Reference

Notice	Project	Description	Requiring Authority
D1	Alteration to Waka Kotahi designation 6707 - SH22	Widening of existing state highway from the Drury Interchange at State Highway 1 (SH1) to Oira Creek to a four-lane urban arterial with separated active transport facilities. Referred to as “SH22 Upgrade” in this AEE.	Waka Kotahi
D2	Jesmond to Waihoehoe West Frequent Transit Network (FTN) Upgrade	- Widening of the existing Jesmond Road from SH22 to near 256 Jesmond Road to a four-lane FTN urban arterial with separated active transport facilities. Referred to as the “Jesmond Road FTN Upgrade section” in this AEE. - A four-lane FTN urban arterial with separated active transport facilities from Jesmond Road to Norrie Road. It includes upgrading existing and constructing new transport corridors. Referred to as the “Bremner Road FTN Upgrade section” in this AEE. - Widening of Waihoehoe Road from the Norrie Road/Great South Road intersection to Fitzgerald Road to a four-lane FTN urban arterial with separated active transport facilities. Referred to as the “Waihoehoe Road West FTN Upgrade section” in this AEE.	AT
D3	Waihoehoe Road East Upgrade	Widening of Waihoehoe Road east of Fitzgerald Road to Drury Hills Road to a two-lane urban arterial with separated active transport facilities.	AT
D4	Ōpāheke North-South FTN Arterial	A new four-lane FTN urban arterial with separated active transport facilities from Hunua Road in the north to Waihoehoe Road in the south. Referred to as the “Ōpāheke N-S FTN Arterial” in this AEE.	AT
D5	Ponga Road and Ōpāheke Road Upgrade	- Widening of Ponga Road from Ōpāheke Road to Jack Paterson Road to a two-lane urban arterial with separated active transport facilities. Referred to as the “Ponga Road Upgrade section” in this AEE. - Widening of Ōpāheke Road from the extent of the FUZ in the north to Ponga Road in the south to a two-lane urban	AT

Notice	Project	Description	Requiring Authority
		arterial with separated active transport facilities. Referred to as the "Ōpāheke Road Rural Upgrade section" in this AEE. • Upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout with active transport facilities, including crossing facilities and re-grading of nine driveways. Referred to as the "Ōpāheke Road Urban Upgrade section" in this AEE .	

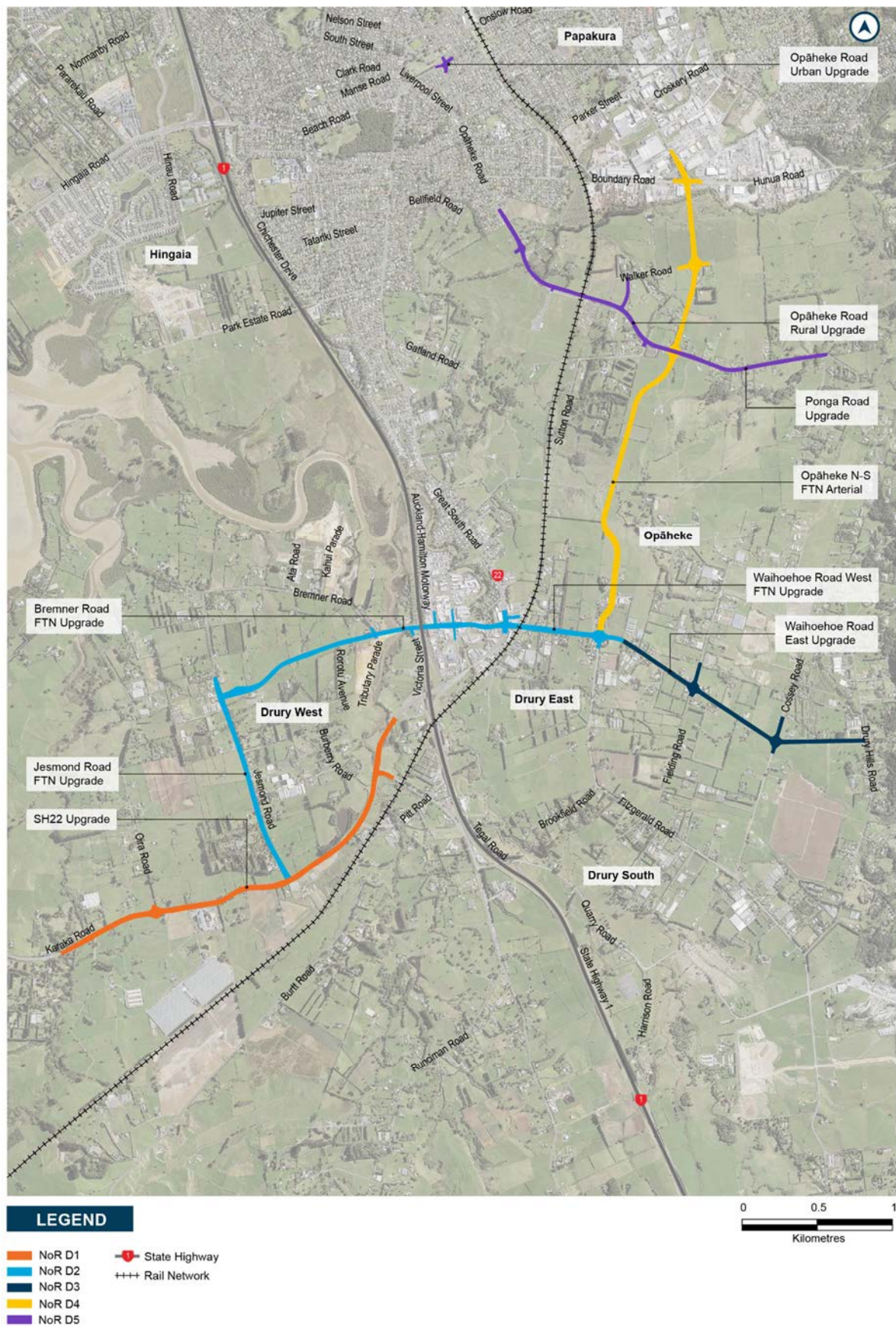


Figure 1-1: Drury Package Overview (Aerial photography source: Auckland Council GeoMaps)

1.1 Requiring Authority Status

1.1.1 Auckland Transport

AT is financially responsible for Auckland's land transport network and services (excluding state highways), including roads, footpaths, cycling, parking and public transport services such as rail. AT is a Council Controlled Organisation under the Local Government (Auckland Council) Act 2009 (LGACA), which states that AT's purpose is to *"contribute to an effective, efficient and safe Auckland land transport system in the public interest"*.

AT's functions are identified in section 45 of the LGACA and include managing and controlling the Auckland transport system in accordance with the LGACA, including performing the statutory functions and exercising the statutory powers set out in section 46 as if AT were a local authority or other statutory body, and acting as a Requiring Authority under section 167 of the RMA.

Under section 47(1) of the LGACA, AT is deemed to be approved as a Requiring Authority, as a network utility operator, under section 167 of the RMA for the purpose of *"constructing or operating or proposing to construct or operate roads in relation to the Auckland transport system" and "the carrying out of an activity or a proposed activity (other than an activity described in paragraph (a)) in relation to the Auckland transport system for which it or the Auckland Council has financial responsibility"*. Subsequently, AT may designate land to construct, operate and maintain roads and any other activities in relation to the Auckland transport system that Council has financial responsibility for.

1.1.2 Waka Kotahi NZ Transport Agency

Waka Kotahi is a crown entity responsible for providing an integrated approach to planning, funding and delivering transport in New Zealand.

The Land Transport Management Act 2003 (LTMA) provides the statutory framework for New Zealand's land transport system and is the statute under which Waka Kotahi operates (in conjunction with the Government Rounding Powers Act 1989 (GRPA) and the Land Transport Act 1998 (LTA)).

The principal objective of Waka Kotahi under section 94 of the LTMA is *"to undertake its functions in a way that contributes to an effective, efficient, and safe land transport system in the public interest"*. Waka Kotahi's functions are set out in section 95(1) and the principles under which it must operate are affirmed in section 96 of the LTMA.

Section 61 of the GRPA sets out the powers and duties of Waka Kotahi in relation to state highways. Waka Kotahi has the sole powers of control for all purposes, including construction and maintenance, of all state highways under this Act. Further, section 88 states that Waka Kotahi is able to declare a state highway, or part of a state highway, a limited access road.

Waka Kotahi was approved under section 167 of the RMA as a Requiring Authority by two gazette notices in 1994 and 2015.

Pursuant to the 1994 notice, Waka Kotahi may designate land, water, subsoil or airspace for the *"construction and operation (including the maintenance, improvement, enhancement, expansion, realignment and alteration) of any State highway or motorway pursuant to the GRPA"*. It may also designate land, water, subsoil or airspace for *"the purpose of constructing or operating (or proposing to construct or operate) and maintaining cycleways and shared paths in New Zealand pursuant to the GRPA and the LTMA."*

1.2 The Supporting Growth Programme

The Supporting Growth Programme is a collaboration between AT and Waka Kotahi to plan transport investment in Auckland's future urban zoned areas over the next 30 years. AT and Waka Kotahi have partnered with Auckland Council, Manawhenua and KiwiRail Holdings Limited (KiwiRail) and are working closely with stakeholders and the community to develop the strategic transport network to support Auckland's growth areas, which are shown in Figure 1-2.

The key objective of the Programme is to protect land for future implementation of the required strategic transport corridors/infrastructure. As a form of route protection, designations will identify and appropriately protect the land necessary to enable the future construction, operation and maintenance of the transport corridors/infrastructure required to support Auckland's growth areas. The Drury Arterial Network is intended to support the south growth area as shown in Figure 1-2.

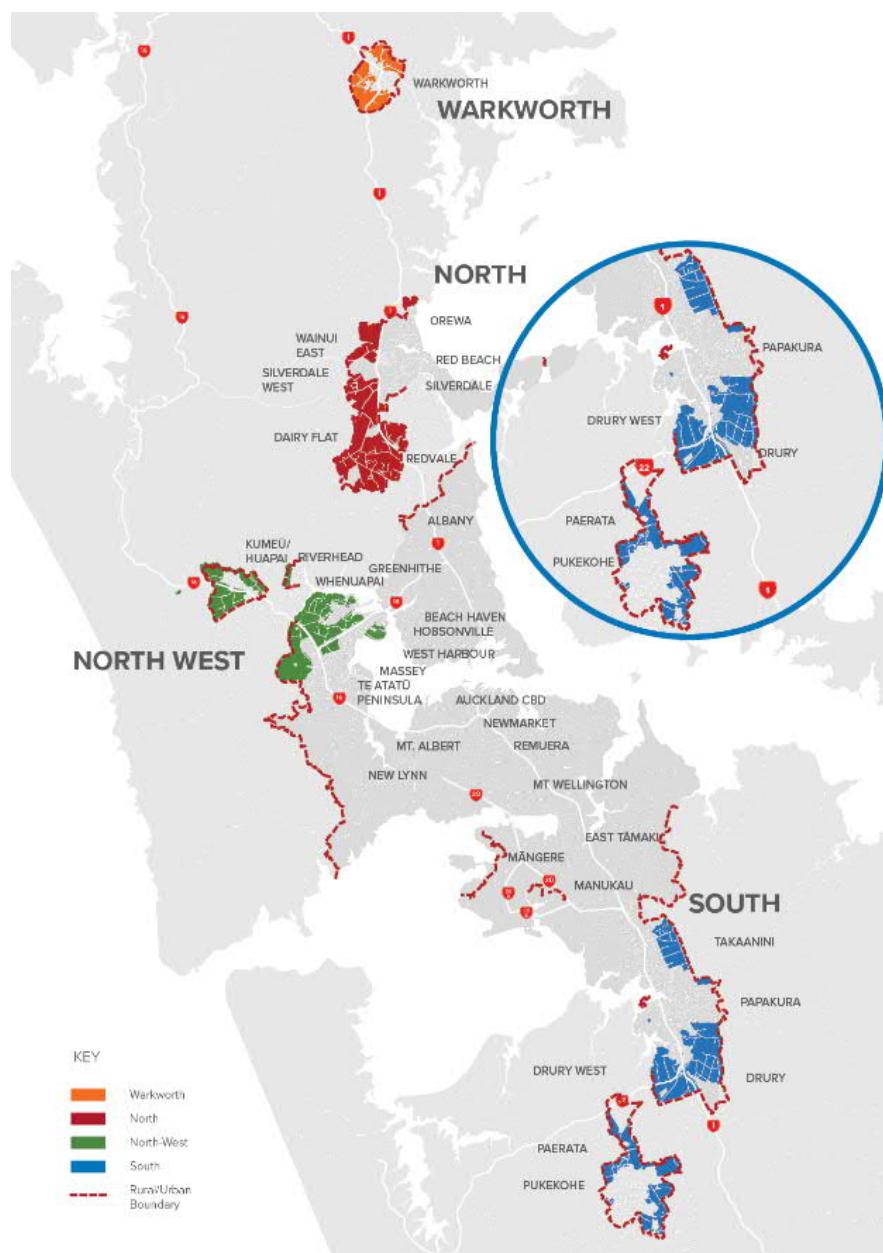


Figure 1-2: Future Urban Areas of Auckland, Highlighting the Southern Growth Area

1.3 Document Volumes and Structure

The AEE (this report) and supporting documents are structured as set out in Table 1-2.

Table 1-2: Structure of AEE and Supporting Documents

Volume	Title	Contents
1	Form 18	Forms for each NoR
2	Assessment of Effects on the Environment (this report)	Part A: - Background and reasons for the projects - An overview of the NoRs Part B: - An overview of the assessment approach including: the approach to existing and likely future environment; assessment of alternatives; approach to the design and construction methodology Part C: - The engagement undertaken Parts D to H: A separate part for each Project which includes: - A description of the Project - Existing and likely future environment - Assessment of alternatives - Assessment of effects on the environment - Summary of measures to manage adverse effects - Summary of conclusions made in the statutory assessment Part I: - An assessment of the Drury Package, and individual Projects where applicable, against relevant statutory and non-statutory documents. Part J: - Conclusion Appendices: - Assessment of Alternatives Report - Relevant Statutory and Strategic Planning Documents
3	Drawings	Indicative Design Drawings for each NoR
4	Supporting Technical Reports	- Assessment of Transport Effects - Assessment of Effects on Historic Heritage - Assessment of Landscape and Visual Effects - Assessment of Ecological Effects - Assessment of Arboricultural Effects - Assessment of Construction Noise and Vibration Effects - Assessment of Traffic Noise and Vibration Effects - Assessment of Flooding Effects - Urban Design Framework and Evaluation - Ngati Tamaoho Drury NoR Historic Summary

2 Background and Context

2.1 Need for the Supporting Growth Programme

Auckland is New Zealand's largest city, home to approximately 1.65 million people. In 2017, Auckland attracted 36,800 new residents; more than the rest of the country combined. The Auckland Plan 2050 – Development Strategy signals that Auckland could grow by 720,000 people to reach 2.4 million over the next 30 years. This will generate demand for more than 400,000 additional homes and require land for 270,000 more jobs¹. Most of this growth will go into existing urban areas. However, around a third will go into future urban zoned areas (greenfields) as identified in the Auckland Unitary Plan: Operative in Part (AUPOIP).

In July 2017, the Future Urban Land Supply Strategy (FULSS) was updated in line with AUPOIP zonings, with 15,000 hectares of land allocated for future urbanisation. The FULSS provides for sequenced and accelerated greenfield growth in ten areas of Auckland.

The significant growth anticipated will pose a number of future transport challenges for the region. Given the scale and duration of the growth proposed, the early route protection of critical transport corridors provides the required certainty for AT, Waka Kotahi, stakeholders and the community. The implementation of the strategic transport network required to support the growth will be staged over the next 30 years. A key part of this integrated approach is collaborating with Auckland Council as it develops Structure Plans and works towards progressing subsequent plan changes to rezone land in the future urban areas.

The required transport networks will play a vital role in the success of new neighbourhoods by providing safe, accessible and sustainable travel choices that connect communities and encourage a transformational shift from private vehicles to public transport and active transport. The early protection of these strategic transport corridors will provide for the following outcomes at a Programme-wide level:

- **Supporting and enabling growth:** Protecting improved and new transport corridors will support Council's growth aspirations for the growth areas of Auckland, including intensification or density of growth, resulting in more efficient urban land development.
- Improved access to economic and social opportunities and resilience of the strategic transport network: Protecting improved and new transport corridors will:
 - improve travel choices and access to the critical economic and social needs of the existing and future communities
 - reduce an over-reliance on existing strategic transport corridors, and
 - better align the form and function of existing transport corridors with the planned urban form.
- Key to this is achieving a transformational mode shift from private vehicles to public transport and active transport – which will provide for greater people moving capacity and greater travel choice for all people as the city grows.
- **Land use and transport integration:** Integrating transport solutions with Council's aspirations for land use and urban form can provide for growth in a way that delivers high quality urban outcomes,

¹ Draft Auckland Plan 2050 Development Strategy: <https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/development-strategy/future-auckland/Pages/what-auckland-look-like-future.aspx>

placemaking and enhanced liveability - including the desire for a quality, connected urban environment

- **Improved safety:** Protecting improved and new transport corridors will help to address existing and increasing safety risks on transport corridors as growth areas urbanise, including:
 - improved safety for all transport modes
 - provision of dedicated space for cyclists and pedestrians to safely accommodate these modes
 - specific safety improvement projects, such as improvements to existing road and rail corridors
 - a reduction in private vehicle travel as a result of mode shift towards public transport and active transport.
- **Sustainable outcomes:** Protecting improved and new transport corridors will support the Government's policy shift towards more sustainable outcomes. This includes a reduction in greenhouse gas emissions and improved climate change resilience - through effective land use and transport integration and supporting mode shift towards more sustainable travel choices such as public transport and active transport.
- **Infrastructure integration:** Integrating the transport response with the needs and opportunities of network utility operators to provide a better whole of system outcome.

2.2 Previous Programme Phases

In 2015, AT, Waka Kotahi and Auckland Council formed the Transport for Future Urban Growth (TfUG) Programme to investigate, plan and deliver the transport networks needed to service the urban growth areas across North, North West and South Auckland over the next 30 years. AT, Waka Kotahi and Auckland Council prepared a Strategic Business Case, which confirmed the scale and urgency of the issue and a need to progress a transport response to the growth.

In 2016, AT, Waka Kotahi and Auckland Council worked in partnership to develop a TfUG Programme Business Case. The Programme Business Case informed the TfUG Programme and the indicative network prepared at that time. It also identified route protection of key transport corridors as the priority focus area for the next steps of the programme. The TfUG Programme is now known as the Supporting Growth Programme.

The AT board in February 2019, and the Waka Kotahi board in May 2019 approved the Indicative Business Cases for each growth area (Warkworth, North, North West and South) to further test and develop the recommendations of the Programme Business Case. The Indicative Business Cases identified an indicative strategic transport network, which includes indicative locations for new or upgraded public transport connections, active transport links and roads or state highways. The South Indicative Business Case recommended the Indicative Strategic Transport Network for Southern Auckland shown in Figure 2-2.

The Southern growth area and Indicative Strategic Transport Network was split into packages for the development of detailed business cases and route protection. The Drury Arterial Network is one of the five packages in the Southern growth area. The Drury Local Detailed Business Case recommended the Drury Arterial Network shown in Figure 2-3 overlaid on the indicative zoning signalled by the Drury-Ōpāheke Structure Plan (it is noted that this provides a broad level indication of the zoning pattern intended by Council but is subject to future Plan Changes and statutory processes). This

network was endorsed by the AT Board on 29 October 2020 and Waka Kotahi Board on 21 December 2020. The history is summarised in Figure 2-1.

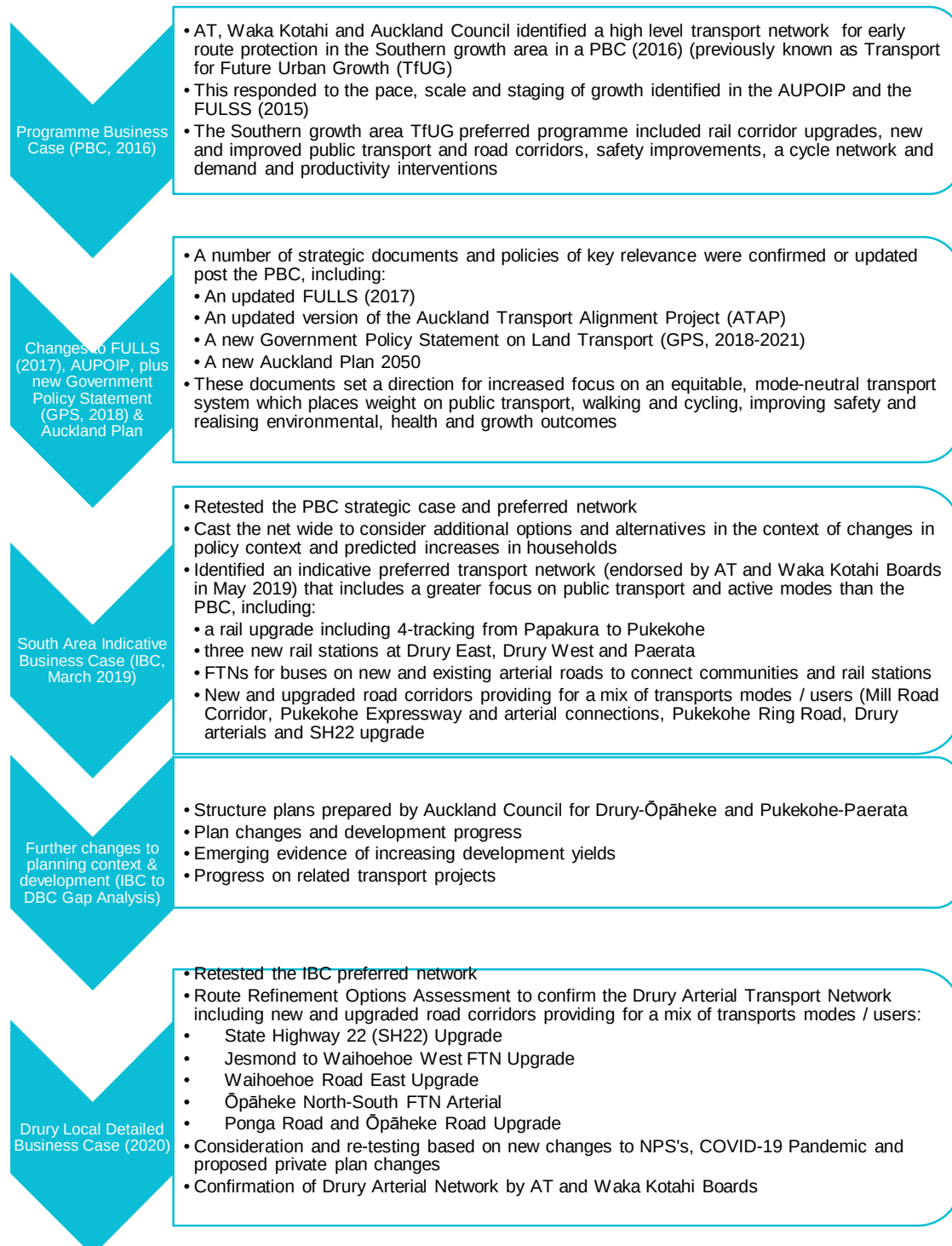


Figure 2-1: History of Previous Programme Phases

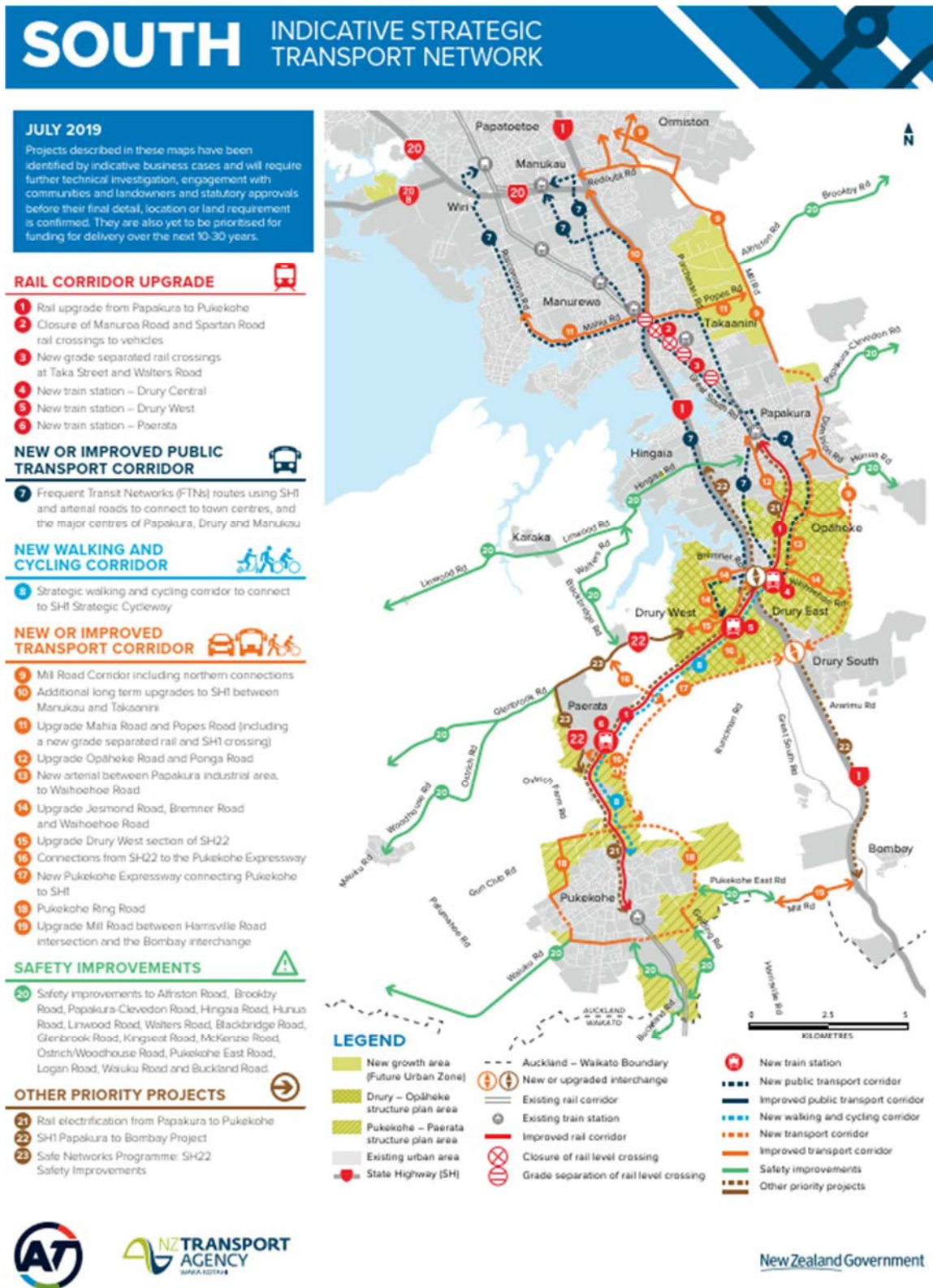
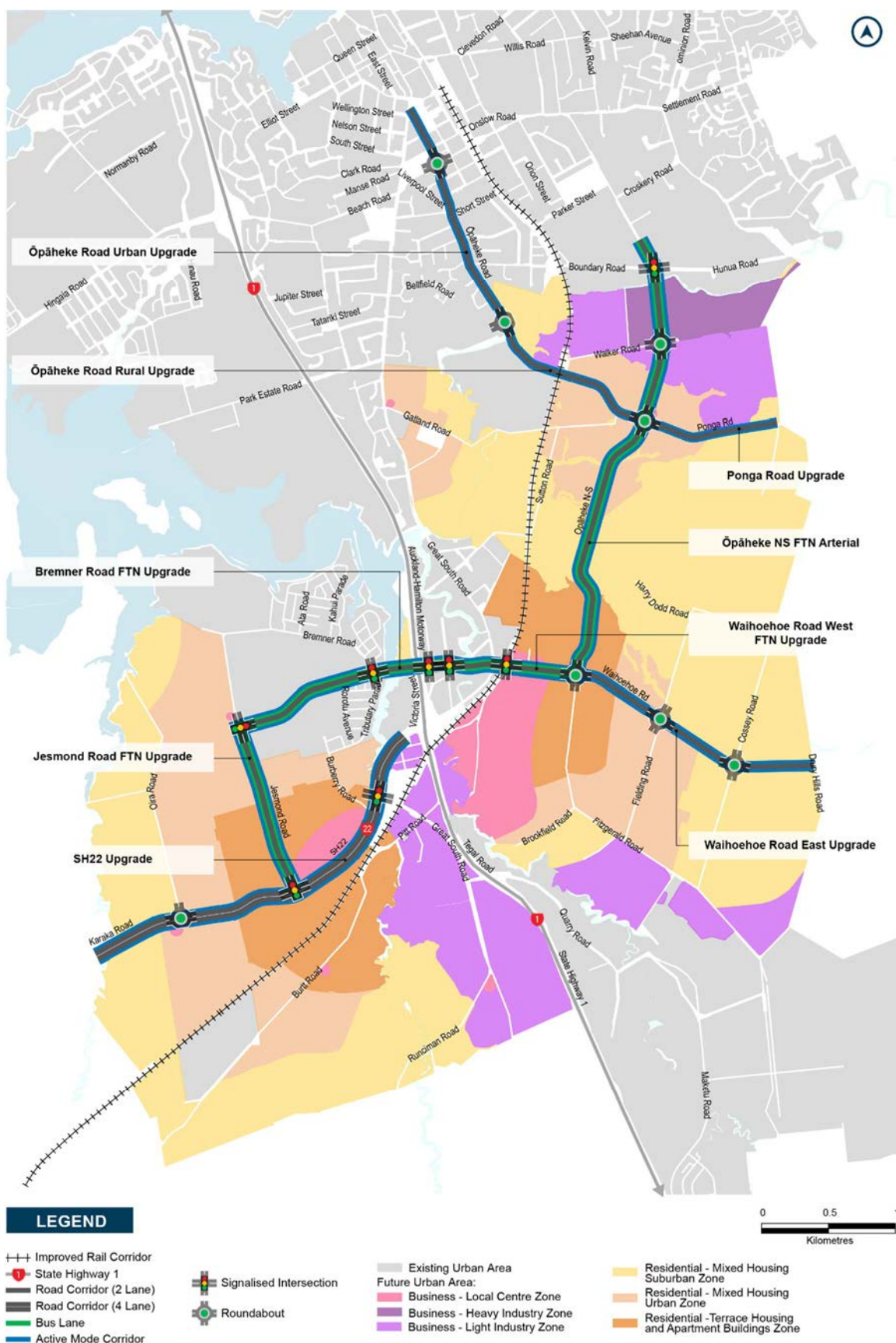


Figure 2-2: Southern growth area – Indicative Strategic Transport Network



2.3 Reasons for the Drury Arterial Network

The wider Drury-Ōpāheke area in the south of Auckland has been signalled to undergo significant urban growth. In August 2019 Auckland Council completed structure planning for this area. Over the next 30 years, the Drury-Ōpāheke Structure Plan area is estimated to provide approximately 22,000 houses, 12,000 jobs and increase from a current population of just over 3,300 to a population of about 60,000. The Structure Plan, as shown in Figure 2-4 indicates the Council's anticipated land use patterns (zoning) and key transport connections.

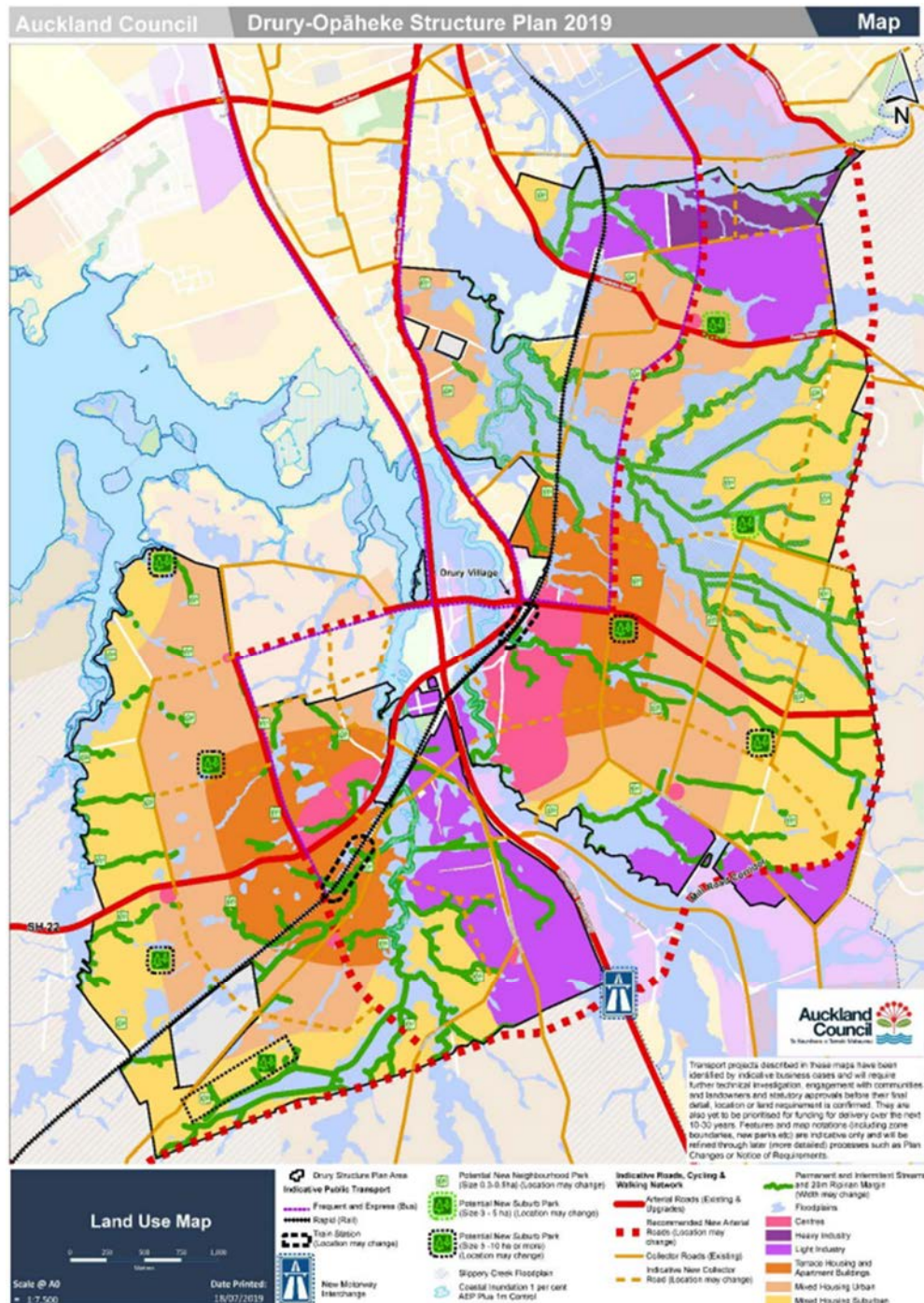


Figure 2-4: Auckland Council Drury-Ōpāheke Structure Plan 2019

Since the preparation of the Drury-Ōpāheke Structure Plan, land in Drury-Ōpāheke have been recently live zoned through developer led plan changes (e.g. Auranga Special Housing Area, Plan Change 6 and Bellfield Estate) and are urbanising. Additionally, developers have progressed, and are actively looking to advance, their private plan changes. At the time of writing this report, Auckland Council had accepted four private plan changes (three in Drury East and one in Drury West) and another has been submitted in Drury West. Plan changes are the next 'step in urbanisation' and provide the specific zoning that will enable urban development in each area. Broadly, the plan changes in the west align with the Structure Plan indicative zonings and are anticipated with the sequence of development proposed in the FULSS. The plan changes in Drury East largely provide for the Structure Plan indicative land uses. However, the centre is proposed as a Metro Centre (higher density) and the urbanisation of this area has the potential to result in urban development in advance of the sequencing signalled in the FULSS; which could expedite growth of the Drury area and advance the requirements for delivery of supporting infrastructure if they are approved and implemented.

Based on the growth anticipated in the Drury-Ōpāheke area, the following issues are likely to arise if the Drury Arterial Network is not able to be implemented:

- Access to employment and social amenities will be compromised by congestion and lack of viable alternatives due to over-reliance on SH1;
- This over-reliance on a single strategic route (SH1) will also cause reliability, resilience, safety, and productivity issues for residents in the surrounding urban area and beyond;
- The lack of capacity for public transport, walking and cycling across the transport system will result in the ability for transformational mode shift to be challenged; and
- Without the provision of improved transport infrastructure, the planned growth in the Drury-Ōpāheke area will give rise to safety issues, poor connectivity and urban form outcomes as summarised for each Project in Table 2-1. The Projects respond to the specific issues identified.

It is therefore critical that the transport system supports the growth proposed.

The need for route protection of the transport network in the Drury-Ōpāheke growth area is driven by the rate and scale of committed developments, including Special Housing Areas, the planned release of land by Auckland Council and pressure from developers who, as indicated earlier, are proposing to accelerate urban growth in Drury. If the transport corridors are not protected soon, ahead of the development, this may result in a lack of certainty around private development investment, disruption to future communities (e.g. if the infrastructure is developed following urbanisation) and / or a loss in ability to influence good urban form.

While the Drury Package involves five NoRs, a range of mechanisms to protect the transport corridors were considered. These methods are summarised in Statutory Methods section 4.2.6 and described in more detail in the Assessment of Alternatives Report provided in Appendix A.

Table 2-1: Project Specific Reasons

Notice	Key Issues / Reason for Project
NoR D1: Alteration to Waka Kotahi designation 6707 – SH22 Upgrade	- The current form and function of SH22 will not support the urbanisation of the Drury area (including the proposed Drury West centre), resulting in poor connectivity and urban form outcomes; - Urbanisation of the Drury area combined with high speeds, a high number of accesses and increasing volumes (vehicles, PT and active modes) on SH22, will lead to an increased risk of deaths and serious injuries (DSIs) and intersection crashes; and - Failure to integrate the change in function of SH22 with the timing and form of urban development will result in a compromised urban form and movement function.
NoR D2: Jesmond to Waihoehoe West FTN Upgrade	- The current form and function of the Jesmond Road, Bremner Road and Waihoehoe Road West corridor will not support the urbanisation of the Drury West area, resulting in poor connectivity and urban form outcomes; and - The lack of safe and attractive multi-modal access to the proposed Drury West centre and planned strategic public transport network will limit transport choice and access to economic and social opportunities for those living and/or working in the Drury West area.
NoR D3: Waihoehoe Road East Upgrade	- The current form and function of the Waihoehoe Road East corridor will not support the urbanisation of the Drury area, resulting in poor connectivity and urban form outcomes; and - The lack of safe and attractive multi-modal access to the proposed Drury centre and planned strategic public transport network will limit transport choice and access to economic and social opportunities for those living and/or working in the Drury area.
NoR D4: Ōpāheke N-S FTN Arterial	- The lack of north-south arterial connections through the Drury-Ōpāheke growth area (currently relying on Great South Road) will limit connectivity of communities to existing and proposed centres and employment areas; and - Rapid growth and lack of attractive north-south transport choices in the Ōpāheke/Drury East area will limit transport choice and access to economic and social opportunities for those living and/or working in the Drury-Ōpāheke area.
NoR D5: Ponga Road and Ōpāheke Road Upgrade	- The current form and function of Ōpāheke Road and Ponga Road will not support the future urbanisation of the Ōpāheke area, resulting in poor connectivity and urban form outcomes; and - The lack of safe and attractive multi-modal access to the Papakura centre, future employment areas, and the strategic road and public transport networks, will limit transport choice and access to economic and social opportunities for those living and/or working in the Ōpāheke area.

3 Overview of Drury Package NoRs

This section provides an overview of the Drury Package NoRs. The objectives for each Project reflect the transport issues and land use integration outcomes that the Projects seek to address, as outlined below. Further details on each of the NoRs are discussed in Parts D to H of this report.

Table 3-1: Overview of Drury Package NoRs

Notice	Projects	Purpose	Objectives	Extent	Lapse Period	Overview of Properties Affected
D1	SH22 Upgrade	No change to existing purpose: State Highway 22	- Provide a transport corridor that supports and integrates with the urban growth in Drury by improving accessibility and connectivity along SH22 - Provide a transport corridor that is safe for all users - Provide for additional capacity and a choice of transport options including active transport	- Linear designation 3.1km long from the SH1 Drury Interchange in the east, and the extent of the FUZ between Woodlyn Drive and Oira Road in the west. - No alteration is proposed to the separate portion of the designation to the east of SH1.	A lapse period is not required for NoR D1 because the designation being altered has already been given effect to.	42 properties directly affected, including: - Council owned land: two properties totalling approximately 8,441m² - Crown owned land: 15 properties totalling approximately 13,930m² - Privately owned land: 25 properties totalling approximately 105,606m² - Hydro: one property totalling approximately 95m² - Land use includes rural, rural-residential, business and reserve land use
D2	- Jesmond Road FTN Upgrade - Bremner Road FTN Upgrade - Waihoehoe Road West FTN Upgrade	Construction, operation and maintenance of an arterial transport corridor	- Provide an arterial transport corridor that connects key destinations in Drury East and West to support and integrate with urban growth in Drury - Provide an arterial transport corridor that is safe for all users - Contribute to mode shift by prioritising frequent and reliable public transport and provide a choice of transport options including active transport	Linear designation 4.1km long from SH22 in the southwest along Jesmond Road, greenfields, Bremner Road, Norrie Road and Waihoehoe Road West to east of Fitzgerald Road.	15 years	111 properties directly affected, including: - Council owned land: six properties totalling approximately 7,161m² - Crown owned land (excluding railway): one property totalling approximately 6,189m² - Privately owned land: 100 properties totalling approximately 158,787m² - Railway: two properties totalling approximately 2,415m² - Hydro: two properties totalling approximately 7,556m² - Land use includes rural, rural-residential, industrial / business and reserve/open space land use
D3	Waihoehoe Road East Upgrade	Construction, operation and maintenance of an arterial transport corridor	- Provide an arterial transport corridor that connects key destinations in Drury East and to support and integrate with urban growth in Drury - Provide an arterial transport corridor that is safe for all users - Contribute to mode shift by providing a choice of transport options including active transport	Linear designation 1.8km long from the proposed intersection with Ōpāheke N-S FTN Arterial in the east, to Drury Hills Road in the east.	15 years	33 privately owned properties directly affected, totalling approximately 58,281m² - Land use includes rural, rural-residential, business and recreation land use
D4	Ōpāheke N-S FTN Arterial	Construction, operation and maintenance of an arterial transport corridor	- Provide a new north south arterial transport corridor between Drury and Papakura that improves network resilience to support and integrate with the urban growth in Drury-Ōpāheke - Provide an arterial transport corridor that is safe for all users - Contribute to mode shift by prioritising frequent and reliable public transport and provides a choice of transport options including active transport - Provide for long term identification and protection of an arterial transport corridor to support urban growth in Drury-Ōpāheke	Linear designation 3.4km long between Hunua Road in the north and Waihoehoe Road in the south.	20 years	35 properties directly affected, including: - Council owned land: two properties totalling approximately 1,004m² - Privately owned land: 30 properties totalling approximately 303,283m² - Hydro: three properties totalling approximately 2,227m² - Land use includes rural, rural-residential, industrial / business and reserve land use
D5	- Ponga Road Upgrade - Ōpāheke Road Rural Upgrade - Ōpāheke Road Urban Upgrade	Construction, operation and maintenance of an arterial transport corridor	- Provide an arterial transport corridor that improves connectivity to and through Ōpāheke to support and integrate with the urban growth in Ōpāheke - Provide an arterial transport corridor that is safe for all users - Contribute to mode shift by providing a choice of transport options including active transport	- Linear designation 2.6km long from Jack Paterson Road in the east to the extent of the FUZ in the west. - Nine driveways designated 150m by 100m designation for an intersection upgrade	20 years	67 properties directly affected, including: - Council owned land: 5 properties totalling approximately 8,733m² - Privately owned land: 60 properties totalling approximately 104,345m² - Railway: one property totalling approximately 4,120m² - Hydro: one property totalling approximately 227m² - Land use includes rural, rural-residential, residential, business and reserve/open space land use

3.1 Lapse Period

This section outlines the lapse periods proposed for each of the notices. A lapse period is not required for NoR D1 because the designation being altered has already been given effect to. The purpose of the Supporting Growth Programme is to route protect land for future implementation of the required strategic transport corridors and infrastructure. Therefore, there is a need for long term route protection to recognise the uncertain timing of the adjoining urban development areas and maintain the opportunity to enable integration with land use as it changes, to provide certainty and access, and to protect the corridor from inappropriate development until such time as the arterial transport corridors are required to support and facilitate the planned urban growth. Although developer plans aim to accelerate growth in Drury, funding of the Drury Arterial Network is currently uncertain and construction staging and timing has yet to be confirmed. As such the proposed transport corridors need to be protected so that they can be implemented in the future when required. Lapse periods ranging from 15-20 years are sought for the Drury Package consistent with the anticipated time periods for implementation according to FULSS and transport modelling.

A lapse period of 15 years is proposed for NoR D2 and D3 as they are predicted to be implemented in the FULSS first decade of development, by 2028. A lapse period of 20 years is proposed for NoR D4 and D5 as they are predicted to be implemented within the second decade (2028 to 2038) or third decade (2038 to 2048) of development. A summary of lapse period proposed for each of the NoRs is provided in Table 3-2.

Table 3-2: Summary of Proposed Lapse Periods

Notice	Lapse Period
D1	Not applicable as existing designation has already been given effect to
D2, D3	15 years
D4, D5	20 years

Despite the longer lapse periods proposed for the NoRs, the proposed designations are required now to provide greater certainty on the following matters:

- It protects the corridor from inappropriate development and enables effective transport and land use integration as future urban land is urbanised and developed overtime
- It allows for staged implementation of the corridors where initial collector roads may be funded or delivered by developers before the arterial form is required
- It provides certainty to everyone that the projects can be constructed and operated when required, responding to growth
- It provides adequate time to undertake property negotiations and processes, including access negotiations and acquisitions as necessary
- It provides adequate time to complete further site investigations and design (preliminary, detailed and construction) of all aspects of a project
- It provides adequate time to secure project funding; and
- It provides adequate time to complete construction procurement and tendering processes.

3.2 Outline Plan

This AEE provides an assessment of an indicative design for each of the Projects in the Drury Package. In accordance with section 176A of the RMA, AT or Waka Kotahi (as the requiring authorities) will submit to the Council (as the territorial authority) one or more outline plan(s), detailing all relevant aspects of the Projects following the completion of detailed design of each Project and prior to the commencement of construction. Section 176A(3) states that:

(3) Any outline plan must show –

- (a) the height, shape, and bulk of the public work, project, or work;*
- (b) the location on the site of the public work, project, or work;*
- (c) the likely finished contour of the site;*
- (d) the vehicular access, circulation, and the provision for parking;*
- (e) the landscaping proposed; and*
- (f) any other matters to avoid, remedy, or mitigate any adverse effects on the environment.*

The proposed conditions for the Projects also require the submission of a number of management plans as part of the outline plan process. Upon receiving an outline plan, the Council has 20 working days to request any changes to the outline plan. The requiring authority may accept or reject the requested changes. If the requested changes are rejected, Council may appeal against the decision to the Environment Court.

3.3 Works within Proposed Drury Package Designations (s176(1)(b) Approval)

Under section 176(1)(b) of the RMA, anyone other than a requiring authority with an earlier designation is restricted from carrying out work on the designated land that would prevent or hinder the designated work without first obtaining the requiring authority's consent.

The proposed Drury Package designations will protect the land for the construction of the future arterial transport corridors which generally traverse rural land zoned for future urban development. Drury-Ōpāheke is a planned growth area and some of the urban development is likely to start occurring adjacent to the proposed designations before the future arterial transport corridors are required.

Where necessary, AT and Waka Kotahi will work with land owners and developers under the process in section 176(1)(b) to provide written consent for earthworks, interim road upgrades (or new roads), integrated stormwater solutions and development within the proposed designations – provided those works will not prevent or hinder the work authorised by AT's and the Waka Kotahi designations for the Drury Package. It is anticipated that collector roads and integrated stormwater solutions within the arterial corridors maybe delivered in partnership with developers.

3.4 Designations to be Reviewed after Construction

The proposed designations include land required for both temporary and permanent works. Once construction is complete, the designation area will be reviewed, and will be removed from those areas that are not required for the operation of the transport corridors. AT and Waka Kotahi will review their designations and remove parts of those designations using the process set out in section 182 of the RMA.

3.5 Land Subject to Existing Designations

Some of the land to be designated for the Drury Package Projects is already subject to existing designations which are generally other network utility operators.

In order to undertake work in accordance with a designation on land where there is an existing designation in place, the written consent of the requiring authority for the earlier designation is required under section 177(1)(a). The table below sets out the approvals required under section 177(1)(a) for each Project:

Table 3-3: Approvals required under section 177(1)(a) for each Project

Project and Requiring Authority	Requiring Authority -S177(1)(a) Approval Required
SH22 Upgrade – Waka Kotahi	None
Jesmond to Waihoehoe West FTN Arterial - AT	Waka Kotahi (SH1) - 6706 Kiwi Rail (North Island Main Trunk (NIMT)) - 6302
Waihoehoe Road East Upgrade - AT	First Gas (Pukekohe to East Tamaki Gas Pipeline) - 9104
Ōpāheke North South FTN Arterial - AT	First Gas (Pukekohe to East Tamaki Gas Pipeline) - 9104
Ponga and Ōpāheke Road Upgrade - AT	First Gas (Pukekohe to East Tamaki Gas Pipeline) - 9104 Kiwi Rail (NIMT) - 6302

This written approval is required in order for AT to be able to undertake works in accordance with the later designations (proposed within the Drury Package). It is not required in order to designate the land for those later works. For this reason, written approval under section 177(1)(a) of the RMA has not yet been obtained. Consultation with all the requiring authorities, whose approval will be required in the future, has taken place and will continue as the Project is developed. Written approval from these requiring authorities will be obtained by AT a later date during detailed design of the Projects (once further details of the works within the proposed designations are known).

3.6 Scope of Assessment of Effects for Drury Package NoRs under s171 and s181(2) of the RMA

Section 171(1) of the RMA sets out the matters that must be considered by a territorial authority in making a recommendation on a NoR for a new designation. Under section 181(2), those same matters are to be considered 'with all necessary modifications', in relation to a notice of requirement for an alteration as if it were a notice of requirement for a new designation. In the context of the Drury Package, NoR D1 is for an alteration to an existing designation (6707), and NoRs D2 – D5 are for new designations.

When assessing the actual or potential effects on the environment under section 171 of the RMA, the assessment of effects on the environment for the Drury Package NoRs has been limited to matters that trigger a district plan consent requirement as these are the only activities authorised by the proposed designations and alteration to existing designation. Where NES or regional plan consenting requirements are triggered, these will not be authorised by the proposed designations and alteration to existing designation, and will require resource consents in the future.

In this report, the assessment of effects is limited to matters that would trigger a district plan consent requirement under the AUPOIP. However, relevant national and regional resource consent matters have been considered to inform the Project's design, options assessment and the proposed designation footprint.

This distinction between district and regional consent considerations is outlined in greater detail in the ecological, flooding, arboriculture and landscape and visual assessments included in Volume 4. The assessments of effects that have been undertaken to support the Drury Package include:

- Traffic and Transportation
- Cultural
- Historic Heritage
- Landscape and Visual
- Ecology
- Arboriculture
- Flooding (natural hazard)
- Noise and vibration
- Network utilities
- Community
- Property, land use and business
- Urban design evaluation.

NoR D1 alters the existing SH22 designation 6707 already held by Waka Kotahi. The alteration is limited to the works proposed as part of the alteration as described in this report. It does not include works that could be undertaken within (or effects that are or could reasonably be generated by) the existing designation.

3.7 Future Resource Consents

In the future prior to construction, the Projects within the Drury Package will require NES and resource consents for a number of activities to enable the proposed works. These resource consents are not sought at this time, but will be sought when detailed design for each of the Projects is completed so as to confirm consent requirements, understand the actual or potential effects of activities that require consent and define the measures proposed to manage any adverse effects. The future resource consents likely to be required for the Projects are summarised below:

- Resource consents for the disturbance of contaminated, or potentially contaminated land under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
- Resource consents for specified infrastructure works within rivers, streams and natural wetlands under the Resource Management (National Environmental Standards for Freshwater) Regulations 2020.
- Resource consents for the following activities under the AUPOIP:
 - Bulk earthworks and associated discharge of sediment
 - Vegetation removal
 - Stormwater discharge to land or water
 - Discharge of contaminants to land
 - Activities (including structures and associated works) in, on, under or over the bed of rivers, streams, wetlands
 - Water take, use and diversion
 - Temporary construction works and minor vegetation removal in significant ecological areas (SEAs).

At this stage, no relocation of Transpower's pylons or transmission lines is anticipated and therefore no resource consents will be required under the Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009.

As discussed above, although resource consents are not being sought at this stage, their implications have been considered in the indicative designs, options assessment and the proposed designation footprints.

3.8 Considerations under other Legislation

In addition to matters requiring consideration under the RMA, there are further statutory considerations that are relevant to the Drury Package including:

- **Public Works Act 1981** – the acquisition of land required
- **Heritage New Zealand Pouhere Taonga Act 2014** – authorities for works on or in any archaeological sites
- **Reserves Act 1977** – reserves affected

- **Wildlife Act 1953** – the disturbance or relocation of protected species (e.g. hunting, taking and / or killing of wildlife for certain purposes and / or causing damage)
- **Freshwater Fisheries Regulations 1983** – the provision of fish passage in waterways.

No authorisations under the above legislation is being sought at this time. Where relevant, the requirement for additional statutory authorisations is noted in this report for completeness. The additional authorisations will be applied for at the appropriate phase of the Projects in the future. For example, at the time of specific design within the proposed designation corridors.



PART B

Designation and Assessment Approach

4 Designation and Assessment Approach

The Drury Package includes five NoRs. The sections below discuss the general approach to the assessment of existing and future environment, the alternatives assessment, and the design and construction methodology for all of the NoRs. Specific details and assessment relating to each NoR within the Drury Package are provided in Parts B to E of this report.

4.1 Approach to Existing and Likely Future Environment

The Drury Package is located within the Drury-Ōpāheke area including Drury West, Drury East and Ōpāheke. Within the Drury Package there are a range of existing zoning and land use patterns including areas with existing urban or open space zoning including live zoned precincts, and areas with future urban zoning (FUZ), which are currently rural greenfield environments, areas currently being developed and established developed areas.

The purpose of the Drury Package is to protect the necessary transport corridors that will support the future urbanisation of the Drury-Ōpāheke area. Accordingly, it is anticipated that the transport corridors will not be constructed and operational until urbanisation of the Drury-Ōpāheke growth area has at least been confirmed or is under development. Assessing the effects on the environment solely as it exists today (i.e. at the time of this assessment) will not provide an accurate reflection of the environment in which the effects of the construction and operation of the transport corridor will be experienced.

The timing for construction of the Projects within the Drury Package is not certain. To enable an assessment of the potential effects of the Projects on the environment, the assumed construction start dates are summarised below. However, the actual timing for construction could be sooner or later than this date:

- NoR D1, D2 and D3: by approximately 2028
- NoR D4 and D5: from approximately 2028 to 2048.

Within the Drury Package Project areas there are a range of existing and future urban zoning patterns, which influence the likely future environment for assessment purposes. Project areas with existing urban zoning or rural zoning that are not identified for future urban growth are not likely to materially change in the future (e.g. Bremner / Norrie Road and Hunua Road industrial areas and open space zoned land across Drury-Ōpāheke). Those Project areas that are currently rural or urban zoned but have recently been live zoned or up-zoned for urban development or have a FUZ are likely to experience material change because of the urbanisation contemplated by the operative planning provisions (e.g. within the Drury 1 and Ōpāheke 1 Precincts and FUZ across the Drury-Ōpāheke area). Where Project areas have FUZ, it is likely the construction of the transport corridors will occur in parallel with the urbanisation of these areas. Accordingly, when considering the environment within which the effects of the construction and operation of the transport corridor are likely to occur, this assessment considers whether it is appropriate to consider the existing or likely future environment for specific Project areas.

While land within the FUZ may currently be used for a range of general rural activities, it is recognised as a transitional zone and the AUPOL policy framework signals a land use change to an urban form over time. The timing of this change is expected to occur after the construction of the transport corridors, in parallel with provision of transport or potentially iteratively (e.g. so stages of the transport

corridors are developed over time). The likely future environment of the FUZ during the operation of the transport corridors has, therefore, been assessed as an urban or a developing urban environment albeit without a confirmed urban land use pattern or 'determined' urban form. Consideration to this is also given in the mitigation measures proposed for the proposed designations and alteration to existing designation. Where relevant, the urban land use patterns outlined in AC's Structure Plan for the Drury-Ōpāheke growth area has been considered together with any proposed plan changes depending on how far advanced they are through the plan making process.

Table 4-1 below sets out the likely future environment of the various Project areas based on where the relevant operative plan provisions signal a high probability of land use change over time.

The existing and future environment assumed in the assessment of each NoR are set out in more detail in Parts D to H of this report.

Table 4-1: Existing and Likely Future Environment across Drury-Ōpāheke

Project area	Environment today	Zoning	Likelihood of Change of the environment (based on zoning/policy direction)	Likely Future Environment (based on zoning/policy direction)
Drury-Ōpāheke Structure Plan area	Rural	Future Urban	High	Urban: mix of Centre, Mixed Use, Business and Residential land (with small areas of special purpose and open space use signalled) in general pattern signalled in Structure Plan
Drury-Ōpāheke²	Business	Business (Industrial)	Low	Business (Industrial)
	Open Space	Open Space	Low	Open Space
	Undeveloped and currently developing greenfield area	Local and Neighbourhood Centre, THAB, Mixed Housing Urban and Suburban	High	Urban including a range of uses including residential, business, education and open space signalled by existing zoning
Papakura	Urban Residential	THAB Mixed Housing Urban Mixed Housing Suburban	Medium	Urban Residential (higher density)
	Cemetery	Special Purpose - Cemetery	Low	Cemetery

² Outside of the Drury-Ōpāheke Structure Plan area. These areas include areas zoned for development including Drury Village and open space areas including Drury Sports Complex, Ōpāheke Sports Fields and reserves. They also include undeveloped and currently developing greenfield areas including Drury 1 Precinct including Auranga Development and Ōpāheke 1 Precinct including Bellfield Estate.

4.2 Consideration of Alternatives

4.2.1 Statutory Requirement to Consider Alternatives

When considering a NoR by a requiring authority, a territorial authority is required under section 171(1)(b) of the RMA to have particular regard to whether adequate consideration has been given to alternative sites, routes, or methods of undertaking the work if either:

- a) The requiring authority does not have an interest in the land sufficient for undertaking the work; or
- b) It is likely the work will have a significant adverse effect on the environment.

In this instance, AT and Waka Kotahi do not currently have an interest in all of the land required for the construction and operation of the Projects. Section 171(1)(b)(ii) is therefore relevant to the assessment of the Drury Package.

AT and Waka Kotahi have considered an appropriately broad range of possible alternative routes and other methods for undertaking the Projects. The development of alternatives for the Drury Arterial Network was completed through a sequential options assessment process and refined through the development of these NoRs. Avoiding and/or minimising adverse effects on sensitive areas where practicable has been a key driver for the identification of the proposed designation corridor and the subsequent refinement of the corridor.

4.2.2 Alternative Assessment Methodology

The assessment of alternatives for the Drury Arterial Network involved the following stages:

- a) The identification of Indicative Strategic Transport Networks (corridors) within, and connecting to Auckland's Southern growth areas through the Southern Indicative Business Cases (corridor assessment). In February 2019 and May 2019 the AT and Waka Kotahi Boards (respectively) approved the South Indicative Business Case;
- b) Grouping the corridors within the South Indicative Strategic Transport Network into five packages including the Drury Arterial Network;
- c) Consideration of alternative route alignment options for the Drury Arterial Network (route refinement assessment);
- d) Further refinement of each route in the Drury Arterial network in order to determine the extent of the designations necessary for each Project (preferred alignment design refinement); and
- e) Confirmation of the Projects for route protection. In October and December 2020 the AT and Waka Kotahi Boards (respectively) approved the Drury Arterial Network as part of the Drury Local Detailed Business Case.

An assessment framework for the alternatives assessment which included a Multi-Criteria Assessment (MCA) for use in both the corridor and route refinement assessment processes. The MCA was developed for use across the Supporting Growth Programme. At the route refinement phase, this option evaluation process was tailored to make it specific to the requirements of the Drury-Ōpāheke programme area.

The MCA framework is a common tool used to assist in the alternatives assessment decision-making process. It provides an opportunity to understand how different options compare against a set of

standard and grouped criteria. The MCA framework developed and adopted by the Project Team involved the following:

- **Assessment criteria:** Transport outcomes and the four well-beings: Cultural, Social, Environmental and Economic. Several sub-criteria were developed under each wellbeing grouping which were assessed by technical specialists.
- **Opportunities:** identifying opportunities that can be taken forward in developing the options. These were identified by the relevant technical specialist.
- **Additional inputs:** Partner (Manawhenua, Auckland Council and KiwiRail) and landowner feedback, policy analysis, value for money and resilience.

Options were assessed, and where appropriate, scored at each stage by a multi-disciplinary team, using the MCA framework. Constraints mapping and existing evidence from desktop research were the main sources of information to assist with assessment. In assessing the criteria, guidance was provided by the policy direction of the AUPOIP (e.g. overlays), which could place constraints on the various options identified.

Assessment of the options against the criteria was completed by technical experts and discussed at several MCA workshops. The MCA was not the sole means of assessing options but was a tool that informed and was complementary to the decision-making process for the preferred option. The process incorporated input from Manawhenua, feedback from the consultation and engagement process and subject-matter experts. Manawhenua representatives have expressed views, provided specialist advice and raised key issues through workshops and hui held throughout the process.

Figure 4-1 outlines the alternatives assessment process undertaken for the Projects through the corridor assessment and route refinement phases (stages (a) to (e) in the list above). Following this process, a comprehensive assessment of alternatives was undertaken and is provided in Appendix A.

A summary of the alternatives assessment for each NoR, including an overview of the options considered, key decisions made during the assessment of options and design refinement is also outlined in Parts D to H of this report.

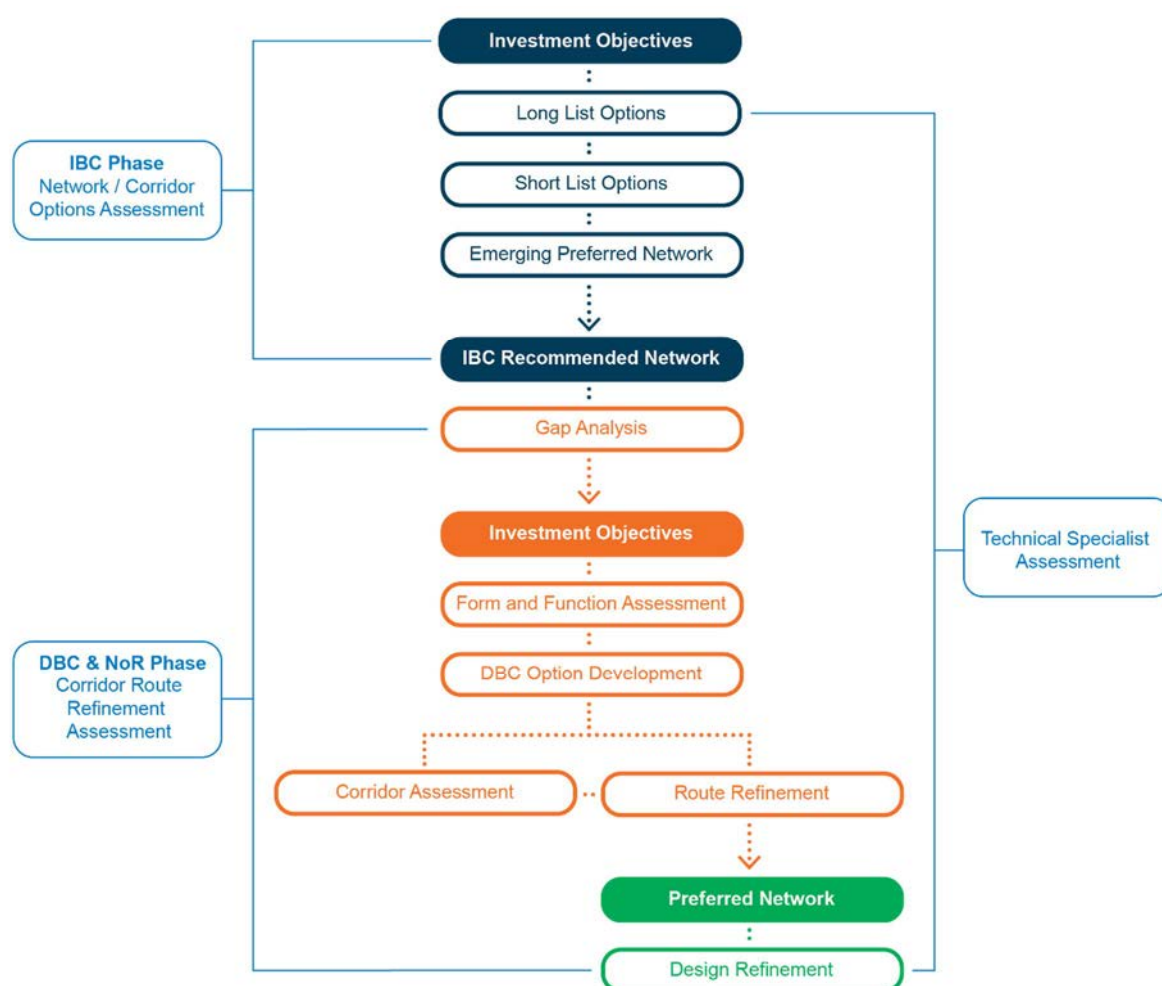


Figure 4-1: Alternatives Assessment Process

4.2.3 Intersection Form Assessment

Once the preferred route refinement options for the Projects were identified, an assessment was undertaken to determine preferred intersection forms across the network.

Considerations for alternative intersection treatments for the Drury Package included:

- Maintaining existing vehicle access to private property where practicable, but not in a way that precluded efficient movement along the corridor, particularly for PT and active modes
- Adequate consideration of modal needs at intersections, for example priority intersection requirements for FTN and safe and efficient crossing opportunities for active modes
- Intersection size (determined by SiDRA modelling), particularly in more constrained existing urban areas
- Ensuring each intersection had sufficient space for queuing length and the level of service is acceptable

Where an intersection was required, guidance was used to determine whether this should be a roundabout or a signalled intersection. The guidance considered a number of factors including operational performance, safety, road environment and different road users. The guidance adopts a 'Safe Systems' approach in line with AT's Vision Zero Policy and recommends roundabouts as the first choice for at-grade intersections due to the safety benefits for vehicular traffic resulting from

slowing down through traffic and reducing the number of conflict points. However, where roundabouts are not appropriate, signalised intersections are then analysed. For either intersection typology chosen, design features were also considered to ensure that the intersection meets the needs of different users safely and effectively and responds to site specific factors.

4.2.4 Design Refinement

During the route refinement options assessment process, Project Team specialists identified a number of areas where further design considerations could be considered, or refinements should be made to deliver a better outcome. Once a preferred option was selected by the Project Team through the route refinement assessment, designers and specialists worked together to identify and make design refinements with the purpose of either enhancing the route or further minimising adverse effects of the preferred option. This process was particularly useful where each option assessed had both positive and negative effects, allowing a more balanced approach that adopted positive, and avoided negative, effects where possible.

Further design refinement was undertaken following feedback from AEE specialist assessments and site investigations. For some projects, this resulted in additional refinement of the design. For example, to further reduce effects on a particular environmental feature.

The design and the proposed designation boundaries were also informed through discussion with stakeholders and affected land owners.

4.2.5 Approach to Stormwater Infrastructure

Alternative stormwater designs were considered for the Drury Arterial Network to inform the proposed designation boundaries for each Project. The land required for stormwater infrastructure to service the corridors is dependent upon the type of stormwater management devices chosen for each corridor. In order to determine the type and location of stormwater infrastructure for each corridor a design options process was undertaken. This process is summarised below:

- Identification of appropriate stormwater management devices for each corridor
 - The type of stormwater management devices identified for use was based on a number of factors including the surrounding land-use, the likely attenuation, detention and water quality requirements based on the Drury-Ōpāheke Structure Plan, form of the transport route, road hierarchy and how connectivity to any adjacent properties is to be provided.
- Identification of flood attenuation requirements and potential wetland locations
 - The following approach was generally taken to determine the need for, and location of attenuation devices such as stormwater wetlands, noting that stormwater attenuation devices tend to be most efficient where sited at a centralised location to capture larger catchments:
 - Assess the downstream flood risk
 - Estimate the runoff from maximum probable development (that is, maximum expected impervious areas within the transport corridor)
 - Design of a primary (10-year) network to cater for the runoff
 - Location and sizing of primary (10-year) attenuation devices if required to address any lack of capacity in the downstream network or to reduce the size of stormwater infrastructure (pipes) required.
 - Identification of secondary (100-year) flow paths and floodplains

- Location and sizing of secondary (100-year) attenuation devices to reduce floodplain and overland flow path extents.
 - If it was determined that a stormwater wetland was required, the location of the wetland was identified by locating the wetland suitably off-line at a low point along the alignment and close to the corridor for easy access and maintenance while avoiding high value environmental features. Also required was an outlet structure to discharge to a nearby natural stream.

Where environmental constraints had been identified by technical specialists through the route refinement options assessment, these were also considered as part of the design process.

As urban development planning for the urban land use surrounding each of the Projects progresses, there is an opportunity for iterative design to integrate stormwater solutions between the urban land use and transport system. As discussed in section 3.3, AT and Waka Kotahi will work with land owners and developers under the process in section 176(1)(b) to provide written consent for integrated stormwater solutions and development within the proposed designations – provided those works will not prevent or hinder the work authorised by AT's and Waka Kotahi proposed designations and alteration to existing designation for the Drury Package. It is anticipated that integrated stormwater systems within land designated for the arterial corridors may be delivered in partnership with developers.

4.2.6 Statutory Methods

Section 171 of the RMA requires an assessment of alternative methods in addition to routes and sites. A number of statutory methods to achieve the Projects were assessed as shown in Figure 4-2.

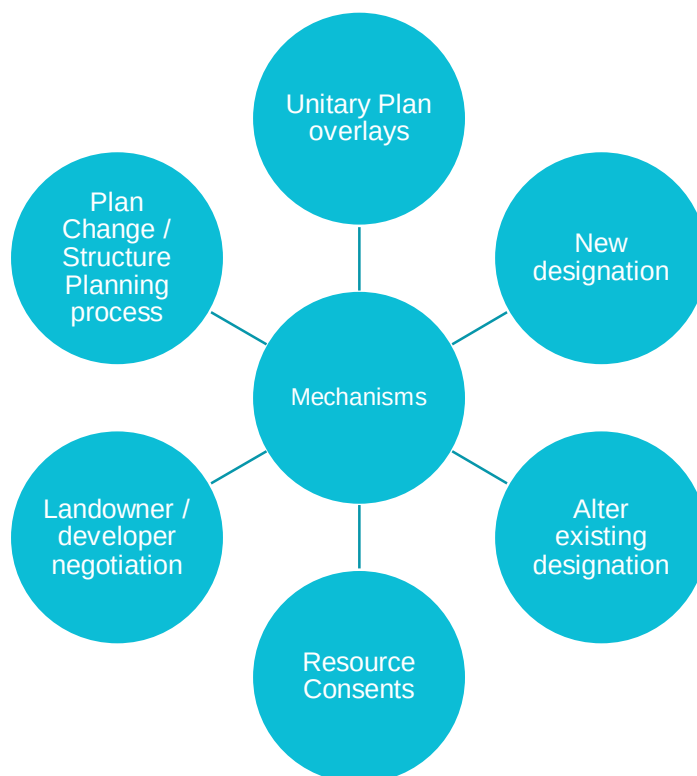


Figure 4-2: Route Protection Mechanisms

The planning context, key risks and considerations which may influence the preferred route protection mechanism were identified for each Project and each method evaluated taking into account the relevant planning context and identified risks and considerations.

Of the identified methods short term designations, legislation/ statutory document changes, AUPOIP 'corridor overlay' and resource consents were not considered appropriate methods for the Projects from the outset because they would not offer the appropriate long term protection of land required to implement the Projects.

Long term designations were the preferred method as they provide certainty to landowners, they signal the long-term transport system, recognising it may be implemented in stages, and they can enable interim use of the land where appropriate. The following methods were preferred for the Drury Arterial Network:

- An alteration to the existing designation (6707) was the recommended route protection mechanism for the SH22 Upgrade because there is already an existing designation and it provides an efficient and effective mechanism for providing route protection and providing certainty to all parties.
- New designations were the recommended route protection mechanism for the rest of the Drury Package as they provide the most efficient and effective mechanism for providing route protection in a changing urban environment and provide certainty to the community and to affected landowners.
- For the Ōpāheke Road Urban Upgrade corridor, a designation was recommended to protect the discrete areas of private land required for driveway regrading and the Ōpāheke Road / Settlement Road roundabout however the road reserve was not designated as the upgrade works can generally be entirely provided for within the existing road corridor

An assessment of each of the methods is detailed within the Alternative Statutory Methods section of the Assessment of Alternatives report attached at Appendix A.

4.2.7 Conclusion on process

A wide range of alternatives have been investigated for the addressing the future transport needs of the Drury-Ōpāheke growth area. The process and conclusion reached for each Project is documented in sections 8, 15, 22, 29 and 36 of the Report. The preferred option for each Project has been based on a comprehensive and robust optioneering process taking into account Manawhenua, stakeholder and landowner feedback and specialist assessment inputs. As such it is concluded that adequate consideration has been given to alternative sites, routes and methods for undertaking the work, satisfying the requirements of s171(1)(b) of the RMA.

4.3 Approach to Design

The proposed designations will protect land sufficient for the construction, operation and maintenance of the future arterial transport network. The design of the Drury Arterial Network has focused on developing the indicative alignments for the Projects that make up the Drury Package to a level sufficient to inform the proposed designation footprint and to assess an envelope of effects that includes potential construction areas, operational and maintenance requirements and areas required to mitigate effects.

The indicative designs provide preliminary alignments for the transport corridors that could be constructed within the proposed designation boundary to indicate what the final design of the Projects

may look like. The final details for the Projects (including the design and location of associated works including bridges, culverts, stormwater management systems, soil disposal sites, signage, lighting at interchanges, landscaping, realignment of access points to local roads, and maintenance facilities), will be refined and confirmed at the detailed design and resource consenting stage. As noted above, it is anticipated that there may also be subsequent changes to the construction works required as surrounding land use change progresses.

The design for the Projects has been based on the current (generally) rural land which has been zoned for future urban development. It is likely that some of the urban development will start occurring adjacent to the proposed designations before the future arterial transport corridors are required. As development progresses, AT and Waka Kotahi will work with land owners and developers on approvals required to work within the designation footprints to enable development (for example interim collector roads until the arterial is required in the future, or earthworks and development up to the future arterial road reserve).

The indicative designs are included in the drawing set in Volume 3. These have informed the proposed designation footprint and include ancillary components, such as construction areas and potential stormwater treatment requirements. The detailed design will be undertaken before construction and submitted as part of the Outline Plan or Plans (as the Outline Plans may be staged to reflect Project phases or construction sequencing) to Council prior to construction of the Projects. Resource consents will also need to be applied for in the future.

The indicative design drawing set contained in Volume 3 for each Project includes the following:

- General arrangement plan, including proposed designation boundary
- Plan and longitudinal section
- Typical cross-section
- Bridge typical cross-section (if relevant).

While the design and effects assessment has focussed on the ultimate form of the transport infrastructure (for example, a four lane FTN corridor) this does not preclude an interim step in the formation of part of the road corridor to support development. For example private developers constructing a two lane collector road before the four lane FTN arterial is required to service the full level of anticipated future growth.

The following sections provide an overview of the design philosophy and approach to the various design components.

4.3.1 Form and Function Approach

A Corridor Form Assessment Framework was designed to provide a consistent methodology to define the desired corridor form and function requirements across the Supporting Growth programme. Typical cross sections for each of the corridors within the Drury Arterial Network were confirmed through a collaborative process with AT and Waka Kotahi. This included a set of standard cross section typologies that could be implemented across the Drury Arterial Network. The corridor form and function for the Drury Package are shown in Figure 4-3.

The proposed cross sections, including any cross sections agreed with developers, informed the operational requirements for the proposed upgrades and new roads. This informed the proposed designation footprints required for the operation of the Projects.

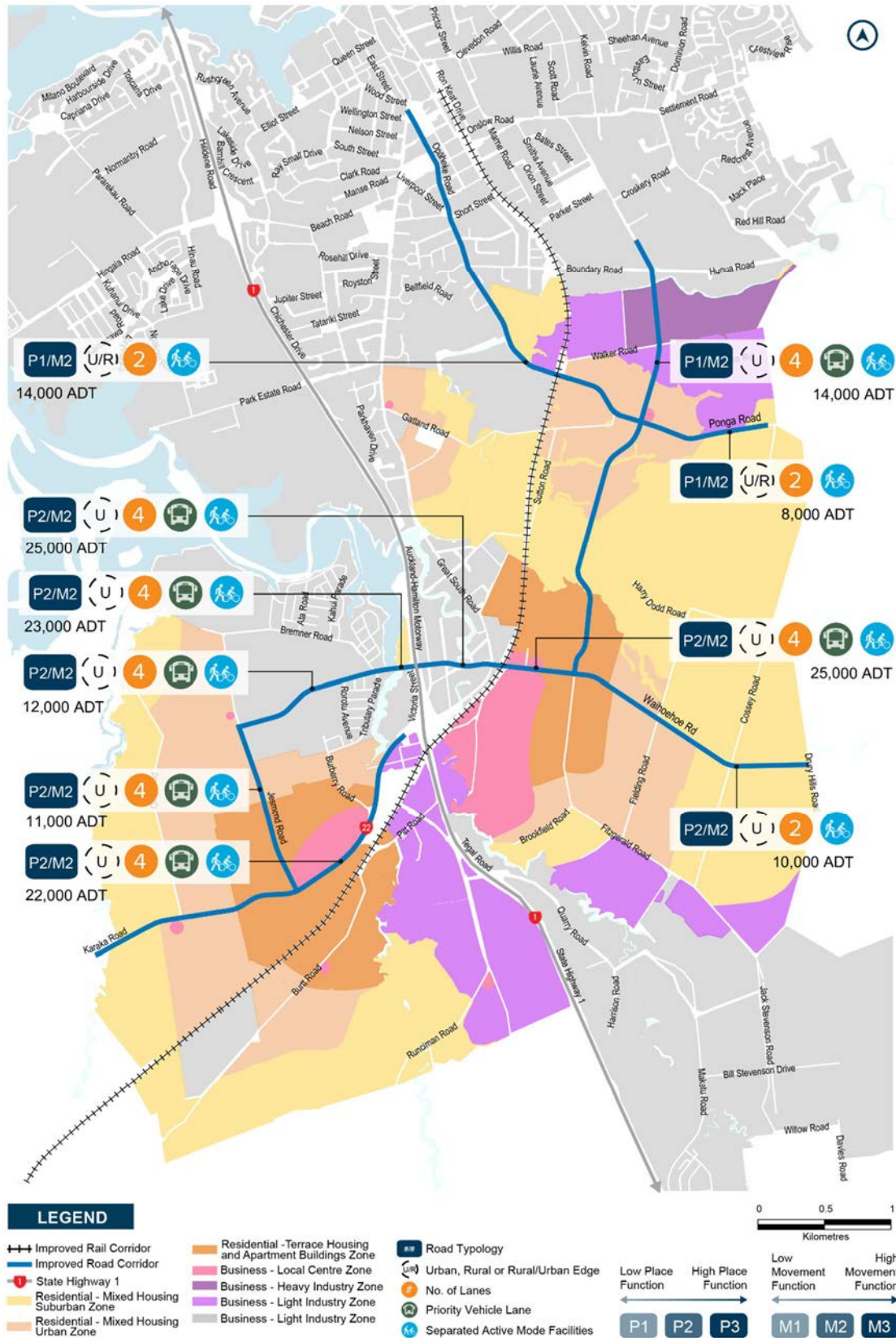


Figure 4-3: Drury Package Form and Function overlaid on indicative zoning identified within the Drury-Ōpāheke Structure Plan

4.3.2 Design Philosophy and Standards

The final design of the Drury Arterial Network will be confirmed in subsequent design phases. The design philosophy that informed the indicative designs developed for route protection is described in the following sections. Where appropriate, the following design standards and other relevant national standards were adopted when developing the design philosophy for the Drury Arterial Network:

- Transport Design Manual (TDM) – Auckland Transport
- Austroads Guide to Road Design (AGRD)
- State Highway Geometric Design Manual (SHGDM)

4.3.2.1 Arterial Corridor Design

Geometric Design

The indicative design of the Drury Arterial Network was developed in line with a range of geometric design standards such as:

- A design speed of 60km/h was adopted for all the arterial roads with a posted speed of 50km/h.
- The horizontal alignment was designed to best accommodate each corridor taking into account the existing topography and future land use.
- Normal crossfall of 3% is provided on all roads in accordance with the TDM and AGRD.
- A minimum desirable vertical gradient of 0.5% and a maximum vertical gradient of 6.0% was adopted for the alignments. Where possible, grades have followed the existing ground and are as flat as possible, consistent with the longitudinal drainage requirements.
- Generally, unless constrained, 1V:3H slopes have been adopted as the default batter for cut and fill slopes to meet maintenance requirements. 1V:2H spill through slopes have been adopted as the default approach for abutments at bridge locations, radially transitioning to 1V:3H side batter slopes.
- Bridge skew angles are limited to a maximum of 30 degrees relative to the service being crossed.
- The proposed designation footprints allow sufficient space for segregated active mode facilities and active mode crossings at intersections.
- Given the limited geotechnical information available, retaining walls are detailed as typical. Final wall types will be confirmed during subsequent design phases.
- Sections of the existing SH22 and Bremner Road corridors form part of an existing over-dimension route. The proposed designation footprint will accommodate freight movements and over-dimension or overweight movements within these corridors.

Intersections and local road tie-ins

The general approach to intersections is as follows:

- New intersections are located on straights where possible or large constant elements such as a single large horizontal radii
- Intersection approach angles are limited between 70° and 110° from the main alignment
- Intersection layouts take into consideration the input from traffic modelling data to inform the lane configuration.
- Intersections are graded to match the road profile and longitudinal grade of the main through road.

- Tie ins with side roads are as close to the intersection as possible whilst maintaining the safety to the road users. Vertically, the grade on the side road approach is between 0.5% and 8% to help avoid unnecessary earthworks and minimise tie in lengths.

Typical Cross Sections

The cross-section design incorporates AT Urban Street and Road Design Guide and Vision Zero design features. Typical cross-sections have been developed for the Projects within the Drury Arterial Network which generally incorporate the following elements:

- Berm and berm planting
- Footpath
- Separated cycleway
- Traffic lanes
- Bus lanes (FTN corridors only) and bus stop facilities
- Solid or flush median
- Communications duct for utilities
- Stormwater management
- Street lighting

Indicative cross sections for each Project within the Drury package are provided in Parts D to H of this report. Final cross-sections will be produced at the detailed design stage and will be submitted as part of the Outline Plan(s).

Utilities

Development of the design for utilities has not been undertaken. Engagement with the following utility providers was undertaken during the design development:

- Transpower;
- Watercare;
- First Gas Ltd;
- Counties Power;
- Vector Ltd.

The utilities that may be potentially affected have been identified and discussed with the respective owners. Specific recommendations identified during discussions with utility providers are noted on the drawing set included in Volume 3 and described in more detail in section 5.2.2 and in the individual indicative construction methodologies for each Project. Future design refinement will be required so that any potential impacts on utilities are managed and a process for ongoing engagement with affected utility providers is covered in the proposed designation conditions.

Other Design Elements

Design development of the following elements has not been undertaken and will be confirmed during detailed design:

- Pavement and surfacing;
- Signs and road markings;
- Landscaping;

- Road safety barriers;
- Lighting;
- Bus stop facilities; and
- Traffic signals.

4.3.2.2 Stormwater Design and Management

As resource consents are not being sought at this stage, the stormwater design approach for the Projects has focussed on identifying an indicative and feasible treatment methodology and proposed designation footprint required for appropriate stormwater management. The design of specific stormwater treatment features will be further developed at the future detailed design stage for each Project and resource consents sought at that time.

The indicative stormwater design and associated designation footprint has been developed taking into account existing stormwater infrastructure and stormwater management requirements, as well as future stormwater discharge and diversion, stormwater runoff quality, and flood hazard requirements. The AUPOIP and other industry standards, regulations and guidelines have been used to direct the indicative stormwater management footprint as described in the sections below.

Where stormwater management can likely be integrated with existing or future urban development no additional designation footprint for stormwater management has been proposed.

Stormwater Quality:

The proposed designation footprints have allowed for indicative stormwater quality treatment in accordance with Auckland Council Guideline GD01 for all existing and proposed impervious areas, except where a Project only consists of a pedestrian or cycle path. Generally, the indicative designs adopt treatment swales or wetlands, depending on which best fits the local conditions and topography. In some more urban settings, raingardens may be used. These devices have been selected on the basis that they are proven good practice, green infrastructure methods well suited to road corridors and the contaminants generated within them.

Stormwater Quantity

Retention and Detention

AUPOIP SMAF 1 design criteria for retention and detention measures has been allowed for each corridor in the Drury Arterial Network that is within the FUZ/greenfield environments, where discharging to freshwater streams. These criteria are summarised as follows:

- Provide retention (volume reduction) of at least 5mm runoff depth
- Provide detention and a drain-down period of 24 hours for the difference between the pre- and post-development runoff volumes from the 95th percentile, 24-hour rainfall event minus the 5mm retention.

Flooding

Where required, attenuation storage to match pre-Project peak flows to post-Project peak flows for either or both the 10- and 100-year rainfall events has been provided. Attenuation will be provided within devices which can be designed to detain larger storm events, including wetlands, ponds,

swales and in some instances rain gardens. In some instances, diversions or provision of compensatory flood storage is provided.

Resilience to flooding was applied through:

1. Setting the corridor vertical alignment above the 100-year ARI flood plain where practicable
2. Providing 0.5m freeboard for culverts between the headwater level and edge of the corridor
3. Providing freeboard to bridges in accordance with the Waka Kotahi Bridge Manual requirements

Stream Crossings

All existing streams and stream crossings will be maintained through either culverts or bridges. Bridges and culverts are proposed within the indicative design where appropriate to manage environmental effects. However, the final form of stream crossings with consideration to upstream ponding, erosion protection and fish passage will be confirmed during the future detailed design and resource consenting phase.

4.3.3 Urban Design Framework

Land use and transport integration, through the placement and interrelationship of movement networks and the areas they pass through, has the potential to contribute to high quality liveable places. The Drury Arterial Network will have a meaningful, and positive impact on the liveability and quality of the urban areas planned for Auckland's southern growth areas.

In recognition of this, the Supporting Growth Design Framework (the Design Framework) was established for the Programme. The Design Framework provides measurable guidance for outcomes-based decisions throughout each phase of the Programme delivery. The design principles that make up the Design Framework seek to ensure that any transport networks will contribute positively to new and existing communities, the environment and the social and economic vitality of Auckland.

There are twenty design principles that provide high level guidance on the following attributes: 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 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 Drury Arterial Network Urban Design Evaluation and Framework (the Urban Design Evaluation) (provided within Volume 4) provides a project specific overview and evaluation of the urban design considerations and inputs applied during option development and refinement of the Drury Arterial Network. The Urban Design Evaluation provides urban design focused commentary on the indicative design detail and recommends urban design outcomes that should be considered in future design stages. It also identifies future transport and land use integration opportunities for the network. The urban design evaluation for each Project are summarised in sections 9.13, 16.13, 23.13, 30.13 and 37.13.

4.4 Construction Methodology Approach

Within Parts D to H of this report, an overview of the indicative construction methodologies for each NoR is provided. This section describes the overall approach to these methodologies and how they have informed the proposed designation footprint.

Within each overview in Parts D to H for each Project, a description of key elements of construction is provided and an indicative construction programme. The information is indicative only and is intended to provide sufficient detail of the proposed construction activities to inform the proposed designation footprint (i.e. for key site compound and laydown areas), assess the potential effects on the environment, and to identify any necessary measures to avoid, remedy or mitigate those effects, where appropriate and relevant to the NoRs (as opposed to any outline plan to be submitted and any resource consents to be sought at a later date).

The construction methodologies which have informed the proposed designation footprints have been developed based on the indicative design and the current land use / land form in which the corridors are located. The actual construction of the Project will be influenced by many factors including the detailed design, timing of the Project, any measures to mitigate effects and the conditions of the proposed designation and any resource consents sought in the future and importantly land development that has occurred along the corridors in the meantime. As such, Waka Kotahi and AT seek flexibility in the Projects construction methods (where appropriate) to accommodate these factors and to retain opportunities to reduce the impacts and duration of any adverse effects of construction.

The construction of the Projects will be undertaken within management plan framework (as set out in the following section) and will be consistent with the conditions of each of the proposed designations and alteration to existing designation. If the contractors wish to undertake construction activities that are not within the scope of the proposed designations, or future resource consents, additional authorisations may need to be obtained at that time.

4.4.1 Environment and Stakeholder Management

Potential adverse effects from construction activities will be managed through the implementation of a suite of management plans or plans (where required to manage adverse effects of each NoR) including:

- Cultural Monitoring Plan
- Construction Environmental Management Plan (CEMP);
- Stakeholder and Communication Management Plan (SCMP);
- Network Utilities Management Plan (NUMP);
- Construction Noise and Vibration Management Plan (CNVMP);
- Construction Traffic Management Plan (CTMP);
- Urban and Landscape Design Management Plan (ULDMP);
- Heritage and Archaeology Management Plan (HAMP);
- Bird Management Plan (BMP); and
- Tree Management Plan (TMP).

The management of any potential or actual effects rising from construction activities that relate to resource consenting matters will be provided for when these consents are sought.

4.4.2 Site Establishment

4.4.2.1 Site Facilities

Site facilities and services are required to support construction along the proposed Project alignments. The proposed compound site locations identified for each Project enable easy access to key construction zones and arterial routes. Depending on its purpose, a site compound will generally be approximately 2,000m² to 3,000m², an area required for projects of the size and nature of the Drury Package, and to accommodate facilities generally including:

- Site offices including lunchrooms and ablution facilities;
- Services connection (power, water and communications);
- Car parking facilities;
- Waste management facilities;
- Laydown areas and lockable storage containers;
- Workshop space and plant/equipment storage areas and maintenance facilities;
- Refuelling facilities;
- Wheel washing and cleaning facilities; and
- Facilities for pre-casting products.

The use of these compounds will only be required during the construction period and the site will be reinstated upon completion of the works.

4.4.2.2 Site Clearance

Site clearance to allow for construction activities across the Projects may involve the removal of topsoil, fences, structures, trees, vegetation and other clearance works such as building demolition. Vegetation removal will be carried out by a suitably qualified contractor and will be in accordance with relevant designation conditions. Traffic management will be required during the clearing of vegetation adjacent to live carriageways.

In some instances, site clearance includes the demolition of existing buildings. Where properties are affected due to property boundary changes or impact to their driveways, accommodation works will be undertaken. Any property demolition will be carried out by qualified and competent specialised demolition subcontractors. The scope of demolition and accommodation works will be verified by the Projects contractors once detailed design and construction planning progresses.

4.4.2.3 Sediment Control

For each Project, an Erosion and Sediment Control Plan will be prepared by the contractor as part of future applications for resource consent. During construction, surface water will be managed in accordance with the applicable resource consent conditions and Auckland Council Erosion and Sediment Control Guidelines.

While subject to detailed design and resource consents, it is anticipated the Project sites will be managed through standard sediment control measures including, but not limited to:

- Silt fences, including around pond and lower batter of earthworks;
- Clean and dirty water diversion bunds;
- Sediment retention ponds and decanting systems;

- Flocculant chemicals;
- Stabilisation measures, mulching, grass seeding;
- Wheel wash station for trucks carting spoil; and
- Stormwater diversion to minimise overland flows on earthworks.

Parts D to H of this report identify the proposed measures specific to each Project including indicative locations for sediment retention ponds. To ensure ponds can be operational and maintained throughout the construction works they are located at the low points of the construction zones, outside the permanent works area. Areas for sediment control measures during construction have been provided for in the proposed designation footprint.

4.4.2.4 Traffic Management and Access

Construction of the Projects will likely involve disruption to the surrounding existing road networks and property access. Assessment and further detail of construction traffic effects are provided within the Assessment of Transport Effects provided in Volume 4, and summarised for each Project in Parts D to H of this report. Generally, access along the existing Project alignments will largely be maintained, however some closures will be needed for critical activities at night or on weekends. These disruptions will be managed by a CTMP that will set out traffic management methodologies and mitigation measures to be adopted for each of the Projects during construction. The CTMP will need to consider the potential road closures, temporary speed limit during construction, construction truck operating period to avoid peak time, any capacity reductions through lane closure, and any other ancillary effects such as shoulder closures and intersection closures.

Site Access Points (SAPs) will be required to access the nominated construction zones and work areas. Each construction zone may require several access points to ensure adequate access and flexibility for the construction works. Access for construction vehicles, plant and materials will be via the designated SAPs.

The SAPs and temporary traffic management controls will be in accordance with the Waka Kotahi code of practice for temporary traffic management (CoPTTM), and Temporary Traffic Management Plans will be developed by the contractor for the various stages and requirements of each of the Projects construction activities.

4.4.3 Network Utilities

Works in relation to any network utility will be undertaken in accordance with the NUMP and any agreements made with each network utility operator to ensure compliance with their methodologies, standards and requirements. The exact scope of works for service relocation will be confirmed through site investigations and be consulted and confirmed with the respective utility operators once detailed design of each Project is complete.

Service relocation works will be undertaken by a qualified and competent sub-contractor in consultation with the appropriate utility operators. Where works are required on the verge, they will be carried out under temporary traffic management.

4.4.4 Bridge, Culvert and Stream Works

Resource consents for bridge, culvert and related stream works will be sought as part of the future application for resource consents from Auckland Council. The bridge, culvert and stream works will be confirmed during detailed design and be undertaken in accordance with any specific conditions on the designation and the applicable resource consent conditions.

4.4.5 Earthworks

Resource consents for bulk earthworks will be sought in the future at detailed design and resource consents stage. Bulk earthworks will be required to accommodate road formation and contouring for the proposed stormwater wetlands. Bulk earthworks will be undertaken during summer earthworks months and minor earthworks and pavement construction can be carried out all year round provided sediment runoff and environmental controls are managed accordingly. Earthworks will typically include the following activities once enabling works have been undertaken:

- Topsoil stripping and removal of any other unsuitable material;
- Proof rolling and commencement of filling to a suitable subgrade layer;
- Final trimming and topsoil placement; and
- Landscaping and site reinstatement.

Within each of the construction areas an earthwork compound for handling, stockpiling some topsoil, loading and conditioning site won material will be established to enable better utilisation of the existing material. Where required, top soil stockpiles can also be utilised. The topsoil can be used as water diversion bunds for environmental control purposes. The remaining volume will need to be stockpiled in site laydown areas. Stockpiles of up to 5,000m³ along the alignments will be required at approximately 500m intervals. Areas for these activities have been provided for within the proposed designation boundaries.

Suitable dust management measures will be implemented in accordance with the CEMP for each Project and are anticipated to include:

- Water carts to minimise dust during earthworks
- Covered trucks hauling material onto and off site
- Mulching and top soiling of exposed earthworks

Erosion and sediment control measures will be installed as described in section 4.4.2.3 in accordance with the applicable resource consent conditions and Auckland Council Erosion and Sediment Control Guidelines.

4.4.6 Noise and Vibration

Assessment of construction noise and vibration effects for each Project are provided within the Assessment of Construction Noise and Vibration Effects provided in Volume 4, and summarised for each Project in Parts D to H of this report. Generally, construction noise and vibration will be managed to ensure its compliance with the relevant standards through a CNVMP, which will be prepared for each Project. This plan includes information required by, and to demonstrate compliance with, NZS 6803:1999 Acoustics – Construction Noise such as:

- General construction management practices;
- Context specific noise and vibration management and mitigation measures;

- Monitoring and reporting requirements;
- Procedures for handling complaints; and
- Review procedures.

4.4.7 Trucking Requirements

Trucking requirement volumes are preliminary and approximate. Assessment and further detail of construction traffic effects are provided within the Assessment of Transport Effects provided in Volume 4. Once detailed design of each Project is confirmed in the future, movements, as well as construction noise effects will be reassessed as part of the applicable Outline Plan and will be managed by the CTMP and CNVMP that will set out traffic and noise and vibration management methodologies and mitigation measures to be adopted for the Project during construction.

4.4.8 Construction Works Areas

The table below provides an overview of the typical construction elements, and the areas required to construct these elements for typical roading projects of this nature. Across the Projects these areas have generally been adopted within the proposed designation footprint to ensure sufficient construction areas are allowed for within the proposed designation boundary. Final works areas will be determined during detailed design and informed through the outline plan process.

Table 4-2: Typical Construction Work Areas

Construction Element	Typical Area Required for construction
Construction of batter slopes (rural)	6m from earthworks batter slopes
Construction of batter slopes (urban)	2m from earthworks batter slopes
Bridge construction (abutments)	20m either side of the bridge, and minimum 40m behind each abutment ends
Bridge construction (piers)	20m either side, and 10m longitudinally next to piers
Bridge construction (deck)	20 x 45m for crane pad and access for bridge beams
Retaining wall construction (minor/ small retaining walls e.g. timber or blocks works)	Typically 6m outside the wall
Retaining walls (large) e.g. secant pile wall, sheetpiles	15m outside of wall, 5m behind
Stormwater wetland	6m around for access and environmental controls.
Temporary sediment pond	3% of earthworks catchment area up to 1,500m ² (5ha) – typically 20 x 60m with 6m around for bunds and maintenance
Stormwater diversion or drain	6m from the diversion
Haul Roads	Minimum 15m for one- way. Large trucks e.g. ADT is 3m wide, and the tracks need 1m bunds either side. Aim for two way for safety in design

Construction Element	Typical Area Required for construction
Construction access road	Typically 4m wide for smaller vehicles, utes, etc. No heavy vehicle access.
Reconnecting property access (e.g. service lanes)	4m – 6m
Main site compound	1,000-3,000m ²
Additional site compound	1,000 – 2,000m ²
Construction yards (laydown)	Will typically occupy 500m ² to 1000m ² of the site compound area. Site laydown for material storage only are required, evenly spread out along the proposed alignment every 200m to 500m.
Construction yards (intersections works)	Approx. 5,000m ² each intersection to the rural side
Upgrades / tie ins to existing roads	Extent of permanent works
Drainage and culvert pipes	For smaller size culverts, between 300mm to 450mm diameter, and not requiring water diversion will only typically require 6m of work area around the perimeter of the permanent works Larger culverts above 450mm diameter will require a larger working area. Water diversion may be required and typically a work area 20m past the extent of the permanent works at the upstream end and 15m at the down-stream end
Headwalls	Typically 10m x 10m
Access roads / driveways	As required to accommodate access



PART C

Drury Package Consultation and Engagement

5 Consultation and Engagement

5.1 Introduction

This section provides an overview of partner, stakeholder and public engagement for the Drury Package. It summarises engagement during each phase of the Project including the tools and activities implemented, the parties engaged, the common issues and themes raised and the engagement outcomes.

Engagement for the Drury Arterial Network through all project stages including at the IBC, the DBC including options assessment and NoR preparation. Engagement has been with partners, key stakeholders, stakeholders, directly affected land owners and the wider community. The stages of engagement and feedback from those engaged with are described in the following sections.

5.1.1 Engagement Programme

The Drury Package has been through various phases of development and engagement. These development phases are set out in the table below.

Table 5-1: Project development and engagement summary

Project Stage	Timing	Engagement Summary
Programme Business Case (PBC)	2015 - 2016	- Engagement with partners, stakeholders and potentially affected parties has been ongoing since the development of the PBC in 2015. The PBC stage included engagement with partners. - Workshops, meetings and events were held with Manawhenua, Local Boards, communities and a wide range of stakeholders, to understand the issues, opportunities and community aspirations in each area.
Indicative Business Case (IBC)	2018/19	- The purpose of IBC engagement was to build on the PBC and to receive feedback and input from partners, stakeholders and the general public on the short-listed options being considered for the four business case areas. - Engagement was undertaken via information days, workshops and meetings to develop an IBC for the entire South growth area.
Detailed Business Case (DBC) / Notice of Requirement (NoR)	2019 - 2020	- The engagement and communication in the DBC built on the engagement undertaken during the earlier PBC and IBC stages of the Project - Engagement with stakeholders, developers, and landowners was undertaken to prepare the DBC and NoRs. - Engagement was undertaken in two stages. An initial feedback stage that sought to share information and seek feedback via website content, letters, e-updates, emails, phone calls, information sheets and online community engagement platform i.e. Social Pinpoint. A further engagement stage was undertaken subsequent to this that focused on understanding property impacts and sharing our indicative designation areas with landowners.

5.2 Engagement Summary

The purpose of this section is to summarise the engagement undertaken for the Drury Package, identify key themes or issues raised and how these themes have influenced the Projects.

Engagement and consultation has been undertaken with the following parties and stakeholders:

- Project Partners – Manawhenua, Auckland Council and KiwiRail
- Key Stakeholders
 - Auckland Council – Strategic, Regulatory, Local Boards (Franklin, Papakura and Manurewa), Parks, Heritage
 - Utility Providers – Watercare, First Gas, Transpower, Vector, and Counties Power
 - Heritage NZ Pouhere Taonga
 - Kāinga Ora
 - Ministry of Education
 - Department of Conservation
 - Fire and Emergency New Zealand
 - Developers – Lomai Properties Limited, Ma Development Enterprises (Auranga Development), Bellfield Estate, Oyster Capital, Kiwi Property Group Limited and Fulton Hogan
 - Southern Infrastructure Forum (utility infrastructure alignment).
- Wider Community – general community in Auckland's South particularly Drury and Ōpāheke and directly affected landowners.

5.2.1 Engagement with Project Partners

5.2.1.1 Ngā Manawhenua

Across the Programme, there are fourteen Manawhenua (Ngāti Tamaoho, Te Ahiwaru, Ngāi Tai ki Tāmaki, Ngāti Manuhiri, Ngāti Maru, Ngāti Te Ata Waiohua, Ngāti Whanaunga, Te Runanga o Ngāti Whātua, Ngāti Whātua o Kaiparai, Te Ākitai Waiohua, Te Patukirikiri, Ngāti Pāoa Trust Board, and Te Kawerau ā Maki) that were involved in the development of the indicative strategic transport networks, including the Drury Arterial Network. The Programme maintains a Manawhenua Forum (for operational and kaitiaki level interaction). The focus of the Manawhenua Forum is programme-wide delivery, particularly seeking consistency across projects.

Ngāi Tai ki Tāmaki, Ngāti Maru, Ngāti Tamaoho, Ngāti Te Ata Waiohua, Te Ahiwaru, Ngāti Whanaunga and Te Ākitai Waiohua have been actively involved in the development of the Drury Package and NoR documentation. Through regular hui, they have contributed to option development, alternatives assessment and design refinement processes for each corridor.

Manawhenua input into the alternatives assessment for the Projects was carried out alongside other specialist inputs in the MCA assessment process during alternatives evaluation. This process and specific feedback received is outlined in the Alternatives Assessment Report at Appendix A. The Manawhenua Forum also provided an opportunity for Manawhenua to highlight any concerns or opportunities that were then fed back into the design and planning processes. Key concerns and opportunities highlighted by Manawhenua included:

- Water quality – particularly stormwater treatment
- Ecology
- Cultural heritage

The Project team and Manawhenua have also attended site visits, and met at multiple hui to discuss other aspects of the Projects such as approach to the NoRs, assessment of environmental effects, updates from project environmental specialists and to discuss the approach to cultural impact assessments.

While Ngāti Tamaoho, Ngāi Tai Ki Tamaki, Te Ākitai Waiohū and Ngāti Te Ata Waiohū confirmed their intent to prepare a Cultural Impact Assessment (CIA) for inclusion in the NoR documentation. At the time of preparing this report, and due to their internal resourcing constraints (not least of which includes the COVID-19 pandemic) these have not been completed to date. A Historic Summary was prepared by Ngāti Tamaoho (included in Volume 4).

A number of workshops were held with Manawhenua to work collaboratively on the draft condition set. The conditions that relate to ongoing Manawhenua involvement in the Project were developed and agreed with Manawhenua.

5.2.1.2 Auckland Council Integration

Throughout the Supporting Growth Programme, Auckland Council Integration Meetings have been held regularly since May 2018. Throughout the Project, the Drury project team has attended the Auckland Council integration meetings to provide updates on key Project milestones and decisions. The purpose of the meeting is to inform Auckland Council on progress of the programme and collaborate on key deliverables. Key matters discussed at the meetings are:

- Updates on the wider programme and Project
- Keeping each other informed about upcoming meetings with individual landowners and developers in the South, to ensure consistent messaging
- Reviewing collateral/poster material for community engagement
- Confirming attendees at engagement events
- Updates on structure plans and private plan changes.

5.2.1.3 KiwiRail

The rail system is a key part of the transport network to provide for growth in the southern growth area. Proposed improvements includes electrification, new stations and capacity upgrades. While these improvements are not specific to the Drury Package, KiwiRail are a partner. The Waihoehoe Road and Ōpāheke Road North Island Main Trunk (NIMT) rail line overbridges have been discussed with KiwiRail. Before works commence, any works within the rail corridor will be discussed, and permission to work within their designation and within the rail corridor will be sought from KiwiRail for the bridge construction activities.

5.2.2 Engagement with Key Stakeholders

5.2.2.1 Auckland Council

Local Boards

The Project Team have provided regular presentations to the Franklin, Papakura and Manurewa Local Boards and Councillors in the Project areas. The draft Drury Arterial Network was presented to the Auckland Council 'special' Planning Committee (as part of the South Indicative Strategic Transport Network) on 13 February 2019 and on 18 March 2020. These meetings covered the

projects in the south and provided an opportunity for Auckland Council and Local Board representatives to ask questions and seek clarifications about the Drury Arterial Network.

The purpose of these meetings was to update the Local Board members on the work undertaken in relation to the DBC/NoR, to share plans for the proposed landowner engagement for 2020 and share feedback received following the engagement undertaken. The meetings provided an opportunity to share an integrated story on infrastructure planning (transport, water, wastewater) for the Project area, respond to any Local Board queries and seek feedback from the Local Board on how we can reach a fair representation of the community through our engagement methods. The three Local Boards were updated via email throughout 2020 as the Projects advanced and were provided with an information pack prior to the first stage of engagement.

There was general support from the Local Boards for the planned projects, recognising the need for route protection of key linkages and provision of public transport and active transport facilities in the Drury area. The Local Boards supported a holistic view of infrastructure, council assets, community facilities, and open space networks. Local Board feedback has been considered as part of refinement of the Projects.

Parks

The Project Team has met with the Auckland Council Customer & Community Services Directorate to discuss the Drury Arterial Network, in terms of the potential impacts of the Projects on parks and reserves, and areas where impacts on parks and reserves have been reduced through the alternatives assessment. It also provided an opportunity for Auckland Council to share information on the future uses and upgrades planned for parks and reserves in the wider area to inform the design and assessments, including proposed upgrades to the Drury Sports Complex and recent, and ongoing upgrades to Ōpāheke Reserve. On the basis of the information shared by Council, further design refinement was undertaken to reduce impacts on Parks land including Ōpāheke Sports Park within Ōpāheke Reserve. Subsequently, Auckland Council Parks have not raised any further concerns with the proposed designation boundaries on their land.

Heritage

The Project Team has met with Auckland Council Heritage to discuss the Drury Local Network, in terms of any potential impacts of the Projects on items of historic heritage, and areas where impacts on historic heritage have been reduced through the alternatives assessment. It also provided an opportunity for Auckland Council to share information on historic heritage in the area arising out of their recent research for the Drury-Ōpāheke Structure Plan, to help inform the design and assessments. The Council acknowledged that some sites containing historic heritage are not protected and will be zoned for development (FUZ), and these historic heritage features are unlikely to be protected through development of the land. The Council noted the impact on the former Drury Cheese factory (CHI Site) and that this site has might have some community interest. Future assessment of these values has been discussed with the Council and is identified in the Assessment of Historic Heritage Effects provided within Volume 4, and summarised and summarised in sections 9.4, 16.4, 23.4, 30.4 and 37.4 for each of the NoRs.

Engagement, including a site visit, with the Auckland Council Heritage team has been ongoing throughout the preparation of the Assessment of Historic Heritage Effects which forms part of the NoRs.

Cemetery Services

The Project Team has met with Auckland Council Cemetery Services onsite at the Papakura Cemetery to discuss the proposed works at the Ōpāheke Road / Settlement Road intersection (NoR D5). Specifications of setback from burial plots were identified to assist in determining a preferred intersection configuration. Auckland Council identified that if the cemetery was impacted there would be interest from the Returned Services Association and Local Board. Additionally, the family of adjacent burial plots should be contacted if the Cemetery is impacted. Engagement with Auckland Council continued identifying the need for landowner approval at the time of construction, in the future.

5.2.2.2 Heritage New Zealand Pouhere Taonga

The Project Team has met with Heritage New Zealand Pouhere Taonga (HNZPT) in February and December 2020 to discuss the Drury Arterial Network. In February the Project Team shared the preferred options, any potential impacts of the Projects on items of historic heritage, and areas where impacts have been reduced on items of historic heritage through the alternatives assessment. It also provided an opportunity for HNZPT to share information on historic heritage in the area and raise opportunities or concerns around impacts on historic heritage arising from urban development and/or the Projects. The Project Team advised HNZPT that resource consents and HNZPT authorities will be sought in the future. In late 2020 the Project Team presented the findings of the historic heritage assessment and proposed mitigation measures with HPTNZ.

5.2.2.3 Ministry of Education (MoE)

The Project Team has met with MoE during 2018 to 2020 to discuss potential new school locations in Drury and issues/opportunities with potential route options. These discussions with MoE occurred at a joint level with AT and Auckland Council and at project level. The particular areas of interest for MoE include:

- Plans for developing a new primary school in Drury by 2021
- Future school sites and long-term needs, including potential new school locations in Drury
- Issues/opportunities with the recommended transport networks / connections within growth areas
- Integration between projects and future transport connections

Feedback from MoE has been considered as part of refinement of the Projects. As part of this, an agreement was reached through Plan Change 6 proceedings with AT, MoE and adjoining landowners on the position of the alignment of the Bremner Road FTN Upgrade where it meets Jesmond Road. The design has been developed to align with this agreement. A meeting was held in early 2020 to discuss the proposed alignment from Jesmond Road to Bremner Road with reference to MoE's site at 281 Jesmond Road and Designation 5062 near Burberry Road and discuss timing of the projects. It was agreed to continue ongoing communication with MoE since the timing of the proposed schools and the Drury Arterial Network are uncertain.

In December 2020 the Project Team met with MoE to provide an update on the Drury Package. MoE shared their plans for completion of Drury West Primary School (Burberry Road site) in 2022 and to lodge an NoR early 2021 for the site at 281 Jesmond Road. Discussion around access to the 281 Jesmond Road site was held with access to be provided onto the new Jesmond to Bremner link road once constructed in the future. Engagement with MoE will be ongoing throughout the post-lodgement phase.

5.2.2.4 Department of Conservation (DOC)

The Project Team has met with DOC to discuss the Drury Arterial Network and any potential impacts of the Projects on DOC land. It also provided an opportunity for DOC to share information on conservation land in the area. DOC identified public conservation land north of Bremner Road which holds a pa site. This has recently been included as a Site of Significance to Mana Whenua in the AUPOIP. DOC also noted discussions with the Waka Kotahi Papakura to Drury South project team and that ground penetration studies had been undertaken on this site as part of that project.

5.2.2.5 Fire and Emergency NZ (FENZ)

The Project Team met with FENZ to discuss the Drury Arterial Network progress and to seek feedback. The areas of interest for FENZ include ensuring adequate and rapid access to fire stations including, any new/changes to heavy and/or light rail crossings. The Project Team has discussed a proposed future fire station in Drury. Feedback from FENZ has been considered as part of refinement of the Projects

5.2.2.6 Network Utilities

Watercare

Engagement with Watercare has been regular and ongoing throughout the development of the Drury Package. In addition to consideration to their existing assets, Watercare is a key network utility required to plan for future urban growth in the southern growth area. Areas of interest to Watercare that relate to the Drury Package include:

- Location of the Waikato 1 Watermain, including at the intersection of Waihoehoe Road and Great South Road (NoR D2), at Ōpāheke Road near the NIMT rail line (NoR D5) and at the Hunua Road Boundary Road intersection (NoR D4)
- Proposed booster station at 72 Hunua Road (NoR D4)
- Location of pump stations and aspirations for future water infrastructure to support the future growth.

The key feedback from Watercare has been in relation to the Waikato 1 watermain which the Project Team has considered as part of refinement of the Projects, in particular the Waihoehoe West FTN Upgrade (part of NoR D2) and the Ōpāheke Road Rural Upgrade (part of NoR D5). During engagement with Watercare the following was discussed:

- Waikato 1 Watermain at the Waihoehoe Road/ Great South Road intersection (part of the Jesmond Road to Waihoehoe Road West FTN Upgrade (NoR D2)) will need to be relocated at the time of works, as this cannot be avoided due to the bridge abutments from the Waihoehoe NIMT bridge.
- Waikato 1 Watermain can be protected if required at the Hunua/Boundary Road intersection (part of the Ōpāheke N-S FTN Arterial (NoR D4)).
- Opportunities for the Projects to integrate at the proposed booster pump station at 72 Hunua Road, adjacent to the proposed Boundary Road / Hunua Road intersection with Ōpāheke N-S Arterial (NoR D4), were explored and a mutually agreeable solution was developed. This included the internal road layout for the booster station being designed to accommodate the potentially shifted kerb space.

- Following feedback from Watercare, the design of the Ōpāheke Road rail overbridge (NoR D5) was revised, shifting the alignment to the north to avoid impacts on the watermain as well as the sports fields at Ōpāheke Reserve.

Watercare were also provided the opportunity to review the draft General Arrangement Drawings to ensure they aligned with previous discussions. The draft condition for a Network Utility Management Plan (NUMP) was also shared with Watercare for comment.

First Gas

Engagement with First Gas has been ongoing throughout the development of the Drury Package, with regular meetings to discuss issues/opportunities for managing and operating high-pressure transmission pipelines through pipeline easements and designation corridors, particularly with the planned growth surrounding their assets. Matters of interest to First Gas that relate to the Drury Package include:

- Project overview / updates and information sharing
- Integration of their infrastructure with the proposed road upgrades
- Their existing designation (Designation 9104) that will be overlapped and/or altered to re-align their network by the Waihoehoe Road East Upgrade (NoR D3), Ōpāheke N-S FTN Arterial (NoR D4) and Ponga Road Upgrade (NoR D5)
- Shared list of conflicts between their infrastructure and proposed networks
- Identified solutions to address the conflicts
- Landholdings and easements

Discussions with First Gas are ongoing as we work through a proposed programme for altering/ relocating and potentially realigning the existing First Gas designation (9104) which runs parallel to, and within NoR D4, and where the gas line crosses SH22 and part of the future Drury centre development area. Feedback from First Gas has been considered as part of refinement of the Projects, particularly where protection, relocation and approvals will be required in the future.

First Gas were provided the opportunity to review the draft General Arrangement Drawings to ensure they aligned with previous discussions. The draft condition for a NUMP was also shared with First Gas for comment.

Engagement with First Gas will continue, particularly at the detailed design stage. Of note, where the proposed Drury Package designations intersect existing First Gas designation, approval will be sought from First Gas for any works within their designation boundary.

Transpower

Engagement with Transpower has been ongoing throughout the development of the Drury Package, with regular meetings to discuss issues/opportunities for managing and operating the Transpower Grid. In addition to consideration to their existing assets, Transpower is a key network utility required to plan for future urban growth in the southern growth area. General matters of interest for Transpower include:

- Project overview / updates and information sharing
- Impacts arising from growth on network assets in Auckland and identification of risks to network

- Integration and network alignment with other infrastructure corridors, including the SH1 Papakura to Drury South project currently being developed by Waka Kotahi as part of the NZ Upgrade Programme (NZUP)
- Transpower network is generally considered sufficient for 20 years with the timing of new infrastructure in the 10-20-year horizon
- Land use challenges and expectations in greenfield areas
- Collaborating and sharing resources for similar outcomes
- Coordinating GIS information in terms of assets

Specific feedback from Transpower in relation to the Projects includes:

- Pylon (asset) impacts specifically for the Ngakoroa Stream crossing on Bremner Road (part of the Jesmond to Waihoehoe Road West FTN Upgrade (NoR D2)) to the west of SH1 where both the 110KV and 220kV overhead lines cross. Transpower advised on clearance distances for working under and around the lines. The Project has incorporated feedback from Transpower on clearance requirements for these lines.
- Advice on the application of the AUPOIP provisions, corridor and National Standards to its assets
- The timeframes and process for approvals to relocate pylons and Transpower assets. However, relocation of pylons is not proposed for the Drury Projects.

Feedback from Transpower has been considered as part of refinement of the Projects. In particular, where the 220kV and 110kV lines pass over the Ngakoroa Stream bridge on Bremner Road, vertical clearance is constrained by the transmission lines and the required stream flood levels. The Project Team has been working with the Waka Kotahi Papakura to Drury South team, as this project proposes to replace the existing Bremner Bridge crossing the Ngakoroa Stream in the near future (associated with SH1 widening). The Jesmond to Waihoehoe Road West FTN Upgrade (NoR D2) will construct a new bridge (or widened bridge) adjacent to this in the future to provide for the FTN lanes. The design of this bridge has been informed by the Papakura to Drury South project, which has been developed to provide adequate clearance. It is also understood that the 110kV towers may be relocated in conjunction with the Papakura to Drury South project.

Transpower were also provided the opportunity to review the draft General Arrangement Drawings to ensure they aligned with previous discussions. The draft condition for a NUMP was also shared with Transpower for comment.

Vector

Engagement with Vector has been ongoing throughout the development of the Drury Package, with regular meetings to discuss issues/opportunities for managing and operation of Vector assets. There are no Vector electricity networks within the Drury projects, so discussions have focused on their gas infrastructure. In addition to consideration to their existing assets, Vector is a key network utility required to plan for future urban growth in the southern growth area. Matters of interest for Vector include:

- Project overview / updates and information sharing
- Impacts arising from growth on network assets in Auckland and identification of risks to network
- Timing of new infrastructure
- Collaborating and sharing resources for similar outcomes
- Coordinating GIS information in terms of assets

Specific feedback in relation to the Drury Package includes the location of gas lines on SH22 and the existing network in the Manurewa / Drury area. Impacts on the Vector gas network are minor and feedback from Vector received by the Project Team has been considered as part of refinement of the Projects.

Counties Power

In addition to consideration to their existing assets, Counties Power is a key network utility required to plan for future urban growth in the southern growth area. Engagement with Counties Power has been ongoing throughout the development of the Drury Package, with regular meetings to confirm interfaces, identify specific assets, and discuss issues/opportunities to align with planned new 110Kv feed from Drury to Paerata / Pukekohe with a new substation in the next five years. Key matters of interest for Counties Power included:

- Existing Medium Voltage overhead lines along sections of SH22
- Counties Power's expansion plan at its existing substation off Ōpāheke Road

Feedback from Counties Power received by the Project Team has been considered and integrated as part of refinement of the Projects. Generally, the following was agreed between Counties Power and the Project Team:

- Low voltage lines will be relocated as required
- Existing 22kV overhead lines will need to be relocated/undergrounded as part of the improvement works
- Existing fibre cables will need to be relocated and/or protected during construction
- Existing 110kV line poles will need to be relocated
- Regrading of the entrance to the substation at 9 Ponga Road, which has a network of 22kV cables beneath, will be required as a result of the Ōpāheke Road Rural Upgrade works (part of NoR D5). The opportunity to move this access to Sutton Road as part of the substation upgrade works was also discussed.

Counties Power were provided the opportunity to review the draft General Arrangement Drawings to ensure they aligned with previous discussions. The draft condition for a NUMP was also shared with Counties Power for comment.

5.2.2.7 Developers

The Project Team have engaged with multiple developers. Engagement with developers enabled greater understanding of their land holdings and established relationships for ongoing engagement. Engagement with developers in the wider Drury and South Auckland area are ongoing. Some developers with interests in the Projects generally, rather than property directly impacted by the transport networks, have also been engaged with. Engagement with developers was led in some instances by the Project Team, and by developer 'relationship owners' from within Waka Kotahi and AT. Engagement focused on how their land is potentially impacted by the proposed alignments, understanding the process and potential timing for approving the Projects and opportunities for integration.

Kāinga Ora

The Project Team has met with Kāinga Ora to discuss the Drury Local Network and its relationship with Kāinga Ora assets / property. Kāinga Ora have three sites in Drury: Jesmond Road; top end of

Burberry (in Auranga Development); and 1 East Street (north of Drury Domain). They also own a single dwelling at 8 Fitzgerald Road.

The Project team was particularly interested in Kāinga Ora's East Street Development as NoR D2 proposes to realign Tui Street (off Waihoehoe Road to Great South Road with restricted turning movements (left in and left out). Kāinga Ora advised they have no immediate plans for the development of this site and designs are still at the concept stage with no planning assessment undertaken by Kāinga Ora for the site. Kāinga Ora are looking to progress this development further in 2021.

For the Jesmond Road site, turning lanes into the site off Jesmond Road were discussed. The Project team have advised there will be sufficient width in the road corridor to provide this in the future.

The Burberry Road site is not impacted by the Projects.

Karaka and Drury Limited – Auranga Development and Proposed Plan Change 51 (Private): Drury 2 Precinct:

Engagement with Karaka and Drury Limited (Auranga) has been undertaken throughout the development of the Drury Package. Auranga and the Project Team have a working relationship and information sharing is ongoing throughout the development of the Drury Projects.

Auranga and Auranga B1

With regard to NoR D2, the alignment of a new section of road between Jesmond Road and the road currently being formed in the Auranga Development ("Road 1") which forms part of the Bremner Road FTN Upgrade that was agreed through an appeal on Plan Change 6 (now operative) by AT and affected landowners. Engagement with Auranga and property owners in this area has helped to inform the indicative design and proposed designation footprint.

The transport corridor at the eastern extent of Road 1 within Auranga Development is currently under construction for a two lane road, and an agreement has been made with AT on the land required for the four lane road corridor. The interim road formation will be prepared by Auranga with the full 28m cross section to be upgraded in the future by AT as part of the Drury Package.

Auranga have provided advice on development within the precinct which has informed the indicative design and proposed designation boundary.

Auranga B2 (PC51)

Auranga informed the Project Team about their recently lodged Plan Change 51 adjacent to SH22 (NoR D1). The interface with the Drury Package Projects was discussed.

Bellfield Estate TBC

The Project Team met with a representative of the Bellfield Development in September 2020 to discuss plans for the Ōpāheke Road (rural and urban) upgrade. Bellfield wanted to make sure the access to the development would be retained during construction works and had no issues with the proposed upgrade. The proposed stormwater wetland associated with NoR D5 in Ōpāheke Reserve was discussed. Bellfield advised they would be starting earthworks within the northern aspect of the reserve for flood mitigation associated with their development. This also involves including recreational facilities for the community (as part of their development agreement). They saw no issues with the

location of the proposed stormwater wetland (which will upgrade an existing stormwater wetland within the reserve).

Fulton Hogan Land Development Limited – Proposed Plan Change 49 (Private): Drury East Precinct

Feedback from Fulton Hogan Land Development Limited (Fulton Hogan) was received by the Project Team. Fulton Hogan has significant land holdings at Drury East within the Future Urban zone, to the east of Fitzgerald Road. Fulton Hogan provided written feedback on the Drury Package that was provided to the Project Team. The feedback identified that Fulton Hogan *generally supports the intent of the transport options shown, and encourages the Supporting Growth Alliance to finalise them and progress the Notice of Requirement and land take process.*

In December 2020 the Project team offered to meet with Fulton Hogan to discuss, and provide an update on the Drury Arterial Network. Fulton Hogan did not seek to meet with the Project Team.

Oyster Capital Limited – Proposed Plan Change 50 (Private): Waihoehoe Precinct

Oyster has proposed a plan change on 49 hectares of land on the northern side of Waihoehoe Road east of the NIMT rail line. In early 2020, Oyster provided written feedback on the Drury Package. In summary, the feedback identified that *Oyster generally supports the intent of the transport options*, however provided the following feedback:

- The proposed north-south connection extending Ōpāheke Road through Drury East should be designed as a two lane collector road rather than a four lane arterial road.
- Land to facilitate the widening of Waihoehoe Road should be taken from both sides of the road rather than taking land predominantly from the northern side of the road.

In September 2020, the Project Team met with Oyster to discuss these concerns, in particular providing a summary of alternatives assessment and reasoning for the proposed alignments. During this engagement, Oyster identified their key issues as:

- Ōpāheke N-S FTN: alignment, width of road and proposed designation;
- Waihoehoe Road West: widening to the north side; and
- Intersection of Waihoehoe Road West and Ōpāheke N-S FTN.

Agreement with Oyster to realign the southernmost section of the proposed Ōpāheke N-S FTN Arterial within the proposed Waihoehoe Precinct Plan Change area (PC50) was made. The key reason for the realignment is to better integrate the proposed transport corridor with Oyster's development plans with the ability for land to be set aside either side of an initial collector road built by Oyster to upgrade to the four-lane FTN arterial in the future. Engagement with Oyster is ongoing.

Lomai Properties – Proposed Plan Change (Private): Waipupuke

Engagement with Lomai Properties has been undertaken to share information on the Drury Package and the proposed Waipupuke private plan change which interfaces with SH22 Upgrade (part of NoR D1) and Jesmond Road FTN Upgrade (part of NoR D2). Lomai Properties were also interested in future upgrades to Oira Road and the Jesmond Road extension and the proposed Drury West rail station.

Lomai Properties are supportive of the Drury Package and suggested collaboration and to continue information sharing with the Project Team.

5.2.2.8 Southern Infrastructure Forum

A Utility Infrastructure Alignment forum lead by the Supporting Growth Programme in partnership with Watercare was attended by the Supporting Growth Programme in August 2018, June 2019 and October 2019. This forum provided an opportunity for integration between infrastructure/utilities projects in the South. The Southern Infrastructure Forum included representation from:

- KiwiRail
- AC
- Watercare
- Vector
- Transpower
- Healthy Waters
- Chorus
- Housing NZ
- Crown Infrastructure Partners
- AT
- Waka Kotahi
- Auckland System Management

5.2.3 Engagement with Landowners and the Community

Engagement with landowners and the community during preparation of the NoRs was undertaken in four phases, as well as a follow up stage, as outlined in Table 5-2. The sections below provide a summary of the engagement outcomes at each of these phases.

Table 5-2: Overview of Landowner and Community Engagement

Engagement Phase	Description
Phase 1: June – July 2019	Prior to the public release of the South Indicative Strategic Network, approximately 1,500 letters were sent to property owners whose properties were within broad “corridor study areas” for some of the projects in the south. Landowners were invited to meet with Project team members to discuss what that might mean for them. The Project team met with landowners individually to gain an understanding of local knowledge of the area, how they use their land, to talk through the indicative strategic transport networks and to understand any potential constraints, issues and opportunities. 38 engagement meetings were conducted with Drury landowners.
Phase 2: December 2019	Letters were sent to approximately 230 landowners within the Drury Package project areas seeking feedback on the draft preferred options identified for the SH22 upgrade, Jesmond Road, Bremner Road, Waihoehoe West FTN upgrades and Ōpāheke North-South FTN arterial projects. An email update was also sent on 12 December 2019 to stakeholders to advise them of the draft preferred options sent to landowners, and share plans for engaging with potentially affected owners in 2020. Responses were received from 14 landowners and 10 stakeholders.

Engagement Phase	Description
Phase 3: May to June 2020	Letters were sent out in early May 2020 to 231 directly affected landowners, seeking a meeting to discuss the indicative designation boundaries. At the one-to-one meetings the Project Team was able to introduce the projects to the landowners, go over the wider network map, explain the designation process and discuss the indicative area of their properties that may potentially be affected by the routes. The initial engagement period was extended from four weeks to five to give more opportunities for landowners to meet with the Project Team. At the end of the five weeks, a total of 40 landowner meetings had been undertaken. As discussed below, a post engagement follow up with non-responders was undertaken to increase the uptake of engagement. During the consultation period an interactive map was launched on Social Pinpoint to seek feedback on the preferred options for the Ōpāheke Road Rural, Ponga Road and Waihoehoe Road East Upgrades. Feedback was received in response to three questions asked about travel preferences, safety of the new active transport paths and any further feedback. This is discussed in the sections below.
Phase 4: October 2020	Letters were sent to landowners directly affected by the Ōpāheke Road Urban Upgrade (part of NoR D5). This included properties that were directly affected by the proposed intersection works at Ōpāheke / Settlement Road and nine properties requiring driveway regrading. A letterbox drop in the surrounding area was undertaken to inform the community about the proposal. At the time of writing this report, four landowner meetings had been undertaken and a few community members commented on the flyer on a local Facebook group page. This is discussed in the sections below.
Post engagement follow-up	A post engagement follow-up occurred at the close of the extended five-week engagement period. The overall take-up of the Project Team's offer to engage with potentially impacted landowners was lower than expected (less than 20 per cent). A number of actions were undertaken to increase engagement reach including proactively phoning and emailing landowners including outbound calling to landowners that had not been heard from and sending a follow-up letter to landowners who had not responded previously. This follow up resulted in 40 further landowners booking meetings with the Project Team.

5.2.3.1 Phase 1 - June to July 2019

The key themes raised throughout the June to July 2019 engagement were dependent on the landowners' individual circumstances and future plans in relation to their properties. Responses ranged from support, ambivalence, acceptance that the area is changing, future opportunities to strong opposition. Key themes included:

- **Access:** How access to properties will be impacted, and how it will be restored;
- **Loss of Amenity:** Concerns with impacts on lifestyle if houses and living spaces are closer to upgraded or new roads that are significantly busier and alter the current rural lifestyle amenities;
- **Loss of Value:** Concerns of impacts on property value prior to designation, ability to sell prior to an unknown construction date with a designation, reliability of market value if land is acquired and value of property if a new road or busier road is closer to the house.
- **Site Acquisition/Land Development:** Response to potential land acquisition was varied, some were open to this whilst others opposed it. Most were concerned about restrictions on future plans (development, value, saleability and lifestyle), and wanted to understand the process and potential timing for approving the Projects.

- **Alignment Concerns:** Driven by concerns related to impacts on their properties (and in some cases on features in the environment that they were aware of) many landowners questioned the location of the alignments.
- **Change of sense of place:** Many landowners, particularly in the more rural areas have moved to the area for future retirement and or a quiet rural lifestyle, and have voiced concerns over the changes the Projects and zoning changes will have on their vision of the future. However, many understood that the area is likely to experience a lot of change.
- **Uncertainty:** Many expressed frustration at the lack of detail and certainty of timing and why we were engaging with them when we did not have any detail to share.

5.2.3.2 Phase 2: December 2019

The feedback received from landowners in December 2019 generally related to alignment concerns, loss of property, loss of amenity, and timing for construction. There was support for the proposed widening of roads to accommodate active transport. Some landowners wanted equitable land take from both sides of the road.

5.2.3.3 Phase 3: May to June 2020

Social Pinpoint

In total there were approximately 270 unique users³ to visit the site spending an average of 2.04 minutes. There were 14 comments and 6 survey responses. Feedback from survey responses included:

- People would like to see the proposed active transport paths as an alternative to cars connecting key employment centres and transport hubs, but realistic journey's should be considered.
- Highlighted the existing dangerous environment for active transport and the importance of lowering road speeds.

Landowners

The key themes raised by landowners in the May to June 2020 engagement period related to property (acquisition/loss of value/access), alignment of the proposed new roads and impact to property boundaries. Timing for construction of the Projects was raised frequently in relation to property impacts. Specifically queries regarding timing of property acquisition and ongoing tenure of property was also a concern. The overall sentiment of landowners towards the Projects at these meetings was recorded as neutral. In the meetings, the Project Team assisted landowners in understanding Project reasoning and processes including explaining the rationale on the indicative design and layout of the proposed transport infrastructure, process and guide to NoRs and the submission process, lodgement timing and next steps.

The Project Team held a workshop to discuss the outcomes from the landowner engagement. The team discussed the feedback received from the landowners in relation to the design of the projects. While no fundamental design changes to the Projects were made, there were adjustments to the proposed designation boundary and opportunities, including identification of valued trees and private property adjustments were identified, to address landscape and visual amenity at detailed design stage.

³ The number of individual people who visited the webpages

5.2.3.4 October 2020

Engagement in October 2020 related to the Ōpāheke Road Urban Upgrade (part of NoR D5). The key themes raised by landowners related to property (acquisition/loss of value/access), alignment of the proposed intersection and subsequent impact to their property. Timing for construction of the project was queried specifically regarding timing of property acquisition/compensation. One landowner queried how the proposed intersection upgrade will improve traffic safety. Another landowner indicated their support for improved walking and cycling facilities.

A community flyer drop took place on 3 October to all properties identified with access onto Ōpāheke Road and Settlement Road. A few community members commented on the flyer on a local Facebook group page. They shared their concerns online regarding the proposed upgrade of the intersection to a roundabout. A few members noted the current safety issues with the intersection (red light running, heavy vehicle trucks) and considered that a roundabout would not improve safety. In response, the Project team drafted a memo to the Papakura Local Board to address the concerns and encouraged local board members to share this information with any community members and/or direct any queries to the Project team.

5.2.3.5 Post-Engagement Follow-up

As indicated earlier, the number of landowners responding to requests to meet to discuss the Projects were quite low. A number of explanations were considered as to why the uptake of engagement with affected landowners was not higher. These explanations included:

- **Prior engagement** – the landowner may have had contact with the programme during an earlier stage of engagement and may be broadly satisfied that they've understand the likely impact and do not require additional information.
- **Low owner occupancy** – property records (based on landowner 'address for service' information as opposed to the physical address of the property) suggests that as many as 70 per cent of properties impacted are not owner-occupied therefore are likely tenanted.
- **Covid-19** – initial communication about the engagement took place during Level 3 lockdown, while actual engagement (largely by phone, email or video conference) took place during either Level 2 or Level 1. While Covid-19 has only been rarely referenced by members of the community as a potential barrier to engagement or overarching concern, it may be a factor in the overall low take up.
- **Developer private plan changes** – in the Drury area there are a number of developer led proposed private plan changes submitted to Council and anticipated in the near future. Developer interest covers a large area in Drury East/West including areas adjacent to the Drury Package projects on SH22, Jesmond Road, Waihoehoe Road and part of the proposed Ōpāheke N-S FTN Arterial. While some developers do not own the majority of the land they are seeking rezoning for, it is likely they have some arrangement with private land owners. These landowners may be less inclined to follow up with the Project Team on the basis that a developer plans to buy their property if the plan changes are approved.

To ensure the Project Team engaged with as many landowners as possible, proactive calls and emails were sent to landowners, and a second follow-up letter was sent to landowners who had not yet booked a meeting. These letters were sent in July 2020 to encourage landowners to contact the Project Team.



PARTS D to H

Explanation of the following Parts of this report

Explanation of the following Parts of this Report

For description and assessment purposes the Drury Package has been split into five separate Parts in this AEE. Each of the following parts relate to the individual NoRs and Projects in the Drury Package (see Figure 0-1):

- Part D – NoR D1: State Highway 22 Upgrade
- Part E – NoR D2: Jesmond to Waihoehoe Road West FTN Upgrade
- Part F – NoR D3: Waihoehoe Road East Upgrade
- Part G – NoR D4: Ōpāheke North-South FTN Arterial
- Part H – NoR D5: Ponga and Ōpāheke Road Upgrade.

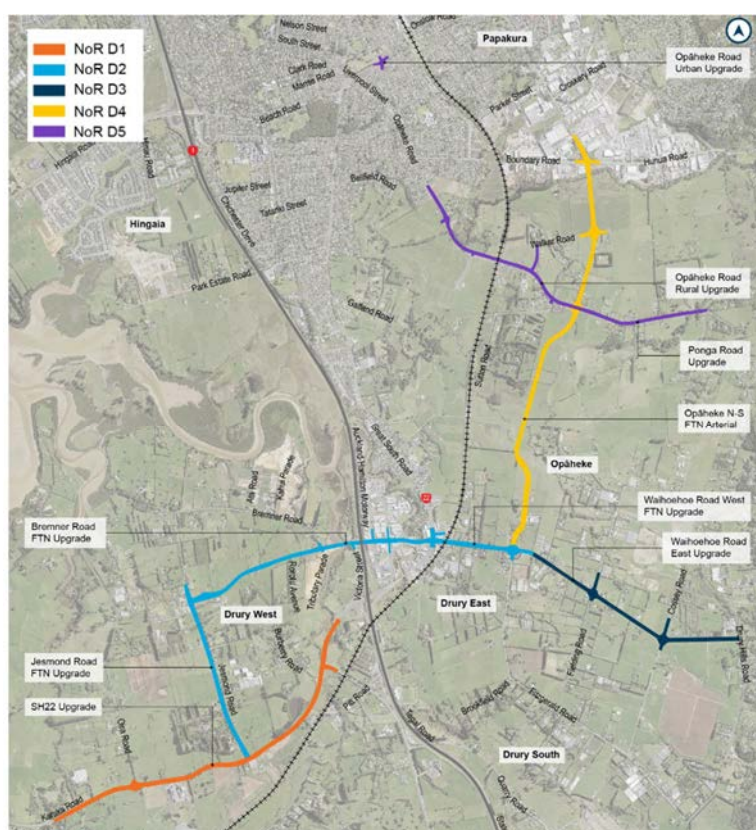


Figure 0-1 Overview of Drury Package (Aerial photography source: Auckland Council GeoMaps)

Each of the Parts (D to H) describe the following aspects of each Project:

- Summary of the Project Objectives and proposed lapse date (where relevant);
- A description of the Project including its form and function, indicative construction methodology, timing and staging;
- Existing and likely future environment for assessment purposes;
- Assessment of alternatives;
- Assessment of effects on the environment;
- Summary of measures to manage adverse effects;
- A summary of the statutory assessment of the Project (see Part I).

Part I, section 41, of the AEE provides the statutory assessment undertaken for the Drury Package as whole, and individual aspects of the Projects where applicable.



PART D: NOR D1

Alteration to Waka Kotahi Designation 6707

State Highway 22

6 SH22 Upgrade: Description of Project and Proposed Works

NoR D1 alters the existing SH22 designation 6707 already held by Waka Kotahi. The alteration is limited to the works proposed as part of the alteration as described in this report. It does not include works that could be undertaken within (or effects that are or could reasonably be generated by) the existing designation.

6.1 Project Description

SH22 currently has a sub-regional and strategic function serving as a key state highway connection between Drury, Glenbrook and Paerata and onto Pukekohe. As the surrounding area is urbanised over time and alternative routes are implemented (particularly the proposed Pukekohe Expressway), the function of SH22 will change from a rural state highway to an urban arterial connecting the communities of Drury West and the wider area to centres, employment and rail stations. This is likely to include a reduction in the speed limit. The SH22 Upgrade will also improve future connectivity to the proposed Drury West train station which currently forms part of the New Zealand Upgrade Programme (NZUP) project. The location of the Project in its wider context is shown in Figure 6-1.

The SH22 Upgrade (NoR D1) consists of the widening the existing alignment of SH22 to a four-lane arterial with separated active transport facilities along each side of the road corridor. The Project extends approximately 3km from the SH1 Drury Interchange in the east, and the extent of the FUZ between Woodlyn Drive and Oira Road in the west.

The proposed upgrade will integrate with the timing and form of proposed future urban development in the Drury area. It will provide an appropriate urban form and movement function to respond to the expected growth, while also providing a much safer road environment for all road users.

In the east the Project will tie in with the SH1 Drury Interchange and future upgrades proposed to the interchange by the Waka Kotahi Papakura to Drury South Project. West of the Drury Interchange the Project proposes a reconstructed bridge over the Ngakoroa Stream. The Project continues west along the existing alignment tying into Great South Road (signalised intersection), Burberry Road (priority, left in-left out intersection), McPherson Road (priority, left in-left out intersection), Jesmond Road (signalised intersection) and Oira Road (roundabout). In the south west the Project will tie into the existing road formation to the east of Oira Creek. Along the alignment three stormwater wetlands are proposed. An overview of the design is provided in Figure 6-1 and an indicative cross-section of the proposed corridor upgrade is provided in Figure 6-2.

An alteration to Waka Kotahi's existing designation 6707 is proposed to allow sufficient land for the road widening plus, tie ins with existing roads, stormwater infrastructure, batter slopes and retaining structures. The proposed alteration also includes land required for other construction related activities including construction compounds and laydown areas, construction traffic manoeuvring and the re-grade of driveways. There is no alteration proposed to the separate portion of the designation to the east of SH1.

The key features of the proposed upgrade include:

- Widening of SH22 road corridor from its current general width of 20m to enable a 30m wide four-lane road with separated active transport facilities

- Localised widening around the existing intersections to accommodate for vehicle queuing and tie-ins and active transport facilities/crossings
- Demolition and reconstruction of the existing Ngakoroa Stream Bridge
- New and extended culverts
- Three stormwater wetlands
- Batter slopes and retaining to enable widening of the corridor, and associated cut and fill activities (noting the indicative design of these are based on the existing land form and urban development adjoining these areas may change the work requirements).
- Vegetation removal along the existing road corridor
- Areas for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring.

The works described for the Project could be carried out in stages as urban development occurs surrounding the Project area.

Indicative design drawings are provided in Volume 3 of this AEE and the Project design standards and details further described in Section 4.2.7.



Figure 6-1: Proposed SH22 Upgrade

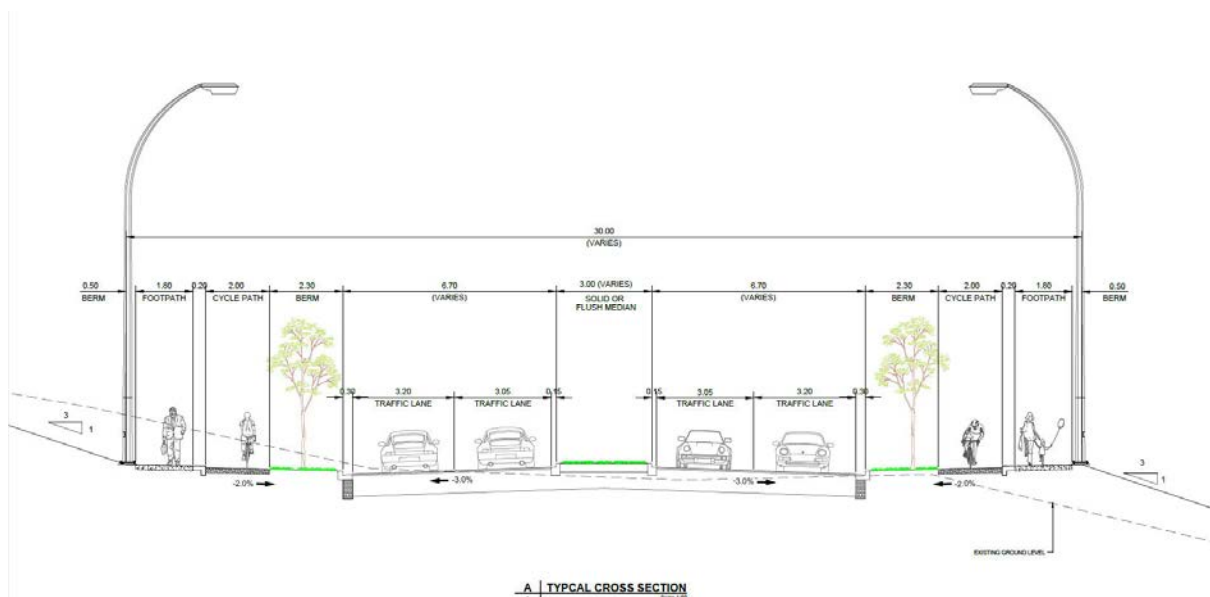


Figure 6-2: Typical Cross Section

6.2 Project Objectives

The Project Objectives reflect the transport outcomes that were identified for the Southern Growth Area (in the IBC) and specifically the Drury Arterial Network (in the DBC). The Project Objectives for the SH22 Upgrade are:

1. Provide a transport corridor that supports and integrates with the urban growth in Drury by improving accessibility and connectivity along SH22
2. Provide a transport corridor that is safe for all users
3. Provide for additional capacity and a choice of transport options including active transport.

6.3 Lapse

A lapse period is not required for NoR D1 as the existing designation proposed to be altered has already been given effect to.

6.4 Indicative Construction Methodology

The general construction methodology for the Project is outlined in Section 4.4 and further detail is outlined in the sections below. The indicative construction methodology, including the working room areas specified in Table 4-2, have informed the proposed designation boundary.

6.4.1 Construction Overview

Construction of the Project will include earthworks, construction of bridges, pavement, drainage and stormwater wetlands, and service relocation. The works will also include the construction of two new signalised intersections, a roundabout and other tie ins with existing roads.

To facilitate the construction works the site has been broken into five construction zones. The construction zones are based on the geography and complexity of the works. The works types include bridge works, road widening, wetland construction and intersection upgrades. The five zones are shown in Figure 6-3 and include:

- Zone 1 – road widening and bridge works;
- Zone 2 – new Great South Road intersection works and wetland construction;
- Zone 3 – road widening works;
- Zone 4 – new Jesmond Road intersection works and wetland construction; and
- Zone 5 – road widening works, new Oira Road roundabout and wetland construction.



Figure 6-3: NoR D1 Project Construction Zones

6.4.2 Indicative Construction Programme and Sequencing

The Project is estimated to take 2 to 2.5 years to construct. The implementation timeframe for the Project has yet to be confirmed and will respond to timing of urban development as well as funding availability. However, it is currently anticipated that it will be implemented by approximately 2028. In addition, urban development that may occur ahead of the proposed upgrade has the potential to change the detail of construction requirements than what would be required in the existing environment. The proposed alteration to designation provides for construction in the existing environment acknowledging this may change in the future.

A summary of the indicative construction sequence and methodology is outlined in Figure 6-4.

Enabling Works

1. Surveys, ground investigations and geotechnical testing
2. Check and verify utility and service locations, crossings and depths
3. Service relocation works
4. Accommodation works including property demolition and driveway relocations
5. Establish site offices, laydown areas and car parking for construction personnel

Stage 1 – Westbound Carriageway

1. Install temporary traffic management controls and traffic barriers
2. Implement environmental controls
3. Carry out vegetation removal and remove topsoil, stockpiling at the nominated laydown (to be reused at completion of the project)
4. Cut existing ground to formation level
5. construct embankment to subgrade
6. Install stormwater infrastructure
7. Bridge construction (see below)
8. Pavement works, kerbing and running surface
9. Construct new cycleways and footpaths
10. Traffic switch

Stage 2 – Eastbound Carriageway

1. Commence works once traffic switch complete
2. Pavement works, kerbing and network drainage
3. Construct new cycleways and footpaths
4. Complete intersection works
5. Complete bridge works (see below)
6. Traffic switch to combination of eastbound and westbound lanes (traffic switches may need to be carried out during night shifts)

Bridge Works

1. Site compound and establishment of plant and materials
2. Environmental controls
3. Bridge construction Stage 1 – construct westbound lanes
 - a. Install temporary works
 - b. Construct abutment
 - c. Piling, pier, and headstock construction
 - d. Install bridge beams and decking
 - e. Finishing Works: barriers, settlement slabs, footpaths etc
4. Commission bridge and move traffic onto newly constructed bridge.
5. Stage 2 - Demolish existing bridge
6. Bridge construction – Stage 3 construct eastbound lanes (similar to Stage 1)
7. Commission bridge and move traffic to permanent design

Figure 6-4: NoR D1 Indicative Construction Sequencing Summary

6.4.3 Indicative Construction Methodology

6.4.3.1 Site Establishment

Site Facilities

Construction site compounds and laydowns will be required at a number of indicative locations as shown in Figure 6-5.

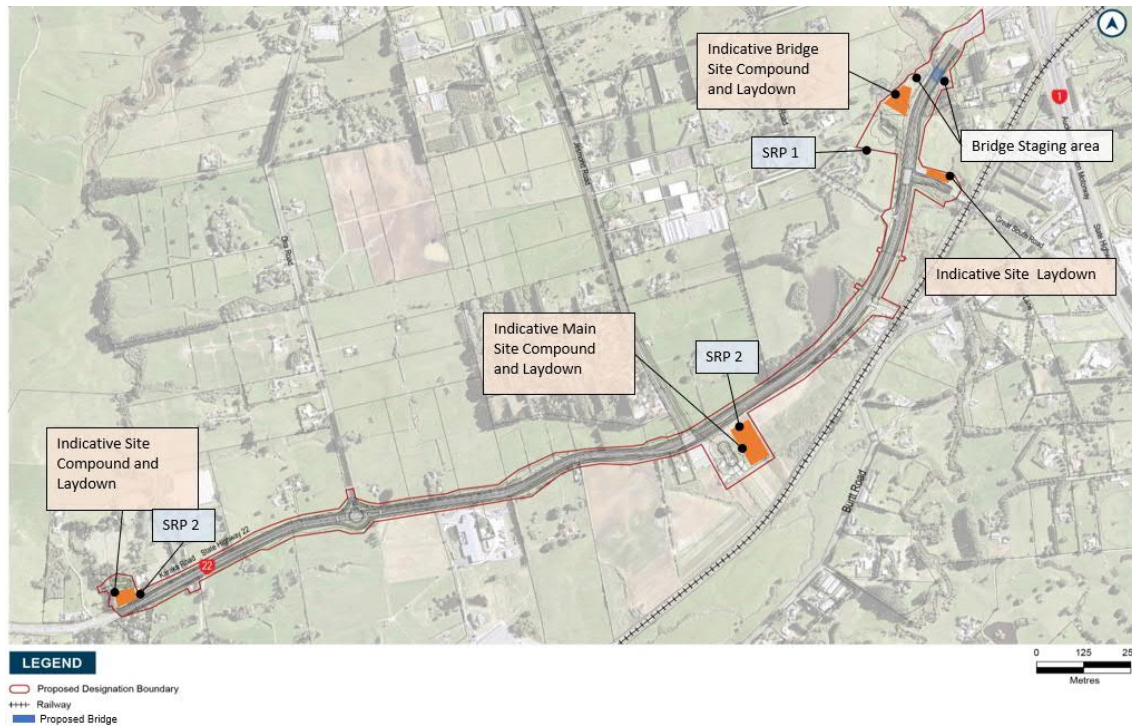


Figure 6-5: NoR D1 Indicative Construction Areas, Compounds, Laydowns and SRPs

Sediment Controls

Where possible, existing surface water runoff from the roadway will be diverted away from the construction site and into the existing network drainage system or existing surface overflow paths subject to future resource consents. Figure 6-5 and Figure 6-6 identify the indicative sediment retention pond locations.

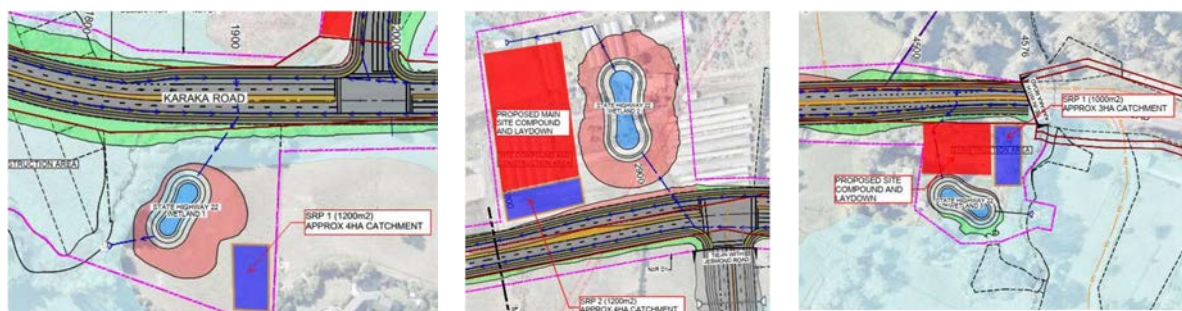


Figure 6-6: NoR D1 indicative areas identified for Erosion and Sediment Control treatment, indicative SRP locations

6.4.3.2 Network Utilities

The Project requires the relocation or realignment of a number of network utilities including gas transmission and distribution, overhead electricity transmission, and telecommunications. Works to network utilities will be confirmed at detailed design and may include the following:

- **First Gas – Transmission Line:** pipe re-alignment, strengthening works, and/ or protection works may be required where the proposed alignment crosses the transmission line.
- **Vector Gas Medium Pressure distribution lines:** these lines are to be realigned on to the new carriageway service corridor. Installation of the new gas line will be carried out using a combination of open trench excavation and directional drilling methods. The existing line is likely to require removal or grout filling where removal is not practicable.
- **Overhead power distribution lines:** If required, lines will be relocated underground, or new overhead poles installed in the new alignment within the carriageway service corridor.
- **Chorus cables** will be relocated to the new verge according to the new design alignment (if required).

6.4.3.3 Culverts and Stream Works

The Project requires new culverts and the extension of existing culverts to accommodate road widening. Resource consents will be sought for culverts and associated stream works at detailed design. These culverts will be constructed at the initial phase of the construction works to ensure surface water flow can be directed through the construction zone without becoming contaminated from the earthwork activities.

Works on new culvert construction may require flow diversion or over pumping. Further investigations will be required during the detailed design and resource consenting phase to confirm the flow volumes and ecological requirements for the diversions.

Installation will be through typical drain laying methods with additional undercutting and earthworks to ensure there are no settlement issues with the new pipework. Installation could be through conventional open trenching or pipe jacking/ tunnelling. However, this will be confirmed once detailed design is complete and resource consents sought.

6.4.3.4 Earthworks

The Project is expected to generate approximately 45,800m³ of excavated (cut) material assumed unsuitable to be used as direct structural fill material and 96,500m³ of fill, with a total volume of material to be moved of 142,300m³. Final earthwork volumes will be confirmed during detailed design.

It is anticipated some unsuitable excavated material can be placed and compacted as non-structural fill outside of the road alignment and where practicable, to utilise excavated material, soil improvement measures, such as cement or lime stabilisation could be used to improve the soil parameters. Alternatively, cut material will be disposed of at a suitable tip site. A borrow source for fill is unlikely to be available close to the works and fill will need to be imported from elsewhere, however fill will be sourced as locally as possible.

6.4.3.5 Drainage and Stormwater

New stormwater drains will be required on both sides of the road to direct the stormwater to the three proposed wetlands. Discharge points for each of the wetlands have been identified and designated accordingly.

Stormwater will discharge to, and works will be required within existing water ways. Resource consents for diversion and discharge of stormwater and stream works will be sought as part of future resource consent processes. These works and activities will be undertaken in accordance with applicable management and mitigation measures and resource consent conditions.

6.4.3.6 Bridges and Structures

The proposed three-span bridge across Ngakoroa Stream will accommodate four lanes of traffic, separated pedestrian paths and cycle paths on both sides of the bridge. At this stage it is envisaged that a construction yard will be required near the bridge site at 67 Mercer Street (on the northern side of SH22), to be used as a construction compound to house a satellite office for the bridge construction crew as well as construction plant, equipment and materials.

The bridge will be constructed in the following stages:

- Stage 1 – Construct new westbound carriageway, once complete, move existing traffic over to new bridge;
- Stage 2 – Deconstruct the existing bridge; and
- Stage 3 – Construct new eastbound carriageway, once complete, move traffic to permanent configuration.

To access the pile locations for stage 1, temporary staging will be required adjacent to the bridge. Once the bridge structure is complete, the temporary staging and accessway can be removed and relocated to the other side of the bridge for stages 2 and 3 (see Figure 6-7). Typically, a 20m wide temporary accessway will be required next to the bridge footprint to allow for the temporary staging (including the construction and dismantling of the staging).

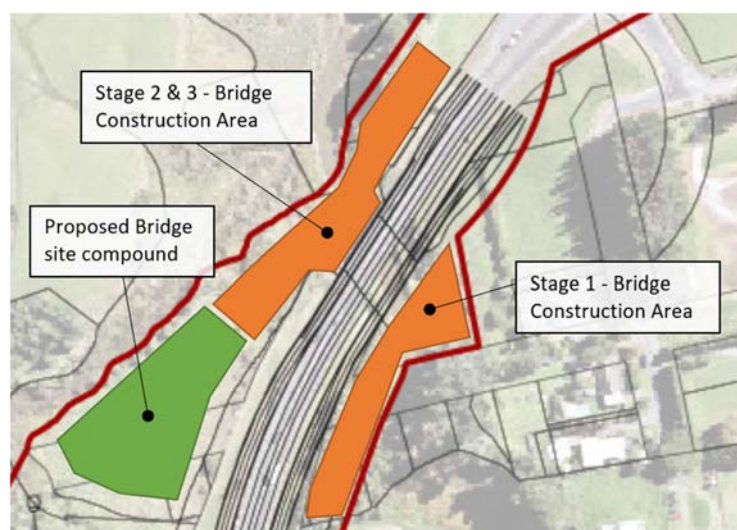


Figure 6-7: SH22 Ngakoroa Bridge Indicative works areas

7 SH22 Upgrade: Existing and Likely Future Environment

This section provides a description of the human, physical and natural features of the existing environment, and the likely future environment within which the widening of SH22 will be constructed, operated and maintained. It draws on information from a number of sources including the technical assessments included in Volume 4. The potential effects of the Project on this environment and measures proposed to manage these effects are detailed in Section 9 of this report.

7.1 Planning Context

Table 7-1: NoR D1 Planning Context (see Figure 7-1)

Existing AUPOIP Zoning and Potential Future Zoning (Drury-Ōpāheke Structure Plan) ⁴	Existing Zoning: • Open Space – Sport and Active Recreation Zone • Open Space – Conservation Zone • Strategic Transport Corridor Zone • Future Urban Zone	Potential Future Zoning: • Open Space – Sport and Active Recreation Zone • Open Space – Conservation Zone • Strategic Transport Corridor Zone • Business - Light Industry Zone • Business – Centre Zone • Residential – Mixed Housing Suburban Zone • Residential – Mixed Housing Urban Zone • Residential – Terraced Housing and Apartment Buildings Zone
Overlays and Controls	Overlays • Natural Resources: High-Use Stream Management Areas Overlay [rp] • Natural Resources: Significant Ecological Area Overlay – SEA_T_530b, Terrestrial [rp/dp] Controls • Arterial Roads • Stormwater Management Area Control Flow 1 [rp] • Macroinvertebrate Community Index • Coastal Inundation 1 per cent AEP Plus 1m Control • Vehicle Access Restriction Control	
Designation(s) and other notations	• Designation – 6707, State Highway 22: To undertake maintenance, operation, use and improvement to the State Highway network, Designations, New Zealand Transport Agency (the designation proposed to be altered)	
Other Non-Statutory Features	• Flood Plains • Flood Prone Areas • Overland Flow Paths	

⁴The likely future zoning is based on the indicative zoning within the Drury-Ōpāheke Structure Plan. These zoning assumptions are not yet confirmed plan provisions, therefore, are not legally part of existing or future environment under s171(1) of the RMA. However they are relevant to the assessment and are considered as an "other matter".

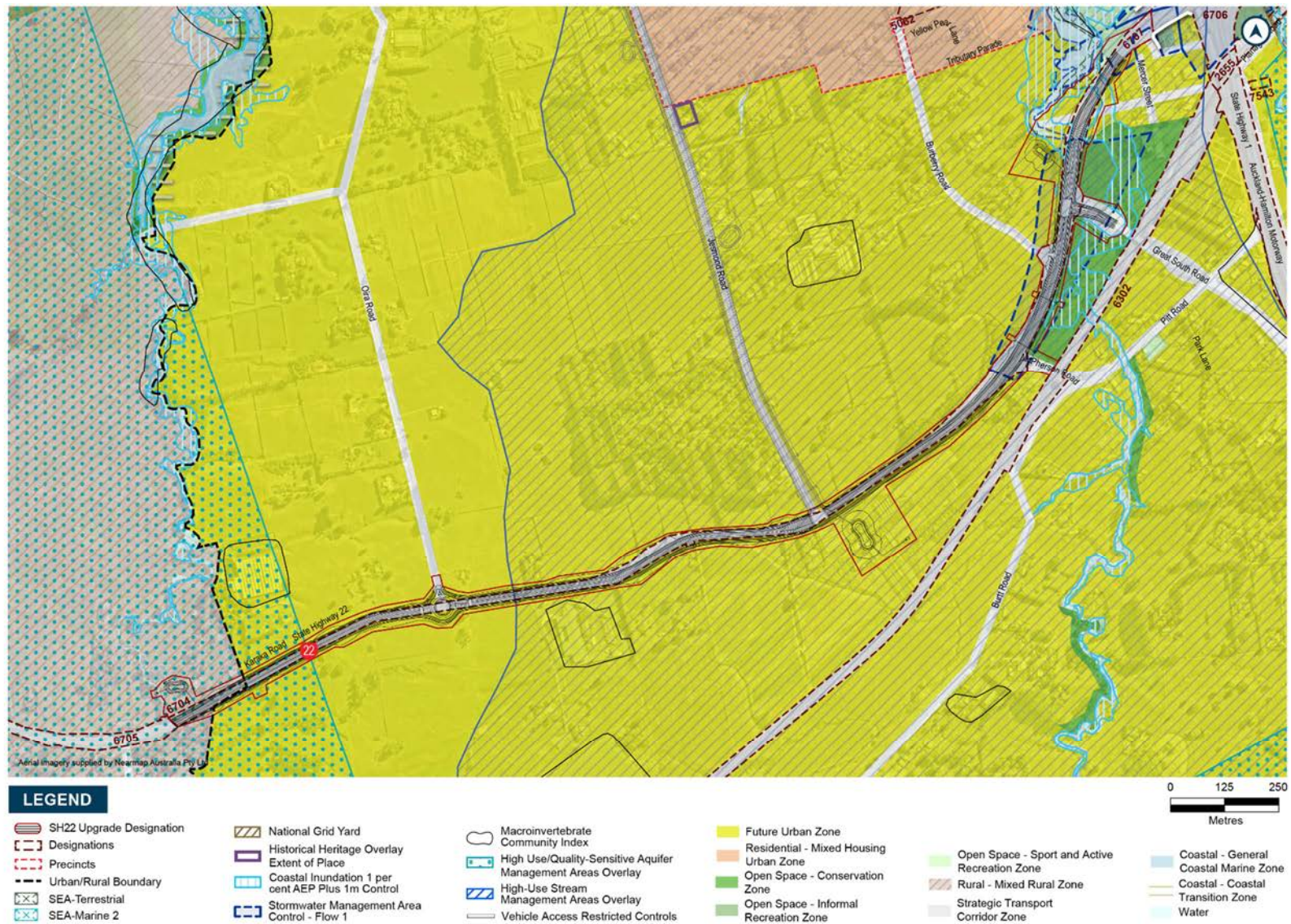


Figure 7-1: NoR D1 Planning Context (AUP/IP)

7.2 Human Environment

Table 7-2: NoR D1 Summary of Existing and Likely Future Human Environment

Land Use and Urban Form	Existing Environment The existing land use surrounding the Project (see Figure 7-2) is largely rural consisting of low density rural residential dwellings and a few rural based businesses including transportation and logistics, horticulture and a show home. Passive and active recreational land use is prominent at the eastern end of the alignment including the Ngakoroa Reserve and the Drury Sports Complex. The rural urban boundary lies at the western extent of the Project and some land on the northern side zoned Countryside Living and rural in character. The remainder of the land adjacent to the corridor is zoned FUZ.												
	Likely Future Environment The land surrounding the proposed alignment in Drury West is mostly zoned FUZ and forms part of the southern growth area and Drury-Ōpāheke Structure Plan area. The area is planned to undergo significant growth and change in the future. The FUZ is planned to urbanise in the next 10 years. The likely future land use environment in which NoR D1 will operate is therefore assumed to be an urban or developing urban environment. Based on the Drury-Ōpāheke Structure Plan and private plan changes lodged with Auckland Council, the land use pattern surrounding the Project is planned to be largely medium to high density residential, with a commercial centre east of Jesmond Road, a small centre at Oira Road and an industrial area to the north east of the alignment (see Figure 7-3). The change in land use is subject to future plan changes to rezone the land. At the time of writing of this report, two private plan changes with an interface with NoR D1 had been lodged with Auckland Council – PC51 (Private) Drury 2 Precinct and Waipupuke private plan change (yet to be referenced). The existing recreational land uses in the Project Area are anticipated to remain. However, it is expected that they may be developed to support the expanding urbanised area. Additional passive recreation uses are also proposed within the structure plan to the south and north of the alignment. The final urban form of the existing FUZ area has yet to be confirmed but the land use outcomes in the area as anticipated by the AUPOIP zoning proposed throughout the Drury-Ōpāheke Structure Plan is summarised below.												
Table 7-3: NoR D1 Anticipated Urban Form													
<table> <tr> <th>Zone</th><th>Anticipated Outcomes</th></tr> <tr> <td>Terraced Housing and Apartment Building</td><td>Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.</td></tr> <tr> <td>Mixed Housing Urban</td><td>Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.</td></tr> <tr> <td>Mixed Housing Suburban</td><td>Development is typically two storey detached and attached housing in a variety of types and sizes.</td></tr> <tr> <td>Business –Centre Zone</td><td>Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a focus for commercial activities and growth. Depending on the final centre zone provisions vary, but typically enable buildings up to eight storeys (in a town centre zone).</td></tr> <tr> <td>Business – Light Industry</td><td>Anticipates industrial activities that do not generate objectionable odour, dust or noise. This includes manufacturing, production, logistics, storage, transport and distribution activities.</td></tr> </table>		Zone	Anticipated Outcomes	Terraced Housing and Apartment Building	Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.	Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.	Mixed Housing Suburban	Development is typically two storey detached and attached housing in a variety of types and sizes.	Business –Centre Zone	Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a focus for commercial activities and growth. Depending on the final centre zone provisions vary, but typically enable buildings up to eight storeys (in a town centre zone).	Business – Light Industry	Anticipates industrial activities that do not generate objectionable odour, dust or noise. This includes manufacturing, production, logistics, storage, transport and distribution activities.
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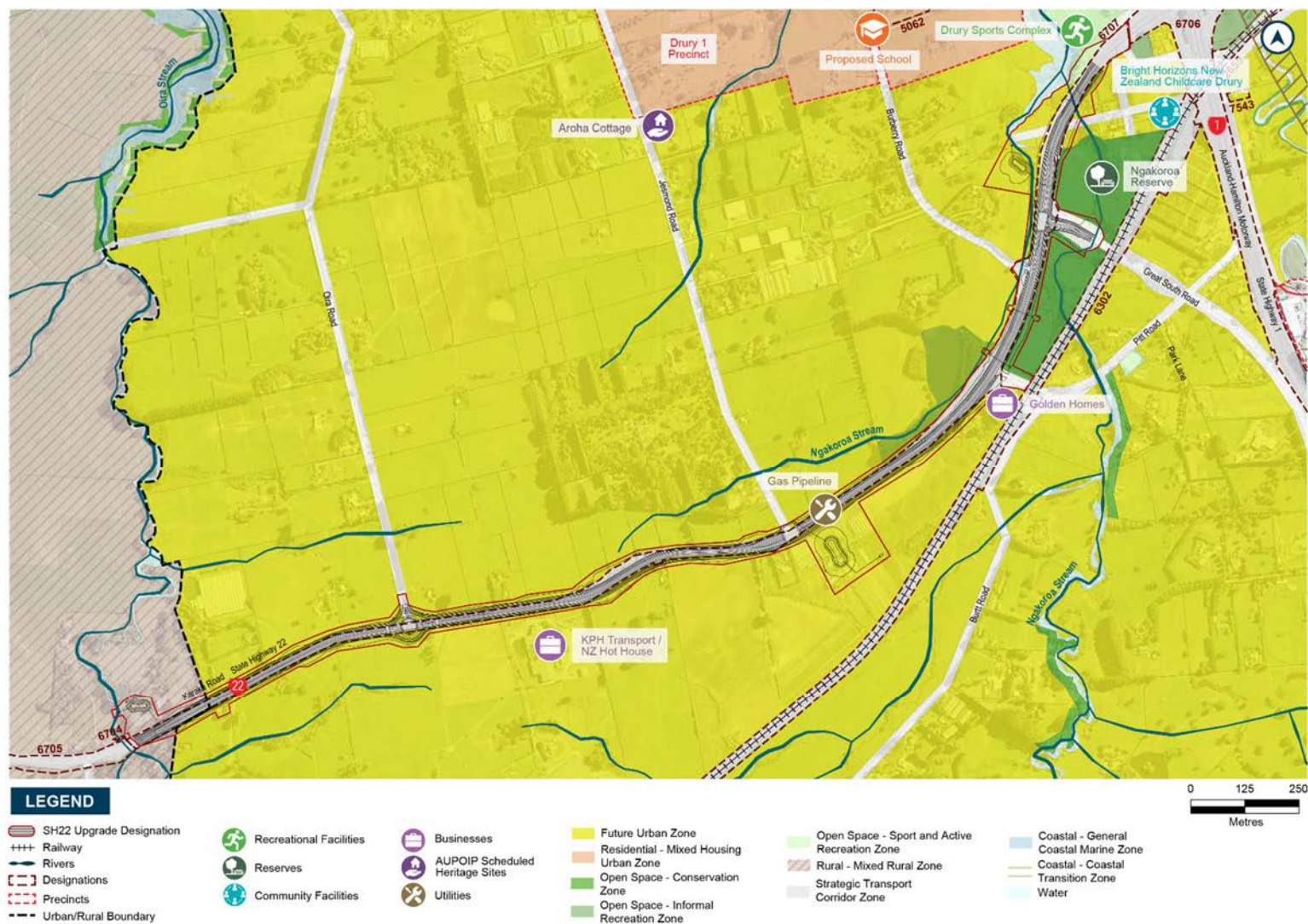


Figure 7-2: NoR D1 Existing Environment – Land Use and Urban Form

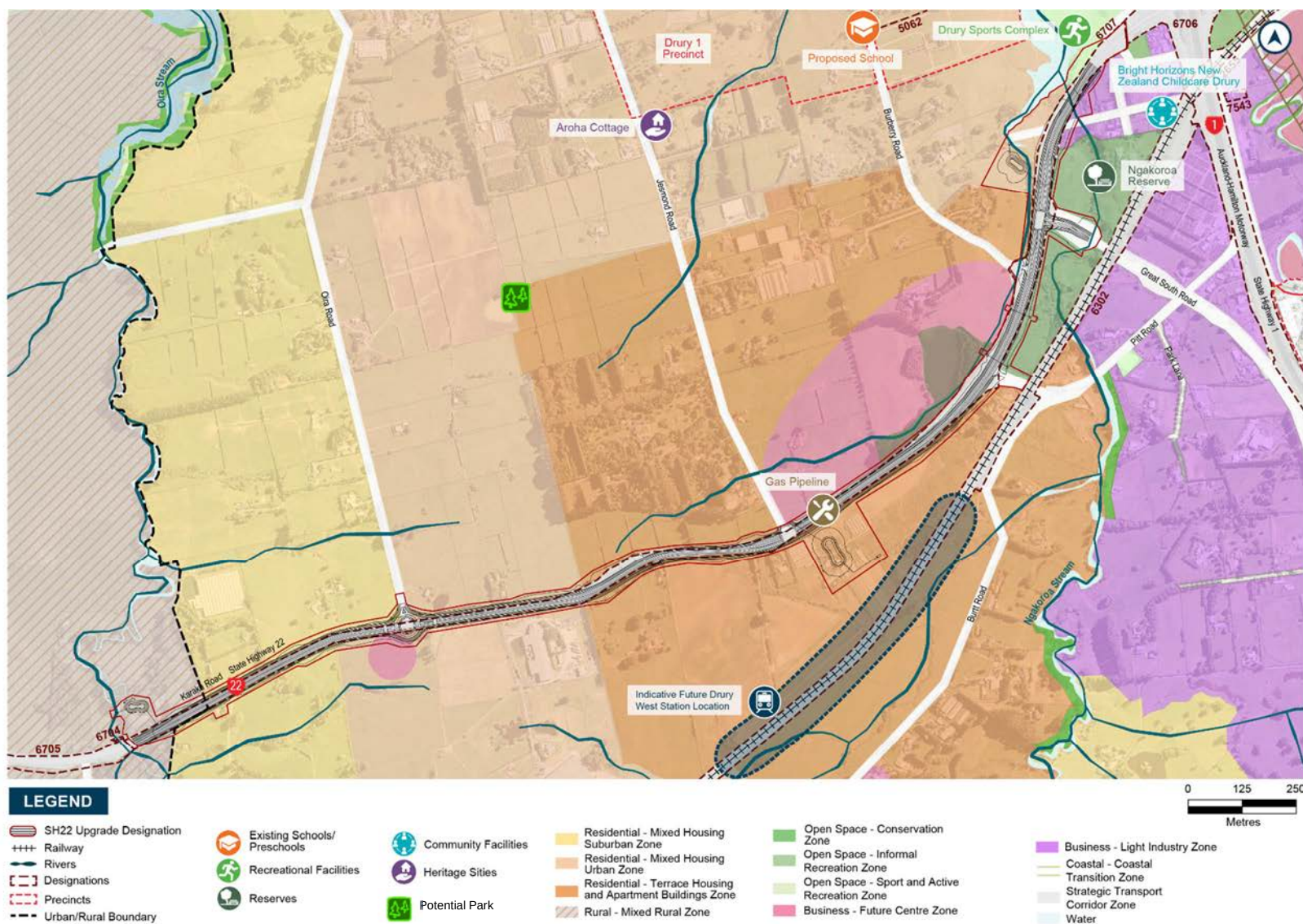


Figure 7-3: NoR D1 Likely, Planned Future Environment – Land Use and Urban Form

Transport

The following text provides a summary of the existing and likely future transport environment relating to the SH22 Upgrade Project. A more detailed description of the transport environment is provided within the Assessment of Transport Effects within Volume 4 of this Document set.

Existing Environment

SH22 and the surrounding transport network can be summarised as follows:

- Two-lane rural state highway with sealed shoulders
- Large volume of mixed traffic with significant through movement between SH1 interchange and urban areas of Pukekohe, Glenbrook and Paerata. The existing daily flow of SH22 is above 22,000 vehicles per day (vpd) which suggests that the existing daily flow already exceeds level of service (LoS) E.
- 60kph speed limit east of the intersection with Burberry Road and 80kph speed limit west of the intersection with Burberry Road
- High proportion of heavy vehicles and part of over-dimension route and partially overweight route (the SH22 section between Great South Road and Victoria Street)
- The intersections are priority controlled, prioritising east-west movement, with no active transport facilities
- There are no public transport facilities
- There are existing safety issues on the corridor The existing properties adjoining SH22 have access either to side roads connected to SH22, or directly onto SH22. Due to the existing land use, the number of access points to SH22 is limited.

Likely Future Environment

The planned growth in the Project area, and the transition from a rural to an urban land use environment, will put significant strain on the existing transport infrastructure. A number of planned future transport projects are identified in the Drury-Ōpāheke Structure Plan (subject to planning and funding approvals) and NZUP and will form part of the future transport network that will enable the planned growth to be realised. These are:

- New rail stations at Drury Central and Drury West*
- New Mill Road Corridor*
- SH 1 Papakura-to-Bombay Upgrade**
- SH 22 Drury-to-Paerata safety improvements**
- Additional rail capacity between Pukekohe and Papakura**
- Regional north-south cycle route between Drury and Pukekohe***
- New rail station at Paerata, and associated park and ride facilities***
- New Pukekohe Expressway***
- The other components of the Drury Arterial Network (proposed within this report) noting that there may be interim transport infrastructure provided by developers within the Drury Arterial Network (for example a local road built by developers which is later upgraded to an arterial) ***
- The future collector roads indicated in the Drury – Ōpāheke Structure Plan are expected to develop through developer contributions as areas are urbanised.

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

Historic Heritage and Archaeological Values

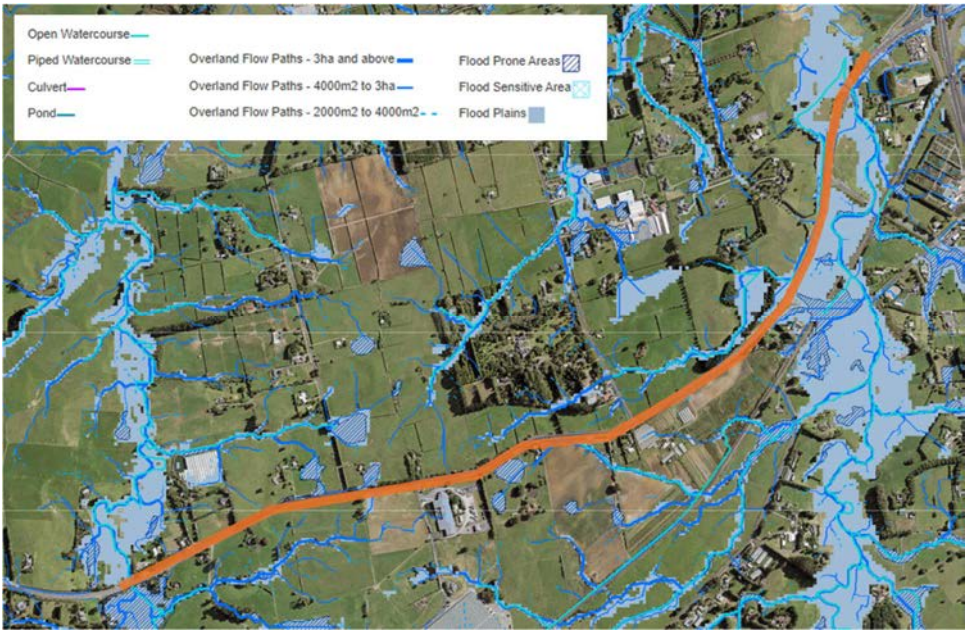
The following text provides a summary of the existing and likely future environment as it relates to historic heritage and archaeological values. A more detailed description of the environment identified through research and site surveys is provided within the Assessment of Historic Heritage Effects within Volume 4 of this Document set.

	Existing Environment There are no recorded historic heritage sites within the Project area and no visible historic heritage sites were observed within the survey area. There is one pre-European Māori site recorded within 200 m of the proposed designation near the Ngakoroa Stream based on 1853 maps. There is reasonable cause to suspect previously unrecorded historic heritage sites may be present within the proposed footprint of NoR D1. This is primarily based on tributaries such as the Ngakoroa Stream and Oira Creek passing within the proposed designation footprint, which are part of a known pre-1900 European and pre-European Māori transport system. Additionally, land near waterways are commonly regarded as areas of high risk for previously unrecorded historic heritage deposits. However, areas adjacent to the existing road corridor are likely to be heavily modified from previous construction of SH22. The likelihood of historic heritage deposits further away from waterways and on modified land is lower. All unrecorded archaeological sites are protected under provisions of the Heritage New Zealand Pouhere Taonga Act 2014 (HNZPT Act). Likely Future Environment The existing environment as it relates to historic heritage and archaeological values is likely to remain the same in the future. There is a possibility that unknown sites could be uncovered during development of the area prior to construction of the transport corridor which would add to the historical understanding of the area.
Cultural Values	There are no identified Sites of Significance to Manawhenua identified under the AUPOIP within or in close proximity to the Project area. Vacant and currently unoccupied land at 67 Mercer Street is identified as Treaty Settlement Land. The cultural values identified by Manawhenua within the Project area highlights the importance of maintenance and enhancement of water quality and ecological values, particularly areas of high indigenous values including SEAs. The proximity of the Project to the Ngakoroa Stream, its tributaries and the Oira Creek means the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage with the potential to uncover undiscovered archaeological sites. The Ngakoroa and Oira Streams and their tributaries are Ngāti Tamaoho statutory acknowledgement areas (Ngāti Tamaoho Deed of Settlement 30 April 2017).
Community and Recreational Facilities	Existing Environment Community and recreational facilities along the corridor include the Drury Sports Complex (access off Victoria Street) and Ngakoroa Reserve. Drury Sports Complex is an active recreation park approximately 9.8ha and is home to the Drury United Football Club. Ngakoroa Reserve is 2.2ha south west of the Drury Sports Complex. The Ngakoroa Stream flows through it, with half of the reserve performing a stormwater detention function and the remainder is an informal recreation space. Part of the reserve has been leased to community groups for use (riding for the disabled). The closest schools currently are Farmhouse Preschool, Karaka School and Wesley College which are all west of the project corridor on or just off SH22. A new Catholic secondary school on Burt Road, Drury (St Ignatius of Loyola Catholic College) is proposed

	and consented. A new primary school site has been designated by MoE on Burberry Road. Drury Village and Paerata Village are the closest villages to the north and south of the project on the same corridor (but outside the proposed designation footprint) and provide some community amenities including halls, local shops and a library in Drury Village. Likely Future Environment Existing open space areas and recreational activities are expected to remain unchanged. Schools in the area are expected to remain, and could grow as the population in the area increases. Although not designated, MoE has purchased land off Jesmond Road for a proposed secondary school. It is likely additional community facilities will be provided as development occurs and the population in the surrounding area grows.
Ambient Noise	The ambient noise environment is reflective of a rural environment where low noise levels are experienced with limited road traffic noise. Noise monitoring was carried out at 235 Jesmond Road and 116 Waihoehoe Road (as the sites were considered to be representative of the existing noise environment of the Project Areas) over seven days with noise levels recorded ranging between 46 - 49 dB LAeq(24hr). This ambient noise level is likely to change as the surrounding environment urbanises.
Utilities	Existing Environment Major utilities in the Project area include: • An existing Counties Power Medium Voltage (MV) overhead line feeds in from the existing Burberry Road and west along the northern side of SH22. To the west of McPherson Road the MV line crosses to the eastern side of the existing road and continues along SH22; • Vector Gas Medium Pressure distribution lines run along the southern side of SH22 from east of the Project area to Oira Road; • East of the SH22 / Jesmond Road intersection the First Gas Transmission Line runs diagonally across the existing road corridor; and • Chorus lines run along both sides of SH22. Likely Future Environment As the areas surrounding the Project urbanises in the future it can be expected that existing utilities will remain, and it is likely additional utilities will be added. Existing overhead powerlines may be undergrounded as part of new development.
Property Details	• 42 properties directly affected, including: • Council owned land: two properties totalling approximately 8,441m² • Crown owned land: 15 properties totalling approximately 13,930m² • Privately owned land: 25 properties totalling approximately 105,606m² • Hydro: one property totalling approximately 95m²

7.3 Natural and Physical Environment

Table 7-4: NoR D1 Summary of Existing and likely Future Natural and Physical Environment

Geology	Existing Environment The area surrounding NoR D1 is mapped as being entirely underlain by Puketoka Formation over the full length, crossing the Ngakoroa Stream in the east. South of the SH22 alignment lie deposits assigned to the South Auckland Volcanic Field, although no widespread volcanic materials are anticipated within the proposed designation. At its closest the proposed designation is located approximately 1.2km south of, and skewed away from the Glenbrook Fault, which is downthrown to the south by approximately 200m. The site sits within the associated Glenbrook Depression, with greywacke bedrock described as being at an extremely low elevation. Likely Future Environment The geological conditions are not anticipated to significantly vary in the future.
Hydrology and Natural Hazards	Existing Environment Key watercourses in the Project area include Ngakoroa Stream at the north eastern end of the corridor and Oira Creek at the south west extent. Ngakoroa Stream runs through the Ngakoroa Reserve and crosses the alignment under an existing bridge structure. Further information on watercourses is provided below under terrestrial ecology. An existing pond exists within 6 Burberry Road, on the northern side of the corridor which discharges through a culvert crossing under SH22 into the Ngakoroa Stream. As shown in Figure 7-4 there are a number of existing flood prone areas alongside SH22 where overland flow paths drain towards Ngakoroa Stream. The existing 100year ARI flood maps from the latest Auckland Council Ngakoroa catchment model with maximum probable development (MPD) and existing terrain show flooding in the Ngakoroa Reserve and overtopping of the existing Ngakoroa Bridge.  Figure 7-4 Hydrology and Natural Hazards surrounding SH22 (Source: Auckland Council GeoMaps, 2020)

Terrestrial Ecology

Likely Future Environment

Although urban development is anticipated the hydrological environment and natural hazard conditions are not expected to significantly vary in the future. In particular, the permanent and intermittent streams are identified in the Drury-Ōpāheke Structure Plan with a 20 metre riparian margin. Floodplains and coastal inundation 1 per cent AEP plus 1 m control are also identified.

The following text provides a summary of the existing and likely future environment as it relates to ecological features and values. A more detailed description of the environment is provided within the Assessment of Ecological Effects within Volume 4 of this Document set.

Existing Environment

The existing environment surrounding the Project area includes a number of habitats (including terrestrial, freshwater and wetland) and species.

Habitats

The existing terrestrial habitats are highly modified and are dominated by agricultural land and exotic ecosystems such as exotic grassland, and exotic amenity planting with small areas of exotic scrub, exotic wetlands, exotic treeland and exotic forest. However, small areas of native or mixed exotic vegetation occur with areas of planted native vegetation and within exotic wetland areas.

Where natural habitat remains, SEAs are identified through the AUPOIP. SEA_T_530b is located within the proposed designation (see Figure 7-5). It includes coastal and riparian wetland vegetation, habitat for threatened bird species and the rare plant species *kaikōmako*.



Figure 7-5 SEA within NoR D1 Project Area

The freshwater habitat within the Project area includes six stream branches. All streams were representative of degraded systems primarily due to historical indigenous vegetation clearance which has then been compounded by agricultural practices. This degradation of riparian vegetation and increased nutrient inputs has also led to loss of bank stability, reduced shading and the proliferation of exotic macrophytes within the streams. Additionally, many streams have been physically altered, through dredging, reclamation and/or drainage of associated wetlands and/or channelization.

Several exotic wetlands were identified within the Project area. A number of these wetlands are highly modified and severely degraded through factors such as vegetation removal, artificial drainage and grazing and pugging from livestock. The wetlands are generally dominated by exotic species including (but not limited to) willow weed, mercer grass and soft rush. However, native species are also present within a number of the wetlands, particularly those associated with the Ngakoroa Stream.

Two of the wetlands are estuarine, associated with the mouth of the Ngakoroa Stream. One of these is a Raupō reedland which is dominated by a mix of raupō and purua grass. This wetland is considered to be a functional indigenous wetland, providing habitat for native flora and fauna species. The other estuarine wetland is an exotic wetland dominated by kikuyu grass but with native species such as purua grass also present.

Species

Automatic bat monitor (ABM) surveys were undertaken within the wider Drury Package area including within the Project area. The ABM survey results suggested that bats are not frequent visitors to the area during their mating and breeding seasons. However, despite bats not being detected within the area to date, the Project area does provide potential habitat features which would be suitable for use by foraging and commuting indigenous long-tailed bats.

Twelve At Risk and three Threatened species of coastal wetland or freshwater wetland bird species, and two species of At Risk forest bird were identified within the wider landscape associated with the Project. The only At Risk species that are likely to be resident and breeding within or directly adjacent to the Project Area are the At Risk – Declining banded rail, spotless crane and fernbird. It is likely that these species are resident (or have the potential to occur in the future), utilising both the coastal and freshwater wetland habitats near the Ngakoroa Stream and/or the large pond adjacent to the Project Area. Habitat availability for the Not Threatened copper skink was confirmed during site investigations, however no other suitable habitat for native lizards was found or considered likely within the Project area. No indigenous lizards were identified as incidental observations. However, the introduced plague skink was identified.

During the site investigations, no indigenous frogs were identified as incidental observations and it is highly unlikely that native frog species would occur within the Project area due to lack of suitable habitat.

No dedicated fish surveys were undertaken as this will be subject to a future resource consent phase.

Likely Future Environment

It is assumed that in a future urbanised scenario, permanent streams and areas of indigenous vegetation will generally be avoided and retained. Greater emphasis on the protection and enhancement of existing watercourses and areas of significant natural value, such as that surrounding the Ngakoroa Stream, is given in the AUPOIP, requiring these areas to be accommodated within the future urban environment. It is also assumed that stormwater design will be integrated into the proposed 'Blue Green Network'⁵ and sediment and pollutants will be controlled at source. For example, if riparian habitat restoration is implemented appropriately, it is considered that in a future scenario many of the features of ecological value could be similar or in some cases enhanced.

Vegetation (Trees)

The following text provides a summary of the existing and likely future environment as it relates to trees. A more detailed description of the environment is provided within the Assessment of Arboricultural Effects within Volume 4 of this Document set.

⁵ The network is a green infrastructure proposal that combines the Auckland wide policies of Section E3, with specific landscape values of the Drury-Ōpāheke area. Proposed by Auckland Council in the Drury-Ōpāheke Structure Plan to guide future urban growth.

	Existing Environment Surrounding the Project area there are 26 identified trees or groups of trees, comprised of 17 tree groups (totalling approximately 257 trees), eight shelter belts with undefined numbers of trees (totalling approximately 890 metres in length) and one identified single tree (as identified in within the Assessment of Arboricultural Effects). Trees that are protected by District Plan provisions in the project area are limited to a group of seven trees within the Open Space zoned land at the southern end of the Drury Sports Complex. There are no trees identified within the current road reserve on SH22. Likely Future Environment The trees in the Project area provide a range of cultural, amenity, landscape and ecological values. It is anticipated that these values will generally increase or remain constant in the timeframes that may apply to the proposed designation. However, the future environment for trees in the Project area is likely to be very different as the land use pattern and zoning changes from rural and FUZ to urban. This change is likely to result in removal of trees that are not protected by the current plan framework. Removal of trees can therefore be expected to occur as the land use changes from a rural environment to an urban environment in the future. The planting of new trees would also occur as part of an urban landscape.
Topography and Landscape Context	The following text provides a summary of the existing and likely future environment as it relates to landscape features and values. A more detailed description of the environment is provided within the Assessment of Landscape and Visual Effects within Volume 4 of this Document set. Existing Environment The Project area comprises the existing SH22 road corridor and extends into adjacent land that is characterised by flat to low rolling crop and pastoral land to the south and gently rolling rural lifestyle living to the north. Land adjacent to the Project area in the north is influenced by the Ngakoroa flood plains. There are no regionally or nationally significant landscapes (ONLs, ONFs or ONCs) within or proximate to the proposed designation boundary. The Project is situated within a broader landscape that has been assessed by the AUPOIP as being suitable for urbanisation. Within the local context of the Project, the low rolling topography and distant views to the Hunua Foothills contribute to the visual amenity (and the picturesque qualities) of the landscape. The indigenous wetland ecosystems and terrestrial SEA environment of the Ngakoroa Stream as well as the Oira Creek riparian edge (at the southern boundary of the Project area) contribute to the natural character values of the landscape. Open space areas such as Ngakoroa Reserve and the Drury Sports Complex are currently poorly connected to each other. Likely Future Environment The land adjacent to the Project area will witness a significant change from rural to urban land use and character over the next 30 years. The quality and natural character values of open space, riparian and wetland environments are generally anticipated to be retained and, in some instances, enhanced as urban development progresses, in accordance with the policy direction of the AUPOIP which generally seeks to protect and enhance these landscape features. Additionally, it is expected that land cover features will undergo significant change alongside future development through the implementation of street tree plantings, public open space design and landscaping within the private yards of future housing development.

8 SH22 Upgrade: Consideration of Alternatives

A detailed assessment of alternatives was undertaken for the Project to identify the proposed method to manage and upgrade SH22 (this process is described in Section 4.2 and further outlined in the Alternatives Assessment Report attached at Appendix A). The following sections provide an overview of the alternatives assessment process through the corridor assessment (IBC Phase) to the route refinement assessment (DBC and NoR Phase). This summary should be read in conjunction with the full assessment, including the process undertaken and outcomes reached, provided in the Alternatives Assessment Report attached at Appendix A.

8.1 Corridor Alternatives Assessment

During the corridor assessment phase, a range of options were considered for the existing SH22 corridor.

These options were:

- Keep SH22 as a strategic road and upgrade parallel local routes
- Upgrades to SH22, including safety improvements and potentially additional lanes to increase capacity
- Do minimum. Safety upgrades to SH22 only
- Widening SH22 to four lanes to increase capacity
- Extend SH22 further west to include Waiuku/Clarks Beach

The widening of SH22 to four lanes progressed to the short list for further investigation. The assessment noted that the form and function of SH22 will change over time as urbanisation occurs and that more thought was required on the form and function, and integration with the Auckland Council Drury-Ōpāheke Structure Plan or future land use change.

It was recommended that due to the planned growth in Drury, SH22 should be upgraded to four lanes from Drury township to Oira Road to increase capacity. Safety improvements were recommended along the rest of SH22. While the Safe Roads Programme safety improvements were recognised as a committed project, those improvements were not considered sufficient to service the projected growth.

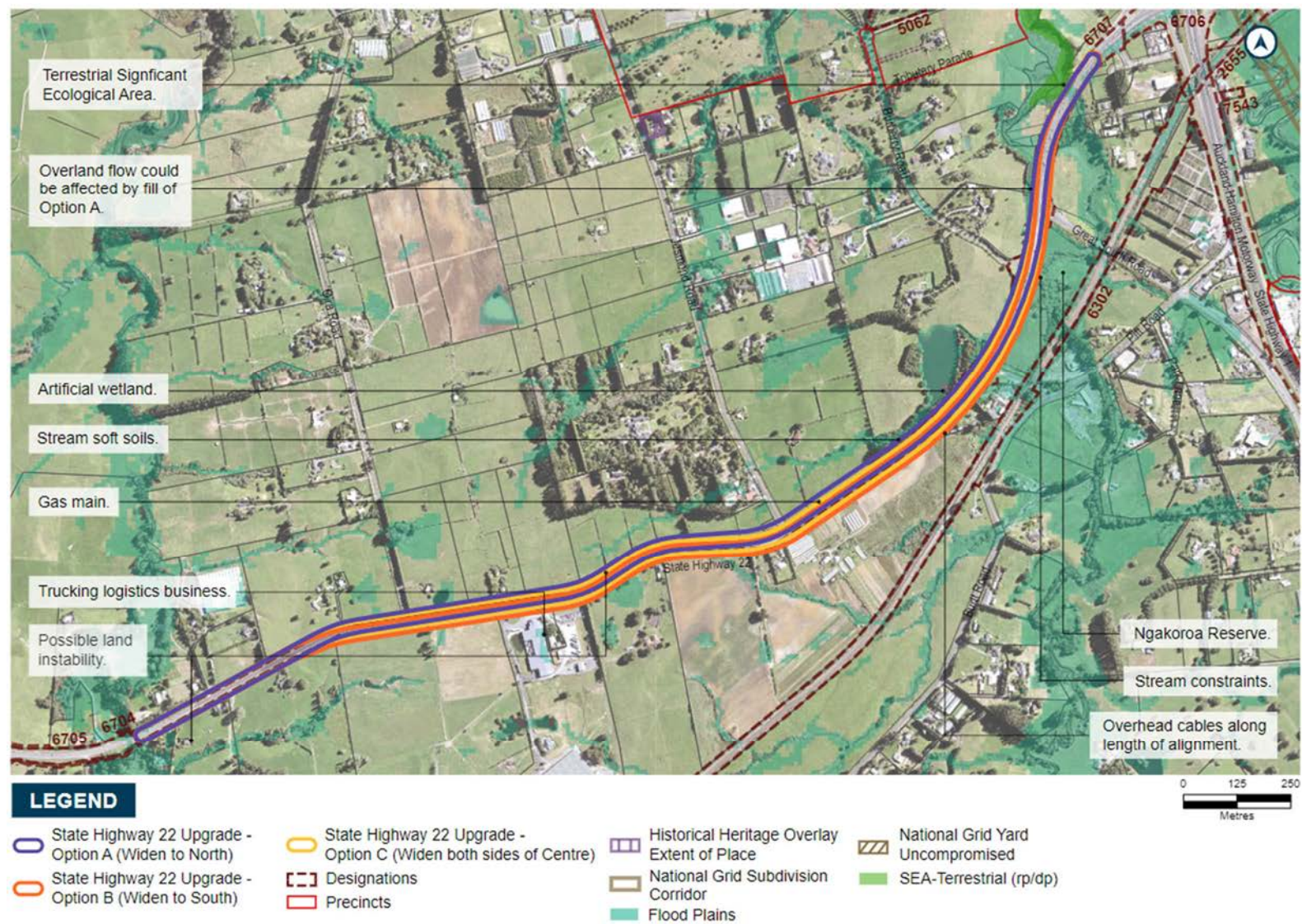
8.2 Route Refinement Alternatives Assessment

8.2.1 Option Development

Route refinement for SH22 Upgrade included specialist assessment of three options on SH22 from SH1 to the extent of the FUZ in the west, including:

- Option A - widening to the northwest of the existing alignment.
- Option B – widening to the southeast of the existing alignment.
- Option C – widening to both sides of the existing alignment.

Each option utilised the 30m typical cross section (for a four lane arterial). The three options are shown in Figure 8-1.



8.2.2 Assessment

The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 8-1. In determining the preferred option, the Project Team considered the MCA assessment and the engagement undertaken with partners, stakeholders and landowners.

8.2.2.1 Preferred Option

The preferred option was determined to be a combination of the Options A, B and C, widening varying sections of the corridor to both the north-west and south-east. This will ensure impacts on various sensitive environmental factors are reduced where possible. This also reflected feedback received from Manawhenua. The preferred option was chosen because it:

- reduces impact on SEAs and Ngakoroa Stream in the north
- reduces impact on Ngakoroa Reserve located to the south east of the corridor
- reduces impact on streams (south east), overland flow paths and artificial wetland to the north west
- avoids impacting an artificial pond which is a planned feature of the future centre and may involve more complex construction
- allows areas of suspected instability to be avoided where possible
- minimises sight distance issues on Great South Road by widening to the west at this point

Where there were no differentiating constraints, the existing corridor was widened to both sides to minimise pavement reconstruction.

All route refinement options achieved the same level of performance when assessed against the transport outcomes.

Throughout the design refinement process for the preferred option specific consideration was given to steepening fill embankments to minimise impacts on Ngakoroa Stream and minimise the Project footprint and associated impacts on private properties. Maintaining property access was also a key consideration during design refinement.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams.

Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the SH22 Upgrade has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Project.

8.2.2.2 Discounted Options

The following table summarises the reasons for discounting the three options individually.

Table 8-1: Discounted Options - SH22 Upgrade

Option	Reason for Discounting
Option A	• Greater impact on SEA • Slightly more impact on overland flow paths • Impact on artificial pond, potential habitat of threatened and at-risk species and a planned feature of the future centre
Option B	• Greater impact on public reserve • Greater property impact due to works required at McPherson junction. • Slightly more impact on overland flow paths
Option C	• Greater property impact due to works required at McPherson junction. • Temporary traffic management during construction more complex • Impact on SEA

8.2.2.3 Intersection Form

Along the preferred corridor, there are three intersections to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future:

- **Jesmond Road / SH22:** Signalised intersection preferred because:
 - FUZ land-use (proposed centre and residential) and proximity to future train station increases active mode modal priority
 - High-quality bus priority North-South and East-West through intersection
 - Grade-separation of active modes considered but not considered suitable here due to topography and high urban density
 - Proximity to Drury West Station and connection with SH22 will make this intersection a high conflict zone between all modes (active transport needs more protection).
- **Oira Road / SH22:** Roundabout preferred because:
 - Part of Safe Network programme – identified this intersection as being a roundabout
 - Local centre on south side of SH22 (Karaka Road)
 - Lower density residential adjacent to this intersection suggests a lower active mode demand, put still within cycling catchment of Drury West Centre
- **Great South Road / SH22:** Signalised intersection preferred because:
 - FUZ land-use (centre and residential) and proximity to train station increases active mode modal priority
 - Proximity to Drury West Station, centre, light industry and connection with SH22 & SH1 will make this intersection a high conflict zone between all modes
 - Staging, future collector network and tension between bus priority, car, accommodating active transport safely.

8.2.3 Summary

The preferred option for the SH22 Upgrade was a combination of widening to the north-west, to the south-east and in some places widening on both sides to ensure impacts on environmental constraints were minimised where possible.

Through the intersection form assessment, it was recommended signalised intersections be implemented at the SH22 / Jesmond Road intersection and the SH22 / Great South Road intersection, and a roundabout be implemented at the SH22 intersection with Oira Road.

9 SH22 Upgrade: Assessment of Effects on the Environment

NoR D1 proposes to alter the existing SH22 designation 6707 already held by Waka Kotahi. In relation to this notice, the assessment under section 171(1) of the RMA is limited to the works proposed as part of the alteration. It does not include works or effects that are or could reasonably be generated by the existing designation.

This section provides a summary of the actual and potential effects of the construction, operation and maintenance of the SH22 Upgrade, including whether these effects are positive or adverse and the scale, duration and location of effects.

Key transport outcomes, land use integration and the avoidance of adverse effects on areas or features of high value have informed the extent of the proposed designation alteration. Where avoidance has not been possible, measure to remedy or mitigate significant adverse effects have been proposed. Details of these are included in Section 10 and reflected in proposed designation conditions.

9.1 Positive Effects

The Project will generate a range of positive effects. The nature and degree of these positive effects are discussed in subsequent sections of the AEE, but in summary:

- The Project will provide transport infrastructure necessary to support and integrate with the planned urban growth in Drury-Ōpāheke. The Project will unlock development capacity in the southern growth area where development pressure is accelerating. This is evident from recent private plan changes being lodged with Auckland Council.
- The Project will provide a safe, reliable arterial corridor that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improves access to employment and social amenities. This will improve the way people live in terms of daily commutes and connecting to the community. In particular, it will:
 - Significantly improve transport facilities for all modes. This will improve safety for those that travel by car, freight, active mode and public transport and will significantly reduce the risk of DSIs;
 - Improve corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand;
 - Provide journey time benefits for general traffic in the morning peak (8min 32s), inter peak (1min 24s) and evening peak (5min 43s), when compared with the likely future environment without the project.
 - Integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.
 - Improve active mode connectivity to recreational facilities (including Ngakoroa Reserve and the Drury Sports Complex) including the ability to tie into the proposed greenways and recreational corridors anticipated by the Drury - Ōpāheke Structure Plan, Blue-Green Network;

- Predicted traffic noise level changes during operation of the Project (together with the implementation of other proposed roading transport projects) are generally expected to reduce compared to the likely future environment without the Project.
- The upgraded bridge over Ngakoroa Stream will increase the freeboard which provides a significant increase to the resilience of the bridge to flooding and increases conveyance of flood water under the bridge.
- Slower speed limits adjacent to existing dwellings and commercial activities and an improved streetscape will improve the experiential qualities of the corridor for users as well as private properties adjacent to the road corridor.
- Net increase in green infrastructure within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences.
- The Project will provide health and wellbeing benefits to the wider community through providing active mode and public transport choices.
- Opportunities to present any new historic information identified during the works to the community through information boards and other displays as the historic heritage of the area is currently not well understood.

9.2 Traffic and Transportation

The potential effects of the Project on traffic and transportation have been assessed in the Assessment of Transport Effects report, provided in Volume 4. The effects assessment has been assessed on the likely future environment, based on the full build out of the southern growth areas in 2048+, and taking into account relevant wider infrastructure upgrades. This methodology is outlined in the Assessment of Transport Effects Report. The potential effects are summarised below, and should be read in conjunction with that report.

9.2.1 Positive Effects

The Project will have significant positive effects on the operation of SH22 and enable future growth in Drury. It will provide a safe, reliable arterial corridor that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improves access to employment and social amenities.

In particular, the Project will significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport. The provision of additional segregated active transport facilities will significantly improve safety for vulnerable users and significantly reduce the risk of DSIs for the predicted demand.

The Project will improve corridor capacity, resulting in improved journey times and reliability for future transport, freight and public transport demand. The upgrade will integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

The positive effects of the Project are discussed in further detail in the assessment of operational effects below.

9.2.2 Operational Effects

The existing SH22 (without the Project) is not fit for purpose to support the planned future urban growth. An assessment of the existing traffic environment of the Project Area demonstrates there are already congestion and safety issues along this corridor, and as the surrounding area is urbanised over time, it is anticipated that these issues will increase significantly.

The existing daily flow already exceeds LoS E (22,000 vpd) which means the corridor is close to maximum capacity for the size and type of road, and barely manages to operate safely given the current conflicts in movement (strategic and local access). The current state of traffic congestion is not fit for purpose to accommodate additional growth in this area and will likely lead to increased congestion and poor safety outcomes as traffic is diverted to lower-standard alternative roads.

The crash history along this section of the existing SH22 road corridor confirms there are safety issues along the corridor, with a total of 78 crashes recorded in the 10-year period between 2010 to 2019. These included two fatal crashes involving pedestrians, and 11 serious injury crashes which were due to vehicles turning/crossing, being rear ended or losing control/involved in a head on collision. Also, there are currently no dedicated pedestrian or cycle facilities on SH22, and the road shoulder does not provide any protection for vulnerable users for both east-west and north-south future demand.

Significant adverse effects are expected if future growth progresses and the existing SH22 corridor remains the same. Modelling indicates that the growth of east-west traffic in the area is expected to grow from 24,400 vpd to 65,300 vpd (2048+). Adverse effects from increased traffic flows include increased safety risk and severance for all users and decreased journey time reliability for general traffic and public transport. This will then lead to further undesirable transport and land use integration outcomes.

9.2.2.1 General Traffic Effects

As the surrounding area is urbanised over time, the proposed SH22 Upgrade will enable the function of the corridor to change from a rural state highway to an urban arterial road. The change in function will involve a reduction of the speed limit to 50kph, and a number of new intersections, reducing the attractiveness of this route for strategic movements. This will encourage the use of alternative faster routes via SH1 and the future Pukekohe Expressway (once completed) for these movements.

The transition in SH22's function from a rural two-lane state highway to an urban four-lane arterial will also increase east-west traffic capacity and improve priority for north-south crossings. The additional capacity will result in improved journey times and reliability for future freight and public transport demand. The journey time benefits for general traffic is expected to be largest in the morning peak (8min 32s), followed by the inter peak (1min 24s) and evening peak (5min 43s), when compared with the likely future environment without the Project.

The additional capacity provided by four lanes will also allow flexibility in how the corridor is operated in the future and create an opportunity to improve the place function along SH22 further. In the short and long term, the additional capacity can provide space for priority vehicles, such as buses or high-occupancy vehicles or additional support for crossing and accessing movements (irrespective of an alternative route for strategic travel, additional capacity is required on SH22).

9.2.2.2 Safety Effects

The Project has been designed with consideration of the latest safety guidance, including AT's Vision Zero and Waka Kotahi's Road to Zero. The Project is expected to result in a number of positive safety effects compared to the existing corridor, including the following:

- The provision of additional segregated walking and cycling facilities along SH22, which will significantly improve safety for vulnerable road users. It will also provide significantly improved walking and crossing facilities at Oira Road, Jesmond Road, and the Great South Road intersection, resulting in a safer environment for all road users
- Reducing speed limits to more appropriate urban speeds (e.g. 50km/h), which will significantly improve the speed environment, with enhanced place function and consequential reductions in the risk of DSIs. In particular, it will significantly reduce the risk of DSIs for the predicted demand (east-west and north-south) for walking (9,900 daily) and cycling (2,900 daily)
- It will significantly reduce the likelihood of head-on crashes by providing raised medians to separate the two directions of traffic
- It will provide additional lane capacity to accommodate the strategic traffic in this corridor that could otherwise divert to less suitable rural or future neighbourhood roads.

9.2.2.3 Walking and Cycling Effects

The Project will have positive effects on walking and cycling. The Project proposes separated walking and cycling facilities along both sides of the SH22 corridor, with dedicated pedestrian and cycle crossing facilities at Jesmond Road, Great South Road and Oira Road. These will connect with the expected future adjacent facilities (included in NoR D2 and the future collector network).

The proposed walking and cycling facilities have been designed in accordance with the latest AT and Waka Kotahi standards and policies regarding safety and design. The provision of separated facilities will significantly reduce the likelihood and exposure to potential crashes, enabling safe movement for vulnerable road users along and across SH22. In addition to these safety benefits, the proposed walking and cycling facilities will:

- Improve integration with the future walking and cycling network, resulting in improved east-west and north-south walking and cycling connectivity
- Lead to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips
- Serve as a key enabler for greater use of active transport modes by providing a safe connector route between urban areas and the proposed Drury West and Drury Central Rail Stations. This will significantly improve existing and likely future safety and network connectivity
- Support growth surrounding SH22 and significantly improve safety and access to employment and social amenities.

9.2.2.4 Public Transport Effects

The Project is expected to have positive effects on the operation of public transport with the inclusion of additional traffic lanes on the existing cross-section of the corridor. This will allow for more capacity, provide for more north-south crossings and enable the wider future frequent transit corridor (Drury and Ōpāheke) to connect from Jesmond Road to access the proposed Drury West Station.

The Project is expected to have the following public transport benefits:

- Improved journey time performance and consistency for public transport users as the additional traffic lane will allow for more public transport capacity
- Reduced delays and improved reliability for public transport services on SH22 (east-west) and the future transit network (north-south)
- Improved integration with the future public transport network and improved east-west and north-south connectivity, as well as improved access to employment and social amenities
- Increased resilience of the public transport network
- Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.

9.2.2.5 Effects on Access

The operation of the Project is expected to have neutral effects on access. Based on the high traffic flow per day along SH22 and its limited access classification, direct property access is not recommended onto the network given the potential negative safety implications.

Some existing properties will therefore face a minor diversion impact onto the main network as direct property access is limited to left-in and left-out only movements. However, these effects are expected to be offset by the more reliable and significant improvements to safety and overall, there will be a decrease in crash exposure between driveways, general traffic and active modes. By limiting direct property access onto the corridor, the crash risk of cars merging onto the road and crossing multiple traffic lanes will be eliminated.

9.2.3 Construction Effects

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for each construction zone (as described in section 6.4). In terms of construction effects, there are several potential adverse effects mainly linked to temporary traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). Potential adverse effects on transport during the construction of the Project can be summarised as follows:

- **Temporary traffic management** will be required to delineate live traffic away from the construction zones. The scale of temporary traffic management is largely dependent on the various stages and requirements of the construction activities. It is expected that full road closure may be required for some specific activities, such as road surfacing, traffic switches and bridge beam installation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work
- **Construction traffic movements** to accommodate the movement of significant earthworks and imported aggregates for pavement construction will likely result in the increase of traffic volume on construction routes used during the construction period of SH 22 upgrade.
- **Construction vehicles** will include truck movements (heavy), light delivery and staff/contractor vehicle movements (light). The total estimated trips associated with construction works are approximately 39,000 truck movements staged over two and three years.
- **Road safety** impacts from site access points, posted speed and sight lines for construction vehicles.
- **Pedestrian and cyclist safety**: the road shoulder may not be available at certain times for pedestrians and cyclists to use during construction. Potential effects on pedestrians and cyclists

will be reassessed prior to construction to reflect the current traffic environment at the time of construction.

- **Existing driveways** that remain during construction will be required to have temporary access provision.

It is recommended the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

9.2.4 Mitigation Measures

9.2.4.1 Operational Effects

Based on the assessment of effects, as summarised above, the Project will have significant positive effects on the operation of the transport system. There are no anticipated adverse effects that require mitigation.

9.2.4.2 Construction Effects

To address the potential construction effects identified, a Construction Traffic Management Plan (CTMP) will be prepared prior to the start of construction. Any CTMP prepared will be submitted to Council for information ten working days prior to the start of works. Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. The objective of the CTMP is to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP will include:

- Methods to manage the effects of temporary traffic management activities on traffic;
- Measures to ensure the safety of all transport users;
- The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
- Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
- Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
- The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads;
- Methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

Auditing, monitoring and reporting requirements relating to traffic management activities will be undertaken in accordance with Waka Kotahi's Code of Practice for Temporary Traffic Management.

9.2.5 Summary of Traffic and Transportation Effects

The existing SH22 (without the Project) is not fit for purpose to support the planned future urban growth, with the existing traffic flow already exceeding LoS E, and a total of 78 crashes recorded in the last decade. Significant adverse effects are expected if future growth progresses and the existing SH22 corridor remains the same, with decreased journey time reliability for general traffic, freight and public transport and increased safety risks.

The Project will have significant positive effects on the operation of SH22 and will enable future growth in Drury. It will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improves access to employment and social amenities.

The Project will improve all transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode, and public transport. It will improve corridor capacity resulting in improved journey times and reliability for future freight and public transport demand. The upgrade will also significantly improve safety for vulnerable users and will significantly reduce the risk of DSIs for the predicated walking and cycling demand. The Project is not expected to have any adverse operational effects that require mitigation.

In terms of construction effects, some potential adverse effects are anticipated, but these are mainly linked to temporary traffic management, and can be appropriately mitigated through a CTMP.

9.3 Cultural

9.3.1 Discussion

This section presents our understanding of the cultural values and issues of significance to Manawhenua in respect of the Project. This section draws from our engagement with Manawhenua and inputs provided by Manawhenua during Project development. Ngai Tai ki Tāmaki, Ngāti Maru, Ngāti Tamaoho, Ngāti Te Ata Waiohū, Te Ahiwaru, Ngāti Whanaunga and Te Ākitai Waiohū have been actively involved in the development of the Drury Arterial Network.

It is proposed to designate part of a property that is Treaty Settlement Land (67 Mercer Street) mainly for temporary construction area. The Project Team has discussed this with LINZ who administers the land who advised the land is currently vacant and advised on the process to occupy the land.

Ngāti Tamaoho reached a settlement with the Crown on its Treaty claim in 2017 (Ngāti Tamaoho Deed of Settlement 30 April 2017). Within the SH22 Upgrade area, the Ngakoroa and Oira Streams and their tributaries are Ngāti Tamaoho statutory acknowledgement areas.

The Project does not affect any identified Sites of Significance to mana whenua under the AUPOIP, wāhi tapu, other taonga or Maori land. However, In developing the Project, recognition has been given to both the relationship of Tangata Whenua to their lands, culture and traditions in this area and the commitment to partnership between Manawhenua and Waka Kotahi (as representative of the Crown) founded through Te Tiriti o Waitangi. The partnership approach that has been taken in delivering the Project with Manawhenua is discussed further in respect to engagement in section 5.2.1.1 Ngā Manawhenua of this AEE.

Manawhenua involvement has included participation in all Project phases through options assessment, design refinement and effects assessment of the preferred corridor. Engagement with these iwi groups has included site walkovers to identify and address any culturally significant effects, as well as discussion of the approach to cultural impact assessments which could accompany the NoRs. While initially Ngāti Tamaoho, Ngāi Tai Ki Tamaki, Te Ākitai Waiohua and Ngāti Te Ata Waiohua intended to prepare a Cultural Impact Assessment (CIA) for inclusion with this NoR documentation, these were unable to be completed to date. A Historic Summary was prepared by Ngāti Tamaoho (included in Volume 4) which has been used as a reference by the Project team.

This partnership with Manawhenua highlighted the following matters of importance:

- **Water quality:** the importance of maintenance and enhancement of water quality, particularly through stormwater treatment.
- **Ecology:** the importance of maintenance and enhancement of ecological values, particularly areas of high indigenous values and SEAs.
- **Cultural heritage:** the importance of imposing an appropriate accidental discovery protocol for undiscovered archaeological sites, particularly given the proximity of the works to the Ngakoroa Stream, its tributaries and the Oira Creek. Manawhenua identified the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage.

The Project has also recognised Manawhenua cultural values, particularly with regards to the mauri of, and the relationships of Manawhenua with natural and physical resources including freshwater, land and air resources. Significant adverse effects on these values have been avoided, remedied or mitigated as appropriate. In particular, sufficient land has been included within the proposed designation to provide appropriate stormwater discharge treatment (subject to future resource consenting processes). SEAs, wetlands and waterways have been avoided where practicable. Manawhenua expressed a strong preference for reducing impacts on the SEA adjacent to the Ngakoroa Stream. They also expressed a strong preference for bridges instead of culverts, or box culverts (that have no structure in the bed of the stream) and reducing infrastructure within floodplains.

9.3.2 Mitigation

A number of workshops were held with Manawhenua to work collaboratively on the draft condition set. The conditions that relate to ongoing Manawhenua involvement in the Project were developed and agreed with Manawhenua. The proposed designation conditions include the following measures to ensure ongoing involvement Manawhenua in further Project design and construction and enable the continued recognition of Manawhenua cultural values throughout the Project lifecycle.

Cultural Advisory Report

Manawhenua will be invited to prepare a Cultural Advisory Report prior to the start of detailed design of the Project. The objective of the Cultural Advisory Report is to assist in understanding and identifying Ngā Taonga Tuku Iho ('treasures handed down by our ancestors') affected by the Project, to inform their management and protection. To achieve the objective, Waka Kotahi will invite Manawhenua to prepare a Cultural Advisory Report that:

- Identifies the cultural sites, landscapes and values that have the potential to be affected by the construction and operation of the Project;
- Sets out the desired outcomes for management of potential effects on cultural sites, landscapes and values;
- Identifies traditional cultural practices within the area that may be impacted by the Project;
- Identifies opportunities for restoration and enhancement of identified cultural sites, landscapes and values within the Project area;
- Taking into account the outcomes of the above, identifies cultural matters and principles that should be considered in the development of the Historic and Archaeological Management Plan (see section 9.4.3), Urban and Landscape Design Management Plan (ULDMP) (see section 9.5.4) and the Cultural Monitoring Plan (see below).
- Identifies and (if possible) nominates traditional names along the Project alignment, noting there may be formal statutory processes outside the Project that apply to any decision-making process.

The desired outcomes for management of potential effects on cultural sites, landscapes and values identified in the Cultural Advisory Report will be discussed with Manawhenua and those outcomes reflected in the relevant management plans where practicable.

Development of other Management Plans

Manawhenua will be invited to participate in the development of the ULDMP to provide input into relevant cultural landscape and design matters as outlined above. Additionally, the Historic and Archaeological Management Plan will be prepared in consultation with Manawhenua.

Cultural Monitoring Plan

Prior to the start of construction works or enabling works, a Cultural Monitoring Plan will be prepared. The objective of the Cultural Monitoring Plan is to identify methods for undertaking cultural monitoring. The Cultural Monitoring Plan will include:

- Requirements for formal dedication or cultural interpretation to be undertaken prior to start of Construction Works in areas identified as having significance to Mana Whenua;
- Requirements and protocols for cultural inductions for contractors and subcontractors;
- Identification of activities, sites and areas where cultural monitoring is required during particular Construction Works;
- Identification of personnel to undertake cultural monitoring, including any geographic definition of their responsibilities; and
- Details of personnel to assist with management of any cultural effects identified during cultural monitoring, including implementation of any Accidental Discovery Protocol.

9.3.3 Cultural Summary

The Project team have worked closely with Manawhenua throughout the Project lifecycle and have taken their values and concerns into consideration, including on ecological values, water quality and cultural heritage. In particular, the indicative design has responded to minimise impacts on high value SEAs.

Overall the indicative design of the Project and future design and construction management measures will respond positively to the matters raised by Manawhenua and is consistent with the values they identified during Project design and engagement processes.

9.4 Historic Heritage

The Assessment of Effects on Historic Heritage, included in Volume 4, assesses the potential effects on historic heritage resulting from the future construction and operation of the Project. The report assesses the potential effects on any identified recorded historic heritage sites and unidentified subsurface archaeological remains that might be exposed during future construction. The report should be read in conjunction with the summary set out below.

9.4.1 Construction Effects

The assessment found no recorded historic heritage sites or deposits within the footprint of the Project.

Newly recorded archaeological sites were identified near the Ngakoroa Stream (to the north of the proposed designation), which indicate a likelihood of exposing previously unrecorded deposits during construction of the Project. The areas with the highest risk for site exposure include those near waterways adjacent to Oira Creek and Ngakoroa Stream. A track was identified on a pre-1900s survey plan which follows the same general route as the existing SH22. This indicates the potential presence of unidentified historic heritage within the proposed designation footprint.

Should previously unrecorded sites exist, without mitigation, they could be adversely impacted by earthworks during construction of the Project.

However, if sites are found this provides an opportunity to present this information to the community through information boards and other displays as the historic heritage of the area is currently not well understood.

9.4.2 Operational Effects

There will be no adverse operational effects of the Project on historic heritage.

9.4.3 Mitigation Measures

As a proposed condition of the alteration to designation, a HAMP will be prepared prior to the start of construction. The HAMP will:

- Set out the methods for the identification and assessment of historic heritage within the designation to inform detailed design
- Identify the known and potential historic heritage sites within the designation
- Set out the Heritage New Zealand Pouhere Taonga Act 2014 (HNZPTA) authority requirements for any pre-1900 sites identified for a precautionary authority.

Since archaeological survey cannot always detect sites of traditional significance to Māori, or wāhi tapu, the appropriate mana whenua authorities will be consulted regarding the possible existence of such sites, and the recommendations in this report.

Any potential adverse effects on previously unrecorded archaeological deposits that are exposed during the works can be mitigated by obtaining a precautionary HNZPTA authority. This authority will be sought prior to construction of the Project.

9.4.4 Summary of Effects on Historic Heritage

While, there are no known historic heritage sites within the Project area, there remains a risk of exposing potential previously unrecorded historic heritage deposits. With the mitigation measures described in section 9.4.3 in place, the potential adverse effects of the proposed construction of the Project on historic heritage values will be managed appropriately.

9.5 Landscape and Visual

The Assessment of Landscape and Visual Effects, included in Volume 4, assesses the potential effects on landscape character, natural character and visual effects associated with the construction and operation of the Project and recommends ways of mitigating these effects. The effects were assessed in the following two categories:

Temporary Effects (Construction Effects): Describes the anticipated impacts on the bio-physical elements and features of the landscape resource (landform, vegetation and hydrology) resulting from the construction of the Project. It also includes visual amenity effects for both public and private viewing audiences from construction works.

The construction activities required to implement the Project are categorised under the following broad headings:

- **Site enabling works** - site establishment, demolition and vegetation clearance;
- **Project formation works** - bulk earthworks and formation of new road surface and batter slopes, culvert upgrades, stormwater wetlands, private driveway regrades and bridge construction;
- **Finishing works** - lighting, signage, footpath/cycleway details and line markings, streetscape elements and landscaping (including street trees, mitigation planting and riparian/wetland planting (to be determined by detailed design through the ULDMP and by regional resource consents)).

Permanent Effects (Operational Effects): Describes the effects on the landscape of completed works (including integrated landscape mitigation measures), the significance of physical landscape change and ultimately the resulting effects of the Projects on landscape character, natural character and visual amenity for both public and private viewing audiences. This section summarises the potential effects and mitigation measures proposed. The summary below should be read in conjunction with the report.

9.5.1 Positive Effects

A number of positive landscape and visual effects are anticipated as a result of the operation of the Project (including proposed mitigation as detailed in 9.5.3). Positive effects are likely to include:

- A streetscape to match the emerging urban form within adjacent land;
- Improved and/or new opportunities for active modes of transport and the ability to provide improved connectivity to Ngakoroa Reserve and the Drury Sports Complex. Also, the ability to tie into the proposed greenways and recreational corridors anticipated by the Drury - Ōpāheke Structure Plan, Blue-Green Network;
- Net increase in green infrastructure within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences.

- Slower speed limits adjacent to existing dwellings and commercial activities improving on the experiential qualities of the corridor for users and private properties adjacent to the road corridor.

9.5.2 Construction Effects

9.5.2.1 Physical Landscape Effects

During construction, potential adverse effects on the physical landscape include construction laydown areas, extent of vegetation clearance, the scale and location of proposed cut and fill slopes (noting the scale anticipated may reduce as a result of urban development prior to the construction of the Project), construction of the proposed stormwater wetlands and bridge construction.

Indicative site compound and construction areas will temporarily occupy pastoral land that is already somewhat modified by existing rural land use. All areas will be reinstated (grassed) at the completion of the construction period. The physical landscape effects resulting from establishment and use of the construction work areas within the Project area will be low.

Broad areas of street-side vegetation and localised areas of indigenous terrestrial vegetation are proposed to be removed during construction. Overall, the physical landscape effects likely to arise from vegetation clearance during construction will be temporary and will be moderate-low.

The proposed earthworks associated with the construction of the Ngakoroa Bridge will result in a carriageway that is approximately 2m above existing road surface. The proposed cut and fill slopes range in scale, and will be shaped to integrate into the surrounding modified landform. Overall, impacts on the physical landscape in constructing the proposed earthworks and structures will be low.

To construct the proposed stormwater wetlands, earthworks to re-shape the land and achieve optimal depths and edge profiles will be finalised at detailed design. Wetlands 1 and 3 are proposed within open pastoral areas, outside of existing waterways, within land that is already modified by rural land use. Wetland 2 is proposed within an existing agricultural property. On that basis, impacts on the physical landscape to construct the proposed stormwater wetlands are considered to be low.

Potential effects on private properties adjacent to the existing SH22 road corridor during the construction period will be moderate-low and include:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;
- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences; and
- Potential construction of retaining walls.

Site finishing works to be determined at detailed design will occur within the already modified areas of the Project. Resulting physical landscape effects are expected to be negligible.

9.5.2.2 Temporary Visual Effects

The construction of the Project is anticipated to be staged within five construction zones along the proposed corridor, over a period of 2 to 2.5 years. Adverse visual effects are anticipated to occur progressively through the Project area during the construction period. The consideration of visual effects through the construction phase acknowledges the full range of activities (and their resultant visual impact), required to implement the upgraded road corridor.

Adverse visual effects for the transient public viewing audience are likely to be low through the construction phase, taking into account areas where adverse effects are likely to be heightened during the temporary construction period. Similar effects are likely to be heightened for the private viewing audience directly adjacent to the Project area on the basis of more direct and prolonged engagement with the Project's construction activities. The nature and significance of the potential adverse visual effects is considered to be moderated through the Project area by the following aspects:

- Road works and construction activities can generally be expected to occur within the SH22 corridor
- The SH22 carriageway is already a dominant element within the visual composition of the Project area;
- The existing road corridor landscape has already been modified by previous works required to shape the existing SH22 road corridor.

Therefore, visual effects for transient viewing audiences will be low and visual effects for private viewing audiences are likely to range between moderate-low to moderate during construction.

9.5.3 Operational Effects

9.5.3.1 Natural Character Effects

In reconstructing the SH22 Ngakoroa Stream bridge, limited indigenous vegetation clearance is expected to occur within the wetland and riparian margins of Ngakoroa Stream (subject to future resource consent approvals). Widening to the south of the existing bridge (through alternatives assessment) has significantly reduced impacts on the SEA wetland and riparian margins. Removal of indigenous vegetation within wetland and stream environments (albeit limited) has the potential to alter the character of these areas by heightening the impression of further human modification. As the detailed design progresses and resource consents are sought, the full extent and type of indigenous vegetation affected (within the Ngakoroa Stream and wetland environment) will be determined. It is anticipated that reinstatement and mitigation planting at the completion of works will assist with mitigating any landscape and natural character effects arising from the Ngakoroa Stream bridge crossing. Mitigation measures are outlined in section 9.5.4.

On the basis of the above (allowing for future landscape mitigation of riparian areas), adverse natural character effects are likely to be low.

9.5.3.2 Visual Amenity Effects

Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to proximity to the corridor. These include:

- For existing properties set back from the Project area, the visual amenity effects will be a small incremental increase in existing effects from the road corridor.
- As a direct result of the Project, residents may experience some level of material change to the visual composition and residential amenity of the road corridor as perceived from private property.
- Impacted properties may experience heightened visual amenity and residential character effects as a direct result of driveway regrading, potential loss of yard space and by the greater proximity of the carriageway and footpaths/cycleways to private dwellings however, it is considered appropriate when viewed in the context of a medium-high density urban environment in the long term.

- Public viewing audiences will continue to engage with a similar transport environment, within the backdrop of an increasingly urban neighbourhood character. Over time visual amenity and appeal for users will improve, due to an improved streetscape design, maturing street trees and berm plantings and greater accessibility to active modes of transport.

Based on the above, visual effects within the Project area are likely to be very low and moving to beneficial for public viewing audiences through the operational phase of the Project. For the private viewing audience, the visual effects are likely to be moderate-low to low, reducing over an extended period of time.

9.5.3.3 Landscape Character Effects

The principal elements of the Project (including the road form, driveway regrading, batter slopes, stormwater wetlands and structures) will permanently alter the character of the existing SH22 road corridor and adjacent landscape. The existing corridor is currently distinctively rural in character owing to the limited streetscape features, unstructured hedgerow and shelter belt plantings and the existing rural land uses adjacent to the corridor. It is recognised that this rural character will likely change to a more urban area prior to construction of the Project as proposed private plan changes are already signalling urbanisation of the area.

Within the proposed designation, broad areas of street-side vegetation (within private property), are proposed to be removed. While most of this vegetation is not considered significant on an individual basis, collectively it contributes to the visual amenity of the road corridor and provides a degree of screening and privacy for properties adjacent to the road. If not mitigated, removal of this vegetation will have adverse effects on the landscape character of the existing road corridor. Mitigation measures are outlined in section 9.5.4.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport, reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features are expected to improve landscape and urban amenity within the future corridor. The Project is anticipated to operate within the context of increased urbanisation as adjacent FUZ land is progressively live-zoned and urbanised. On that basis, the magnitude and nature of landscape change proposed by the Project is considered to accord with that which will occur throughout the localised landscape over time.

9.5.4 Mitigation Measures

To address the modification to the landscape arising from the Project, prior to construction, an Urban and Landscape Design Management Plan (ULDMP) will be prepared. The ULDMP will include the following matters which address the principal elements of the Project that are likely to give rise to temporary and permanent adverse effects on landscape character, natural character and visual amenity:

1. **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.
2. **Bridges and structures:** demonstrate visual integration and sense of place considerations based on Mana Whenua preferred design principles for the proposed bridge structure over Ngakoroa Stream.

3. **Active transport connectivity:** investigate opportunities to integrate active transport facilities with existing and future open space, including Ngakoroa Reserve and Drury Sports Complex, and with future urban developments that may be development prior to the construction of the Project.
4. **Planting design details:** landscape design and planting design details will be prepared for the Project that demonstrate the following:
 - a. Street trees along the full length of SH22 in conjunction with shrubs and ground cover species appropriate for the use within stormwater treatment areas and berms. Species and tree stature should be selected to correspond with adjacent land use and blue-green areas, in accordance with the 9 key principles outlined in the Auckland's Urban Ngahere (Forest) Strategy,
 - b. Identification of existing trees and vegetation that will be retained. Where practicable, mature trees and indigenous vegetation should be retained
 - c. Identification of areas where top soil may be re-used within the project area
 - d. Reinstatement planting within private property boundaries in consultation with property owners
 - e. Shape of and treatment of fill slopes and residual land, to integrate with adjacent land use and areas where the Project intersects with the proposed Blue-Green Network.
 - f. Stormwater wetland design and planting
 - g. Integration of Mana Whenua preferred design principles in relation to planting, structures and hard landscape elements.
 - h. Site preparation, implementation and maintenance requirements for all planting typologies.

The general location of recommended mitigation measures is shown in Appendix 1. Landscape Plans and Images: Maps 09-13 within the Assessment of Landscape and Visual Effects (Volume 4). The proposed mitigation measures will, where practicable be integrated with any revegetation requirements of future resource consent processes. Opportunities for integration of landscape mitigation works with the proposed Blue-Green Network, indicated by the Drury – Ōpāheke Structure Plan will also be considered.

9.5.5 Summary of Landscape and Visual Effects

Overall landscape and visual effects range from low to moderate for the construction phase and very low to moderate-low for the operational phase. Future development of FUZ areas on adjacent land will substantially change the scale and character of the adjacent landscape as experienced from within the road, and will absorb the landscape and visual changes proposed within the Project area.

With the proposed mitigation measures in place to address effects on landscape, natural character and visual amenity (implemented through an ULDMP), the proposed features and scale of the Project are able to be appropriately integrated into the existing and future landscape adequately to remedy the potential adverse effects arising from the Project.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport (improving connectivity), reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features and the resulting streetscape are expected to improve landscape and urban amenity within the future corridor.

9.6 Ecology

The Assessment of Ecological Effects, included in Volume 4, assesses the potential ecological effects of the Project on the environment, where these relate to ecological values that are subject to district plan controls in the AUP. Those ecological matters that trigger Regional plan and/or Freshwater NES resource consent applications will be assessed and consents sought at a later date for the Project, with any required mitigation assessed fully at that time. However, potential ecological effects of the activities likely requiring resource consents and/or wildlife permits at a later stage of the Project were considered in the report to inform alignment and design options and to inform the proposed designation boundary for the Project. The ecological assessment of effects follows the Environment Institute of Australia and New Zealand (EIANZ) Guidelines. These were used to assess the ecological value of identified ecological features and evaluate the magnitude and level of potential effects that the Project could have on these features. The report should be read in conjunction with the summary set out below.

9.6.1 Positive Effects

A positive ecological effect currently anticipated as a result of the Project is a net increase in green infrastructure and associated habitats within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands.

9.6.2 Construction Effects

9.6.2.1 Summary of Potential Construction Effects, Prior to Mitigation

The proposed construction activities have the potential to cause adverse effects on ecological features within and adjacent to the Project area, without mitigation. Potential construction effects that relate to the activities authorised by the proposed alteration to designation are:

- Vegetation removal leading to the permanent loss of terrestrial habitats;
- Construction activities causing light, noise and vibration leading to the disturbance and displacement of indigenous fauna.

9.6.2.2 Magnitude of Construction Effects

The magnitude of construction effects listed above on impacted ecological features are discussed in the following sections.

Terrestrial Habitats

Construction effects have been assessed in relation to vegetation that is subject to district plan controls and relates to the loss of permanent habitat for native fauna (e.g. bats, birds and lizards). Compliance with the Wildlife Act 1953 relating to the unintentional killing, injuring or disturbing of native fauna (e.g. bats, birds and lizards) has also been considered for these trees.

There are no trees/vegetation identified within the Project Area that are subject to district plan controls that will be removed due to the Project. A group of trees in the Drury Sports Complex will be retained and protection measures during construction will be specified in a Tree Management Plan which will be implemented prior to commencement of construction.

As the trees will be retained, the magnitude of construction effects on terrestrial habitats is considered to be negligible.

Species

Bats

Bats have not been detected within or adjacent to the Project area therefore, it is unlikely that construction activities (including light spill, noise and vibration) would result in the disturbance or displacement of individuals or their roosts because they are likely infrequent visitors to the area. As such, the magnitude of effect on bats is considered to be low.

Birds

Noise, vibration and lighting disturbance caused by construction activities could displace indigenous birds from suitable nesting and foraging habitat adjacent to the Project area, particularly where sensitive At Risk – Declining species occur within adjacent wetlands.

Coastal wetland bird habitat

Many of the coastal bird species which occur (or are likely to occur) within the Ngakoroa Stream wetlands adjacent to the Project area are Threatened or At Risk species. Habitats used by these birds include the open water, intertidal mudflats and coastal wetland habitats. The majority of coastal and wetland birds such as gull, shag and tern species use the stream corridor for foraging but have no known breeding habitat or specific roost sites. However, the WL19 Raupo reedland (wetland D1W7) directly adjacent to the Project area, including the construction works area, provide very high value habitat for banded rail, fern bird and spotless crane, which may use these areas for foraging and breeding.

Figure 9-1 identifies the temporary construction works area including the proposed site compound and bridge laydown area (red), two bridge construction areas (yellow) and the new bridge construction (blue). These areas are directly adjacent to WL19 raupo reedland habitat (wetland D1W7), which has been highlighted as potential habitat for breeding banded rail fern bird and spotless crane. The habitat directly within the bridge construction footprint is suboptimal due to the existing road infrastructure and therefore birds are unlikely to nest at this location.. However high value habitat does occur directly adjacent to the bridge staging area. The disturbance caused by construction noise, vibration and lighting directly adjacent to breeding habitat has the potential to adversely impact the breeding success of these At Risk species.

The location of these facilities is largely unavoidable as an all-weather construction yard will be required for bridge construction and staging will be required from both sides of the bridge. The construction compound will house a bridge construction satellite office, construction plant, equipment and materials. Access to the site will be via the State Highway, and will allow for heavy construction vehicle access, such as concrete trucks, transporters, delivery trucks, and cranes. Typically, a 20 m wide temporary accessway will be required next to the bridge footprint to allow for the temporary staging, including the construction and dismantling of existing and new bridges. During construction of the Project, night works may be required and site compounds are likely to be lit overnight.

Existing buffer vegetation, such as exotic wetland, exotic scrub and planted vegetation (see Figure 9-1) occurs within the Project area. Although the exotic vegetation is unsuitable for breeding At Risk – Declining wetland birds, these habitats provide a buffer for adjacent habitat from construction

activities. Where practicable, e.g. along the boundary of the site compound and stockpile / laydown areas, there is an opportunity to retain these vegetation buffers during construction by creating wetland setback buffers. Where removal of buffer vegetation is unavoidable, e.g. bridge staging areas, this should be reinstated and restored following construction, with native wetland and coastal scrub planting.

Background noise and lighting is likely to increase with urbanisation of the FUZ areas surrounding the Ngakoroa Stream. Construction disturbance caused by the Project to breeding birds will be localised to areas of the stream adjacent to the bridge, but is considered to be a key concern. Birds are sensitive to disturbance from light, noise and vibration, which may cause displacement and nest abandonment if construction were to coincide with the breeding season (September to February).

Overall, the magnitude of effect of the Project on the coastal habitat used by the local bird population within the immediate vicinity of the Ngakoroa Stream is considered to be moderate. This is based upon the regional importance of some of the affected bird species, the relative frequency of construction effects and the reasonable likelihood of those effects to occur on the local coastal wetland bird population.

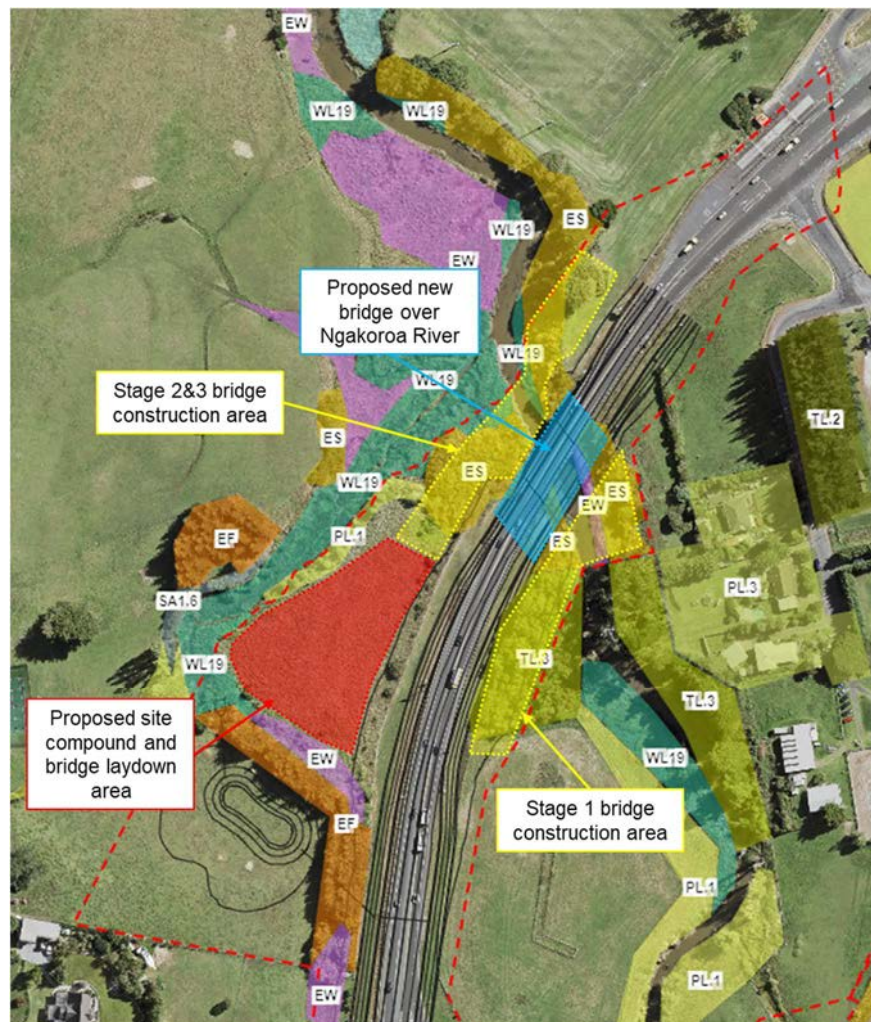


Figure 9-1: shows the WL19 Raupo Redland/wetland D1W7 (potential breeding habitat for coastal wetland birds) relative to the required temporary construction works area including, site compound and bridge laydown area (red), stage 1, 2 and 3 bridge construction areas (yellow) and the new bridge (blue).

Freshwater wetland bird habitat:

New Zealand dabchick (At Risk- Recovering) have been observed and may breed in the artificial pond at 6 Burberry Road adjacent to the Project area (20m at its closest point). The habitat at this location for freshwater birds is therefore considered to be high value. However, construction effects relating to noise, vibration and light from the Project are at a sufficient distance from the habitat therefore the magnitude of effects are low.

Forest bird habitat:

The birds which occur in the remainder of the Project area are common in the local area (modified agricultural land and exotic habitats) and habitat is considered to be of Low ecological value. These birds are adapted to human modified environments and suitable foraging habitat of equal quality will remain adjacent to the Project area during construction. Therefore, the magnitude of effects from the Project construction activities on the local forest bird population is considered to be low.

9.6.2.3 Level of Construction Effects

In accordance with EIANZ Guidelines Table 9-1 below summarises the overall level of potential ecological effects for each key ecological feature and fauna group related to the Project. Section 9.6.4.1 discusses the mitigation measures required to minimise any residual effects associated with construction activities.

Table 9-1: NoR D1 Summary of potential ecological effects (prior to mitigation) during construction based on ecological value and magnitude of the effect

Ecological Feature	Ecological Value	Magnitude of Construction Effects	Level of Ecological Effect (prior to mitigation)
Terrestrial habitat – district matters	Low	Low	Low
Bats	Low	Low	Very Low
Birds – coastal wetland	High	Moderate	High
Birds – forest	Low	Low	Very Low
Birds – freshwater wetland	High	Low	Low

The assessment identified that the potential level of ecological effects from the construction of the Project on the majority of ecological features are Very Low or Low, with the exception of coastal wetland birds, where the level of effect is High. In accordance with the EIANZ Guidelines mitigation measures are proposed for those effects which are Moderate and above, and as such mitigation is required for the Project's construction effects on coastal wetland birds. These measures are outlined in 9.6.4.1.

9.6.3 Operational Effects

9.6.3.1 Summary of Potential Operational Effects, Prior to Mitigation

The Project involves upgrading an existing road from two lanes to four and although some adverse effects may occur from the current baseline, many operational effects such as fragmentation, noise and lighting are likely to be pre-existing effects from operation of the existing road.

In summary, potential operational effects from the Project on indigenous fauna that relate to the activities authorised by the proposed alteration to designation are:

- Loss in connectivity to indigenous fauna (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

9.6.3.2 Magnitude of Operational Effects

Bats

As bats have not been recorded within or adjacent to the Project area, it is considered unlikely that the operation of the Project (including noise and vibration from traffic and light from the road) would result in the disturbance or displacement of individuals or their roosts. As such, the magnitude of effect on bats is considered to be low.

Birds

The potential operational effects from the Project on birds include displacement as a result of light spill and noise during operation of the widened road corridor, and fragmentation of habitats where the Project crosses habitat corridors. However, as the Project is to widen an existing road, adverse effects such as fragmentation and disturbance already exist. In the Project area, noise and vibration are likely to be reduced from the existing baseline due to improved bridge design and reduced speed limits along the widened road corridor. Additionally, any coastal wetlands birds currently utilising the Ngakoroa Stream are potentially habituated to existing light levels or may already avoid the existing corridor. Furthermore, potential gradual incremental changes in habitat, caused by surrounding urbanisation on both sides of SH22, such as increased light spill into the high value wetland areas, could, discourage nesting and therefore reducing viability of native fauna persisting over time.

As operational effects from the road are likely to reduce in regards to noise and vibration and assuming that the future operational lighting effects are designed to ensure the effects on coastal birds do not change (or preferably, are improved), then the magnitude of operational effects from the Project on coastal wetland birds is considered to be low. Where practicable, lighting along stream corridors should be minimised as described above, to reduce potential effects on coastal wetland birds.

The forest bird species present in the Project area are common, not threatened species, adapted to use habitats modified by humans. As such, the magnitude of effects from the Project on forest habitat birds is considered to be low.

New Zealand dabchick (At Risk- Recovering) have been observed and may breed in the artificial pond adjacent to the Project area. At this location, noise and vibration are likely to be reduced from the

existing baseline due to reduced speed limits along the upgraded road. Similarly, it is assumed that the future operational lighting effects are likely to be similar to existing. In addition, retaining the buffer of existing trees between this habitat and the Project area will minimise overall disturbance. The magnitude of operational effects on freshwater wetland birds are negligible.

Herpetofauna

Records of At Risk indigenous lizard have been identified in the wider landscape, but no suitable habitat was found within the Project area for these species. However, suitable 'surrogate' habitat (exotic scrub, exotic forest edge and rank grassland) was identified within the Project area which could potentially support native copper skink (Not Threatened).

Native lizards require vegetated corridors (such as riparian stream corridors) to facilitate natural dispersal. The Project is upgrading an existing road and bridge and therefore is not considered to create any additional barriers to movement or dispersal of lizards. During detailed design/resource consent, opportunities should be sought to enhance/retain vegetated corridors under bridges or include ledges within culverts or under bridges to allow for lizard connectivity.

Native lizards are likely to be habituated to existing disturbance such as noise, vibration and lighting but the final design will ensure that this will not increase for the operation of the Project. It is considered that the magnitude of operational effects on indigenous lizards will be low, without mitigation.

9.6.3.3 Level of Operational Effects

Table 9-2 below summarises the overall level of operational ecological effects for each key features and fauna groups. The assessment identified that the level of ecological effects from the operation of the Project on all of the ecological features will be very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project operational effects.

Table 9-2: NoR D1 Summary of potential ecological effects (prior to mitigation) during operation based on ecological value and magnitude of the effects

Ecological Feature	Ecological Value	Magnitude of Operational Effects	Level of Ecological Effect (prior to mitigation)
Bats	Low	Low	Very low
Birds – coastal wetland	High	Low	Low
Birds – forest	Low	Low	Very low
Birds – freshwater wetland	High	Negligible	Very low
Herpetofauna	Low	Low	Very low

9.6.4 Mitigation Measures

9.6.4.1 Construction Effects

The only aspect that requires mitigation is construction activities on Threatened or At-Risk wetlands birds in the Ngakoroa Stream wetlands. The wetland habitats (associated with coastal wetland birds) within and adjacent to the Project area, specifically wetland D1W7 (Ngakoroa wetlands) associated with the Ngakoroa Stream, will be resurveyed in the future at the same time as resource consents are sought (at detailed design) in order to confirm the ecological value of the wetlands for Threatened or At-Risk wetland birds, whether the Project will or may have a moderate or greater level of ecological effect on Threatened or At-Risk wetland birds and their habitat, and whether mitigation measures detailed in this section are still required.

If the wetland bird survey confirms that the Project will or may have a moderate or greater level of ecological effect on Threatened or At Risk Wetland birds, construction activities and compounds will be planned so as to reduce noise, vibration and light effects on Threatened or At-Risk coastal wetland birds. The following management controls are recommended to form the basis of a Bird Management Plan (BMP).

- Where practicable, construction works should commence prior to the bird breeding season (September to February) in order to discourage bird nesting.
- Prior to any construction works (including establishment of site yards) taking place within a 50m radius of the Ngakoroa wetlands a nesting bird survey of Threatened or At-Risk wetland birds should be undertaken by a suitably qualified and experienced person (SQEP). Surveys should be repeated at the beginning of each bird breeding season and following periods of construction inactivity.
- Protection and buffer measures if nesting Threatened or At-Risk Wetland birds are identified within 50m of any construction area (including laydown areas). This could include:
 - A. a 20 m buffer area around the nest location and retaining vegetation. The buffer areas should be demarcated where necessary to protect birds from encroachment. This might include the use of marker poles, tape and signage;
 - B. monitoring of the nesting Threatened or At-Risk wetland birds by a Suitably Qualified and Experienced Person. Construction works within the 20m nesting buffer areas should not occur until the Threatened or At-Risk wetland birds have fledged from the nest location (approximately 30 days from egg laying to fledging) as confirmed by a Suitably Qualified and Experienced Person; and
 - C. minimising the disturbance from the works if construction works are required within 50 m of a nest, as advised by a Suitably Qualified and Experienced Person;
- Where practicable, a 10m wetland setback shall be created between the edge of the Ngakoroa Stream wetlands and the construction area (along the edge of the stockpile/laydown area). This should be achieved by retaining existing vegetation and/or additional planting with native coastal forest/riparian/wetland species (as appropriate). Signage or marker poles shall also be used to clearly delineate the wetland area to prevent encroachment.
- Any light spill from construction areas into the Ngakoroa Stream wetlands should be minimised as far as practicable.

The BMP should be consistent with any ecological management measures to be undertaken in compliance with conditions of any regional resource consents granted for the Project.

With the implementation of the mitigation detailed above, it is considered that the magnitude of construction effects from the Project on Threatened or At-Risk wetland birds within and adjacent to

the wetlands associated with the Ngakoroa Stream within and adjacent to the Project Area will be reduced to Low.

9.6.4.2 Operational Effects

In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project operational effects.

9.6.5 Summary of Effects on Ecology

Table 9-3 summarises the ecological values, magnitude of operational and construction effects and subsequent level of effect for each ecological feature for NoR D1. The construction and operation of the Project were assessed to have a negligible or low level of effect on the majority of relevant habitats (terrestrial) and fauna species, as they relate to the activities authorised by the proposed alteration to designation. However, the indigenous wetland habitat (D1W7 and D1W6) within and directly adjacent to the Project area has been highlighted for its potential importance to support a range of Threatened and At Risk coastal and wetland bird species. There is potential that during construction of the Project, the disturbance (noise, vibration and light) caused by activities within the construction areas and during the replacement of the existing Ngakoroa Bridge could impact breeding birds such as banded rail, fernbird and spotless crane. A BMP is therefore recommended to reduce the potential adverse level of construction effects from moderate to low.

Table 9-3: Ecological values, magnitude of effect and level of effects summary table for NoR D1

Feature	Value	Construction prior to Mitigation		Construction with Mitigation		Operation prior to Mitigation		Operation with Mitigation	
		Magnitude	Level of Effect	Magnitude	Level of Effect	Magnitude	Level of Effect	Magnitude	Level of Effect
Terrestrial habitat (district matters)	Low	Negligible	Very low						
Bats	Low	Low	Very Low			Low	Low		
Birds – coastal wetland	High	Moderate	High	Low	Low	Low	Low		
Birds – forest	Low	Low	Very Low			Low	Very Low		
Birds – freshwater wetland	High	Low	Low			Negligible	Very Low		
Herpetofauna	Low					Low	Very Low		

9.7 Arboriculture

The Assessment of Arboricultural Effects, included in Volume 4, assesses the potential effects of the Project on existing trees protected by the AUPOIP district plan provisions, and recommends ways of mitigating these effects. Any trees that trigger regional plan consenting requirements were considered to inform design and alignment choices, however effects on these trees will be further assessed and managed through a future resource consent process. Due to the changing nature of the environment and plan rules applicable to tree protection in rural vs urban land zoning, a detailed re-assessment of protected trees and their status under the AUPOIP will be undertaken closer to the time of construction.

Potential effects on arboriculture during construction and operation of the Project and proposed mitigation measures are described in the following sections. The report should be read in conjunction with the summary set out below.

9.7.1 Positive Effects

A large number of the trees, located in groups along the existing road corridor are tree privet (*Ligustrum lucidum*), which is a plant pest species. The removal of these pest plants will have a positive impact on natural forest regeneration, as the invasive weed species can suppress native plants.

Additionally, widening of the existing corridor with road-side berms provides an opportunity to establish street trees within the new environment. Establishing street trees within the road corridor will provide opportunities for trees to exist over large portions of the road corridor where currently few exist.

9.7.2 Construction Effects

Within the Project area, only one group of trees, within the southern extent of the Drury Sports Complex, is protected by district plan rules. These trees could be harmed by movement of construction vehicles and machinery, and any physical damage to the trees or alteration to their growing environment could cause adverse effects on the health and safety of the trees. However, it is likely that this group of trees can be avoided and retained and this should be investigated at detailed design.

9.7.3 Operational Effects

Once the road has been constructed, no further effects on trees are anticipated. Ongoing maintenance of street trees and trees retained adjacent to the road corridor is a standard operational requirement that does not generate adverse environmental effects. Street tree planting (as described in section 9.7.4) will result in more trees in the public realm and an enhanced road environment in the long term, which will be positive effects.

9.7.4 Mitigation Measures

As a proposed condition of the alteration to designation, a Tree Management Plan will be developed prior to construction to identify the existing trees protected under the District Plan (i.e. those in the Drury Sports Complex), confirm the construction methods and impacts on each of these trees and

detail methods for all work within the rootzone of trees that will be retained. The Tree Management Plan will include:

- Confirmation that protected trees identified in the Assessment of Arboricultural Effects still exist;
- Advice on how the design and location of works can avoid, remedy or mitigate effects on the existing trees;
- Recommended planting to replace protected trees that require removal;
- Establishing tree protection zones and specifying tree protection measures such as protective fencing, ground protection and physical protection of roots, trunks and branches;
- Detailing methods for all work within the rootzone of trees that are to be retained in line with appropriate arboricultural standards.

Replacement planting will be decided through a planting plan for the Project under the ULDMP proposed as a condition of the proposed alteration to designation. The ULDMP will also include methodologies to establish new trees within the road reserve, including creation of quality below ground environments, correct planting methods and appropriate maintenance.

The Tree Management Plan will be limited to the identification of those trees identified in the Arboriculture Assessment as currently protected under the District Plan, as trees protected under Regional Plan provisions will be addressed as part of a future resource consent process.

9.7.5 Summary of Arboriculture Effects

The majority of Project area contains no trees that are protected under the relevant District Plan provisions of the AUPOIP.

The group of protected trees at the southern end of the Drury Sports Complex can likely be retained and protected through implementation of standard tree protection measures, pursuant to a Tree Management Plan developed prior to construction. Therefore the Project will have negligible effects on trees protected under the district plan provisions.

9.8 Natural Hazards - Flooding

The Assessment of Flood Hazard Effects, included in Volume 4, assesses the potential flood hazard effect of the upgraded transport corridor during its construction and operational phases on the flood extents and levels in the surrounding area. Effects of stormwater quantity, quality and effects on streams will be considered as part of a future resource consent phase. This assessment focusses on flood hazard effects which is a district plan matter under the AUPOIP.

9.8.1 Positive Effects

The existing SH22 bridge over Ngakoroa Stream obstructs flow by 1.8m during a 100 year ARI rainfall event – i.e. the bridge has negative freeboard. The proposed upgrade to the bridge will increase the freeboard which increases conveyance of flood water under the bridge and provides a significant increase to the resilience of the bridge to flooding.

Upstream of the bridge, the 100 year ARI flood difference shows there is a decrease in water levels. The likely future environment near the bridge crossing is urban and Open Space – Active and Recreation Zone.

9.8.2 Construction Effects

The bridge over the Ngakoroa Stream will require temporary staging platforms for piling rigs and cranes to be constructed on the banks and possibly over the stream bed. These platforms could cause a constriction to flood flows and cause a backwater effect raising upstream flood levels if not appropriately designed and located. The combination of a temporary constriction at the bridge and an extreme flood means there is an elevated risk of flooding over the Ngakoroa Reserve for the duration of the temporary works and existing bridge being in place. The existing levels of the western approach mean it would overtop at approximately RL6.4 and prevents this potential effect extending onto existing upstream properties.

A construction compound and construction area for the bridge construction team is proposed on the western side of the Ngakoroa Stream. Some of this area is within a flood plain. Other construction yards and stockpile sites are also proposed along the transport corridor, but these locations are outside flood plains and major overland flow paths and therefore do not present increased flood hazard risks. Construction yard locations will be confirmed during the construction phase and therefore siting them with respect to flooding constraints should be considered further through the CEMP.

The culverts to be installed or upgraded can be constructed offline from existing flow paths or use diversions or over-pumping to isolate working areas. Therefore, it is expected that flooding effects can be appropriately managed during the construction phase.

9.8.3 Operational Effects

Operational flooding effects have been assessed through flood modelling to consider the flooding extents at culvert crossings, bridge structure and areas where the new road embankment significantly encroaches existing flood plains or major overland flow paths. The assessment also considers the extents of flooding on existing properties due to the proposed SH22 upgrade. Where potential flooding effects were identified design refinements were made to minimise any such effects. The following key areas are identified and described in more detail in the sections below:

- SH22 / Ngakoroa Stream Bridge
- Existing culvert crossings at chainage 2200 and 2320.

SH22 Ngakoroa Stream Bridge

The existing bridge forms a significant obstruction to 100 year flood flows – with the bridge beams being submerged by 1.8m.

The new bridge will be set significantly higher and have appropriate freeboard. The improved bridge arrangement removes the flow obstruction and leads to a drop of flood levels by 130mm immediately upstream of the bridge.

The likely future environment near the bridge crossing is urban and Open Space – Sport and Active Recreation Zone. The improved freeboard and reduction in water levels in this area provides a safer environment at the bridge.

Further to the west there is an increase in the depth of floodwater crossing the road corridor.

Culverts

Both existing culverts head up water in the 100 year event which leads to overtopping the road at the nearby low point. At all culvert inlets there is a risk of flooding from blockage from upstream debris. These could be mitigated through creating new overland flow paths, upsizing culverts and secondary inlets and should be considered further at detailed design. Designs will be carried out in accordance with appropriate design standards to manage these effects. A condition on the proposed designation also sets out the outcomes to manage key effects that are to be achieved.

Property Assessment

There is a reduction in the 100 year flood level upstream of the Ngakoroa Bridge and minor changes in flood levels at the existing culverts.

The assessment of change in flood levels for the 100 year event show that no existing private property is considered to be affected in more than a minor way⁶ by the SH22 upgrade works. There is generally limited change in flood levels at Ngakoroa Reserve.

9.8.4 Mitigation Measures

9.8.4.1 Construction

For bridge construction, temporary platforms will be constructed on the banks and over the bed using driven steel piles. Piling rigs will sit on top of the platforms to construct the bridge piers. To minimise the risk of flooding, temporary works need to be set back as far as practicable from the main stream channel. Stockpiling of materials outside the flood plain will also mitigate the potential for blocking flow paths and flood plains. Timing construction works during the dry season when extended periods of low flow are expected will play a key role in minimising the potential for flooding.

Culvert works should be constructed during the initial phase of construction so that flows can be diverted across the construction site to maintain functionality. Temporary diversions or over-pumping will be required to divert clean water away from the existing culverts to allow for extension works. Alternatively, clean water will be maintained through the existing culvert while new culverts are constructed alongside (which will be assessed at resource consent stage). Works should be planned for dry weather/summer conditions to facilitate flow management and reduce the risk of flooding.

Flood hazard risks for the construction phase will be addressed in a CEMP proposed as a condition of the alteration to designation. In preparing the CEMP, key issues to consider are:

- siting construction yards and stockpiles outside the flood plain
- minimising the physical obstruction to flood flows under the existing bridge from temporary works
- staging and programming to carry out work when there is less risk of high flow events, and
- methods to reduce the conveyance of materials and equipment that is considered necessary to be stored or sited within the flood plain (including actions to take in response to the warning of heavy rainfall events).

⁶ As defined in the Assessment of Flooding Effects in Volume 4 of this AEE.

9.8.4.2 Operation

The risk of flooding from culvert blockage can be addressed by upsizing the culverts or providing secondary inlets and this should be considered further at detailed design.

It is recommended that during detailed design, the flood modelling of the pre Project and post Project 100 year ARI levels (both for MPD land use and including climate change) is carried out and measures 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 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)
- that there is no more than a 10% average increase of flood hazard (defined as flow depth times velocity) for main access to authorised habitable dwellings.

Where the above outcomes can be achieved through alternative measures outside of the designation such as flood stop banks, flood walls and overland flow paths, this may be agreed with the affected property owner and Auckland Council.

The above outcomes are included as conditions on the proposed designation.

9.8.5 Summary of Flooding Effects

The overall effect of NoR D1 on flooding is positive or can be adequately mitigated within the proposed designation with the measures described above implemented. Measures or outcomes to be achieved at detailed design have been included as conditions on the proposed designation. This includes addressing flood risk hazard during construction through the CEMP and outcomes for future flood modelling at detailed design.

9.9 Noise and Vibration

The Assessment of Construction Noise and Vibration Effects, attached in Volume 4, contains predictions for construction noise carried out using the methodology recommended in NZS 6803, in accordance with the AUPOIP. The methodology included modelling inputs in regard to a reasonable worst case scenario.

Vibration emission radii were also calculated to provide a reasonable worst case estimate at receivers.

The Assessment of Traffic Noise and Vibration Effects, also attached in Volume 4, contains predictions of road traffic noise were carried out using the method recommended in NZS 6806, in accordance with rule E25.6.33 of the AUPOIP. Projects.

Four scenarios are assessed in accordance with NZS 6806:

- The “Existing scenario” which is the current road network with current traffic volumes, i.e. the existing environment as it is experienced at the time of assessment
- A “Do Nothing” scenario (the likely future environment without the project), which represents the current road network with future traffic volumes, assuming a full build out of the area. This is a theoretical scenario that would not occur in reality. This is because; the current road network could not cope with the future traffic volumes, and future development in the area would not occur without the prior establishment of the new or upgraded roads. Therefore, while the predictions suggest a significant increase in noise level in the Do Nothing scenario compared with the Existing scenario, this would not be a feasible option
- A “Do Minimum” scenario, (likely future environment with the project) which represents the proposed future road network, incorporating NoRs D1 to D5 and other transport projects in the area (refer to the discussion on Assessment Assumptions in the Assessment of Traffic Noise and Vibration Effects in Volume 4). This scenario assumes a full build out of the area, and the transport infrastructure to enable the development. This is a realistic scenario at a point in time when all proposed Projects within the Drury Package are operational. .
- “Mitigation” scenarios, which represent the traffic noise levels at the PPFs at the design year with various specific noise mitigation options implemented with the aim of achieving the noise criteria categories.

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

The summary below should be read in conjunction with both reports.

9.9.1 Positive Effects

Predicted traffic noise level changes during operation of the Project indicate all protected premises and facilities (PPFs) are generally expected to receive slight reduced noise levels in comparison to the Do Nothing (design year without Project) scenario due to SH22 changing from a rural state highway to an urban arterial road. This is mainly due to reduced traffic speeds applied at Do Minimum (design year with Project) in accordance with NZS 6806 and, together with the implementation of all proposed transport projects, will result in an overall positive effect.

It is noted the traffic noise assessment applies a speed reduction at the Do Minimum scenario (likely future growth with the Project) in accordance with NZS 6806. This differs for the transport model where a speed reduction is considered at the Do Nothing scenario (likely future growth without the Project). This is because a speed limit reduction is likely to take place before the Project is implemented (on the existing SH22) as an interim response to urban growth in the area.

9.9.2 Construction Noise and Vibration

9.9.2.1 Potential Construction Noise Levels

Model predictions which assume the works will occur along the proposed designation boundary indicate there are 25 existing properties where the relevant noise criteria would be exceeded without mitigation.

Distances of receivers from the proposed designation area boundary vary greatly along the road alignment with the closest receiver approximately 5m from drainage works.

Model predictions indicate the closest receivers could experience noise levels of up to 85 dB L_{Aeq} during drainage works, based on the noisiest item of plant (plate compactor) operating in the closest position to the receiver along the proposed designation boundary, without mitigation. However, operation of construction equipment will be intermittent in nature and works in the worst case location typically last around 3 days. Whilst plate compactors have been identified as the noisiest equipment, they are only used as part of drainage works. Similarly, piling is carried out during bridge construction only and for limited durations. Other equipment with lower sound powers will generate lower noise levels and overall average noise levels will be lower for most of the construction period.

These results should be treated as the highest possible noise levels likely to be emitted from the respective equipment. These noise levels would occur infrequently, if at all, as equipment and activities move along the alignment and are not continuously operational. The noise levels provide an indicative prediction of the scale of potential effects based on one possible construction methodology.

9.9.2.2 Construction Noise Effects

The construction noise criteria are predicted to be exceeded at a number of receivers due to the close proximity to the potential areas of work. Closest receivers are 5m from the proposed designation boundary for drainage works, with predicted unmitigated noise levels of around 85-90 dB L_{Aeq} .

The use of noisy items of equipment will likely be intermittent in nature during the relevant construction activities. Although the worst-case situations are not expected to be frequent, due to the setback distances to the majority of the proposed works, these noise levels could result in loss of concentration, annoyance, and a reduction in speech intelligibility.

Night time works at these noise levels are generally not acceptable at residential properties and the use of noisy equipment should be avoided to prevent sleep disturbance. If night-time works are required consultation and mitigation measures will be essential which may include an offer of temporary relocation for the most affected receivers to manage and mitigate adverse effects.

With effective mitigation and management measures in place, such as construction noise barriers along active construction areas within the vicinity of receivers and, enclosures around noisy machinery noise levels can be reduced by up to 10dB at receivers on the ground floor. Resulting worst case noise levels could be reduced to 75 – 80 dB with mitigation implemented and 22 receivers exceeding the applicable noise criteria.

In addition, the road construction is linear, and each receiver would only be affected for part of the overall construction duration. A CNVMP with site specific mitigation as required (as described in section 9.9.4) sets out how to control noise levels and reduce adverse impacts on receivers.

9.9.2.3 Potential Construction Vibration Levels

Four dwellings may experience vibration levels above 5mm/s PPV exceeding the building cosmetic damage criteria for residential properties and one commercial building may experience vibration levels above 10mm/s PPV exceeding the DIN criteria for commercial properties. Predictions indicate a total of nine buildings may receive vibration levels above the amenity criterion of 1 mm/s PPV.

It should be noted that the vibration generating equipment will not be operating all of the time and may not operate right at the boundaries of the area of works.

It is not expected high level vibratory works such as the use of roller compactors or piling will be carried out during night-time. Noisy works should be limited to critical works only if required, and consultation and management plans will be essential to mitigate potential effects on adjacent landowners.

9.9.2.4 Construction Vibration Effects

Initial predictions indicate that the Project building damage criteria may be exceeded at four residential buildings and one commercial building, in particular during the earthworks phase when the vibratory roller compactor is proposed for use. At buildings in close proximity to proposed designation boundary areas, there is the potential for cosmetic damage to buildings (such as cracking), and annoyance from perception of vibration. A building condition survey should therefore be carried out before (during detailed design) and after construction works at properties where predictions indicate the relevant building damage criteria may be exceeded, to determine if any damage is shown to have been caused by construction of the Project. Mitigation measures are described in section 9.9.4.

9.9.3 Traffic Noise and Vibration

In accordance with NZS 6806, the SH22 Upgrade is not considered an Altered road as the anticipated change in noise levels due to the Project do not meet relevant thresholds. However, an NZS 6806 screening assessment was carried out to determine this, which is presented below.

The transport model data showed a speed change was applied under the Do Nothing scenario (likely future growth without the Project) to include safety considerations of the urban growth predicted around the area – before the Project is implemented. As defined within NZS 6806, the Do Nothing scenario is the assessment at design year assuming no alterations are made to the existing road. This assessment has therefore been carried out in accordance with NZS 6806 and the proposed speed change has been applied at the Do Minimum scenario which differs from the Transport model.

The transport modelling also showed that there is a traffic volume decrease under the Do Nothing scenario when compared to the Existing scenario. This is due to the assumption within the transport model that the Pukekohe Expressway will be operational at Design year which provides an alternative route and reduces traffic flows on SH22.

Existing scenario predictions show the noise levels within the NoR D1 Project area range between 47 – 66 dB $L_{Aeq}(24hr)$.

Under the likely future scenario (without the Project), the predicted traffic noise levels range between 46 - 65 dB $L_{Aeq}(24hr)$.

With the Project predicted traffic noise levels show a general decrease with a range of 43 – 63 dB $L_{Aeq}(24hr)$ with all PPFs in Category A. As all PPFs are predicted to receive noise levels in Category A below 64 dB $L_{Aeq}(24hr)$, this Project does not qualify as an Altered road under NZS 6806 and, no mitigation options are required.

The effect of noise level changes has also been considered. Despite a slight traffic volume increase when comparing the Do Nothing and Do Minimum scenarios, the noise reductions, all PPFs but three are predicted to receive noise level reductions, with 11 PPFs receiving noticeable to significant reductions. This is due to SH22 changing from a rural state highway to an urban arterial road with reduced road speeds. As mentioned above, the assessment applies speed reductions at the Do Minimum scenario in accordance with NZS 6806. This differs for the transport model where speed

change is considered at the Do Nothing stage. There is one PPF which is predicted to experience a noticeable increase in noise level of 5 dB when compared to the likely future scenario (without the Project) due to the change in proximity of the new alignment.

9.9.4 Mitigation Measures

9.9.4.1 Construction

Specific mitigation measures will be identified within a Construction Noise and Vibration Management Plan (CNVMP) which will be completed for the Project prior to construction and is a proposed condition of this alteration to designation. The CNVMP will provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate adverse construction noise and vibration effects on receivers. The Assessment of Construction Noise and Vibration Effects outlines the matters to be addressed in the CNVMP, in line with the minimum level of information that must be provided in a CNVMP. This includes:

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

Mitigation measures such as construction noise barriers along active construction areas near the vicinity of receivers and selecting the use of lower vibration emitting equipment wherever possible will

be considered as part of a CNVMP to control and manage construction noise and vibration levels to meet the relevant criteria where practicable.

In addition to a CNVMP, it may be necessary to produce Schedule to the CNVMP where noise and/or vibration limits are predicted or measured to be exceeded.

In managing noise and vibration effects within the above mechanisms, a hierarchy of mitigation measures outlined in the Waka Kotahi “State highway construction noise and vibration guide” will be considered and a best practicable option for mitigation will be implemented, whilst avoiding undue disruption to the community.

As construction will occur several years in the future, receivers may have changed by then, with new and additional receivers in the vicinity due to increased development. Construction noise and vibration effects will be reassessed at the time of construction and managed at the receivers that are present at the time of construction.

9.9.4.2 Operation

No mitigation is recommended for SH22 Upgrade. However, during detailed design before construction commences, reassessment of the road traffic noise will be carried out. This will be undertaken at PPFs to determine if the categories are still achieved without mitigation and to determine BPO mitigation if required. The PPFs and categories are as set out in the Traffic Noise Assessment in Volume 4 and are included as a condition on the proposed designation.

9.9.5 Summary of Noise and Vibration Effects

Predicted traffic noise levels during operation of the Project are generally expected to reduce compared to the Do Nothing scenario resulting in an overall positive effect.

Adverse construction noise and vibration effects can be appropriately managed through the proposed mitigation measures.

9.10 Network Utilities

9.10.1 Construction Effects

A number of utilities, including major utilities, are located within and around the proposed designation. Relocation, diversion or protection of these utilities may be required and short term disruptions may occur. Table 9-4 summarises the known existing and proposed utilities within and around the proposed designation, and the effects the Project is likely to have on these. None of the network utilities are designated.

Table 9-4 NoR D1 Anticipated Effects on existing utilities of other providers

Utility Provider	Asset	Potential Effect
First Gas	Gas Transmission Line	Pipe re-alignment, strengthening works, and/ or protection works may be required where the pipe crosses the proposed alignment
Vector	Gas Medium Pressure distribution lines	Distribution lines will need to be realigned onto the new carriageway service corridor.
Counties Power	Medium Voltage overhead lines	Overhead lines will need to be either relocated underground, or new overhead poles installed in the new alignment within the carriageway service corridor. Short term disruptions may occur to carry out these works.
	Fibre cables	Existing fibre cables will need to be relocated and/or protected during construction
Chorus	Communication lines	Communication lines will need to be relocated to the new verge.

9.10.2 Mitigation Measures

Engagement with network utility operators has been ongoing throughout the Project as detailed in section 5.2.2.6 Network Utilities. Engagement will continue throughout the detailed design and construction of the Project.

As a proposed condition of the alteration to designation, a Network Utilities Management Plan (NUMP) will be prepared prior to construction of the Project. The NUMP will set out a framework for protecting, relocating and working in proximity to existing network utilities. The NUMP will be prepared in consultation with the relevant network utility operators and will include methods to:

- Provide access for maintenance at all reasonable times, or emergency works at all times during construction activities;
- Manage the effects of dust and any other material potentially resulting from construction activities and able to cause material damage, beyond normal wear and tear to overhead transmission lines in the Project area;

- Demonstrate compliance with relevant standards and Codes of Practice including, where relevant, the NZECP 34:2001 New Zealand Electrical Code of Practice for Electrical Safe Distances 2001; and AS/NZS 4853:2012 Electrical hazards on Metallic Pipelines.

Prior to construction, Network Utility Operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for the following activities:

- operation, maintenance and urgent repair works
- minor renewal works to existing network utilities necessary for the on-going provision or security of supply of network utility operations
- minor works such as new service connections
- the upgrade and replacement of existing network utilities in the same location with the same or similar effects as the existing utility.

9.10.3 Summary of Effects on Network Utilities

Through the implementation of the NUMP and in consultation with network utility operators, any potential adverse effects on network utilities can be managed appropriately.

9.11 Community Effects

9.11.1 Positive Effects

The SH22 Upgrade will provide the necessary transport infrastructure required to support the planned urban zoning of land in Drury West (and the wider Drury-Ōpāheke growth area) which is accelerating as a result of numerous private plan changes being lodged with Auckland Council. The proposed alteration to designation will ensure that the upgrade is planned and integrated (and identified in the AUPOIP) to meet the feasible development capacity targets over the next 30 years to support the growing communities in Drury-Ōpāheke.

The Project will provide dedicated active transport facilities, and two additional lanes for vehicles and intersection treatments. This corridor currently has a high risk of incidents of deaths and serious injuries from vehicle accidents, and the Project will provide a safe driving environment that will reduce this risk. This provides health and wellbeing benefits to the wider community, both in terms of reduction of incidents and the reduction of community effects experienced when a vehicular accident death or serious injury occurs within the community.

Improved road conditions and provision of alternate means of transport, including active transport, has the potential to improve the way people live in terms of improving daily commutes (potentially reducing congestion) and community connectivity for both the existing environment (alternate ways to access schools, recreation facilities and employment options along the corridor) but also the future urban community including getting to the proposed Drury West train station and proposed centre on SH22.

Provision of active transport facilities also contributes to health and wellbeing of the community providing active mode alternative transport options.

9.11.2 Construction Effects

SH22 is currently a highly trafficked corridor particularly during busy commuter periods. Depending on the availability of alternate routes or means of travel at the time of construction (for example rail alternatives or the proposed Pukekohe Expressway) and the extent of urban development in the area, disruptions to the corridor could impact on way of life and community cohesion due to increasing the amount of time people within the community spend commuting to work and education and disruption getting around the community.

The function of recreation facilities, households and businesses along the corridor could be disrupted if access is restricted during construction, in particular for businesses such as the Hothouse and KPH Transport at 328 Karaka Road (or any subsequent business that may be located on those sites) that have multiple traffic movements through daily operations.

The amenity values of open space along the corridor (Drury Sports Complex and Ngakoroa Reserve) and private properties (both existing and future urban development) could be disrupted during construction due to dust and noise generated from construction. The proposed alteration to designation includes land zoned as open space. These areas are on the periphery of the reserve/park and use will generally be temporary during construction and will not prevent the ongoing use of the public spaces or effect the amenity values they provide.

9.11.3 Operational Effects

As identified within the positive effects discussed above, the SH22 Upgrade will provide the necessary transport infrastructure required to support planned urban growth in the Drury-Ōpāheke growth area supporting growing communities. In summary (with further detailed provided in section 9.11.1) the Project will:

- Provide health and wellbeing benefits to the wider community, both in terms of reduction of incidents and the reduction of community effects experienced when a vehicular accident death or serious injury occurs within the community;
- Improve the way people live in terms of improving daily commutes (potentially reducing congestion) and community connectivity; and
- Provide active transport facilities that will contribute to improvements to the health and wellbeing of the community providing active mode alternative transport options.

The Project will increase future community use of the Ngakoroa Reserve and Drury Sports Complex with the provision of safe active transport facilities that improve access and connectivity to the Ngakoroa Reserve and the Drury Sports Complex.

Overall, the Project is anticipated to have significant positive effects on the future community in which it will operate.

9.11.4 Mitigation Measures

9.11.4.1 Construction Effects

It is anticipated that all community effects during the construction of the Project will be temporary and can be minimised. A Stakeholder and Communication Management Plan (SCMP) will be prepared prior to the start of construction to identify how the public and stakeholders (including directly affected

and adjacent owners and occupiers of land) will be communicated with throughout the Construction Works.

Access and trip disruption will be managed by the CTMP and SCMP proposed as conditions of the designation. This will allow the contractors to identify movement and access requirements of residents and businesses along the corridor and enable alternate access or access at peak times and minimise trip disruption where practicable. Access will be maintained to recreation facilities and land requirements for construction will be minimised to avoid disruption of active recreation activities and allow passive recreation uses to continue.

Construction effects on amenity values of property and recreation areas can be managed by engagement with corridor residents and stakeholders (identified through the SCMP), noise management (CNVMP), and the overall CEMP to manage potential effects.

9.11.4.2 Operational Effects

Significant positive effects are anticipated from the operation of the Project therefore no mitigation is required. However, through the implementation of the ULDMP a range of measures will be implemented to ensure the Project is appropriately integrated into the surrounding landscape and urban context .

9.11.5 Summary of Effects on the Community

The Project will provide significant positive effects to the community in which it will operate. It is considered that overall, the community (existing and future) will benefit from the changes made to SH22. The work supports planned urban growth and will have significant safety and transport benefits providing a safe and resilient connection that provides for active transport and access to existing and future community resources on or near SH22.

Any potential construction effects can be managed with the development and implementation of the appropriate management plans outlined above and communication with the community and affected land owners / occupiers.

9.12 Property, Land Use and Business Effects

The SH22 Upgrade has sought to reduce potential adverse effects on existing private properties and businesses through alignment and project design, where practicable, while acknowledging the planned urban growth and change in the area balancing these drivers. This has included specific consideration of the potential property and business impacts in the assessment of alternatives as discussed in sections 4.2 and 8 and detailed in Appendix A, and through design refinement and defining the proposed designation boundary.

Where impacts on property, land use and businesses cannot be avoided, the potential effects discussed in this section relate to directly affected properties/landowners. Potential effects on properties and businesses affected by proximity to the Project have been discussed in section 9.11.

The proposed designation requires land to provide a sufficient footprint to enable the construction and operation of the SH22 Upgrade. 25 private properties will be directly affected. These properties are primarily rural and rural-residential, with some open space/reserve land and commercial land use.

A description of existing land use is provided in section 7.2. In summary, land directly affected by the SH22 Upgrade includes the following:

- The majority of land within the proposed designation boundary (i.e. beyond the existing SH22 designation) is currently private farmland. The land is primarily used for grazing with low density rural residential dwellings.
- Four rural based businesses: Golden Homes at 90 Karaka Road, two horticultural businesses (including NZ Hot House at 328 Karaka Road) and KPH Transport at 328 Karaka Road (transportation and logistics). Land proposed to be designated for these businesses is generally the frontage adjacent to SH22, with the exception of one horticulture business where a stormwater wetland and construction compound is proposed on the site.
- The Ngakoroa Reserve and the Drury Sports Complex, which contains both passive and active recreational uses.
- Two private plan changes (PC 51: Drury 2 Precinct and Waipupuke Plan Change (not yet referenced)) have been submitted to Auckland Council for development of land adjacent to SH22 showing that the area is in the process of being urbanised. The timing of this urbanisation relative to implementation of the Project is not confirmed.

The potential pre-construction, construction and post construction effects on directly affected properties is discussed in the following sub-sections.

9.12.1 Pre-Construction

The proposed alteration to designation will not preclude the continued (unchanged) use of any directly affected properties prior to construction. However, in accordance with section 176(1)(b) of the RMA, anyone (other than a requiring authority with an earlier designation) is restricted from carrying out work on the designated land that would prevent or hinder the designated work without first obtaining the requiring authority's consent.

The purpose of the SH22 Upgrade is to support urban growth in the Drury-Ōpāheke growth area. The proposed upgrade is to the existing SH22 road corridor in a rural greenfield area zoned for future urban development and planned to transition from rural to urban land use. As the proposed corridor

will not be implemented until planned development occurs the Project is unlikely to affect the current land use of Drury West until such a time that the area starts to develop.

It is likely urban development will start occurring adjacent to the proposed alteration to designation before the Project is implemented. This is already beginning to be evident with two private plan changes to live zone land for urban development submitted to Auckland Council. It is at this point the proposed alteration to designation may have adverse effects on the development of private property. Any potential and development issues would be addressed through the construction and operation of the Project (further discussed in sections 9.12.2 and 9.12.3). The existing open space and rural zoned areas at the north western and eastern extents of the Project are expected to have a lesser scale of development change as these areas are zoned in line with their existing open space and rural land uses.

As discussed, development is not precluded within the proposed designation area, and Waka Kotahi has actively engaged, or sought to engage, with landowners through the Project development and adapt where practicable. Waka Kotahi will work with land owners and developers under the process in section 176(1)(b) to provide written consent for earthworks, interim road upgrades (or new roads), integrated stormwater solutions and development within the proposed designations – provided those works will not prevent or hinder the work authorised by the proposed alteration to designation.

As there may be some time between the proposed alteration to designation being confirmed and before construction starts, a Project website (or equivalent virtual information source) will be set up with information on the Project. This will include the anticipated construction timeframes and contact details for enquiries. The website will continue to be updated during construction works.

9.12.2 Construction

The proposed alteration to designation includes land required for temporary and permanent works. During construction, the Project will temporarily require land to enable construction activities (detailed in section 6.4). If only temporary occupation of the land is required, it will be leased. Potential effects from the temporary lease/use of land within the proposed designation include disruption to farm activities and businesses, temporary loss of grazing pasture, stock-proof fencing, disruption to access, changes to driveway gradient, loss of vegetation and temporarily affected amenity.

The measures to mitigate these effects will be developed with the directly affected landowners or occupiers. On completion of the works, the designation boundary will be reviewed and may be removed from any land not required for the on-going operation, maintenance or mitigation of effects of the Project.

Potential adverse effects from construction activities are addressed throughout section 9 with appropriate mitigation identified to avoid or minimise effects on properties in proximity to the works. Particular mitigation measures for residential property and business disruption during construction include:

- Implementation of a SCMP prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the Construction Works. Including:
 - Determine adequate notice periods for the commencement of construction activities and works that affect access to properties;

- Inform parties of the expected timing, duration and staging of works and regular updating of progress; and
 - Provide feedback, inquiries and complaints during the construction process.
- Implementation of a CTMP to manage construction traffic and disruption to the local transport network (section 9.2.4), including methods to:
 - Maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be; and
 - Communicate traffic management measures to affected parties.
- Implementation of a CNVMP to provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction and to manage any adverse construction noise and vibration effects on sensitive receivers (section 9.9.4), including methods to:
 - Communicate and engage with nearby residents and stakeholders; and
 - Minimise construction disruption for affected properties during construction.
- In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.
- Implementation of an overall CEMP to manage potential construction effects.

These measures will appropriately minimise disruption to affected properties and allow the continued use of properties where possible. Potential effects will generally be temporary and therefore it is considered that they will be less than minor.

9.12.3 Post Construction

The proposed alteration to designation includes land required for temporary and permanent works. The land required for the Project is shown in the designation plans included with the NoR (see Volume 1). Land required for the permanent work will be purchased and following the review of the designation boundary on completion of the works any land not required for the permanent work or for the on-going operation, maintenance or mitigation of effects of the Project will be reinstated in coordination with directly affected landowners or occupiers. This will include:

- Reinstatement of construction areas and reintegrating with the surrounding landform
- Reinstatement of driveways, accessways, fences and gardens.
- Integration of batters and cut/fill slopes with the landscape.

Therefore the post-construction effects on the use of land will be no more than minor on these landowners.

9.13 Urban Design Evaluation

An Urban Design Evaluation (provided within Volume 4) has been undertaken for the SH22 Upgrade, based on the Design Framework (included in the Urban Design Evaluation in Volume 4) established for the Project. The Urban Design Evaluation provides urban design focused commentary on the indicative design of the proposed corridors and recommends urban design outcomes that should be considered in future design stages through the implementation of the Urban Landscape and Design and Management Plan (ULDMP) proposed as a condition on the designation. The design principles that make up the Design Framework seek that transport corridors contribute positively to existing and new communities, the environment and the social and economic vitality of Auckland.

The specific outcomes intended for the Project are shown in blue in Figure 9-2 below. The measures to achieve these outcomes will be confirmed at detailed design and form a part of the ULDMP as a condition on the proposed alteration to existing designation. The outcomes include:

- Permeable corridors for active modes that provide cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as centres, transport interchanges, open spaces and community facilities. For example, active mode priority and connectivity between the proposed Drury West Station across and along SH22 to the Drury West Centre.
- Address legibility, modal priority for active modes and connectivity demands at intersections. For example, the Jesmond Road and SH22 intersection will require future definition to ensure connectivity between the proposed Drury West rail station to SH22.
- An urban interface approach within the transport corridor (road reserve) that;
 - provides an appropriate interface to the proposed Drury West Centre and local centre and enables buildings and spaces to positively address and integrate with the SH22 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,
 - recognises the transition of densities from THAB to mixed housing urban to mixed housing suburban 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,
 - supports the integration of the proposed Drury West rail station and surrounding land uses.
- Identify urban and landscape design drivers related to the Ngakoroa Stream, Ngakoroa Reserve, and the Drury Sports Complex and how the corridor has responded to and integrated with these character drivers.
- In future design stages, Manawhenua shall be invited to provide input into relevant cultural landscape and design matters including how desired outcomes reflect their identity and values
- A landscape plan that considers recommendations from the landscape and visual, arboricultural and ecological assessments including street tree and stormwater wetland planting, construction compound and private property reinstatement and treatment of batter slopes. Also, to integrate with the Ngakoroa Stream and terrestrial SEA at the future resource consent stage. The landscape outcomes should reinforce the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider active transport network.
- Integrate the stormwater wetlands (SH22 wetland 1 and 2) 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

Further urban design opportunities in the Project area have been identified in Figure 9-2 and are shown in orange. These opportunities could be considered by Waka Kotahi or other parties at future stages of design and development but are not required to mitigate the effects of this Project.

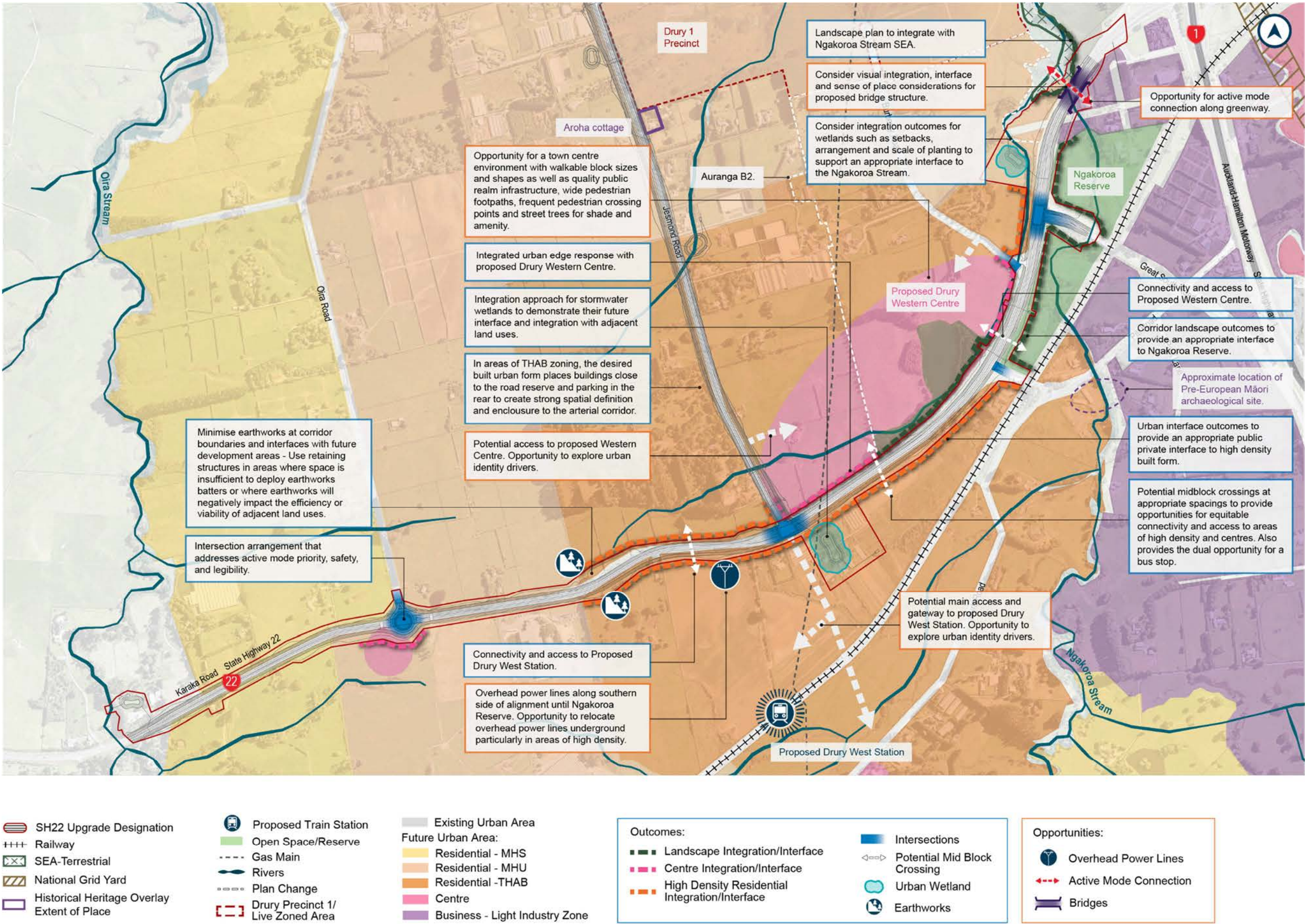


Figure 9-2 SH22 Upgrade urban design outcomes and opportunities overlaid on indicative zoning based on Drury-Ōpāheke Structure Plan

10 SH22 Upgrade: Summary of Measures to Manage Adverse Effects

The positive effects of the Project are set out in Section 9.5.1 of this AEE.

In the first instance, adverse effects have been avoided and mitigated via alignment decisions and design choices. In addition, a range of measures are proposed for the Project to avoid, remedy or mitigate the potential adverse effects identified in this AEE. These measures are summarised in Table 10-1 below.

The measures will be implemented during the development of the detailed design, prior to and during construction, and once the permanent works are completed. These proposed measures are reflected in the proposed designation conditions included with the NoR.

Table 10-1: NoR D1 Summary of measures to avoid, remedy or mitigate potential adverse effects

AEE Section	Topic	Measures	Mechanism to Implement Measures
9.2	Construction Traffic	- Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. - Methods to manage the effects of temporary traffic management. - Measures to ensure the safety of all transport users. - Methods to manage traffic congestion and manage vehicular and pedestrian traffic near schools. - Identification of site access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors. - Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads. - Methods to manage vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be. - The approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads. - Methods to communication of traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services).	Construction Traffic Management Plan (CTMP)

AEE Section	Topic	Measures	Mechanism to Implement Measures
9.3	Cultural Values	• Involvement of Manawhenua in Project design and construction. • Identifying cultural matters and principles that should be considered in the development of other management plans (e.g. ULDMP and HAMP see below). • Ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle. • Establishment of protocols for cultural monitoring during construction works.	• Cultural Advisory Report • Cultural Monitoring Plan
9.4	Historic Heritage	• Confirm the methods for the identification and assessment of historic heritage within the designation to inform detailed design. • Confirm the known and potential historic heritage sites within the designation. • Set out the HNZPTA authority requirements for any pre-1900 sites.	• Heritage and Archaeology Management Plan (HAMP)
9.5	Landscape, Visual, Urban Design and Amenity	• Demonstrate how the Project is designed to integrate with adjacent urban (or proposed urban) and landscape context. • Provide appropriate walking and cycling connectivity to, and interfaces with, existing or proposed adjacent land uses, and walking and cycling connections. Promote inclusive access (where appropriate). • Promote a sense of personal safety. • A concept plan and explanation of the rationale for the landscape and urban design proposals • Developed design concepts, including principles for walking and cycling facilities and public transport. • Urban design and landscape details covering: • road design; • roadside elements; • architectural and landscape treatment of major structures and noise barriers • landscape treatment of permanent stormwater wetlands and swales; • integration of passenger transport; • pedestrian and cycle facilities; • heritage items; and • re-instatement of construction and site compound areas, driveways, accessways and fences. • Planting design details including: • identification of existing trees and vegetation that will be retained and any planting	• Urban and Landscape Design Management Plan (ULDMP)

AEE Section	Topic	Measures	Mechanism to Implement Measures
		requirements. Where practicable, mature trees and native vegetation should be retained; - street trees, shrubs and ground cover suitable for berms; - treatment of fill slopes to integrate with adjacent land use, streams, riparian margins and open space zones; - planting of stormwater wetlands; - integration of any planting requirements required by conditions of any resource consents for the Project; and - reinstatement planting of construction and site compound areas as appropriate. - Detailed specification relating to weed control and clearance, pest animal management, mulching, plant sourcing and planting, including hydroseeding and grassing. - A planting programme and maintenance plan.	
9.6	Ecology	Methods to minimise impacts from construction activities on at-risk and threatened wetland birds in the Ngakoroa wetlands.	- Pre-construction survey - Bird Management Plan
9.7	Arboriculture	- Confirmation that protected trees under the district plan provisions identified in the Assessment of Arboricultural Effects still exist. - How the design and location of works can avoid, remedy or mitigate effects on the existing trees. - Recommended planting to replace trees that require removal. - Establishing tree protection zones and specifying tree protection measures such as protective fencing, ground protection and physical protection of roots, trunks and branches. - Detailing methods for all work within the rootzone of trees that are to be retained in line with appropriate arboricultural standards.	Tree Management Plan (TMP)
9.8	Natural Hazards – Flooding	- Methods to mitigate flood hazard effects such as siting stockpiles out of floodplains, minimising obstruction to flood flows and actions to respond to warnings of heavy rain. - A design that achieves flood risk outcomes relating to flood levels and freeboard for existing habitable floors, flood levels on land zoned for urban or future urban development where there is no existing dwelling, flood prone areas and access.	- CEMP - Flood risk outcomes to be achieved at detailed design (demonstrated through the Outline Plan(s))

AEE Section	Topic	Measures	Mechanism to Implement Measures
9.9.2	Construction Noise and Vibration	- Confirming construction works and anticipated equipment/processes; hours of operation, noise and vibration standards. - Identification of receivers where noise and vibration standards apply. - Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved. - Methods and frequency for monitoring and reporting on construction noise and vibration. - Procedures for maintaining contact with stakeholders, contact details of site supervisor and liaison person. - Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction Noise and/or Vibration Management Schedule will be required. - Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys.	- CNVMP - CNVMS
9.9.3	Operational Noise and Vibration	Confirmation of achieving noise categories at PPFs and, if required, confirmation of BPO.	Noise Mitigation Plan
9.10	Network Utilities	- In consultation with network utility operators, protect, relocate and work in proximity to existing network utilities. - Network utility operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for some activities.	Network Utility Management Plan (NUMP)
9.11	Community	- Methods to regularly communicate with the community, stakeholders and land owners/occupiers during construction, including timeframes. - Identification of a Project liaison person - Method to formalise a complaints and response process (and monitoring thereof). - Links to other communication methods in other management plans. - S176(1)(b) approval process for land owners and developers to enable development (whilst not preventing or hindering the work authorised for the Project).	- SCMP - CNVMP - CNVMS - CTMP - CEMP - S176(1)(b) RMA approval process
9.12	Property, Land use and Business		

11 SH22 Upgrade: Statutory Assessment

Section 171(1) sets out the matters that must be considered by a territorial authority in making a recommendation on a NoR. Under Section 181(2), those same matters are to be considered 'with all necessary modifications', in relation to a notice of requirement for an alteration as if it were a notice of requirement for a new designation.

An assessment of the statutory matters that are relevant to the Project under section 181(2) of the RMA has been undertaken and is presented in Part I, Statutory Assessment.

With reference to those matters, and based on the assessment of effects summarised above, the proposed alteration to designation is generally consistent with the relevant provisions of National Policy Statements, the Regional Policy Statement and the relevant objectives and policies of the AUPOLIP. Adequate consideration has been given to alternative sites, routes and methods of undertaking the Project, and the Project will avoid, remedy or mitigate any adverse effects on the environment. The proposed work and the proposed alteration to the existing designation are also reasonably necessary for achieving the objectives of Waka Kotahi for the Project.

12 SH22 Upgrade: Conclusion

The wider Drury-Ōpāheke area in the south of Auckland has been signalled to undergo significant urban growth in the next 30 years. The Drury-Ōpāheke area will experience significant change over the coming years as the existing rural environment develops into a new urban area. This is accelerating as private plan changes are lodged with Auckland Council. The Project will provide critical transport infrastructure to support and integrate with the planned future growth in Drury-Ōpāheke and the wider south Auckland growth areas.

While some adverse effects will be generated during construction and operation of the Project, these can be mitigated by the management plans and other measures which are proposed as conditions of the proposed alteration to the existing designation. The Project will have significant positive effects, and provide for the social, economic and cultural wellbeing of communities at a local and regional level.

The Project is consistent with the relevant planning documents and statutory tests, thereby satisfying the requirements necessary for Auckland Council to recommend confirmation of the NoR on the basis of the conditions proposed by Waka Kotahi.



PART E: NOR D2

Jesmond to Waihoehoe Road West FTN Upgrade

13 Jesmond to Waihoehoe Road FTN Upgrade: Description of Project and Proposed Works

13.1 Project Description

The Jesmond to Waihoehoe West FTN Project (NoR D2) includes an approximately 4.1km long four-lane FTN arterial route along Jesmond Road, through a new greenfields link between Jesmond Road and Drury 1 Precinct “Auranga Road 1”, Bremner Road, Norrie Road and Waihoehoe Road West. It primarily involves upgrading and widening existing transport corridors with the exception of the new link between Jesmond Road and the Drury 1 Precinct Road 1 and the new bridge connection over Hingaia Stream between Bremner and Norrie Roads. The functional intent of the Project is to provide an urban arterial connecting the growth areas of Drury West and East to the wider network and centres, including providing a frequent transport bus network. The location of the Project is shown in Figure 13-1.

The proposed FTN arterial route will support the urbanisation of the Drury west area, resulting in greater connectivity and improved urban form outcomes for the area. The upgrade will provide safe and attractive multi-modal accesses to the proposed Drury West and East centres and planned strategic transport network, providing greater transport choice and access to economic and social opportunities for those living and/or working in the area.

Generally, a 28m or 30m wide transport corridor will be provided with two general traffic lanes, two bus lanes and separated active transport facilities on both sides of the road corridor. The alignment has been designed to minimise impacts on environmental constraints. The urban arterials will have a likely speed limit of 50kph. Typical cross-sections are provided in Figure 13-2 and Figure 13-3 and indicative design drawings are provided in Volume 3 of this AEE.

A new AT designation is proposed to allow sufficient land for the road widening plus additional land for tie ins, stormwater infrastructure, batter slopes and retaining structures and for other construction related activities including construction compounds and laydown areas, construction traffic manoeuvring and the re-grade of driveways.

For assessment purposes, the Project has been separated into three sections as shown in Figure 13-1, including:

- Jesmond Road FTN Upgrade;
- Bremner Road FTN Upgrade (including Jesmond to Bremner link through the Auranga Development, Bremner Road and Norrie Road); and
- Waihoehoe Road West FTN Upgrade, including the Great South Road intersection.

Key features of the proposed upgrades common to each of the Project sections include:

- A typically 28m or 30m wide road with four lanes and separated active transport facilities
- Localised widening around the existing intersections to accommodate for vehicle queuing and tie-ins and active transport facilities/crossings
- Batter slopes and retaining to enable widening of the corridor and/or stormwater wetland construction, and associated cut and fill activities (noting the indicative design of these are based on the existing land form and urban development adjoining these areas may change the work requirements).

- Vegetation removal along the existing road corridor
- Areas for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring.

The works described for the Projects could be carried out in stages as urban development occurs surrounding the Project area.

Indicative design drawings are provided in Volume 3 of this AEE and the Project design standards and details further described in Section 4.2.7

Further details of each Project section are provided below.

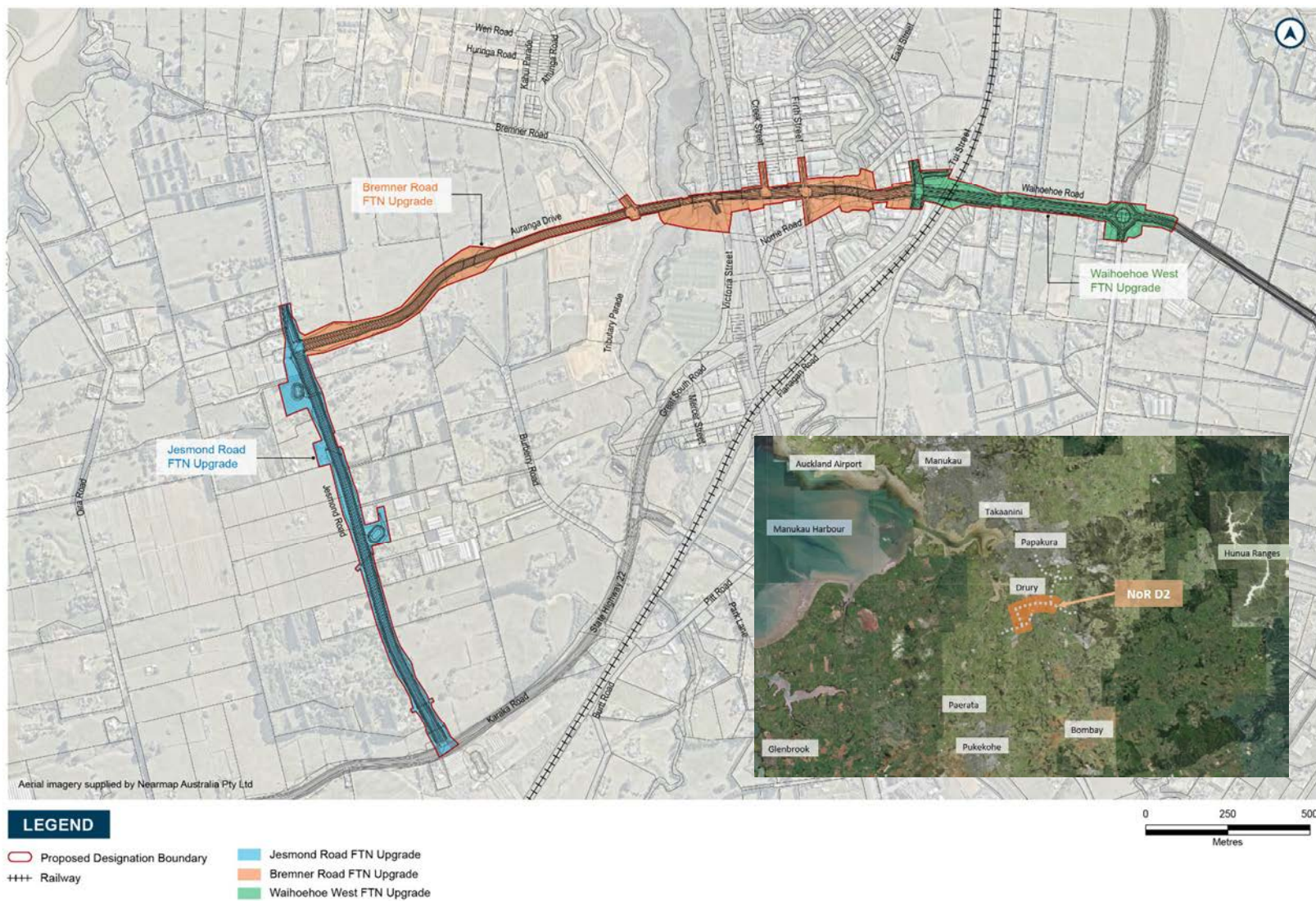


Figure 13-1: NoR D2 Project Sections and Context

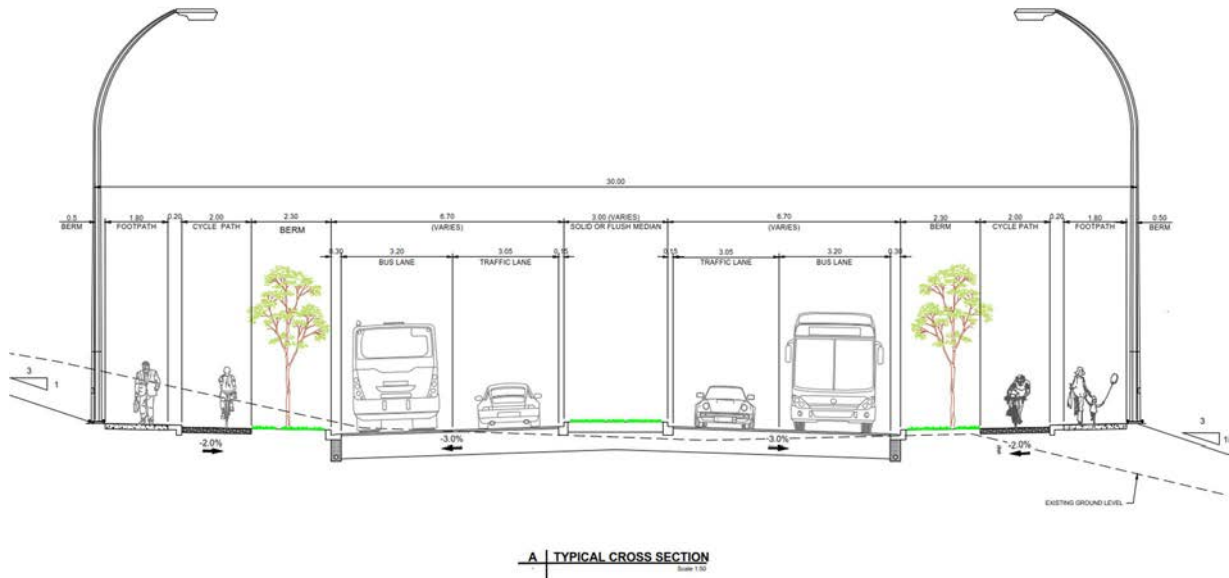


Figure 13-2: Typical 30m Cross Section

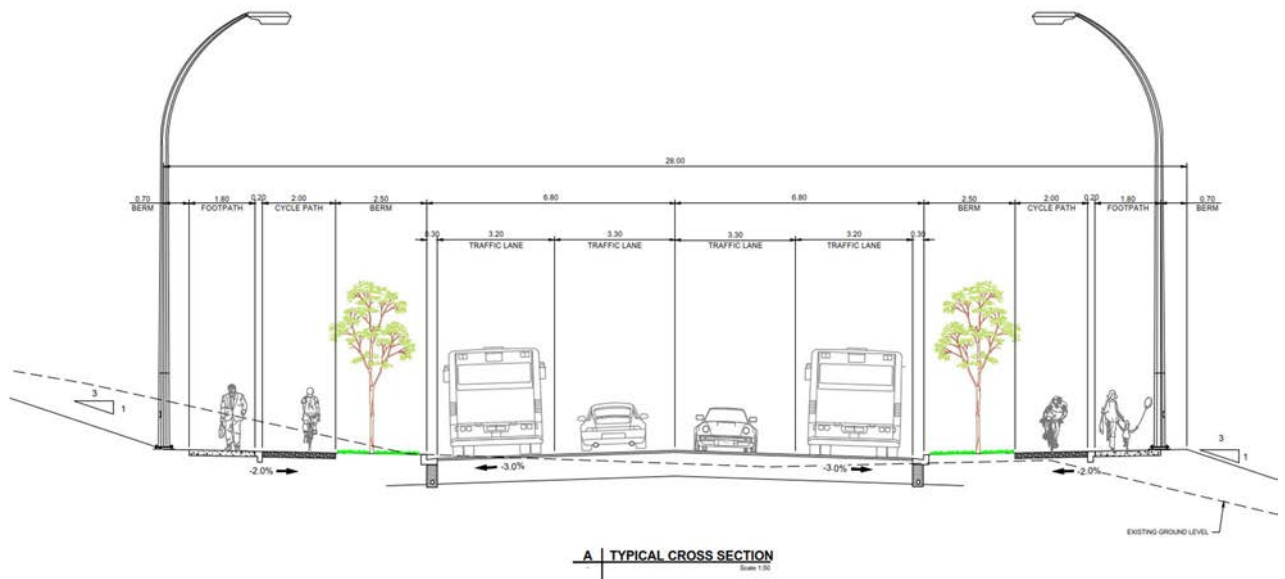


Figure 13-3: Typical 28m Cross Section

13.1.1 Jesmond Road FTN Upgrade Section

The Jesmond Road FTN Upgrade section extends from SH22, approximately 1.4 kilometres north on Jesmond Road. The Jesmond Road upgrade will provide greater accessibility via a north-south link that connects Bremner Road to the proposed Drury West Station and centre, forming a key public transport and active mode spine through Drury West.

At the southern extent Jesmond Road ties into SH22 with a signalised intersection. The corridor continues north widening generally to the western side of the road. Two stormwater wetlands are proposed. In the north the corridor intersects the proposed Jesmond to Bremner Link (described in the section below) and a signalised intersection is proposed. To the north of the intersection the corridor ties into the existing Jesmond Road alignment. An overview of the proposed alignment is provided in Figure 13-4.

In accordance with the design standards and details identified in Section 4.2.7, and in addition to those features listed in Section 13.1, the key features of the Jesmond Road Project section of proposed upgrade include:

- Signalised intersections at SH22 and the new Jesmond to Bremner Link
- New and extended pipe culverts for cross drainage
- Two stormwater wetlands



Figure 13-4: No R D2 Proposed Jesmond Road FTN Upgrade

13.1.2 Bremner Road FTN Upgrade Section

The Bremner Road FTN Upgrade section extends from Jesmond Road in the west, approximately 2km to the end of Norrie Road in the east. This section involves the construction of sections of new road and upgrading existing roads to provide for a four-lane FTN arterial. The functional intent of this section provides greater east-west accessibility that connects Jesmond Road to Great South Road and town centre, forming a key public transport and active mode spine.

A new section of road is proposed from a signalised intersection of Jesmond Road to the new road within the Drury 1 Precinct (Auranga Road 1). This includes a new bridge over an unnamed stream and then a connection into the Auranga Road 1 (east of the stream). The Auranga Development has begun construction of a two lane collector road with active modes on the southern side only which connects with Bremner Road. The proposed alignment follows this 28m wide road and the FTN lanes will utilise berm space in the northern part of the road. This was agreed with Auranga through Plan Changes within the Drury 1 Precinct. The new section of road and the upgrade to Auranga Road 1 is collectively referred to as the “Jesmond to Bremner Link”.

From the east of the Auranga Road 1 and Bremner Road signalised intersection, the existing bridges over the Ngakoroa Stream and SH1 are proposed to be replaced as part of the SH1 widening by the Papakura to Drury South Papakura to Drury South Waka Kotahi project which forms part of the New Zealand Upgrade Programme. The Bremner Road FTN Upgrade will add two additional lanes for the FTN and active transport via widening (or new bridges) to the south of the reconstructed bridges. Widening will continue generally to the south of Bremner Road from the SH1 bridge to the end of Bremner Road/Firth Street intersection. Signalised intersections are proposed at Creek Street and Firth Street. To the east of Firth Street a new connection is proposed over Hingaia Stream from Bremner Road to Norrie Road. The Bremner Road FTN upgrade section continues to the end of Norrie Road where it meets Great South Road. An overview of the proposed alignment is provided in Figure 13-5.

In accordance with the design standards and details identified in Section 4.2.7, and in addition to those features listed in Section 13.1, the key features of the Bremner Road Project section of proposed upgrade include:

- Signalised intersections on Bremner Road with Auranga Road 1, Creek Street and Firth Street
- Between Jesmond and Bremner Roads (Jesmond to Bremner Link):
 - A new road from Jesmond Road to Auranga Road 1 including a bridge across an unnamed stream.
 - Two additional lanes for the FTN within the Auranga Road 1 from the unnamed stream to Bremner Road
- Widening (or new bridges) of the two bridges crossing Ngakoroa Stream and SH1. These two existing bridges are proposed to be reconstructed in the near future as part of the SH1 widening by the Papakura to Drury South Papakura to Drury South Waka Kotahi Project which forms part of the NZUP
- A new connection and bridge from Bremner Road to Norrie Road across Hingaia Stream
- Removal of the Norrie Road Bridge and closure of Norrie Road west
- Removal of access to Bremner Road from Creek Street (south)

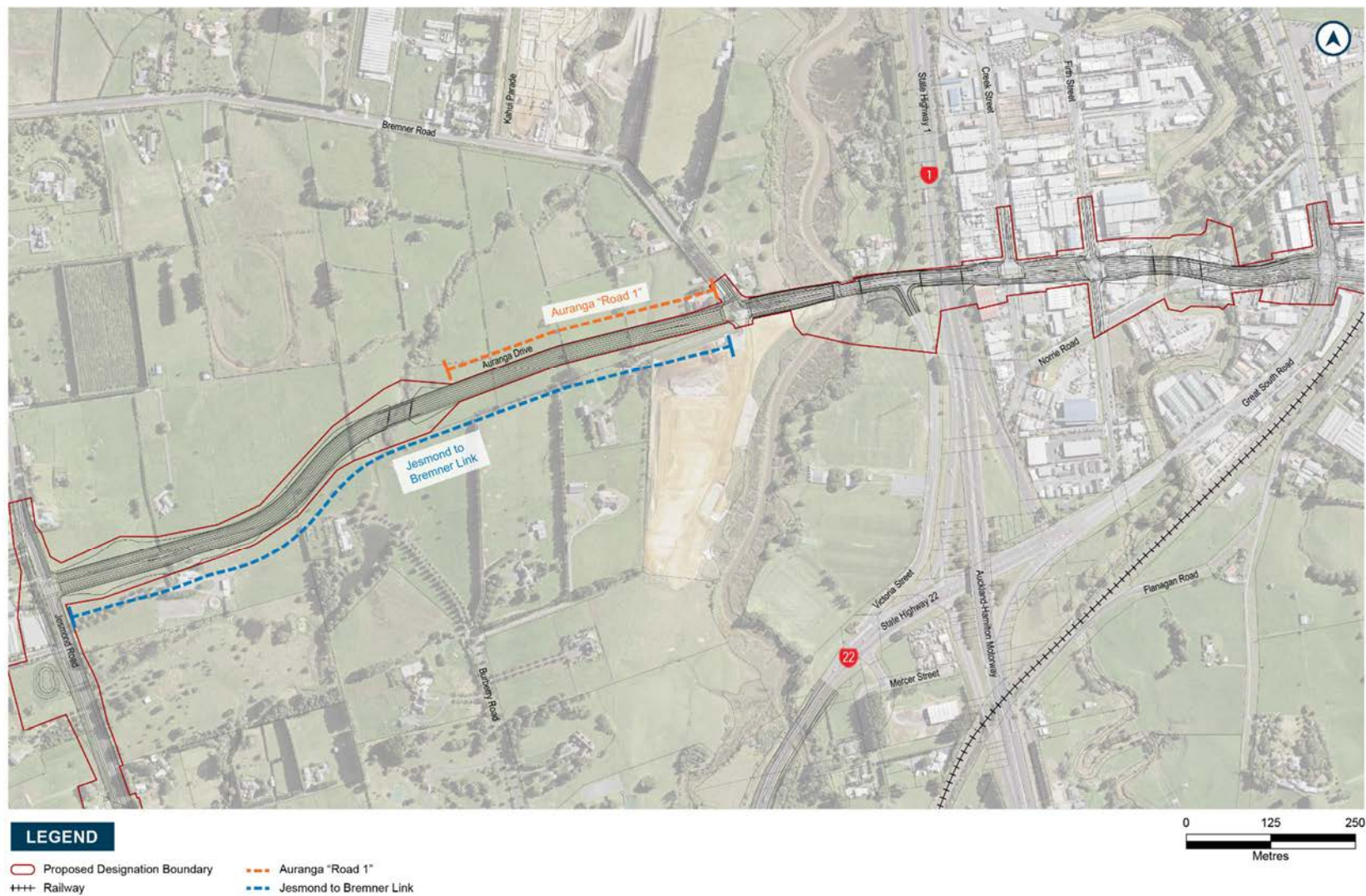


Figure 13-5: NoR D2 Proposed Bremner Road FTN Upgrade

13.1.3 Waihoehoe Road West FTN Upgrade Section

The Waihoehoe Road West FTN Upgrade section extends from Great South Road in the west, approximately 800m east to just past Fitzgerald Road in the east and involves widening the existing two-lane rural road to provide for a four-lane FTN arterial. The functional intent for the section is to provide for a strategic east-west link between strategic north-south and east-west corridors (Norrie Road, Great South Road and the Ōpāheke N-S FTN Arterial) that connects Waihoehoe Road to the Drury Central Station (and associated park and ride facilities) and the proposed Drury centre, forming a key public transport and active mode spine through Drury West.

In the east, the Project includes a signalised intersection at Great South Road. The Waihoehoe Bridge over the NIMT is proposed to be reconstructed to provide for the FTN, active transport and allowing sufficient space underneath for future rail upgrades including electrification and four-tracking. To accommodate the bridge, Watercare's Waikato 1 watermain will need to be relocated. To the west of the NIMT the corridor continues to Fitzgerald Road where a roundabout will tie in with the proposed Ōpāheke N-S FTN Arterial and Fitzgerald Road. To the east of the roundabout the corridor will tie in with Waihoehoe Road East Upgrade (NoR D3) where the corridor reduces to a 24m cross section with two general traffic lanes and separated active transport facilities. The Project ties into the Waihoehoe Road East Upgrade (NoR D3) approximately 140m to the east. An overview of the proposed alignment is provided in Figure 13-6.

In accordance with the design standards and details identified in Section 4.2.7, and in addition to those features listed in Section 13.1, the key features of the Waihoehoe Road West FTN Upgrade section of the proposed upgrade include:

- Realignment of Tui Street to Great South Road
- Upgraded and signalised intersection at Great South Road
- Reconstruction of the bridge crossing the NIMT rail line
- Relocation of the Waikato 1 watermain. The point of re-location to be agreed with Watercare at future detailed design.



Figure 13-6: Proposed Waihoehoe Road West FTN Upgrade

13.2 Project Objectives

The Project Objectives reflect the transport outcomes that were identified for the Southern Growth Area (in the IBC) and specifically the Drury Arterial Network (in the DBC). The Project Objectives for the Jesmond to Waihoehoe Road West FTN Upgrade are:

1. Provide a transport corridor that connects key destinations in Drury East and West to support and integrate with urban growth in Drury
2. Provide a transport corridor that is safe for all users
3. Contribute to mode shift by prioritising frequent and reliable public transport and provides a choice of transport options including active transport

13.3 Lapse

A lapse period of 15 years is proposed for NoR D2.

13.4 Indicative Construction Methodology

The general construction methodology for the Project is outlined in Section 4.4 and further detail is outlined in the sections below. The indicative construction methodology, including the working room areas specified in Table 4-2, have informed the proposed designation boundary. Although the Project has been separated into different sections for assessment purposes, where construction methods are consistent across the three sections this summary has been combined to avoid unnecessary repetition.

13.4.1 Construction Overview

Construction of the Project will include earthworks, construction of bridges (Bremner Road FTN Upgrade and Waihoehoe Road West FTN Upgrade only), pavement, drainage and stormwater wetlands (Jesmond Road FTN Upgrade only), and service relocation. The works will also include the construction of new signalised intersections and other tie ins with existing roads.

To facilitate the construction works of each of the three Project sections, the sites have been broken into construction zones. The construction zones are based on the geography and complexity of the works. The zones include:

- For the Jesmond Road FTN Upgrade, the works are to be constructed in a single construction zone as the works along the alignment are similar in nature;
- For the Bremner Road FTN Upgrade, as shown in Figure 13-7:
 - Zone 1 – Jesmond Road to Bremner Link within Auranga 1 Precinct (CH0 to CH650) (greenfield).
 - Zone 2 – Auranga Road 1 - upgrade of local road within the Auranga Development
 - Zone 3 – Bremner Road from the bridge over Ngakoroa Stream to Great South Road.
- For the Waihoehoe Road FTN Upgrade the works are to be constructed in a single construction zone as the works along the alignment are similar in nature.

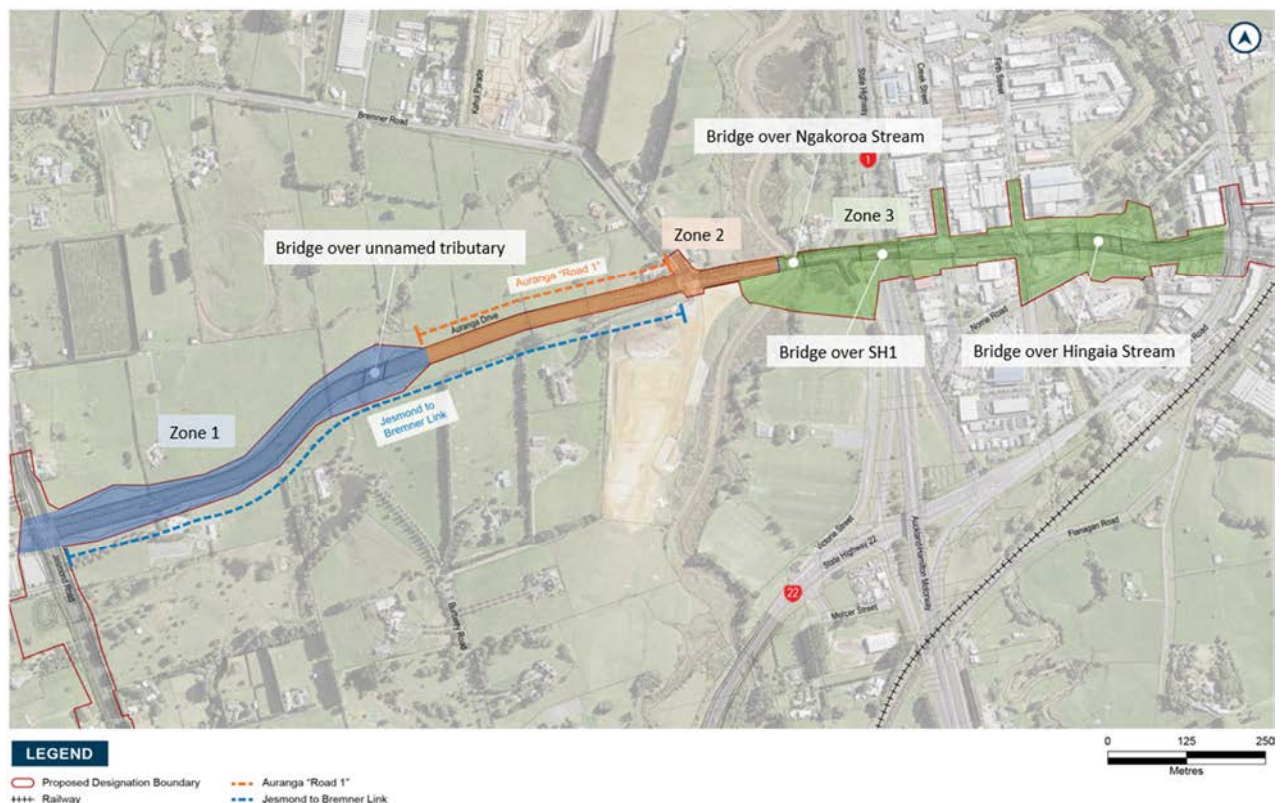


Figure 13-7: Bremner Road FTN Upgrade Construction Zones

13.4.2 Indicative Construction Programme and Sequencing

13.4.2.1 Jesmond Road FTN Upgrade Section

The Jesmond Road FTN Upgrade is estimated to take 1 to 1.5 years to construct. Most of the works will be constructed online, in the existing Jesmond Road alignment, with the exception of the new Jesmond to Bremner Link. The implementation timeframe for the Project has yet to be confirmed and will respond to timing of urban development as well as funding availability. However, it is currently anticipated that it will be implemented by approximately 2028. In addition, urban development that may occur ahead of the proposed upgrade has the potential to change the detail of construction requirements than what would be required in the existing environment. The proposed designation provides for construction in the existing environment acknowledging this may change in the future.

A summary of the indicative construction sequence and methodology is outlined in Figure 13-8.

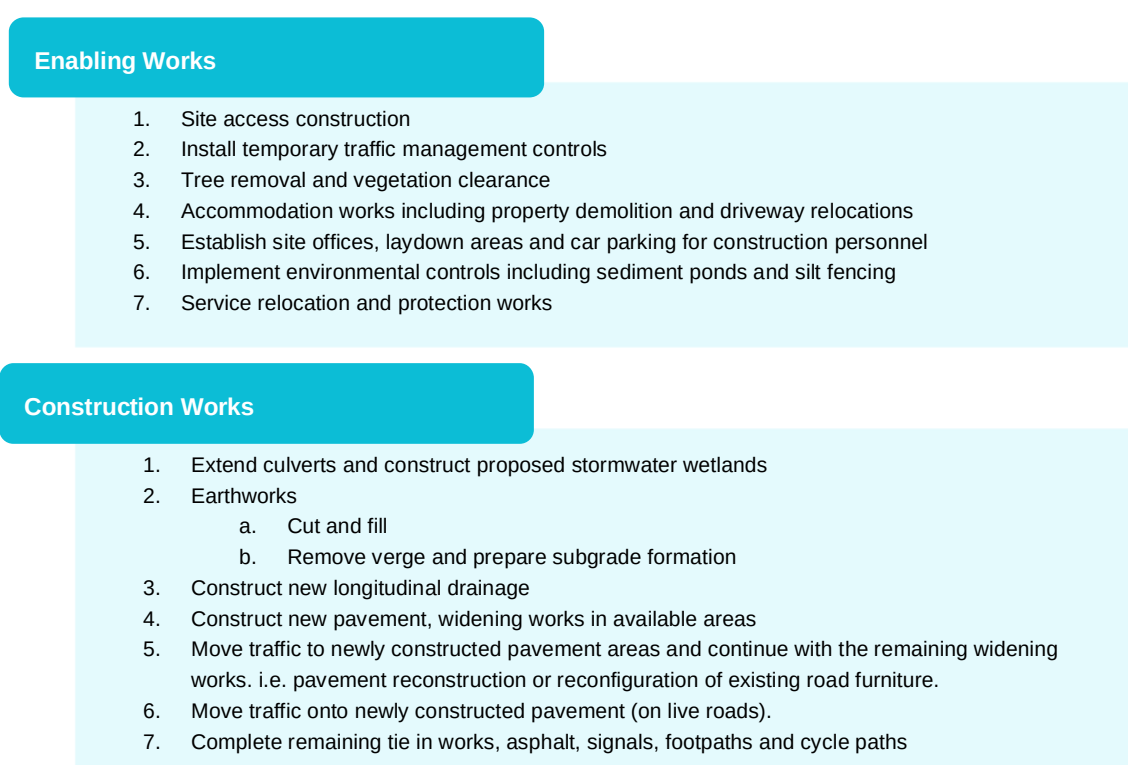


Figure 13-8: Jesmond Road FTN Upgrade Indicative Construction Sequencing Summary

13.4.2.2 Bremner Road FTN Upgrade Section

The Bremner Road FTN Upgrade is estimated to take 3 to 3.5 years to construct. Some of the works will be constructed online along the Auranga Road 1, Bremner Road and Norrie Road alignment, and offline within the new section of road within Jesmond to Bremner Link. The implementation timeframe for the Project has yet to be confirmed and will respond to timing of urban development as well as funding availability. However, it is currently anticipated that it will be implemented by approximately 2028. In addition, urban development that may occur ahead of the proposed upgrade has the potential to change the detail of construction requirements than what would be required in the existing environment. The proposed designation provides for construction in the existing environment acknowledging this may change in the future. A summary of the construction sequence and methodology is outlined in Figure 13-9.

Zone 1 Enabling Works 1. Site access construction 2. Install temporary traffic management controls 3. Tree removal and vegetation clearance 4. Accommodation works including property demolition and driveway relocations 5. Establish site offices, laydown areas and car parking for construction personnel 6. Implement environmental controls including sediment ponds and silt fencing 7. Service relocation and protection works 8. Implement traffic management to establish the construction zone	Zone 1 Construction Works 1. Earthworks a. Culvert construction or modification works. b. Ground improvements, undercuts, embankment foundations. c. Cut and fill to formation level 2. Install bridge beams 3. Construct new longitudinal drainage 4. Construct new pavement 5. Complete asphaltting, tie in works, footpath, cycleway, lighting and landscaping
Zone 2 Enabling Works 1. Implement environmental controls including drainage cesspit sediment protection and silt fencing 2. Implement traffic management to establish the construction zone 3. Service relocation and protection works	Zone 2 Construction Works 1. Minor demolition work of any existing infrastructure to facilitate the upgrade works 2. Minor earthworks, civil and pavement works 3. Finishing works, landscaping, line marking, streetlights and tie in works
Zone 3 Enabling Works 1. Site clearance and demolition works, remove footpath, street lights, grass verge 2. Accommodation works including property demolition and driveway relocations 3. Implement environmental controls including drainage cesspit sediment protection and silt fencing 4. Implement traffic management to establish the construction zone 5. Service relocation and protection works	Zone 3 Construction Works 1. Construct new pavement widening works in available areas, including network drainage. 2. Move traffic onto the newly constructed pavement areas, and continue with stage 2 widening works, i.e. pavement reconstruction or reconfiguration of existing roads 3. Move traffic to enable finishing works, tie ins, and other landscaping works. 4. Asphalt new road, carry out finishing works, and move traffic to the final design configuration.
Bridge Works 1. Site compound and establishment of plant and materials 2. Environmental controls 3. Implement traffic management to enable work areas. a. For Norrie Road Bridge, preferably close the section of Norrie Road within the permanent works scope. 4. Bridge construction (Stage 1 only for Ngakoroa Bridge and Bridge over Southern Motorway) a. Construct abutment b. Piling, pier, and headstock construction c. Install bridge beams and decking d. Finishing Works: barriers, settlement slabs, footpaths, cycleways, landscaping and antigraffiti 5. Move traffic onto newly constructed bridge. 6. Complete landscaping and finishing works	

Figure 13-9: Bremner Road FTN Upgrade Indicative Construction Sequencing Summary

13.4.2.3 Waihoehoe Road West FTN Upgrade Section

The Waihoehoe Road West FTN Upgrade is estimated to take 2 to 2.5 years to construct. Most of the works will be constructed online in the existing Waihoehoe Road alignment. The implementation timeframe for the Project has yet to be confirmed and will respond to timing of urban development as well as funding availability. However, it is currently anticipated that it will be implemented by approximately 2028. In addition, urban development that may occur ahead of the proposed upgrade has the potential to change the detail of construction requirements than what would be required in the existing environment. The proposed designation provides for construction in the existing environment acknowledging this may change in the future. A summary of the construction sequence and methodology is outlined in Figure 13-10.

Enabling Works

1. Accommodation works including building removal and driveway relocations
2. Tree removal and vegetation clearance
3. Establish site offices, laydown areas and car parking for construction personnel
4. Implement environmental controls including silt fencing
5. Service relocation and protection works
6. Implement traffic management to establish the construction zone
7. Provide alternate Tui Street access into Drury Hall and the rugby club. Close Tui Street and establish work area within the proposed designation

Stage 1 & 2 – Eastbound Carriageway (north side widening) & Westbound Carriageway

1. Earthworks
 - a. Top soil strip
 - b. Embankment foundations
 - c. construct embankment to subgrade formation
2. Install stormwater infrastructure
3. Construct pavement works or rehabilitate existing pavement
4. Construct new cycleways and footpaths
5. Complete tie in works, footpath, cycle paths, lighting and landscaping.
6. Intersection construction

Stage 3 – Finishing Works

1. Complete outstanding pavement works. Remove temporary pavement
2. Install median kerbing, line marking and street lighting
3. Install road services, signage and bridge furnishings
4. Complete road finishing works including streetlighting, landscaping, footpaths and cycleways, line marking and roundabout tie ins.

Bridge Works

1. Site clearance including vegetation removal and property demolition/ modification
2. Prepare work area and laydown
3. Install temporary works, including protection for working around rail
4. Bridge construction Stage 1 – construct eastbound section
 - a. Construct abutment
 - b. Piling, pier, and headstock construction
 - c. Install bridge beams and decking
 - d. Finishing Works: barriers, settlement slabs, footpath and cycle path, handrails and screen
5. Commission bridge and move traffic onto newly constructed bridge.
6. Deconstruct the existing Waihoehoe Road Bridge over rail.
7. Install temporary traffic management measures
8. Bridge construction – Stage 2 construct westbound section (similar works to Stage 1)
9. Complete finishing and tie in works, remove temporary works
10. Move traffic to permanent configuration.

Figure 13-10: Waihoehoe Road West FTN Upgrade Indicative Construction Sequencing Summary

13.4.3 Indicative Construction Methodology

13.4.3.1 Site Establishment

Site Facilities

Construction site compounds and laydowns will be required at a number of indicative locations for the construction of each Project section as shown in Figure 13-11 for the Jesmond Road FTN Upgrade, Figure 13-12 for the Bremner Road FTN Upgrade and Figure 13-13 for the Waihoehoe Road West FTN Upgrade.

The areas for site compound locations have been identified for this use because they are accessible from existing roads, have flat terrain to minimise the required earthworks, and are in close proximity to existing establishments such as utilities and commercial areas. The areas generally avoid residential areas and environmental features, minimising unnecessary vegetation clearance and avoiding streams and flood plains.

Construction compounds and laydown areas adjacent to the bridge sites facilitate a suitable area for the delivery and establishment of specific bridge equipment and materials, such as temporary staging, piling rigs, cranes, concrete trucks, formwork and bridge beams. Where additional laydown is needed along the alignments it will be accommodated within the proposed designation footprint.

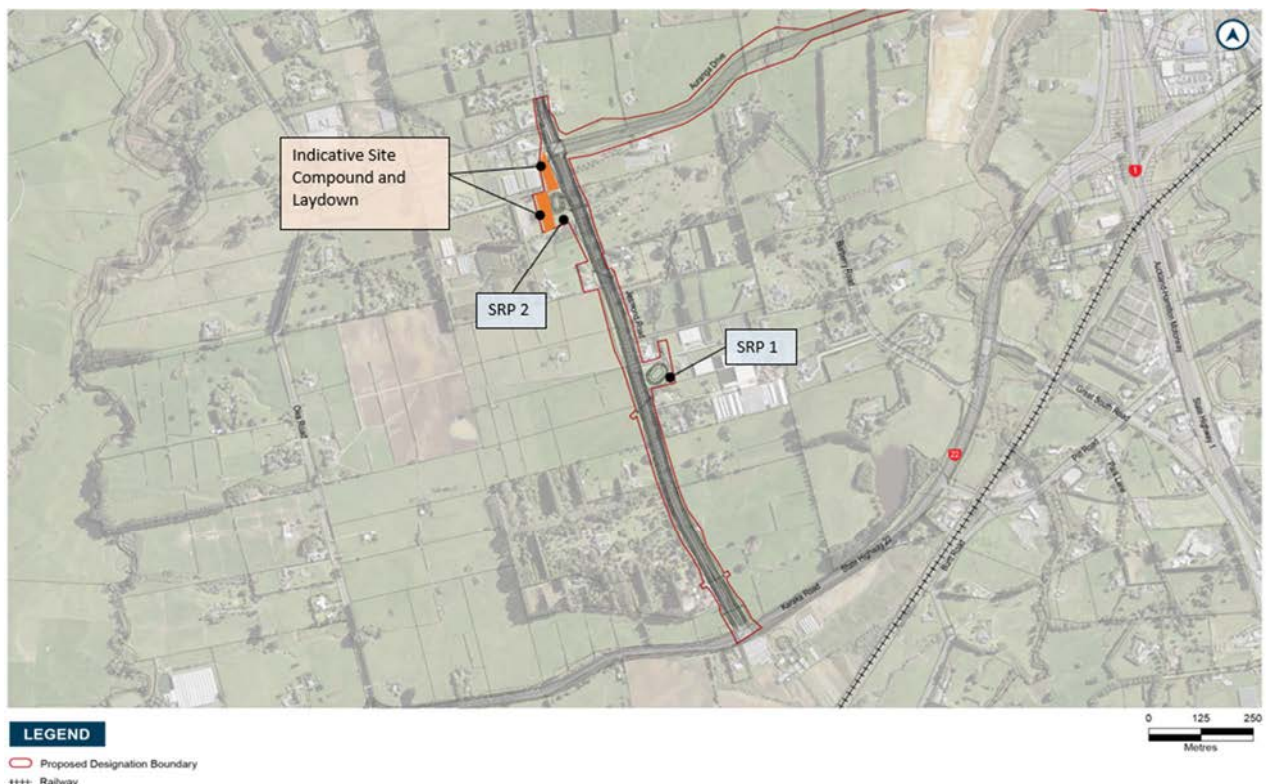


Figure 13-11: Indicative Compounds, Laydowns and sediment retention ponds (SRPs) for Jesmond Road

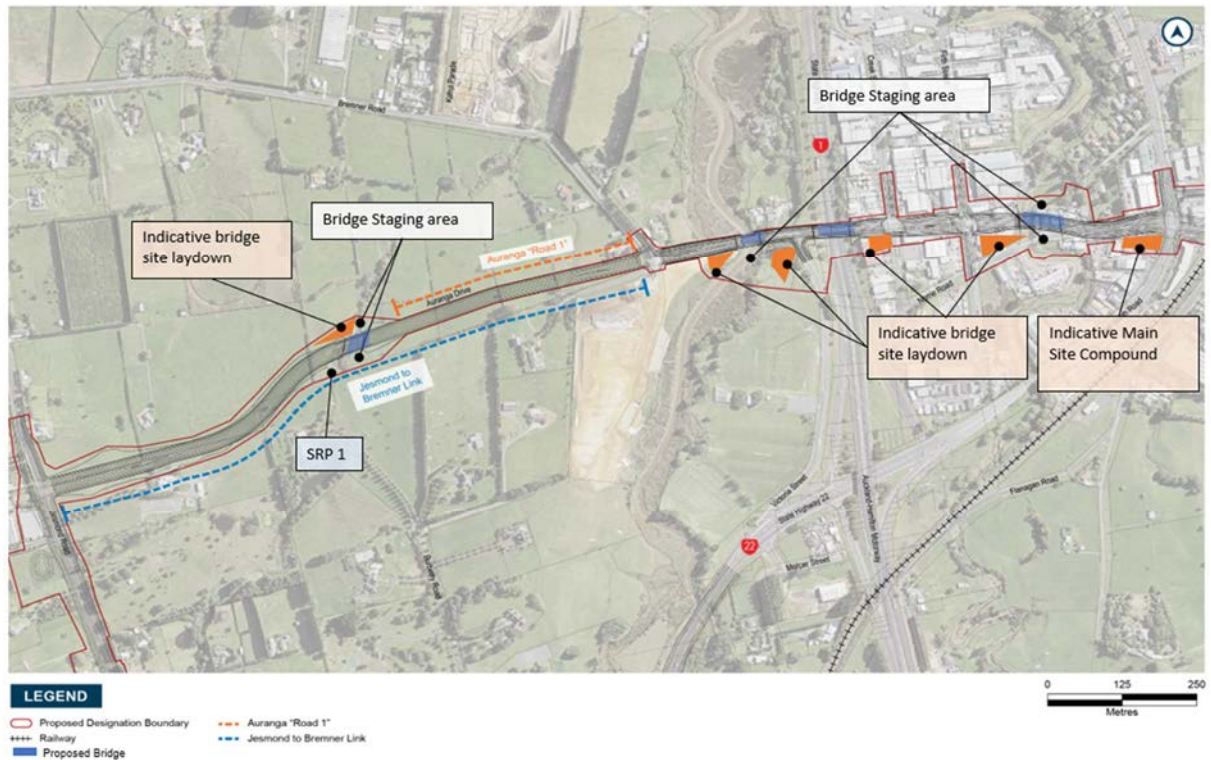


Figure 13-12: Indicative Construction, Compounds, Laydowns and SRPs for Bremner Road



Figure 13-13: Indicative Construction, Compounds, Laydowns for Waihoehoe Road West

Sediment Controls

For the Jesmond Road FTN Upgrade, subject to future resource consents, during construction the surface water runoff will be diverted into the temporary sediment retention ponds to be treated before being discharged back into the waterway. Figure 13-11 and Figure 13-14 identify the proposed sediment retention pond locations. The Bremner Road FTN Upgrade construction zone 1 will likely require a temporary sediment retention pond to treat the surface water runoff as shown in Figure 13-12 and Figure 13-15.

For Bremner Road FTN Upgrade construction zones 2 and 3 and the Waihoehoe Road West FTN Upgrade, subject to future resource consents, surface water from the construction work areas will need to be treated prior to discharge. Within these construction zones it is not anticipated works will involve large earthworks areas. Therefore, localised erosion and sediment control measures will be implemented within these sites. Localised measures can include minimising open earthworks areas by using cut and cover methods, installing silt fencing, using filter cloth around drains, and sandbags, or hay bales near discharge points to filter out the sediments.

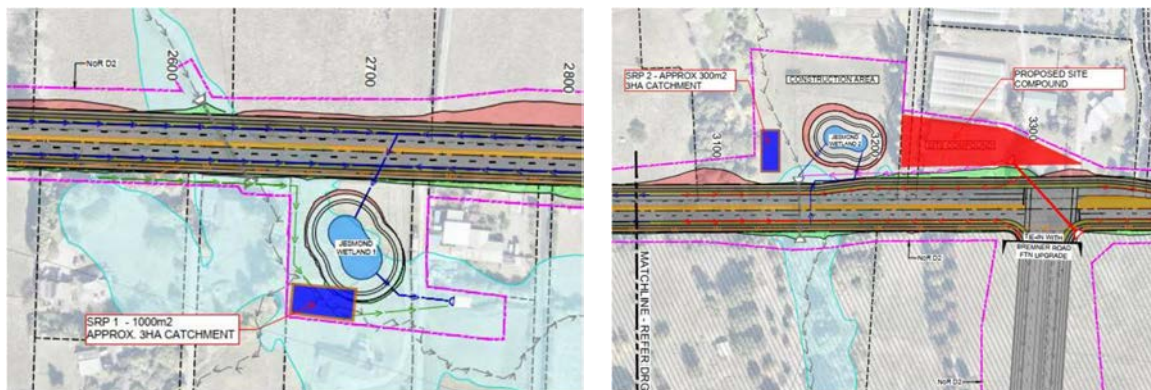


Figure 13-14: Jesmond Road FTN Upgrade indicative areas identified for Erosion and Sediment Control treatment

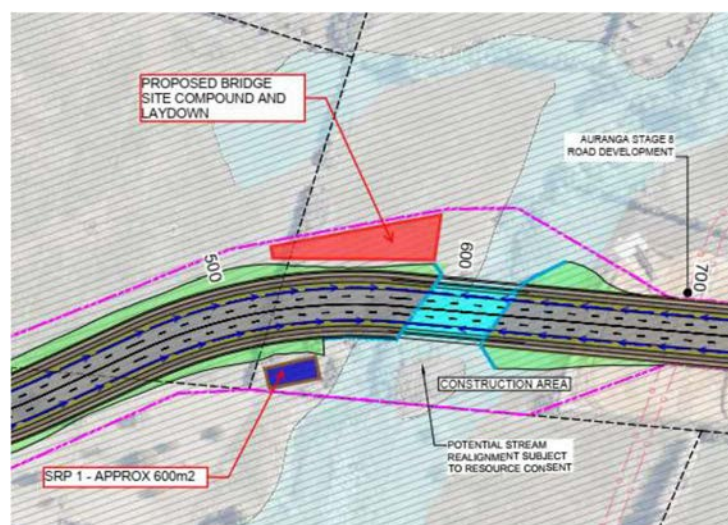


Figure 13-15: Bremner Road FTN Upgrade indicative areas identified for Erosion and Sediment Control treatment

Traffic Management and Access

For the Bremner Road FTN Upgrade, temporary traffic management measures will be required within the Drury commercial area to facilitate the efficient construction of the new Bremner Road FTN Upgrade section in Norrie Road, and bridge over the Hingaia Stream. In particular, it is proposed to close off Norrie Road from Great South Road to Firth Street, while still allowing for access to the local businesses on either side of the existing Norrie Road Bridge over the Hingaia Stream. Additionally, works on the bridge over SH1 may require some temporary traffic management measures on SH1, including reduced speed limits, night works and detours, temporary barriers, and lane reconfigurations.

Tui Street will be realigned to Great South Road to provide access to the existing Drury Hall and Rugby Club (or any businesses or community facilities are operational at the time).

13.4.3.2 Network Utilities

The Project requires the relocation or realignment of a number of network utilities including gas transmission and distribution, overhead electricity transmission, and telecommunications. Works to network utilities will be confirmed at detailed design and may include the following:

For the Jesmond Road FTN Upgrade:

- **Vector overhead power distribution lines:** the lines to the east of Jesmond Road run for the full length of the proposed works. While the road widening is predominantly proposed on the western side of Jesmond Road, where widening will take place on the east it will conflict with the existing power poles and overhead lines will conflict with new streetlights, footpath, or cycle paths and will likely require relocating underground. If impacted, new power cables will be installed by direct bury or directional drilling methods. Once installed the power can be switched to the new lines. The outages will be limited with cut overs taking a matter of hours, typically during low demand periods.
- **Chorus:** the existing communication lines running underground along Jesmond Road will be relocated to their final design location within the proposed road corridor. This will need to be identified and confirmed in the detailed design phase. It is likely that the existing cables will remain in situ until the new cables are installed, and cut overs only resulting in short outages for each user.
- **Vector medium pressure gas distribution line:** this pipeline will be identified and confirmed in the detailed design phase and will likely require relocation into the proposed road service corridor.
- **Watercare:** information obtained from BeforeUDig service indicated no Watercare assets are located within the works area. This will need to be confirmed and verified onsite prior to detailed design.

For the Bremner Road FTN Upgrade:

- **Transpower overhead transmission lines:** accurate survey information will be required to confirm the clearance from the proposed alignment to the underside of the power lines. The Project Team has discussed the proposed works with Transpower (along with the Papakura to Drury South Papakura to Drury South Project Team as they are replacing the existing bridge over the Ngakoroa Stream) and Transpower's recommendations have been included in the indicative design. Protective measures and/ or special construction techniques will be agreed with Transpower to facilitate the safe construction of the widened (or new) bridge over the Ngakoroa

Stream underneath the transmission line. The overhead line over the western approach to the bridge over the SH1 may be decommissioned in the future.

- **First Gas – Transmission line:** this pipe crosses the proposed alignment near the Auranga Development at CH700. The exact scope of works required around this pipeline will be finalised in the detailed design phase and in consultation with First Gas. The pipeline that is located under the proposed widening may not be designed to cope with the additional loading and a pipe relocation, so strengthening or protection works may be required.
- **Vector Gas Medium Pressure distribution lines:** will be realigned on to the new carriageway service corridor. Installation of the new gas line will be carried out using a combination of open trench excavation and directional drilling methods. The existing gas pipe is likely to require removal where practicable.
- **Counties Power Overhead distribution lines:** If required, lines will be relocated underground or to new overhead poles installed in the new alignment within the carriageway service corridor.
- **Watercare assets:** such as water supply, wastewater pipeline, access chambers, hydrants and others will require protection or relocation to the new road alignment.
- **Chorus:** can be relocated to the new verge according to the new design alignment.

For the Waihoehoe Road West FTN Upgrade:

- **Counties Power Overhead High Voltage Line:** The overhead high voltage power lines and supporting pylons that run across Waihoehoe Road and down the western verge of Fitzgerald Road will likely require relocation to the new proposed service corridor.
- **Vector Gas Medium Pressure distribution lines** will be realigned on to the new carriageway service corridor. Installation of the new gas line will be carried out using a combination of open trench excavation and directional drilling methods. The existing gas pipe is likely to require removal or grout filling where removal is not practicable.
- **Overhead and underground power distribution lines:** overhead power lines running on the southern verge of the proposed alignment will likely need to be relocated underground to provide space for the proposed footpath and cycle paths. New cables will be installed by direct bury or directional drill methods and the power switched to the new lines. Some short-term disruption to affected properties may occur during the cutover operation.
- **Chorus:** the existing cables running underground along Waihoehoe Road will be relocated to their final design location. It is likely that temporary cabling will be required outside the earthworks area until the final cabling can be installed.
- **Watercare assets:** the impact of the proposed embankment fill at the western abutment of the NIMT rail line bridge on the 1200mm diameter watermain (Waikato 1) will need to be assessed during detailed design. However, potential impacts have been discussed with Watercare, and it is likely the Waikato 1 watermain will need to be relocated. The relocation of the watermain will be determined during detailed design in consultation with Watercare. Other Watercare assets conflicting with the proposed alignment may need to be relocated to the new service corridor. Some short-term disruptions to affected properties may occur during the cutover operation of these services.

13.4.3.3 Culverts and Related Stream Works

The Jesmond Road FTN Upgrade section requires new culverts, and the extension and/or replacement of existing culverts to accommodate the road widening. Resource consents for culverts and associated stream works will be sought at detailed design. These culverts will be constructed at the initial phase of the construction works, prior to bulk earthworks, to reduce the excavation required

and ensure groundwater is managed during construction. Works will be planned for the summer months to better manage water flow volumes.

There are no anticipated culvert and related stream works for the Bremner Road FTN Upgrade or Waihoehoe Road West FTN Upgrade.

13.4.3.4 Earthworks

Earthworks volumes are estimates and exclude intersection works, stormwater wetlands and temporary works. Final earthwork volumes will be confirmed during detailed design.

The Jesmond Road FTN Upgrade is estimated to generate approximately 61,800m³ of excavated (cut) material and 6,800m³ of fill, with a total of 68,600m³ of material moved. It is assumed that the material from the cut locations can be used for the earthworks fill locations. Soil improvement measures, such as cement or lime stabilisation may be required to improve the soil parameters.

The Bremner Road FTN Upgrade is estimated to generate approximately 8,800m³ of excavated (cut) material (assumed to be unsuitable to be used as direct structural fill material) and 69,000m³ of fill, with a total volume of material moved at 77,800m³. It is assumed that the material from the cut locations can be used for the general earthworks fill locations. Soil improvement measures, such as cement or lime stabilisation may be required to improve the soil parameters. However, additional fill material will be required from either a borrow source or imported.

The Waihoehoe Road West FTN Upgrade is estimated to generate approximately 2,900m³ of excavated (cut) material (assumed unsuitable to be used as direct structural fill material) and 21,300m³ of fill, with a total volume of material moved at 24,200m³. The bulk of the fill required is on the bridge abutment approach where the alignment is raised by up to 4m. This fill material will likely be imported granular material given the constrained work area available and total volume required. Subgrade improvement techniques may also be required such as undercutting any localised soft spots, or cement and lime stabilising.

13.4.3.5 Drainage and Stormwater

New stormwater drains will be required on both sides of the proposed new and widened roads to direct the stormwater to the two new wetlands for the Jesmond Road FTN Upgrade, or through a stormwater filtration system before being discharged for the Bremner Road FTN Upgrade and the Waihoehoe Road West FTN Upgrade.

Stormwater will discharge to, and works will be required within existing water ways. Resource consents for diversion and discharge of stormwater and stream works will be sought as part of future resource consent processes. These works and activities will be undertaken in accordance with applicable management and mitigation measures and resource consent conditions.

13.4.3.6 Bridges and Structures

The proposed works for each Project section relating to bridges and structures include:

- No bridges or structures are proposed for the Jesmond Road FTN Upgrade
- For the Bremner Road FTN Upgrade the indicative design includes:
 - 35m long bridge over an unnamed tributary, at approximately Chainage 600

- 50m long bridge over the Ngakoroa Stream with mechanically stabilised earth (MSE) wall abutments
- 61m long bridge over SH1
- 70m long bridge over the Hingaia Stream
- For the Waihoehoe Road West FTN Upgrade:
 - A 29m long bridge over the NIMT rail line.

An indicative construction yard and/or compound has been included in the proposed designation boundary for each bridge. This needs to be located near the bridge and will be used as a construction compound and satellite office for the bridge construction crews, construction plant, and material storage.

Bremner Road FTN Upgrade Bridges and Retaining Structures

Several retaining structures are included within the Bremner Road FTN Upgrade, generally located near or at the bridge abutments. The specific design of these structures will be defined in the detailed design phase prior to construction.

Typically, a 6m working corridor in front of retaining walls has been included in the proposed designation boundary for smaller conventional retaining walls. The retaining wall between the bridge over the Ngakoroa Stream and the bridge over SH1 is located under the Transpower overhead transmission lines. In consultation with Transpower, special care and construction techniques will be adopted construct this wall and protect the transmission lines.

The SH1 Upgrade Papakura to Drury South Project proposes to widen SH1 prior to the implementation of the Bremner Road FTN Upgrade, and will involve the construction of new two-lane bridges on Bremner Road over SH1 and Ngakoroa Stream. Therefore, the Bremner Road FTN Upgrade will widen the (or construct new) bridges from two lanes to four lanes in the future.

It is anticipated the construction method of all four bridges in the Bremner Road FTN Upgrade will typically follow conventional bottom up bridge construction techniques.

To access the pile locations near streams, temporary staging will need to be constructed next to the bridges.

Once the bridge structure is complete, the temporary staging and accessway can be removed and/ or relocated for the next stage or bridge site. Typically a 20m wide temporary accessway will be required next to the bridge footprint to allow for the temporary staging (including the construction and dismantling of the staging) and this has been included within the proposed designation boundary.

The construction of the four bridges will be sequenced and programmed to ensure potential impacts to local businesses and residents are managed appropriately.

Bridge over an unnamed tributary

A single span bridge over an unnamed stream within a greenfield construction zone. Standard bottom up construction method outlined above with temporary construction areas required to construct the bridge which have been included within the proposed designation boundary.

Ngakoroa Stream Bridge

The two-span bridge over this stream will likely have a central pier on the stream bank (to be confirmed at detailed design). Special considerations for working near the waterways is required such as additional ecological and environmental controls. Temporary access will be required to cross the stream to facilitate the construction works, such as piling, pier column, and headstock construction. Works within watercourses will be assessed as part of the future application for resource consents from Auckland Council.

A Transpower overhead transmission line runs over the top of the Ngakoroa Bridge. Special construction techniques will be adopted in consultation with Transpower. Where required, the use of launching gantry to install the bridge beams under transmission lines will require a preassembly area. This is typically twice the length of the bridge span, plus additional hardstand for the assembly crane. Area for this has been included within the proposed designation boundary. Other safety procedures include isolating or insulating around the overhead lines, stand over personnel, and special permits from the utility provider. The clearance from the new elevated bridge deck to the underside of the power line will meet Transpower requirements.

SH1 Bridge

The sequence for a staged construction process is likely to be as follows:

- Stage 1 – implement traffic management, prepare existing bridge for widening works.
- Stage 2 – construct bridge widening works, foundations and superstructure
- Stage 3 – finishing works and bridge approach tie ins

The western abutment of the SH1 bridge is located in close proximity to the Transpower overhead transmission line. Special construction techniques and treatment to the overhead line, in consultation with Transpower, may be required if the lines are not decommissioned in the future.

In consultation with Waka Kotahi, traffic management will be required on SH1 to facilitate the construction of the abutments and the central pier. This may include reduced speed limits, night works and associated detours, traffic barriers, and lane reconfigurations.

Hingaia Stream Bridge

The existing Norrie Road Bridge will be decommissioned after the new Hingaia Stream Bridge is constructed. The construction method is likely to be as follows:

- Close Norrie Road Bridge and use for construction traffic only
- Construct and open the new Hingaia Stream bridge
- Demolish the existing Norrie Road Bridge

Temporary access designed to support the piling rig, cranes, and delivery trucks will be required to cross the stream to facilitate the works. Temporary access and work areas have been included within the proposed designation boundary.

Waihoehoe Road West FTN Upgrade Bridge

The Waihoehoe Road NIMT bridge will accommodate six lanes of traffic, separated pedestrian paths and cycle paths on both sides of the bridge. The existing Tui Street will be diverted to allow the elevation increase of the proposed alignment. The connection of Waihoehoe Road and Flanagan

Road will be confirmed in conjunction with the future NZUP Rail Station Project in the future. The bridge will be constructed in consultation with KiwiRail, following the safety procedures and requirements of working within the rail corridor in following the stages, as shown in Figure 13-16:

- Stage 1 – Construct the northern half of the new bridge
- Move traffic onto the newly constructed bridge
- Demolish/ deconstruct the existing bridge structure.
- Stage 2 – Construct the southern half of the new bridge
- Complete tie in and finishing works.

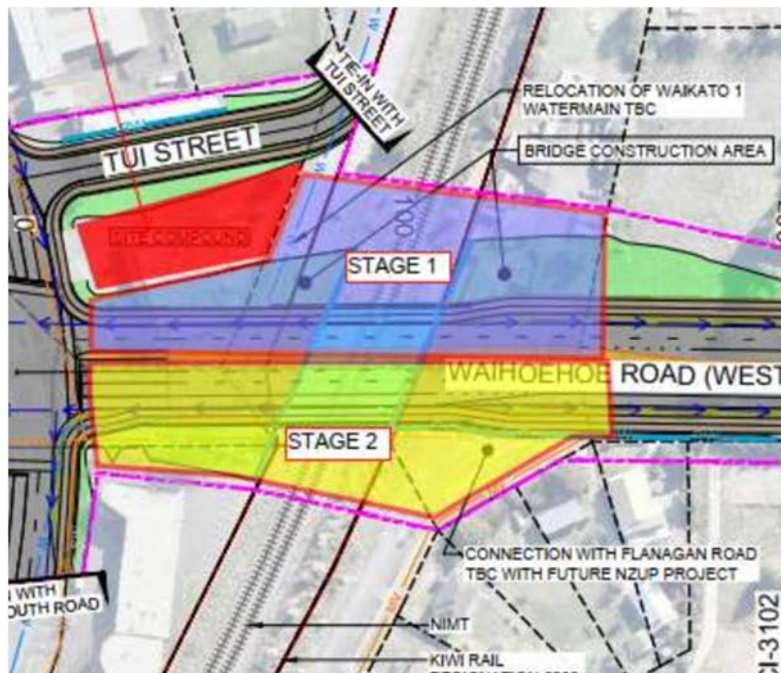


Figure 13-16: Waihoehoe Road West FTN Upgrade Bridge Construction Staging - NIMT Bridge

Permission to work within the rail corridor will be sought from KiwiRail for the bridge construction activities and the bridge demolition or deconstruction will be carried out during a weekend rail shutdown. As noted earlier, it is likely the Watercare Waikato 1 watermain will need to be relocated.

14 Jesmond to Waihoehoe Road FTN Upgrade: Existing and Likely Future Environment

This section provides a description of the human, physical and natural features of the existing environment, and the likely future environment within which the Project will be constructed, operated and maintained. It draws on information from a number of sources including the technical assessments included in Volume 4. The potential effects of the Project on this environment and measures proposed to manage these effects are detailed in Section 16 of this report.

14.1 Planning Context

Table 14-1: NoR D2 Planning Context

Existing AUPOIP Zoning and Potential Future Zoning (Drury-Ōpāheke Structure Plan) 7	Existing Zoning: • Strategic Transport Corridor Zone • Future Urban Zone • Residential – Terraced Housing and Apartments Zone • Residential – Mixed Housing Urban Zone • Business – Local Centre Zone • Business – Mixed Use Zone • Business – Light Industry Zone • Open Space – Conservation Zone • Open Space – Informal Recreation Zone • Open Space – Sport and Active Recreation Zone	Potential Future Zoning: • Strategic Transport Corridor Zone • Residential – Terraced Housing and Apartments Zone • Residential – Mixed Housing Urban Zone • Business – Centre Zone • Business – Local Centre Zone • Business – Mixed Use Zone • Business – Light Industry Zone • Open Space – Conservation Zone • Open Space – Informal Recreation Zone • Open Space – Sport and Active Recreation Zone
Precincts	Drury 1 Precinct	
Overlays and Controls	Overlays • High-Use Stream Management Areas Overlay [rp] • Historic Heritage and Special Character: Historic Heritage Overlay Extent of Place [rcp/dp] - 704, Aroha Cottage • National Grid Corridor Overlay • Significant Ecological Area – Terrestrial • Significant Ecological Area – Coastal • High-Use Aquifer Management Areas Overlay [rp] • Quality-Sensitive Aquifer Management Areas Overlay [rp] Controls • Macroinvertebrate Community Index • Coastal Inundation 1 per cent AEP Plus 1m Control • Stormwater Management Area Control – Flow 1 [rp]	

Designation(s) and other notations	• Designations - 5062, Drury West Primary School, Designations, Minister of Education • Designation – 6706, SH1 – Takaanini to Drury, Designations, New Zealand Transport Agency • Designations - 6302, North Island Main Trunk Railway Line, Designations, KiwiRail
Other Non-Statutory Features	• Flood Plains • Flood Prone Areas • Overland Flow Paths

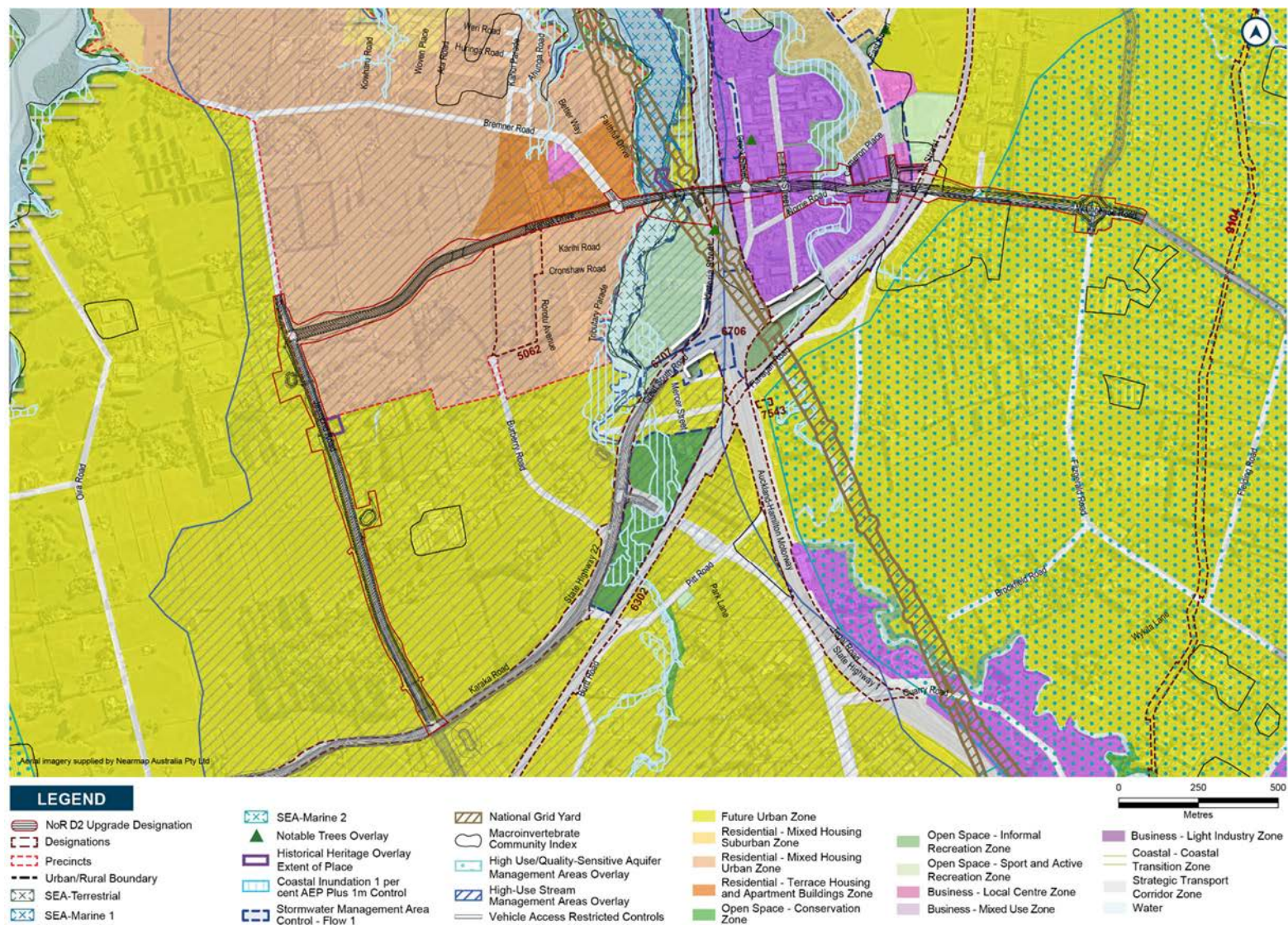


Figure 14-1: NoR D2 Planning Context (AUPOIP)

14.2 Human Environment

Table 14-2: NoR D2 Summary of Existing and Likely Future Human Environment

Land Use and Urban Form	Existing Environment
	The dominant existing land use environment surrounding the Project area is rural, consisting of greenfields/grazing, low density rural residential dwellings. It also contains a few rural based businesses including agricultural, horticultural and a few commercial and business operations (see Figure 14-2). These areas are generally to the western and eastern extents of the Project area. Development has begun in the Drury 1 Precinct, located to the west of the Ngakoroa Stream, with the construction of low to medium density residential dwellings. In the centre of the Project area, to the east of SH1, there is a mix of light industrial businesses such as concreting, automotive maintenance and supplies, fabricators, distribution services, building and machinery supplies. The existing Drury Town Centre, surrounding Great South Road, holds a mix of businesses including food outlets, retail gym, a church and cemetery. Recreational land uses are located to the east of Ngakoroa Stream (Drury Sports Complex) and to the north of Drury Town Centre (Drury Domain).
	Likely Future Environment
	The land surrounding the proposed alignment in Drury West and East is mostly zoned FUZ and forms part of the southern growth area and Drury-Ōpāheke Structure Plan area. The area is planned to undergo significant growth and change in the future. Surrounding Drury Village, the environment is an existing urban centre with a low likelihood of significant change in urban form.
	The likely future land use environment in which the Project will operate is assumed to be an urban or developing urban environment. The existing recreational uses, town centre on Great South Road and light industrial land uses are anticipated to remain, however it is expected they may be developed to support the expanding urbanised area. In the east, construction of the Auranga 1 Precinct will continue, with the rural greenfield areas assumed to be an urban or developing urban environment, planned to be largely medium and high density residential.
	Based on the Drury-Ōpāheke Structure Plan (see Figure 14-3) and proposed private plan changes, the land use pattern within the existing FUZ area surrounding the Project is predicted to be largely medium to high density residential, with commercial centres at the south eastern extent of Jesmond Road and the southern side of Waihoehoe Road. A small centre is also proposed at the northern extent of the Jesmond Road FTN Upgrade Project section. Neighbourhood parks are also proposed west of Jesmond Road and east of Waihoehoe Road. The final urban form of the existing FUZ area has yet to be confirmed but the land use outcomes in the area, as anticipated by the AUPOIP zoning proposed throughout the Drury-Ōpāheke Structure Plan is summarised in Figure 14-3 below.
	At the time of writing this report, five plan changes had been lodged with Auckland Council to urbanise large areas of Drury East and Drury West. NoR D2 has interactions with four of these: • Private Plan Change 50 - Waihoehoe by Oyster Properties on the north side of Waihoehoe Road West, • Private Plan Change 49 – Drury East by Fulton Hogan on the south eastern corner of the Waihoehoe Road / Fitzgerald Road intersection, • Private Plan Change 48 - Drury Centre by Kiwi Property Group Limited on the south side of Waihoehoe Road West • Waipupuke Private Plan Change (yet to be referenced) on Jesmond Road.

Table 14-3: NoR D2 Anticipated Urban Form

Zone	Anticipated Outcomes
Terraced Housing and Apartment Building	Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.
Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.
Mixed Housing Suburban	Development is typically two storey detached and attached housing in a variety of types and sizes.
Business –Centre	Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a focus for commercial activities and growth. Depending on the final centre zone provisions vary, but typically enable buildings up to eight storeys (in a town centre zone).

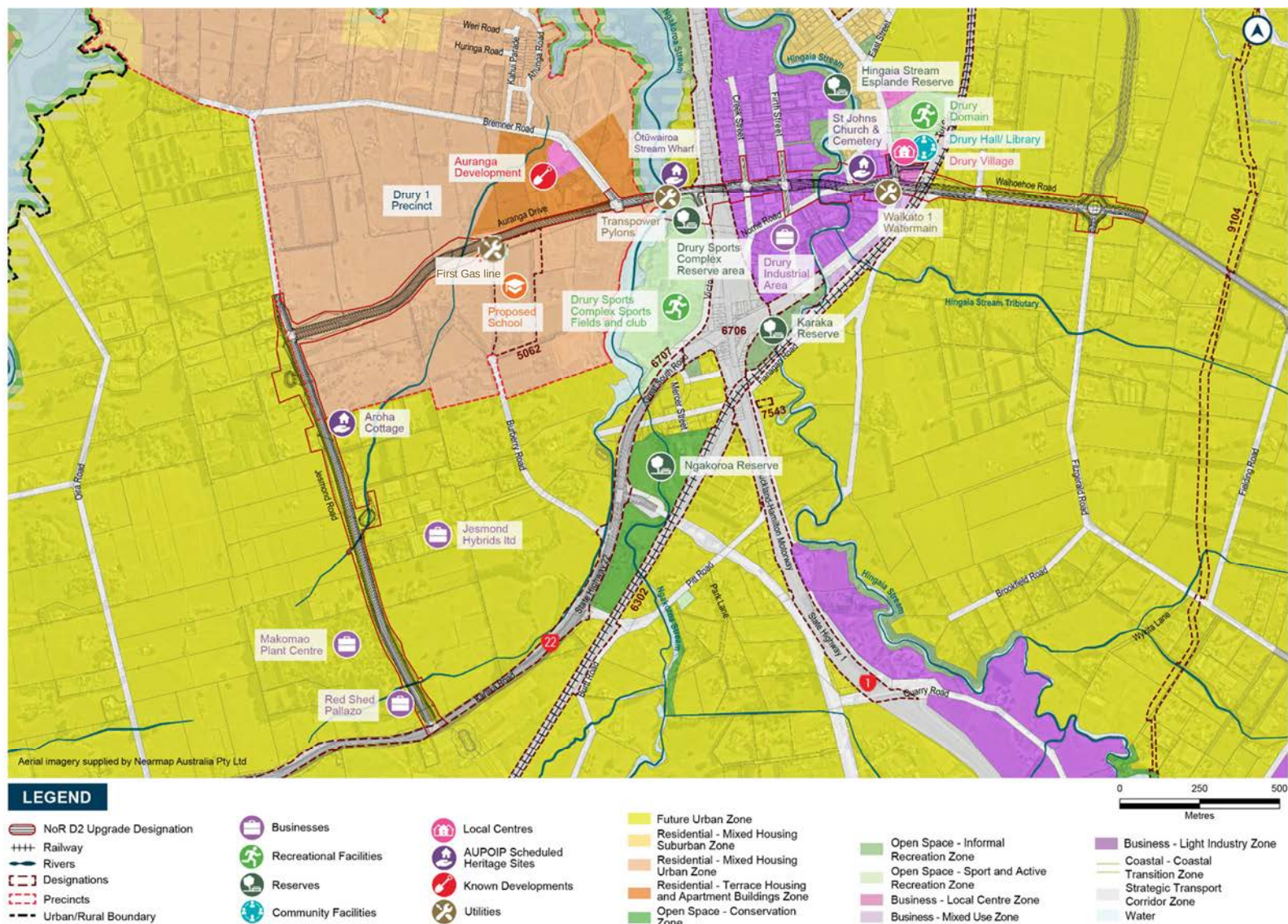


Figure 14-2: NoR D2 Existing Environment – Land Use and Urban Form

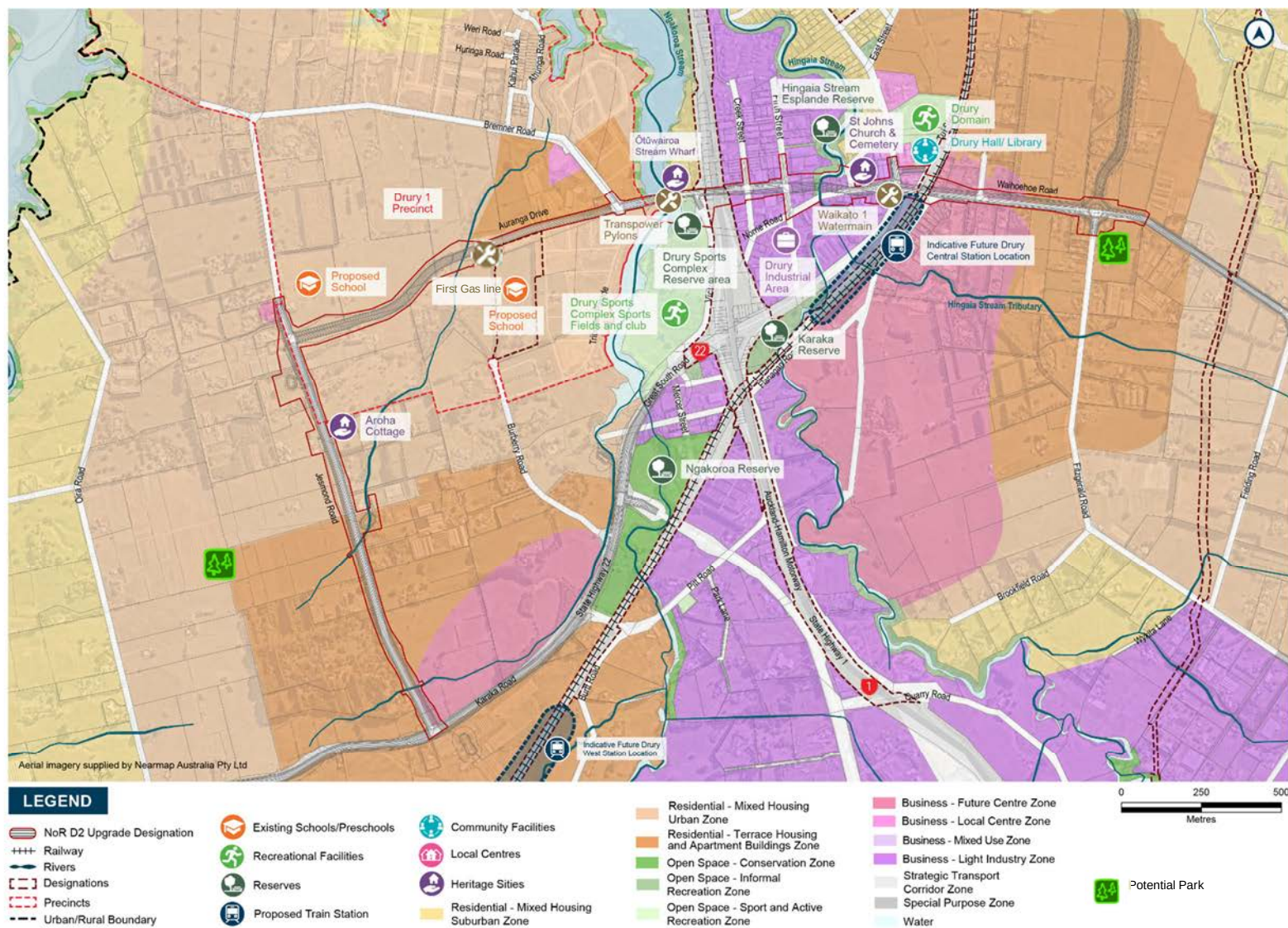


Figure 14-3: NoR D2 Likely Future Environment – Land Use and Urban Form

Transport

The following text provides a summary of the existing and likely future transport environment relating to the Project. A more detailed description of the transport environment is provided within the Assessment of Transport Effects within Volume 4 of this Document set.

Existing Environment

The existing transport network can be summarised as follows:

- Jesmond Road (60kph) and Waihoehoe Road (50kph to 70kph) are rural two-lane secondary collector roads. There are no public transport facilities and limited to no active transport facilities.
- Bremner Road (50 kph to 80kph) is a two-lane secondary collector. Segregated active transport facilities are provided between the Auranga Development up to the Bremner Road bridge. Footpaths are provided for between the bridge and the town centre. There are no public transport facilities. The section between Victoria Road and Firth Road is classified as an over-dimension and overweight freight route
- Norrie Road (50kph) is a two-lane secondary collector with a severe capacity (one-lane capacity) and width restriction at Norrie Bridge limiting east-west movement and access by large vehicles.
- Intersections are priority controlled with limited or no pedestrian and cyclist facilities apart from the intersection at Great South Road which is a roundabout, and at the Auranga Development which is signalised with crossing facilities.
- There are existing safety issues on the corridor.
- The existing traffic volumes on Jesmond Road, Bremner Road and adjacent roads are relatively uncongested. Waihoehoe Road West has a moderate amount of congestion and Great South Road is congested and operating near capacity.

The existing properties adjoining existing roads in the Project area have either direct access onto the roads or side roads.

Likely Future Environment

The planned growth in the Project area, and the transition from a rural to an urban land use environment, will put significant strain on the existing transport infrastructure. A number of planned future transport projects are identified in the Drury-Ōpāheke Structure Plan (subject to planning and funding approvals) and NZUP and will form part of the future transport network that will enable the planned growth to be realised. These are:

- New rail stations at Drury Central and Drury West *
- New Mill Road*
- SH 1 Papakura-to-Bombay Upgrade **
- SH 22 Drury-to-Paerata**
- Additional rail capacity between Pukekohe and Papakura**
- Regional north-south cycle route between Drury and Pukekohe***
- New rail station at Paerata ***
- New Pukekohe Expressway***
- The other components of the Drury Arterial Network (proposed within this report) noting that there may be interim transport infrastructure provided by developers within the Drury Arterial Network (for example a two-lane local road built by developers which is later upgraded to a four-lane arterial) ***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas are urbanised.

Historic Heritage and Archaeological Values

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

The following text provides a summary of the existing and likely future environment as it relates to historic heritage and archaeological values. A more detailed description of the environment identified through research and site surveys is provided within the Assessment of Historic Heritage Effects within Volume 4 of this Document set.

Existing Environment

There are three AUPOIP listed Historic Heritage Extent of Place's (HHEP's) in the Project area which have generally been avoided through the alternative's assessment process. These sites are (see Figure 14-4 and Figure 14-5):

- HHEP 704 and HNZPT listed (site 692), Aroha Cottage / Paymasters House. The site extent has generally been avoided through the alternatives assessment and design phase of the Project. However, the driveway of this scheduled site is proposed to be designated, to enable driveway regrading if required. There is no likelihood of subsurface extents relating to the pre-1900 use of the house as the site has been relocated.
- R12/756, HHEP 2173, Commissariat Redoubt and Ōtūwairoa Stream wharf: The scheduled heritage extent of place of this site is outside of the proposed designation boundary. However the true extent of the redoubt extends south of the HHEP extent, passing under the bridge and into the Drury Sports Complex. The southern extent of the Drury Sports Complex area is within the proposed designation footprint; and
- R12/1129, HHEP 707, Saint John's Anglican Church: This site and the scheduled historic extent of place is outside the proposed designation boundary.

In addition to the AUPOIP HHEP's the following historic sites are present within the Project area (see Figure 14-5):

- Runciman's Homestead, R12/1131
- Waka Tauranga, Portion of R12/1131
- Former Drury Creamery and Casein factory, CHI site 15102
- Unnamed bridge, R12/1152
- Drury Post Office, Store, Bakehouse, Residence buildings, R12/1143
- Unnamed historic buildings, R12/1149
- Railway hotel, R12/1146
- Drury Commercial Buildings, CHI item 15109
- Drury tramway/mineral railway, R12/1222
- Railway workers residences, CHI site 22288

The following historic sites are located outside the proposed designation boundary however there is reasonable cause to suspect subsurface deposits may extend into the Project footprint (see Figure 14-5):

- Drury Railway Station, R12/1139.
- Villa, outbuilding, and cottage (CHI site 22280, SRS site R12/1142)



Figure 14-4: Aroha Cottage HHEP (AUPOIP) showing NoR D2 designation boundary

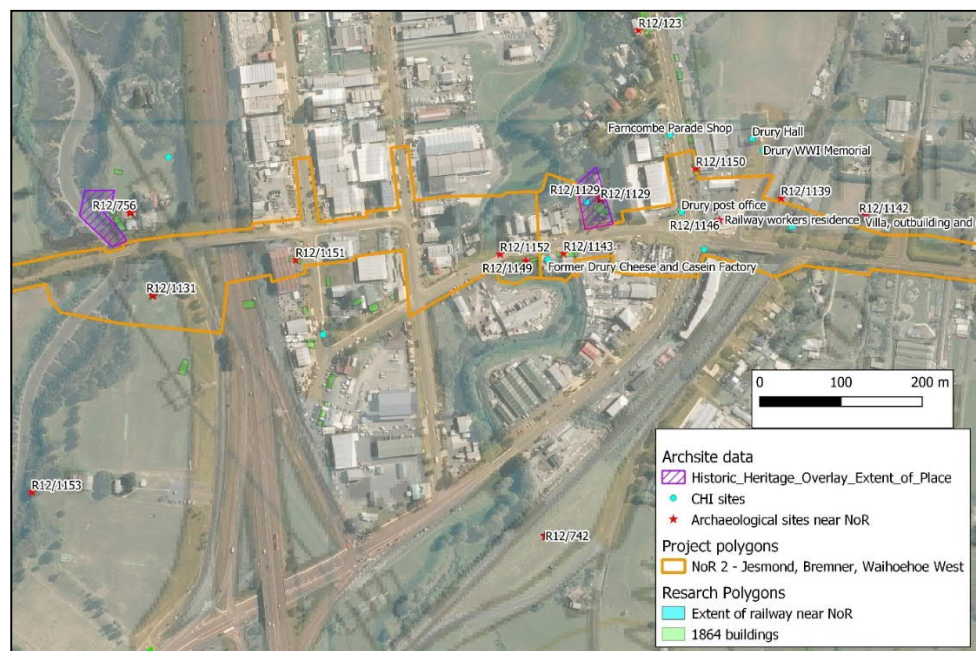


Figure 14-5: Map showing all recorded SRS, CHI, and HHEP sites within or near Bremner Road and Waihoehoe Road sections of NoR D2

There is reasonable cause to suspect previously unrecorded historic heritage sites may be present within the Project area. This is primarily based on the density of pre1900 European sites recorded for the Drury township, the poor existing record of sites within the township, as well as the presence of the many tributaries of the Drury Creek which is a known precontact Māori transport channel. Land near waterways are commonly areas of high risk for previously unrecorded historic heritage deposits. However, areas adjacent to the existing road corridor are likely to be modified from previous construction of existing roads and development. All unrecorded archaeological sites are protected under provisions of the HNZPT Act.

	Likely Future Environment The existing environment as it relates to scheduled historic heritage and archaeological values is likely to remain the same in the future. AUPOIP objectives and policies seek to protect significant historic heritage places from inappropriate subdivision, use and development and encourage and enable their protection, management and conservation, including retention. Therefore it is likely that Aroha Cottage, Commissariat Redoubt and Ōtūwairoa Stream wharf and Saint John's Anglican Church will remain as part of the existing environment. Where sites are not protected through the AUPOIP, or other legislation it is possible that overtime, as the existing area develops, sites could be adversely impacted or destroyed through development of the area prior to construction of the transport corridor. Therefore, in this case the existing environment as it relates to historic heritage and archaeological values may change in the future. In addition, there is a possibility that unknown sites could be uncovered during development of the area prior to construction of the transport corridor which would add to the historical understanding of the area. Where the existing area is a highly modified urban environment (e.g. existing Drury Town Centre) it is less likely to see intensive development prior to the construction of the corridor therefore the historic environment is more likely to remain the same.
Cultural Values	There is one site of significance to Manawhenua (Plan Change 22) identified at 27 Bremner Road approximately 340 metres north of the proposed designation. The cultural values identified by Manawhenua within the Project area highlights the importance of maintenance and enhancement of water quality and ecological values, particularly areas of high indigenous values including SEAs. The proximity of the Project to the Ngakoroa Stream, Hingaia Stream and their tributaries means the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage with the potential to uncover undiscovered archaeological sites. Within the Project area, the Ngakoroa and Hingaia Streams and their tributaries are Ngāti Tamaoho statutory acknowledgement areas (Ngāti Tamaoho Deed of Settlement 30 April 2017).
Community and Recreational Facilities	Existing Environment There are no existing schools immediately adjacent to the Project area, however there is a site designated by the Ministry of Education (designation 5062) off Burberry Road for Drury West Primary School. The site is located within Auranga 1 Precinct, south of the Jesmond to Bremner Link and earthworks are underway at the site. Schools and preschools in the wider area include Farmhouse Preschool, Karaka School, Drury School and Drury Christian School. Within the Auranga Development there are also plans for a retirement village and day-care centre. To the north within Drury Village lies Drury Hall, Drury Community Library and The Drury Lane Shops (local centre) which includes, food outlets, services such as hair, medical and beauty and an ATM. St John's Anglican Church and cemetery - Hoani Tapu, which is also used for the Drury Scout Group is located on Norrie Road. Recreational facilities within the Project area include the Drury Sports Complex and Drury Domain. The Drury Sports Complex is located east of Ngakoroa Stream and is used for football and other active sports (see Figure 14-6). It also has an indoor venue on site and is also used for passive recreation. The entrance to the sports complex is off Victoria Street

which can be accessed from Bremner Road in the north and SH22 at the south. The northern end of the complex does not currently have any sports fields. Drury Domain, located north of Waihoehoe Road off Tui Street hosts the Drury and Districts Rugby Football and Recreation Club Inc.



Figure 14-6: Drury Sports Complex Source: Drury United Football Club

Likely Future Environment

Existing open space areas and recreational activities will remain. Schools in the area are expected to remain, but are likely to grow as the population in the area increases (including the development of Drury West Primary School (41 Burberry Road). It is possible additional community facilities will be provided as development occurs and the population in the surrounding area grows.

The Drury-Ōpāheke Structure Plan identifies a potential new suburb park to the west of the corridor.

Ambient Noise	The ambient noise environment is reflective of a rural environment where low noise levels are experienced with limited road traffic noise. Noise monitoring was carried out at 235 Jesmond Road and 116 Waihoehoe Road (as the sites were considered to be representative of the existing noise environment of the Project Areas) over seven days with noise levels recorded ranging between 46 - 49 dB LAeq(24hr). This ambient noise level is likely to change as the surrounding environment urbanises.
Utilities	Existing Environment Major utilities in the Project area include: • Overhead Counties Power MV and HV cables • Vector Gas Medium Pressure distribution lines • Chorus lines • Overhead Transpower pylons (110kV and 220kV) cross Bremner Road at the Ngakoroa Stream and west of SH1. • First Gas Transmission line • Watercare assets including the 1200mm Watercare Waikato 1 Watermain which runs under Great South Road and Waihoehoe Road, traversing across the western approach and parallel to the NIMT Likely Future Environment As the areas surrounding the Project urbanises in the future it can be expected that existing utilities will remain, and it is likely additional utilities will be added. Existing overhead powerlines may be undergrounded as part of new development.
Property Details	• 111 properties directly affected, including: • Council owned land: six properties totalling approximately 7,161m² • Crown owned land: one properties totalling approximately 6,189m² • Privately owned land: 102 properties totalling approximately 158,787m² • Railway: two properties totalling approximately 2,415m² • Hydro: two properties totalling approximately 7,556m²

14.3 Natural and Physical Environment

Table 14-4: NoR D2 Summary of Existing and likely Future Natural and Physical Environment

Geology	Existing Environment The area surrounding the Project is mapped as being entirely underlain by Puketoka Formation. To the north of the Project the Hingaia Stream has some associated recent stream alluvium indicated by the geological map although this is only a minor area which does not appear to extend within the Project area. South of Jesmond Road lie deposits assigned to the South Auckland Volcanic Field and to the east of the Project area are basalt lava flows of the South Auckland Volcanic Field overlain by weathered basalts and ash, although no widespread volcanic materials are mapped or anticipated within the Project area. The Project is located approximately parallel to, and 600m south of, the Glenbrook Fault which is downthrown to the south by approximately 200m. The area sits within the associated Glenbrook Depression, with greywacke bedrock described as being at an extremely low elevation. Likely Future Environment The geological conditions are not anticipated to significantly vary in the future.
Hydrology and Natural Hazards	Existing Environment Key watercourses in the Project area include the Hingaia Stream and the Ngakoroa Stream and its tributaries. Several overland flow paths are present in the Project area which, to the east of the NIMT, cross existing roads by means of culverts and discharge towards the Pahurehure Inlet or drain in the greenfields area towards the Ngakoroa Stream. Two bridge structures allow flood conveyance for the Ngakoroa and Hingaia Streams that discharge towards the Pahurehure Inlet. To the west of the NIMT the Project area lies on a catchment ridgeline with several overland flow paths draining either north or south, away from the existing road. As shown in Figure 14-7 there are a number of existing flood plains, flood prone areas, overland flow paths and streams surrounding the corridor, and significant flood plains are evident at Ngakoroa Stream, Hingaia Stream and to the northeast of the Project area. The existing 100year ARI flood maps from the latest Auckland Ngakoroa catchment model with MPD and existing terrain show flooding within the greenfield area and overtopping of the existing Norrie Road bridge that extends into Firth Street and surrounding properties. Flooding is also shown at existing culvert crossings on Jesmond Road and at properties at 64, 119, 123, 125 and 131 Jesmond Road.

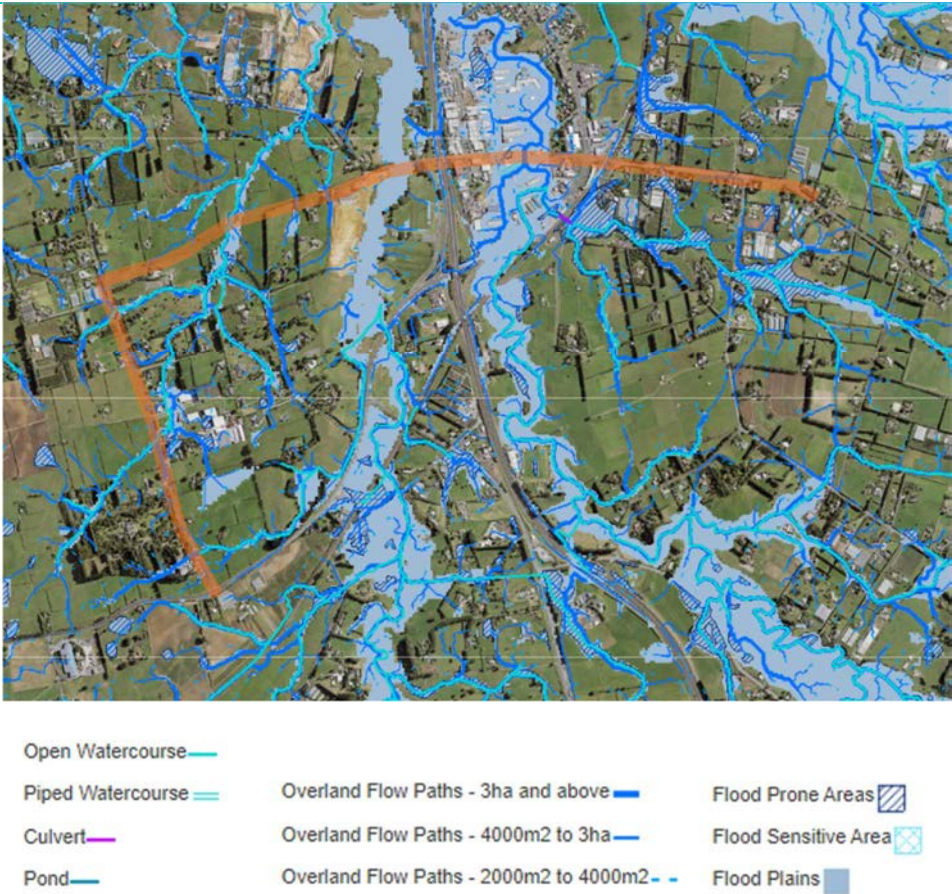


Figure 14-7: Hydrology and Natural Hazards surrounding the Project (Source: Auckland Council GeoMaps, 2020)

Likely Future Environment

Although urban development is anticipated the hydrological environment and natural hazard conditions are not expected to significantly vary. In particular, the permanent and intermittent streams are identified in the Drury-Ōpāheke Structure Plan with a 20 metre riparian margin. Floodplains are also identified in the structure plan.

Terrestrial Ecology

The following text provides a summary of the existing and likely future environment as it relates to ecological features and values. A more detailed description of the environment is provided within the Assessment of Ecological Effects within Volume 4 of this Document set.

Existing Environment

The existing environment surrounding the Project area includes a number of habitats (including terrestrial, freshwater and wetland) and species.

Habitats

The existing terrestrial habitats are highly modified, with the original forest cleared, dominated by agricultural land and exotic ecosystems such as exotic grassland, and exotic amenity planting with small areas of exotic wetland, exotic scrub, exotic treeland and exotic forest. However, small areas of native or mixed exotic vegetation occur with areas of planted native vegetation within exotic wetland areas.

Where natural habitat remains, SEA's are identified through the AUPOIP. The following SEA's are located within the proposed designation boundary (see Figure 14-8):

- SEA_T_530b (within boundary): coastal and riparian wetland vegetation. Habitat for threatened bird species and the rare plant species kaikōmako
- SEA_M1-29b (within boundary): a wetland system which grades from freshwater vegetation, through rush-dominated saltmarshes to mangrove habitat forming an important migration pathway for many native freshwater fish species.



Figure 14-8: SEA's within the NoR D2 Project area

The freshwater habitat within the Project area includes seven stream branches. All streams were representative of degraded systems primarily due to historical indigenous vegetation clearance which has then been compounded by agricultural practices. This degradation of riparian vegetation and increased nutrient inputs has also led to loss of bank stability, reduced shading and the proliferation of exotic macrophytes within the streams. Additionally, many streams have been physically altered, through dredging, reclamation and/or drainage of associated wetlands and/or channelization.

Several wetlands were identified within the Project area. A number of these wetlands are classified as highly modified, exotic wetlands. However, the wetland complex associated with the Ngakoroa Stream retains extensive areas of intact native species dominated wetland. The exotic wetlands are highly modified through factors such as vegetation removal, farm ponds and grazing of livestock. The wetlands are generally dominated by exotic species including (but not limited to) willow weed, mercer grass and soft rush. Little native species are present including slender spike rush and swamp millet.

At the mouth of the Ngakoroa Stream estuarine wetland is present, classified as Sea rush and oioi upper estuarine zone. This wetland is largely intact and dominated by native vegetation types. Native species include oioi, swamp millet and saltmarsh ribbonwood. Outside of the hightide zone the left bank has recently been planted with native species and the right bank is dominated by exotic amenity planting associated with the Drury Sports Complex.

Species

Automatic bat monitor (ABM) surveys were undertaken within the wider Drury Package area including within the Project area. The ABM survey results suggested that bats are not frequent visitors to the area during their mating and breeding seasons. However,

	despite bats not being detected within the area to date, the Project area does provide potential habitat features which would be suitable for use by foraging and commuting indigenous long-tailed bats. The desktop study identified a number of At Risk and Threatened species of coastal wetland or freshwater wetland bird species, and two species of Threatened forest bird within the wider landscape associated with the Project. However, many of these species are highly mobile, utilising large areas and are not likely to be directly affected by the Project. Banded rail, fernbird and spotless crane (all At Risk- Declining) are the only species likely to occur within or directly adjacent to the Project Area where the Project crosses the Ngakoroa Stream wetlands. Wetland values have been degraded near the existing bridge, reducing the of nesting coastal wetland birds within the Project footprint, however some high value suitable habitat remains directly adjacent to the Project Area. Habitat availability for the Not Threatened copper skink was confirmed during site investigations, however no other suitable habitat for native lizards was found or considered likely within the Project area. No indigenous lizards were identified as incidental observations. However, the introduced plague skink was identified. During the site investigations, no indigenous frogs were identified as incidental observations and it is highly unlikely that native frog species would occur within the Project area due to lack of suitable habitat. No dedicated fish surveys were undertaken as this will be subject to a future resource consent phase. Likely Future Environment It is assumed that in a future urbanised scenario, permanent streams and areas of indigenous vegetation will largely be retained. Greater emphasis on the protection and enhancement of existing watercourses and areas of significant natural value, such as that surrounding the Ngakoroa Stream, is given in the AUPOIP, requiring these areas to be accommodated within the future urban environment. It is also assumed that stormwater design will be integrated into the proposed 'Blue Green Network' and sediment and pollutants will be controlled at source. For example, if riparian habitat restoration is implemented appropriately, it is considered that in a future scenario many of the features of ecological value could be similar or in some cases enhanced.
Vegetation (Trees)	The following text provides a summary of the existing and likely future environment as it relates to trees. A more detailed description of the environment is provided within the Assessment of Arboricultural Effects within Volume 4 of this Document set. Existing Environment Trees within the Jesmond Road FTN Upgrade Project section that are protected under District Plan provisions are limited to approximately 30 trees in one row (as identified in within the Assessment of Arboricultural Effects) adjacent to Aroha Cottage, 201 Jesmond Road, because they are within the scheduled historic extent of place. Trees within the Bremner Road FTN Upgrade Project section that are protected under District Plan provisions include 44 identified trees and one group of trees (as identified in within the Assessment of Arboricultural Effects). There are three trees within the Waihoehoe Road West FTN Upgrade Project section that are protected under District Plan provisions (as identified in within the Assessment of Arboricultural Effects). Likely Future Environment The existing trees in the Project area provide a range of range of cultural, amenity, landscape and ecological values to the area.

Topography and Landscape Context

For trees surrounding the Bremner Road FTN Upgrade section, these values will generally remain constant in the future. The future environment for trees within this area is likely to change little in general, due to the open space and industrial zoning of the land and the protection that applies to trees within these environments. Natural attrition is likely to be high within these environments due to the built environment and associated activities that may affect trees.

Values of trees surrounding the Jesmond Road and Waihoehoe Road West FTN Upgrades will generally increase in the future over the next ten years. However, the future environment for trees in these areas is likely to be very different as the land use pattern and zoning changes from rural and FUZ to urban. This change is likely to result in removal of trees that are not protected by the current plan framework, with the exception of trees within the Historic Heritage Extent of Place overlay relating to Aroha Cottage. Removal of trees can therefore be expected to occur as the land use changes from a rural environment to an urban environment in the future. The planting of new trees would also occur as part of an urban landscape.

The following text provides a summary of the existing and likely future environment as it relates to landscape features and values. A more detailed description of the environment is provided within the Assessment of Landscape and Visual Effects within Volume 4 of this Document set.

Existing Environment

There are no regionally or nationally significant landscapes (ONLs, ONFs or ONCs) within or proximate to the Project area. The Project is situated within a broader landscape that has been identified by the AUPOIP as being suitable for urbanisation.

The Jesmond Road FTN Upgrade Project area is situated within the existing corridor and extends into adjacent land that is characterised by flat to gently rolling lifestyle living. The low rolling topography and Ngakoroa Stream tributaries contribute to the landscape values of the local setting surrounding the Jesmond Road FTN Upgrade Project area. There are mature exotic trees at the Makomako Plant Centre and a row of young oak trees at the north-western extent of the proposed designation which also contribute to the localised landscape character.

The Bremner Road FTN Upgrade Project area passes through a range of existing landscapes. The Project section area traverses gently undulating topography that is slightly elevated to the west, reducing to the east towards the Ngakoroa Stream environment. The Ngakoroa Stream coastal environment, riparian environments of the tributaries of the Ngakoroa Stream and the SEAs contribute to the landscape values of the area. The historical and cultural sites of interest and associative values combine with the ecological features to create a localised landscape of relatively high value. The Drury Sports Complex located southeast of the Ngakoroa Stream Bridge provides recreational values associated with the margins of the Ngakoroa Stream.

The Waihoehoe Road West FTN Upgrade Project area is situated within the existing road corridor and extends into adjacent land that is characterised by the edge of the Drury industrial area, Great South Road intersection, NIMT and gently rolling landform. The landscape is characterised as rural lifestyle with low natural character values. The low rolling topography of the existing road corridor together with legible views towards the Hunua Ranges and heritage sites associated with the rail corridor contribute to the local sense of place and local values of the Waihoehoe Road West FTN Upgrade environment.

Likely Future Environment

The existing rural land adjacent to the Project area will witness a significant change from rural to urban land use and character over the next 30 years as the growth of the

Auranga Development continues and as developers seek the rezoning of FUZ land in Drury East and West to allow for urban development.

It is anticipated that some of the more extensive abiotic features of the landscape will endure if not define the pattern of future development; these include the Ngakoroa Stream, tributaries and associated floodplain environment.

It is anticipated that land cover features within the Project area will undergo significant change alongside future development through the removal of existing trees, implementation of street tree plantings, public open space design and landscaping within the private yards of future housing developments.

The existing open space, coastal and esplanade environments associated with the Drury Sports Complex and the Ngakoroa and Hingaia Streams may experience landscape enhancement as a result of localised urban development adjacent to these areas in accordance with the policy direction of the AUPOIP which generally seeks to protect and enhance these landscape features.

15 Jesmond to Waihoehoe Road FTN Upgrade: Consideration of Alternatives

A detailed assessment of alternatives was undertaken for the Project to identify the proposed route (this process is described in Section 4.2 and further outlined in the Alternatives Assessment Report attached at Appendix A). The following sections provide an overview of the alternatives assessment process through the corridor assessment (IBC Phase) to the route refinement assessment (DBC and NoR Phase). This summary should be read in conjunction with the full assessment, including the process undertaken and outcomes reached, provided in the Alternatives Assessment Report attached at Appendix A.

15.1 Jesmond Road FTN Upgrade Section

15.1.1 Corridor Alternatives Assessment

TFUG recommended upgrading Oira Road rather than Jesmond Road, due to the location of Oira Road connecting two “indicative” centres which were proposed at the time. Since the TFUG recommended network (in the Programme Business Case prepared in 2016), the Auckland Council draft Ōpāheke-Drury Structure Plan was developed, and the proposed land use changed. At the time of the corridor assessment, Jesmond Road was better aligned with the proposed centre and Drury West train station, therefore Jesmond Road was recommended to be upgraded instead of Oira Road.

A number of new and upgraded arterials in Drury West were investigated at the corridor assessment phase. The figures below show the options investigated at the short and long list stages.



Figure 15-1: IBC Drury West Long List Options

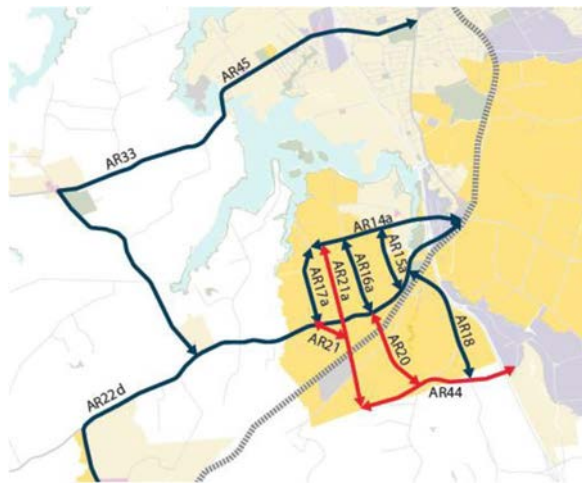


Figure 15-2: IBC Drury West Short List Options

The upgrade of Jesmond Road was identified in the corridor assessment as having good people and public transport movement, with its central location providing a good catchment to proposed residential and employment area. Upgrading Jesmond Road would improve accessibility and act as a good north south link, which could connect to Bremner Road to form a key public transport and active mode spine through Drury West. Positive land use integration and alignment opportunities for serving the FUZ were also identified.

15.1.2 Route Refinement Alternatives Assessment

15.1.2.1 Option Development

Route refinement for the Jesmond Road FTN Upgrade included specialist assessment of three options from the intersection with SH 22 to the intersection with the proposed Bremner Road:

- Option A – widening to the west of the existing road
- Option B – widening to the east of the existing road
- Option C – widening to both sides of the existing road.

The three options for the Jesmond Road FTN Upgrade are shown in Figure 15-3.

15.1.2.2 Assessment

The three options were assessed qualitatively against the MCA framework by each subject matter expert. Constraints identified are shown in Figure 15-3. In determining the preferred option, the Project Team considered the MCA assessment and the engagement undertaken with project partners and landowners.

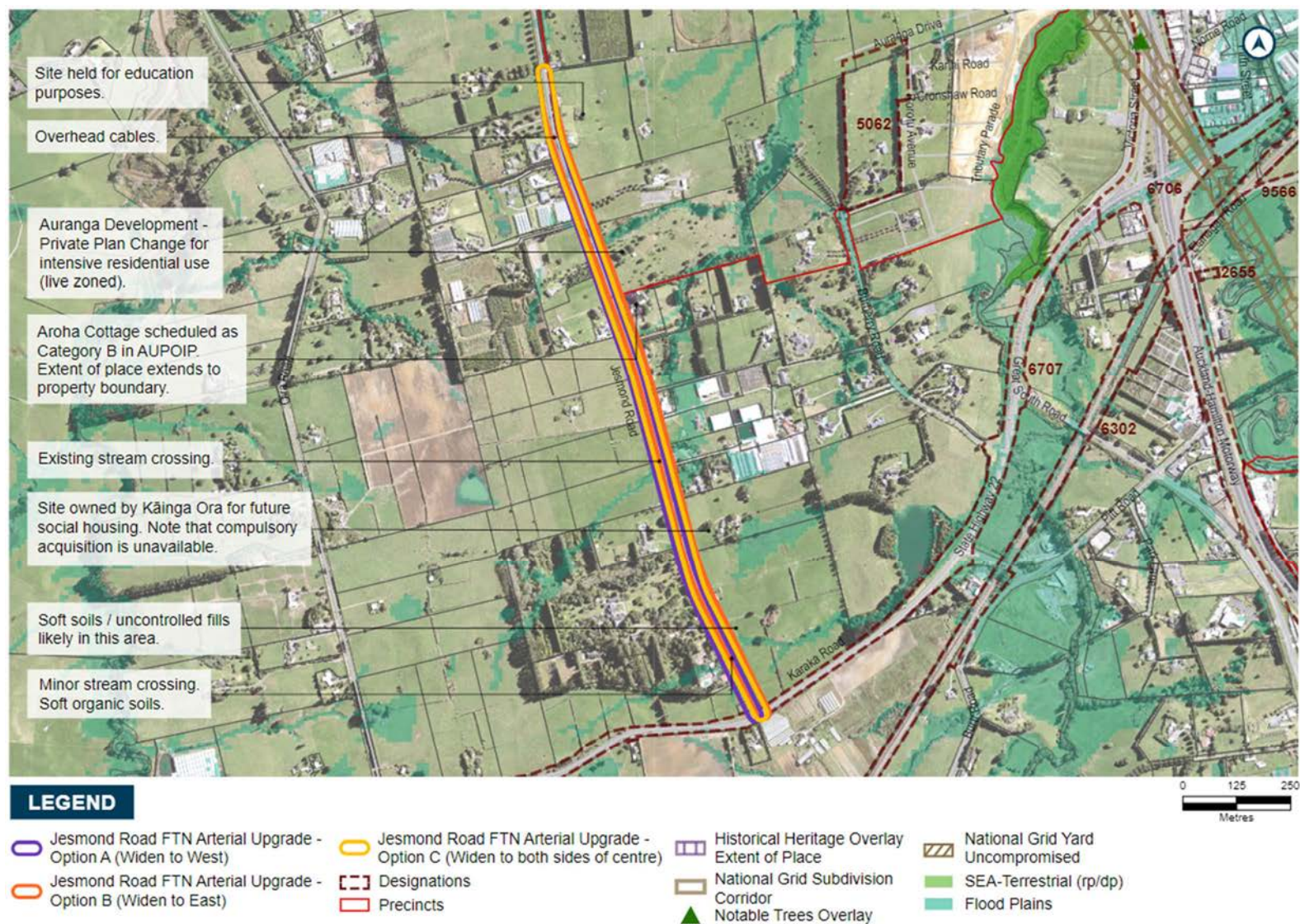


Figure 15-3: Jesmond Road FTN Upgrade Options for route refinement showing constraints and considerations

15.1.2.3 Preferred Option

The preferred option (Option A) is to generally widen to the west of the existing road corridor. The preferred option was chosen because it will:

- Reduce impacts on Ministry of Education and Kāinga Ora land and maintain the area of land available at these sites for community facilities (school and social housing).
- Reduce impacts on Te Aroha Cottage, a scheduled heritage site.
- Reduce overall property impacts as there are less properties requiring full acquisition and less impact on access.
- Reduces impacts on live zoned properties which are likely to be developed in the near future (i.e. does not decrease the footprint for development). This land would also likely be more expensive, so this option also minimises potential land requirement costs.

All route refinement options provided the same level of achievement against the transport outcomes. During design refinement, specific consideration was given to the direction of widening at the southern extent of Jesmond Road, at the intersection with SH22. The alignment was shifted to the east at this location to reduce property impacts. Consideration was also given to a natural wetland on the corner of Jesmond Road and SH22.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which give greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the proposed designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

15.1.2.4 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 15-1: Discounted Options - Jesmond Road FTN Upgrade

Option	Reason for Discounting
Option B	• greater impact on Scheduled Historic Heritage extent of place – Te Aroha Cottage • greater land requirement within Ministry of Education and Kāinga Ora land • greater impact on live-zoned properties and more full acquisition •
Option C	• greater impact on Historic Heritage extent of place – Te Aroha Cottage • greater land requirements within Ministry of Education and Kāinga Ora land • greater impact on live-zoned properties • Temporary traffic management during construction more complex

15.1.2.5 Intersection Form

Two intersections along the preferred corridor, will need to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future:

- **Jesmond Road / Jesmond to Bremner Link road:** Signalised intersection preferred because:
 - PC6 agreement constrains footprint.
 - FUZ land-use (mixed-use and schools) increases active mode modal priority
 - High-quality bus priority and expected future school trips
- **Jesmond Road / SH22:** Signalised intersection preferred as outlined in section 8.2.2.3.

15.1.2.6 Summary

The preferred option for the Jesmond Road FTN Upgrade was Option A, generally widening to the west of the existing road corridor, with the exception of the southern end where the alignment shifts east, to minimise impacts where possible.

Through the intersection form assessment, it was recommended that signalised intersections be included at the Jesmond Road intersections with the new Bremner Road (Jesmond to Bremner Link) and SH22.

15.2 Bremner Road FTN Upgrade Section

15.2.1 Corridor Alternatives Assessment

TFUG recommended a new alignment for Bremner Road in the Programme Business Case preferred transport network plan prepared in 2016. The TFUG recommendation was similar to the recommended alignment for Bremner Road that was developed in the corridor assessment.

A number of existing and new roads were investigated in the corridor assessment to support the Ōpāheke-Drury future urban zone as shown in Figure 15-4 and Figure 15-5. Upgrades to the existing Bremner Road west were assessed, as well as a new alignment through the Plan Change 6 area. An east west connection over SH1 via Quarry Road was also investigated as an upgraded motorway crossing and a new arterial with a new SH1 crossing further south in Drury. Utilising existing infrastructure was an important consideration for this alignment, especially for crossing SH1.

An upgrade to the existing Bremner Road bridge crossing of SH1 to tie into the Auranga Development was recommended in the IBC, as well as an upgrade to Bremner Road east to remove the Firth Street/ Norrie Road 'dog-leg' to connect directly to Great South Road and the proposed Drury Central rail station and centre off Waihoehoe Road.



Figure 15-4: IBC Drury West Long List Options

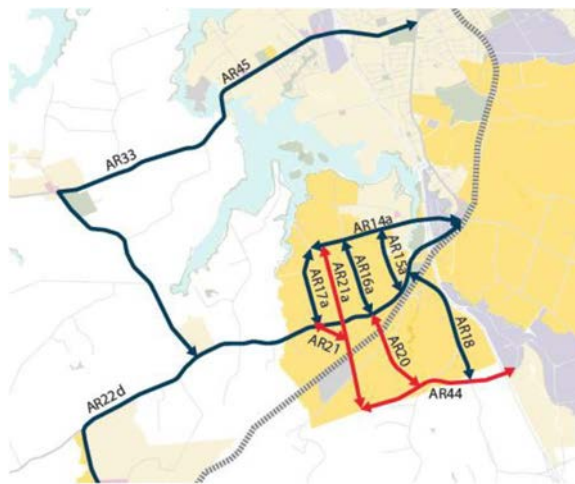


Figure 15-5: IBC Drury West Short List Options

The corridor recommended through the corridor assessment involved a new 330m long viaduct (crossing Firth Street and Norrie Road to near Great South Road) to connect to Waihoehoe Road and cross the rail line. The viaduct over the Hingaia Stream was proposed to address flooding of the existing Drury village and provide resilience for the ARI 100 flood event.

15.2.2 Route Refinement Alternatives Assessment

During the route refinement assessment, the Bremner Road FTN Upgrade Project section was split into three sections for options assessment purposes. The sections are shown in Figure 15-6 and include:

- Bremner Road FTN Upgrade – West section (Jesmond Road to Bremner link): This section crosses through the Drury 1 Precinct and Auranga Plan Change 6 area and the alignment has been agreed through mediation in the Private Plan Change 6 proceedings, of which AT were party to. Because all affected landowners were involved in this process, no options assessment required.
- Bremner Road FTN Upgrade - Central section: This section crosses the Ngakoroa Stream and State Highway 1. Three options were developed to investigate which side of the road to widen (north, south or both sides).
- Bremner Road FTN Upgrade – East section: This section is located from the SH1 crossing to a tie in with Great South Road. This section also includes the potential upgrade of and tie ins with Creek Street, Firth Street and Norrie Road.

Options were developed to focus on opportunities to address connectivity, reduce bridge structures and land requirement, and increase resilience. The options also aim to minimise impacts on the Saint Paul's Anglican Church located on Norrie Road. Additional options were also developed by the Project Team as the options assessment process progressed (as discussed further below). These options were developed to mitigate specific effects that became apparent during the specialist assessment. These effects related to flooding and stormwater, transport outcomes (especially connectivity with the local network) and property impacts.

Once a preferred layout was chosen, three options were developed to investigate which side of the existing roads to widen (north, south or both sides).



Figure 15-6: Bremner Road FTN Upgrade Assessment Sections

15.2.2.1 Bremner Road FTN Upgrade Central section

Option Development

Route refinement for the Bremner Road Central included specialist assessment of three options:

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road

The three options for Bremner Road Central are shown in Figure 15-7.

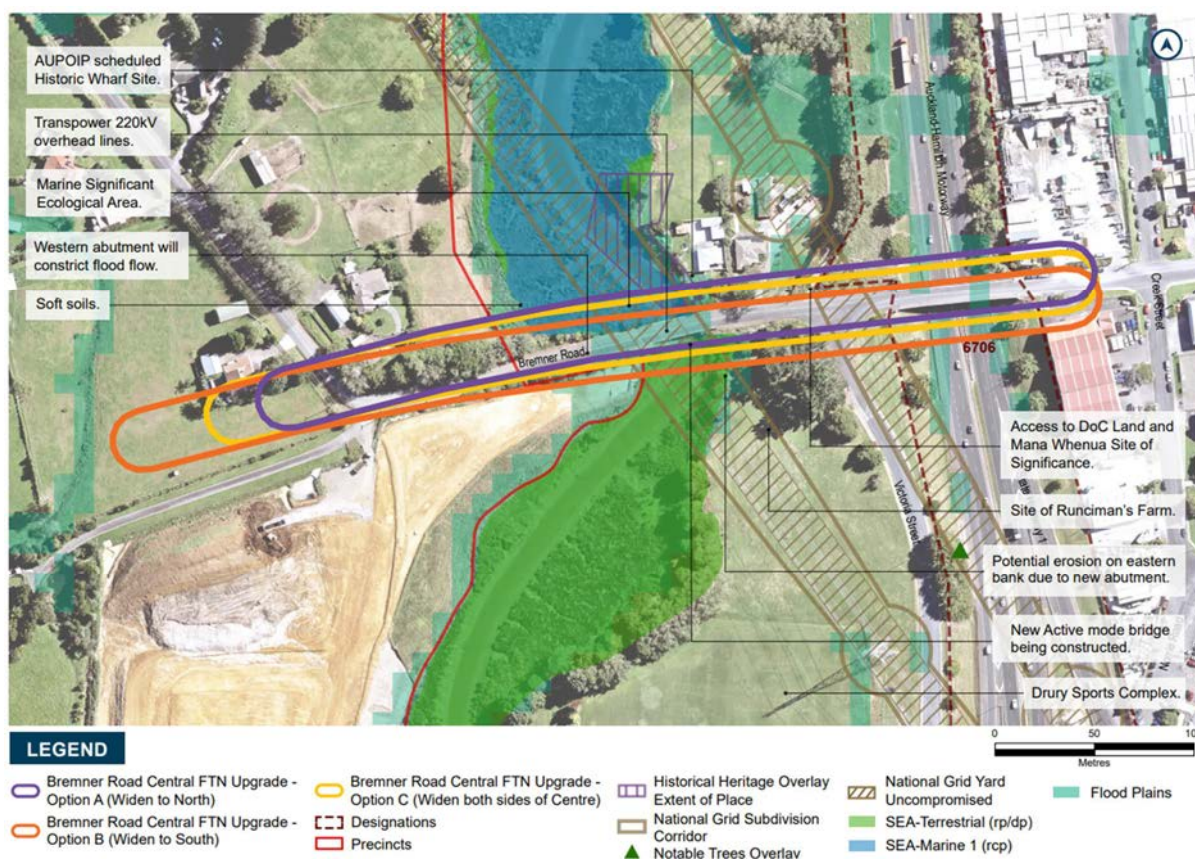


Figure 15-7: Bremner Road - Central section Options for route refinement showing constraints and considerations

Assessment

The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 15-7. In determining the preferred option, the Project Team considered the MCA assessment and the engagement undertaken with Project partners and landowners.

Preferred Option

The preferred option (Option B) is to widen generally to the south of the existing road corridor. The preferred option was chosen because this option:

- Reduces impacts in the coastal marine area in line with policy direction of the New Zealand Coastal Policy Statement and AUPOIP
- Has the least impact on the Marine 1 Significant Ecological Area – which was preferred by Manawhenua
- Avoids scheduled archaeological sites to the north of the existing road
- Has the least property impacts
- Enables more developable land in the FUZ areas adjacent to the Project Area
- Provides for a better interface with the Auranga Development.

All route refinement options provided the same level of achievement against the transport outcomes.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the Project has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 15-2: Discounted Options - Bremner Road FTN Upgrade Central

Option	Reason for Discounting
Option A	• Greater impact on the CMA and SEA M1 (vegetation and habitat) • This option would impact on the scheduled item of historic heritage at 51 Bremner Road • Greater property impact
Option C	• Greater impact on the CMA and SEA M1 (vegetation and habitat) • This option would impact on the scheduled item of historic heritage at 51 Bremner Road • Greater property impacts • Impacts on existing active transport bridge • Complexity of bridge construction staging and traffic management

Intersection Form

Along the preferred Bremner Road FTN Upgrade Central corridor, one intersection needs to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future. For the Bremner Road intersection with the new Jesmond to Bremner Link a signalised intersection was preferred because:

- There is an existing signalised intersection agreed in Drury 1 Precinct plan changes
- Proximity to floodplain and Ngakoroa Stream (SEA).

15.2.2.2 Bremner Road FTN Upgrade - East section

Following the corridor assessment, the gap analysis recommended investigating alternatives to the large bridge structure crossing the Hingaia Stream and floodplain. The first stage of route refinement looked at these alternatives, which also led to different configurations of the intersections and layout of the adjoining local roads (stage 1a). This assessment was undertaken through a scored MCA process to assist in differentiating between the options. Stage 1b involved additional analysis to expand on the MCA framework assessment undertaken in Stage 1a.

Once the general layout was recommended through Stage 1, further route refinement was undertaken to decide which side of the existing roads to widen (Stage 2). In Stage 2 options were assessed qualitatively against the MCA framework. The stages are summarised as follows:

- **Stage 1a:** Assessment of seven route refinement options
- **Stage 1b:** Further assessment of two route refinement options from Stage 1a
- **Stage 2:** From the preferred option from Stage 1b, three options were developed to assess which side of the existing roads to widen

Stage 1a

Initially, four options were developed for assessment (Options A – D). However, additional options were developed in response to feedback from internal specialist and team workshops. The seven options for the Bremner Road – East section are shown in the figures below and include:

- Option A – Upgrade of existing roads
- Option B – Short bridge, Firth Street at grade
- Option C – Short bridge, Firth Street rerouted
- Option D – Long bridge, Firth Street under
- Option B1 – Medium bridge, Firth Street at grade
- Option B2 – Medium bridge (90m), intersections at Firth and Creek Street
- Option D1 – Long bridge (200m), Firth Street under viaduct.

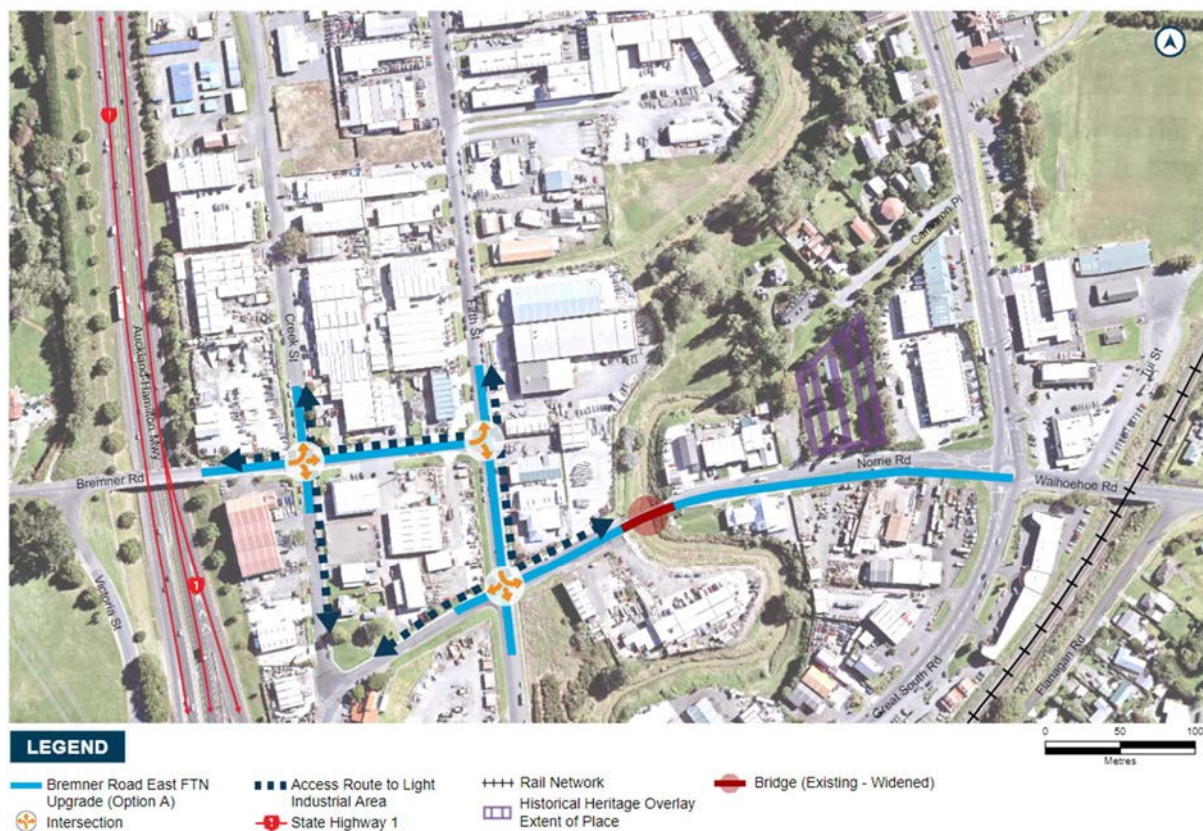


Figure 15-8: Option A - Upgrade of existing roads



Figure 15-9: Option B – Short bridge, Firth Street at grade



Figure 15-10: Option B1 – Medium bridge, Firth Street at grade



Figure 15-11: Option B2 – Medium bridge, intersections at Firth and Creek Street



Figure 15-12: Option C – short bridge, Firth Street rerouted

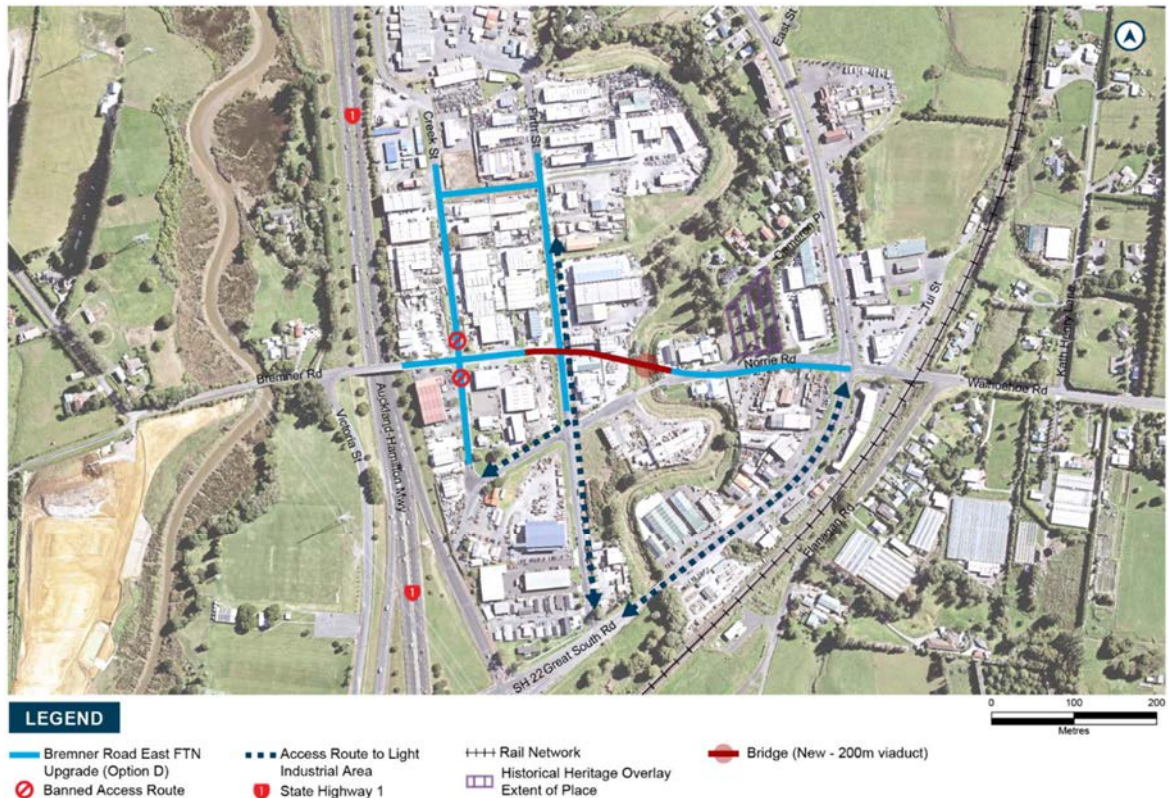


Figure 15-13: Option D – long bridge, Firth Street under

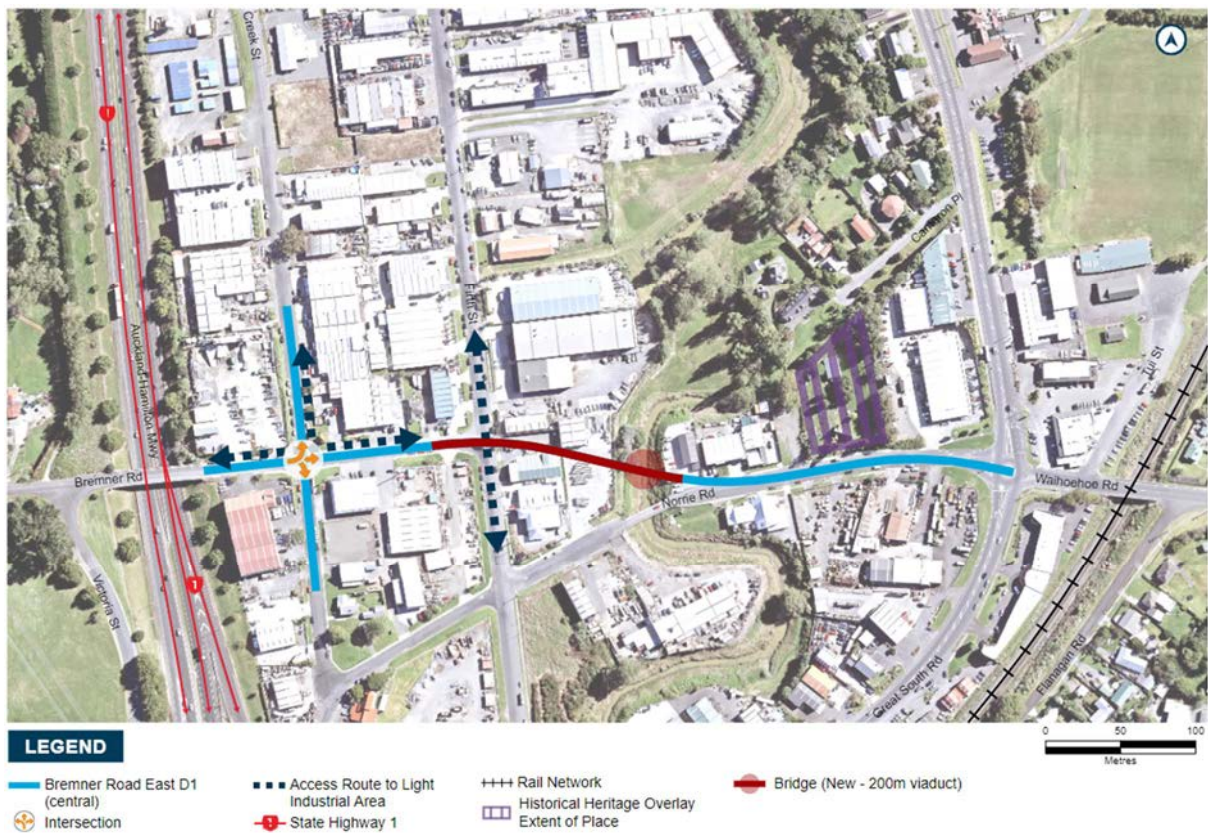


Figure 15-14: long bridge, Firth Street under

Following the assessment from subject matter experts and consideration of feedback received from Project partners, two options, Option B2 and Option D1, were identified to be taken forward for further assessment for the Bremner Road East FTN Upgrade.

All options provide opportunities for enhancement, particularly around the stream environment.

Option B2 was progressed for the following reasons:

- This option supports growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area
- This option does not require the additional connection between Creek Street and Firth Street
- An opportunity was identified to make changes to the Option B2 design which involves closing off Creek Street (south of Bremner Road) to form a T intersection (three-legged). The likely benefits of this opportunity includes:
- Minimises conflicts at the intersection of Bremner Road / Creek Street for vehicles, pedestrians and cyclists
- Reduces delays at the intersection of Bremner Road / Creek Street
- Reduces the footprint of the Bremner Road / Creek Street intersection
- Allows for a continuous active mode link between Bremner Bridge and Firth Street, south of Bremner Road which improves safety and attractiveness for active modes
- Potential to provide an emergency egress should flooding occur at Firth Street
- This option provides a direct connection between residential areas, centres and train stations, as well as integrating with the light industrial area.
- This option provides for a well-connected interface between the public and private realm, and opportunities for placemaking at the Firth Street and Bremner Road intersection.
- This option has neutral impacts on ecology as it will allow the natural regulation of the stream.

Option D1 was progressed for the following reasons:

- This option supports growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area
- This option provides for direct and reliable public transport
- This option provides a direct connection between residential, centres and train stations, as well as integrating with the light industrial area
- This option provides an opportunity for development under the viaduct
- This option has the least land take requirement
- This option has the least impact on stormwater and flooding effects as the new alignment will be raised above the flood plain
- This option has neutral impacts on ecology as it will allow the natural regulation of the stream.

The following table summarises the reasons for discounting the remaining options.

Table 15-3: Discounted Options - Bremner Road East Stage 1a

Option	Reason for Discounting
Option A	- Does not improve through traffic connectivity, and is likely to cause congestion - Would introduce difficulty for bus manoeuvrability and conflict points caused by the staggering of intersections - Has the least positive public transport attractiveness - Retaining the dog leg alignment would limit development potential - Similar land acquisition to Option D1, many small businesses affected - Results in compromised amenity for people using active modes that will share the corridor with industrial traffic - A section of this alignment would be flooded during certain flood events - Widening of the existing bridge may lead to loss of additional stream embankment.
Option B	- Greater land acquisition required - Equal largest impact on stormwater and flooding as the mitigation required for the blocked passage of flood flows will require land take of property south of Norrie Road and openings will be required in the bridge abutments - The proposed bridge piers and embankments of this option may inhibit water flow and fish movement - Ground improvements are likely required alongside significant earthworks to stabilise embankment construction
Option C	- Limited opportunity for an active or desirable interface between the public and private realm due to the differences in road/bridge level and limited opportunities for placemaking. - Greater land acquisition required - Equal largest impact on stormwater and flooding as the mitigation required for the blocked passage of flood flows will require land take of property south of Norrie Road - This option will require significant culverts, retaining walls and fill, as well as a large construction footprint. - The proposed bridge piers and embankments of this option may inhibit water flow and fish movement. - Ground improvements are likely required alongside significant earthworks to stabilise embankment construction.
Option D	- This option does not provide direct access to Creek Street or Firth Street from Bremner Road limiting access to the industrial area and requiring vehicles to detour via Great South Road and then to Firth Street. - Ground improvements would likely be required alongside significant earthworks to stabilise embankment construction. - Limited opportunity for an active or desirable interface between the public and private realm due to the differences in road/bridge level and limited opportunities for placemaking. - Greater land acquisition required - This option could cause a change in amenity for businesses that will be operating under or adjacent to the bridge/flyover. - This option would have a low visual impact from the bridge structure/flyover. However, the scale of the bridge is not out of place within the large industrial landholdings. - This option will require retained abutments and fill, as well as large land requirement and construction complexity.

Option	Reason for Discounting
	Ground improvements are likely required alongside significant earthworks to stabilise embankment construction.
Option B1	- Greater land acquisition required - A section of this alignment would be flooded. - Ground improvements would likely be required alongside significant earthworks to stabilise embankment construction.

Stage 1b

Building on the information through the options assessment, additional analysis was undertaken on Options B2 and D1 to assist in making a recommendation between the two preferred options. Further analysis included qualitative assessment on cost estimates, flooding effects, flood resilience, transport and engagement with Project partners.

Following the further assessment, Option B2 was identified as the preferred option for Jesmond Road. Option B2 was recommended because:

- It will provide a direct and accessible corridor. The two closely spaced intersections can be optimised to reduce conflicts and provide priority for public transport and active transport
- There is an opportunity for the Creek Street intersection to be a signalised T.
- It will have neutral (or potentially positive) flooding effects
- It provides an opportunity to raise the road level to increase resilience.
- The benefits of the additional resilience of Option D1 are small compared to the additional cost of \$17 million.
- Likely re-routing is available in a flood event if a temporary south access can be gained via Creek Street, depending on flood levels.

Option D1 was discounted for the following reasons:

- This option was the most expensive option due to the longer bridge structure
- Completely bridging the floodplain would not provide the additional benefits compared to B2 anticipated in the Stage 1a assessment
- The benefits of the additional resilience of this option were small compared to the cost.

Stage 2

Building on the recommendation of Option B2, three additional route refinement options were developed and assessed to investigate which side of the existing roads to widen for Bremner Road East as follows:

- Option A – widening to the north of the existing roads
- Option B – widening to the south of the existing roads
- Option C – widening to both sides of the existing roads.

The three options for Bremner Road East are shown in Figure 15-15 and were assessed qualitatively against the MCA framework. Considerations made and constraints identified are shown in Figure 15-15. In determining the preferred option, the Project Team considered the MCA assessment and the engagement undertaken with Project partners and landowners.

From the assessment, it was recommended that the existing Bremner Road (east) and Norrie Road be widened to the south (Option B) for the following reasons:

- This option reduces property impacts overall (including access and potential for redevelopment)
- This option avoids impact on the scheduled heritage item (St John's Anglican Church and Cemetery) noting that the former cheese factory at 12 Norrie Road (an Auckland Council CHI building) will be impacted because of this, with mitigation of effects on the cheese factory to be determined following a built heritage assessment
- This option avoids the removal of mature trees associated with St John's Anglican Church and its graveyard.

All route refinement options provided the same level of achievement against the transport outcomes.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which give greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the Project has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

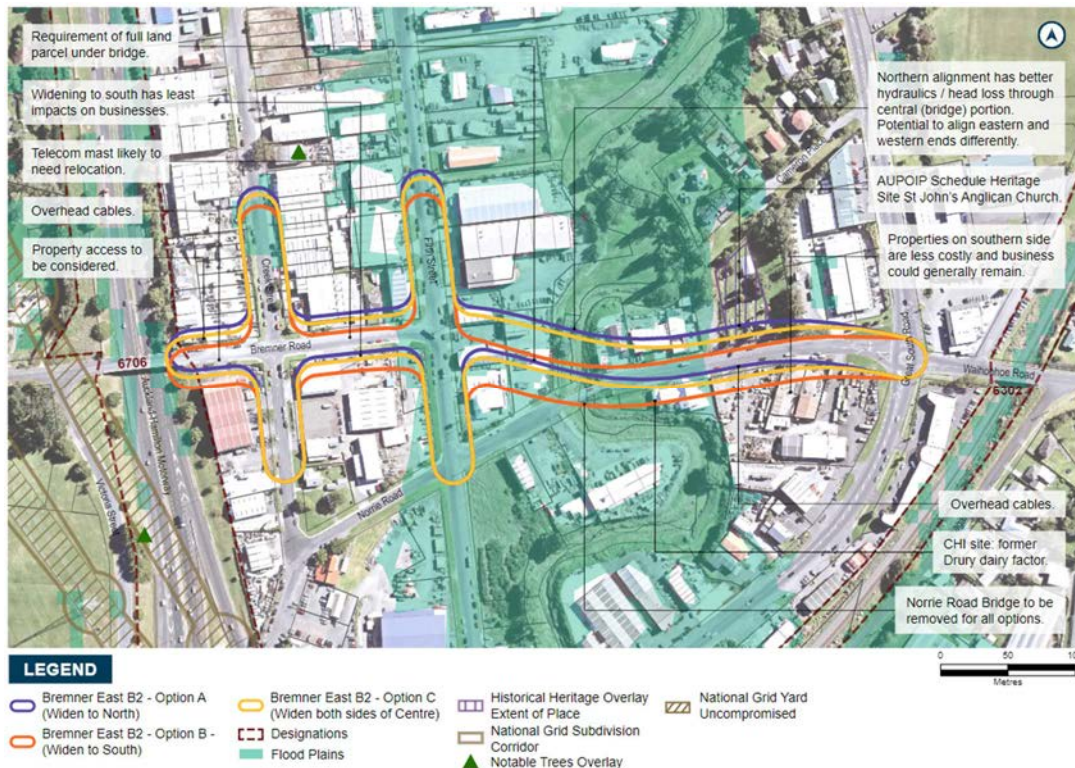


Figure 15-15: Bremner Road FTN Upgrade East Options for route refinement showing constraints and considerations

The following table summarises the reasons for discounting the remaining two options.

Table 15-4: Discounted Options - Bremner Road East Stage 2

Option	Reasons for discounting
Option A	- This option would impact on a scheduled heritage item and gathering place for the community, St John's Anglican Church and Cemetery, at 9 Norrie Road, with potential significant adverse effects on graves and the setting of the church, and potentially on the church itself and its users - It would impact mature trees within the grounds of St John's Anglican Church - This option has greater property impacts overall
Option C	- This option has potential impacts on St John's Anglican Church Cemetery, at 9 Norrie Road, as well as impacts on the unscheduled cheese factory at 12 Norrie Road - This option has greater property impacts overall - This option requires complex staging for the Bremner Road section and complicates the SH1 over bridge construction.

Intersection Form

- Along the preferred corridor, three intersections need to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future: **Bremner Road / Creek Street**: Signalised intersection preferred because:
 - Intersection density to Firth Street and Bremner Road and SH1 too close for roundabout control.
 - High-quality bus priority east-west
- Bremner Road / Firth Street**: Signalised intersection preferred because:
 - Intersection density to Firth Street and Creek Street & SH1 too close for roundabout control high-quality bus priority east-west.
 - Proximity to flood plain and bridges
- Great South Road / Bremner Road / Waihoehoe Road**: Intersection included within the Waihoehoe Road West Corridor (section 15.3.2.5).

15.2.3 Summary

The preferred option for the Bremner Road FTN Upgrade East was Option B2-B and the preferred option for Bremner Road FTN Upgrade Central is Option B, both involving widening to the south of the existing roads to reduce impacts where possible.

Through the intersection form assessment it was recommended that signalised intersections be implemented at the Bremner Road intersections with the Jesmond to Bremner Link, Creek Street, Firth Street and Great South Road.

15.3 Waihoehoe Road West FTN Upgrade Section

15.3.1 Corridor Alternatives Assessment

TFUG did not recommend upgrading Waihoehoe Road, but instead recommended upgrading Fitzgerald Road with a connection to Mill Road south.

A number of arterials were investigated in Drury West during the corridor assessment, and as part of that investigation, upgrading Waihoehoe Road was reconsidered. Ultimately, the Waihoehoe Road upgrades scored slightly higher through the MCA assessment than upgrading Fitzgerald Road. Upgrading Waihoehoe Road provides a greater people and public transport movement function than upgrading Fitzgerald Road, so Fitzgerald Road was discounted.

During the assessment, the Project team identified that upgrading Waihoehoe Road could have potential improvements to freight movements and provide a link between centres, the existing Drury township and proposed rail stations. Upgrading Waihoehoe Road was generally supported in public consultation. Upgrading Waihoehoe Road was considered to increase accessibility and connect strategically into Drury central, providing a good catchment to proposed employment and residential catchments. The figures below show the long list and short list options considered.

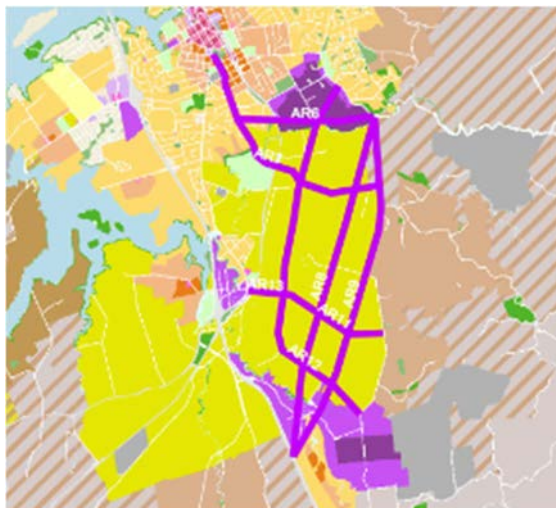


Figure 15-16: IBC Drury East Long List Options

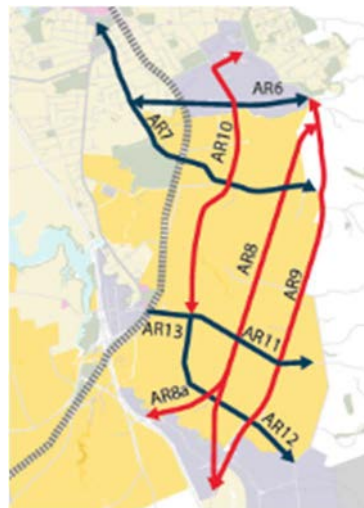


Figure 15-17: IBC Drury East Short List Options

15.3.2 Route Refinement Alternatives Assessment

15.3.2.1 Option Development

Route refinement for the Waihoehoe Road West FTN Upgrade included specialist assessment of three options as shown in Figure 15-18.

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road



Figure 15-18: Waihoehoe Road West FTN Upgrade Options for route refinement showing constraints and considerations

15.3.2.2 Assessment

The three options were qualitatively assessed against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 15-18. In determining the preferred option, the Project Team considered the MCA assessment and the engagement undertaken with Project partners and landowners.

15.3.2.3 Preferred Option

The preferred option (Option A) is to widen generally to the north of the existing road corridor. The preferred option was chosen because:

- This option reduces property impacts – it has the least impact on property access, and requires the least full property acquisition.
- This option has less impact on land proposed for high density development surrounding the proposed Drury Central Rail Station
- This option allows for more flexibility for the rail network (potential station site and four tracking) by providing more room for station connections and curvature of tracks under Waihoehoe Bridge.
- This option means the Waihoehoe Bridge can remain open during construction reducing traffic impacts and the overall construction programme
- This option has slightly less impact on existing utilities.

All route refinement options provided the same level of achievement against the transport outcomes.

During design refinement, specific consideration was made to ensuring access to Tui Street which provides access to a range of businesses and community facilities including Drury Domain and Drury Library.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which give greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the Project has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

15.3.2.4 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 15-5: Discounted Options - Waihoehoe Road West FTN Upgrade

Option	Reasons for discounting
Option B	- Greater property impacts i.e. property access, full acquisition - Technical implications for future rail electrification, four tracking (due to curvature of rail track under the bridge) and future rail station - Slightly more impact on utilities - Greater impact on land proposed for high density development surrounding the proposed Drury Central rail station
Option C	- Greater property impacts i.e. full acquisitions - Widening to both sides of the road means that the Waihoehoe Bridge would need to be closed during bridge deconstruction which would have significant implications on traffic - Slightly more impact on utilities

15.3.2.5 Intersection Form

Along the preferred Waihoehoe Road West FTN Upgrade corridor, two intersections need to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future:

- **Great South Road / Bremner Road / Waihoehoe Road:** Signalised intersection preferred because:
 - FUZ land-use (centre, light industry and residential) and proximity to train station increases active mode modal priority
 - Proximity to railway bridge (+future 4 tracking)
 - High-quality bus priority North-South and East-West.

- Proximity to Drury Central rail station and connection with SH22 will make this intersection a high conflict zone between all modes (active transport needs more protection).
- Grade-separation of active modes considered but not considered suitable here due to centre and high urban density
- Potential pedestrian signals just south for rail access hence operationally preferred to coordinate signals
- Proximity to Drury Central Station with high-quality bus priority east-west (interim) and north-east-west (long term).
- **Ōpāheke N-S FTN Arterial / Waihoehoe Road / Fitzgerald Road:** Roundabout preferred because:
 - Proximity to Drury Central Station with high-quality bus priority east-west (interim) and north-east-west (long term).

15.3.2.6 Summary

Based on the assessment undertaken, the preferred option identified for the Waihoehoe Road West FTN Upgrade was to widen generally to the north (Option A). Through the intersection form assessment it was recommended that a signalised intersection be implemented at the Waihoehoe Road intersection with Great South Road and a roundabout be implemented at the intersection with the proposed Ōpāheke N-S FTN Arterial (NOR D4).

16 Jesmond to Waihoehoe Road West FTN Upgrade: Assessment of Effects on the Environment

This section provides a summary of the actual and potential effects of the construction, operation and maintenance of the Jesmond to Waihoehoe Road West FTN Upgrade, including whether these effects are positive or adverse and the scale, duration and location of effects.

Key transport outcomes, land use integration and the avoidance of adverse effects on areas or features of high value have been key drivers for the identification and selection of the proposed designation corridor and the subsequent refinement of the corridor. Where avoidance has not been possible, measures to remedy or mitigate significant adverse effects have been proposed. Details of these are included in Section 17 and have been reflected in proposed designation conditions.

16.1 Positive Effects

The Project will generate a range of positive effects. The nature and degree of these positive effects are discussed in subsequent sections of the AEE, but in summary:

- The Project will provide transport infrastructure necessary to support and integrate with the planned urban growth in Drury-Ōpāheke. The Project will unlock development capacity in the southern growth area where development pressure is accelerating. This is evident from recent private plan changes being lodged with Auckland Council.
- The Project provides a safe, reliable arterial corridor that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improves access to employment and social amenities. This will improve the way people live in terms of daily commutes and connecting to the community. In particular, the Project will:
 - Significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport and will significantly reduce the risk of DSIs;
 - Dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for future public transport users and business vehicle movements;
 - Provide journey time benefits for public transport are expected to be 12 min in the morning peak over 4 minutes in the inter peak, and over 6 minutes in the evening peak;
 - Significantly improve reliability, resilience and productivity for all road users travelling between Drury East and West;
 - Integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.
 - Improved active mode connectivity to recreational facilities including Drury Sports Complex, Drury Domain and open space planned within Auranga Development, including the ability to tie into the proposed greenways and recreational corridors anticipated by the Drury -Ōpāheke Structure Plan, Blue-Green Network;
- Overland flow currently crosses Jesmond Road in several locations and it is expected that the works will include upgrades to better manage overland flow across the road.
- The new bridge over Ngakoroa Stream on Bremner Road decreases the flooding upstream by 0.16m due to its wider span.

- The new Hingaia Stream Bridge will provide significantly reduced upstream flood risk, improve freeboard and resilience and have a positive effect on the existing flooding affecting the rail transport corridor.
- The removal of the Norrie Road Bridge will result in a reduction of flood levels in the 100 year rainfall event, reducing the flood risk to a number of buildings and roads.
- Slower speed limits adjacent to existing dwellings and commercial activities and an improved streetscape will improve the experiential qualities of the corridor for users and private properties adjacent to the road corridor.
- A net increase in green infrastructure within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences.
- The Project will provide health and wellbeing benefits to the wider community through provision of new active mode and public transport choices as an alternative to the existing network.
- As part of the assessment of the Project several new previously unrecorded archaeological sites were discovered, which improves the historic heritage record of the area. Opportunities to present any new historic information identified during the works to the community through information boards and other displays as the historic heritage of the area is currently not well understood.

16.2 Traffic and Transportation

The potential effects of the Project on traffic and transportation have been assessed in the Assessment of Transport Effects report, provided in Volume 4. The effects assessment has been assessed on the likely future environment, based on the full build out of the southern growth areas in 2048+, and taking into account relevant wider infrastructure upgrades. This methodology is outlined in the Assessment of Transport Effects Report. These effects are summarised below and should be read in conjunction with that report

16.2.1 Positive Effects

The Project will have significant positive traffic and transportation effects. It will provide a safe, reliable multi-modal transport corridor that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improves access to employment and social amenities in and around the Drury-Ōpāheke area.

The Project will significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, active modes or public transport. The dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for future public transport users. The provision of additional segregated active transport facilities will significantly improve safety for vulnerable users and significantly reduce the risk of DSIs.

The Project will integrate with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

The positive effects of the Project are also discussed in further detail in the assessment of operational effects below.

16.2.2 Operational Effects

The existing roads within the Project area are not fit for purpose to support the planned future urban growth. The current environment is a medium to high-speed environment, with poor east-west connectivity for public transport, general traffic, and active modes, with limited or no active transport facilities to protect vulnerable users. Norrie Road also has a severe capacity (one-lane capacity) and width restriction at Norrie Road Bridge, limiting east-west movement, and it is unable to accommodate large vehicles and public transport. Furthermore, there are no public transport facilities or intersections to support or prioritise public transport usage.

As Drury develops in the future, Jesmond Road, Bremner Road and Waihoehoe Road West will need to cater for much higher traffic demand than at present. The existing daily traffic flow is relatively low, but it is expected to grow significantly (from 6600vpd to 41,800vpd) as a result of the planned growth and is expected to operate near general traffic capacity.

The scale of growth will trigger effects on all elements of the transport system. Significant adverse transport effects are expected if future growth progresses and existing infrastructure remains the same. These adverse effects will compromise safety, wellbeing and liveability, and lead to several undesirable transport and land use integration outcomes.

By providing additional FTN capacity, separated walking and cycling facilities and better connections to the proposed public transport network, the Project will ensure that the transport corridor has sufficient capacity to safely and reliably accommodate the future growth anticipated in the area.

16.2.2.1 General Traffic Effects

The Project comprises both new and upgraded corridor elements that will support the urbanisation of the Drury area, resulting in improved connectivity and urban form outcomes. It will provide a four-lane multimodal east-west spine between Drury east and Drury west, which will have two lanes allocated for general traffic and two dedicated FTN lanes. This will increase east-west connectivity, capacity and provide a reliable local connection between Drury east and Drury west in the future.

Modelling shows that as a result of the Project, a larger proportion of traffic will reroute from the surrounding collector network onto the new Bremner Road connection, reducing reliance on the collector network. The Bremner Road connection (east and west of SH1) and improved roading facilities will shorten the travel distance between Drury west and Drury east, and reduce vehicle kilometres travelled by 10,781km daily. Accordingly, while the corridor will remain for general traffic with similar corridor capacity, there will be a reduction in vehicle kilometres travelled due to the shorter east-west connection.

With the significant increase in traffic volumes expected in the surrounding area as it is urbanised over time, the function of Jesmond Road, Bremner Road and Waihoehoe Road West will need to cater for much higher demand. Modelling results show that with the Project in place, although some sections of NoR D2 will experience congestion during peak periods, the traffic lanes and intersections are adequate to accommodate demand based on the general traffic forecasts.

Overall the Project will significantly improve connectivity, reliability, resilience and productivity for all road users in the future growth areas travelling between Drury east and Drury west. It will improve integration with the future urban areas surrounding NoR D2, and as part of the future strategic transport network will enable access to economic and social opportunities for current and future residents in the Drury growth areas.

16.2.2.2 Safety Effects

The Project has been designed with consideration of the latest safety guidance, including AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrades that comprise NoR D2 are expected to result in positive effects on safety including:

- Reducing the speed environment from 70km/h – 80km/h to the more appropriate urban speed of 50km/h. This is likely to result in a safer speed environment, which will significantly decrease the risk of DSIs at intersections and mid-blocks.
- Providing separated and protected walking and cycling facilities in the Project Area to improve safety for existing and vulnerable road users. This will significantly decrease the risk of DSIs along NoR D2.
- Providing safe intersection controls at seven key intersections along the Project Area, with controls on vehicle movements, provision of safer pedestrian crossing facilities at intersections and improvements to vehicle access to adjacent side roads. This will significantly decrease the risk of DSIs at intersections.
- Providing appropriate vehicle lane widths and delineations to enhance the urban environment and to align with the urban speed limit.
- Providing raised medians to separate the two directions of traffic and reduce head-on crashes.

Overall the Project will provide a much safer transport system which significantly reduces the number of DSIs and results in positive effects for all road users. Further complementary measures to achieve the safety outcomes identified will also be identified as part of detailed design.

16.2.2.3 Walking and Cycling Effects

Walking and cycling are key components to the future environment surrounding NoR D2. There are several key attractors which suggest walking and cycling will significantly increase as growth progresses in the Drury area, including high quality FTN routes proposed along the corridors, and the urban growth signalled by the underlying zoning of the area.

NoR D2 proposes separated walking and cycling facilities on both sides of the road from SH22 to Fitzgerald Road, and includes dedicated pedestrian and cycle crossing facilities at seven intersections, which will connect with the expected future adjacent facilities. It will also provide an east-west function connecting Drury west and Drury east, and serve as a gateway to key destinations in Drury including new planned rail stations, centres and the strategic north-south public transport network.

The provision of additional segregated walking and cycling facilities (including safer crossing facilities) will significantly improve safety for vulnerable users and will significantly reduce the risk of DSIs. The Project also proposes to reduce the speed environment to urban speeds such as 50km/h and repurpose the proposed designation corridor to an urban arterial, which will also combat expected safety concerns. Overall, the provision of the FTN and walking and cycling facilities will provide a choice of transport options, reduce reliance on private vehicle trips and result in positive environmental and health benefits.

16.2.2.4 Public Transport Effects

The Project will form an integral part of the future public transport network, providing a primary east-west and north-south function for future planned services and serving as a gateway to key

destinations in Drury. Without adequate facilities for public transport, access to employment and social amenities will be compromised by congested, unreliable and unattractive east-west public transport connectivity.

For public transport, the Project will operate as both a high-quality transit spine for localised trips and the wider Drury-Ōpāheke area. The new corridors will be well connected with the existing network and planned future public transport network, including proposed new rail stations at Drury Central and Drury West, centre and east-west movements between Drury east and Drury west and the wider FTN and rail public transport network.

The dedicated FTN facilities and increases in capacity will result in improved journey time performance and consistency for future public transport users. The journey time benefits for public transport are expected to be largest in the morning peak (12 min), followed by the inter peak (over 4 min) and evening peak (over 6 min).

Overall the upgrade will integrate with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors. The Project will connect the communities of Drury east and west with frequent and reliable public transport between centres, employment and the rail stations.

16.2.2.5 Effects on Access

The operation of the Project is expected to have neutral effects in terms of access. Based on the high flow and four-lane movement function with mixed elements of walking, cycling, public transport and general traffic along NoR D2, direct property access onto Jesmond Road, Bremner Road and Waihoehoe Road West is not recommended given the negative safety implications.

Some properties will therefore face a minor diversion impact onto the main network as direct property access is limited to left-in and left-out only movements. However, these effects are expected to be offset by the more reliable and significant improvements to safety and overall, there will be a decrease in crash exposure between driveways, general traffic and active modes. By limiting direct property access onto the corridor, the crash risk of cars merging onto the road and crossing multiple traffic lanes will be eliminated.

The Bremner Road FTN section interfaces with the Waka Kotahi SH1 Papakura to Drury South project which is part of the NZUP. There are a number of properties on the north side of Bremner Road that will be affected by that project where access will be addressed through those works. Therefore, at this stage the direct access from these properties onto Bremner Road has not been provided as part of the Project works. The SH1 Papakura to Drury South project is expected to lodge their NoR and consent application in mid 2021.

The Waihoehoe Road West FTN Upgrade interfaces with the Drury Central rail station, which is also part of the New Zealand Upgrade Programme. Subsequent to the construction of the station (currently scheduled for completion in 2024), the Waihoehoe Road bridge will be reconstructed to four lanes as part of the Waihoehoe West FTN Upgrade. This means that Flanagan Road will in future no longer have access to Waihoehoe Road in its current position due to the reconstructed bridge and retaining required. As part of the rail station works, an accessway to the new station interchange facilities is planned, which will provide access for Flanagan Road properties.

16.2.3 Construction Effects

The assessment of traffic and transportation construction effects is based on the indicative construction method, construction programme and the nature of works proposed for each construction zone. In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). Potential adverse effects on transport during construction of the Project can be summarised as follows:

- **Temporary traffic management** will be required to facilitate the construction activities. Particularly Construction of bridges in particular will require appropriate sequencing and programming. The scale of temporary traffic management is largely dependent on the various stages and requirements of the construction activities. It is expected that full road closures and diversions will be required for some specific activities and adjustments to intersections may be required to accommodate diverted traffic. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work.
- **Construction traffic movements** to accommodate the movement of significant earthworks will likely result in the increase of traffic volume on construction routes used during the construction period of the Project.
- **Construction vehicles** will include truck movements (heavy), light delivery and staff/contractor vehicle movements (light). The total estimated trips associated with construction works are:
 - For Jesmond Road: approximately 20,500 heavy truck movements staged over one to two years, and approximately 100 light vehicles per day.
 - For Bremner Road: approximately 33,200 heavy truck movements staged over three to four years, and approximately 300 light vehicles per day.
 - For Waihoehoe Road West: approximately 9,400 heavy truck movements staged over two to two and a half years, and approximately 100 light vehicles per day.
- **Road safety** impacts from site access points, posted speeds and sight lines for construction vehicles.
- **Pedestrian and cyclist safety:** provision of walking facilities and cycle diversions if demand exists. However, the analysis of the crash data did not show any current or historic incidents involving pedestrians and cyclists. Therefore, it is expected that the additional construction traffic will be unlikely to have any notable impact to existing active transport modes.
- **Existing driveways** that remain during construction will be required to have temporary access provision through temporary traffic management controls.

It is recommended that the impact of the potential construction traffic effects identified are reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

16.2.4 Mitigation Measures

16.2.4.1 Operational effects

Based on the assessment of effects, as summarised above, the Project will have significant positive effects on the operation of the transport system. There are no anticipated adverse effects that require mitigation.

16.2.4.2 Construction effects

To address the potential construction effects identified, a Construction Traffic Management Plan (CTMP) will be prepared prior to the start of construction. Any CTMP prepared will be submitted to Council for information ten working days prior to the start of works. Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. The objective of the CTMP is to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP will include:

- Methods to manage the effects of temporary traffic management activities on traffic;
- Measures to ensure the safety of all transport users;
- The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
- Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
- Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
- The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads;
- Methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

If required, a Site Specific Traffic Management Plan (SSTMP) will be developed to manage constraints on access to affected properties.

16.2.5 Summary of Transport Effects

The existing roads within NoR D2 are not fit for purpose to support the planned future urban growth. The current environment is a medium to high-speed environment with poor east west connectivity for public transport, general traffic and active modes, with limited or no walking and cycling facilities to protect vulnerable users. Significant adverse transport effects are expected if future growth progresses and existing infrastructure remains the same.

The Project will have significantly positive transport effects and enable growth in the area. It will provide a reliable, multi-modal arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improves access to employment and social amenities.

The Project will improve all transport facilities for all modes, resulting in improved safety for those that travel by car, active modes, or public transport. The upgrade will significantly improve safety for vulnerable users and will significantly reduce the risk of DSIs. It will improve corridor capacity resulting in improved journey times and reliability for public transport users. The Project is not expected to have any adverse operational effects that require mitigation.

In terms of construction effects, some potential adverse effects are anticipated but these are mainly linked to temporary traffic management, and can be managed appropriately through the implementation of a CTMP.

16.3 Cultural

16.3.1 Discussion

This section presents our understanding of the cultural values and issues of significance to Manawhenua in respect of the Project. This section draws from our engagement with Manawhenua and inputs provided by Manawhenua during Project development. Ngāi Tai ki Tāmaki, Ngāti Maru, Ngāti Tamaoho, Ngāti Te Ata Waiohua, Te Ahiwaru, Ngāti Whanaunga and Te Ākitai Waiohua have been actively involved in the development of the Drury Arterial Network.

There is one site of significance to Manawhenua (Plan Change 22) identified at 27 Bremner Road, approximately 340 metres north of the proposed designation. However, the Project does not impact the site, and existing access to the site off Bremner Road will be maintained.

The Ngakoroa and Hingaia Streams and their tributaries are Ngāti Tamaoho statutory acknowledgement areas (Ngāti Tamaoho Deed of Settlement 30 April 2017).

The Project corridor does not affect any identified wāhi tapu, other taonga or Maori land. However, in developing the Project, recognition has been given to both the relationship of Tangata Whenua to their lands, culture and traditions in this area and the commitment to partnership between Manawhenua and AT. The partnership approach that has been taken in delivering the Project with Manawhenua is discussed further in respect to engagement in section 5.2.1.1 Ngā Manawhenua of this AEE.

Manawhenua involvement has included participating in all Project phases through options assessment, design refinement and effects assessment of the preferred corridor. Engagement with these iwi groups has included site walkovers to identify and address any culturally significant effects, as well as discussion of the approach to cultural impact assessments which could accompany the NoRs. Ngāti Tamaoho, Ngāi Tai Ki Tamaki, Te Ākitai Waiohua and Ngāti Te Ata Waiohua intended to prepare a Cultural Impact Assessment (CIA) for inclusion with this NoR documentation, these were unable to be completed to date. A Historic Summary was prepared by Ngāti Tamaoho (included in Volume 4) which has been used as a reference by the Project team.

This partnership with Manawhenua highlighted the following matters of importance:

- **Water quality:** the importance of maintenance and enhancement of water quality, particularly through stormwater treatment.
- **Ecology:** the importance of maintenance and enhancement of ecological values, particularly areas of high indigenous values included SEAs.
- **Cultural heritage:** the importance of having an appropriate accidental discovery protocol for undiscovered archaeological sites, particularly given the proximity of the works to the Ngakoroa Stream, its tributaries and Hingaia Stream. Manawhenua identified the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage.

The Project has also recognised Manawhenua cultural values, particularly with regards to the mauri of, and the relationships of Manawhenua with natural and physical resources including freshwater, land, air and coastal resources. Significant adverse effects on these values have been avoided, remedied or mitigated as appropriate. In particular, sufficient land has been included within the proposed designation to provide appropriate stormwater discharge treatment (subject to future resource consenting processes) and the coastal marine area, SEAs, wetlands and waterways have been avoided where practicable, including through widening to the south at Ngakoroa Stream to avoid the coastal marine area and a marine SEA. Manawhenua expressed a strong preference for reducing impacts on the CMA and SEA to the north of Ngakoroa Stream bridge. They also expressed a strong preference for bridges instead of culverts, or box culverts (that have no structure in the bed of the stream) and reducing infrastructure within floodplains. In response to this, the CMA and marine SEA were avoided by the proposed alignment, and where practicable bridges have been proposed over stream corridors.

16.3.2 Mitigation

A number of workshops were held with Manawhenua to work collaboratively on the draft condition set. The conditions that relate to ongoing Manawhenua involvement in the Project were developed and agreed with Manawhenua. The proposed designation conditions include the following measures to ensure ongoing involvement of Manawhenua in Project design and construction and ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle.

Cultural Advisory Report

Manawhenua will be invited to prepare a Cultural Advisory Report prior to the start of detailed design of the Project. The objective of the Cultural Advisory Report is to assist in understanding and identifying Ngā Taonga Tuku Iho ('treasures handed down by our ancestors') affected by the Project, to inform their management and protection. To achieve the objective, AT will invite Manawhenua to prepare a Cultural Advisory Report that:

- Identifies the cultural sites, landscapes and values that have the potential to be affected by the construction and operation of the Project;
- Sets out the desired outcomes for management of potential effects on cultural sites, landscapes and values;
- Identifies traditional cultural practices within the area that may be impacted by the Project;
- Identifies opportunities for restoration and enhancement of identified cultural sites, landscapes and values within the Project area;
- taking into account the outcomes of the above, identifies cultural matters and principles that should be considered in the development of the Historic and Archaeological Management Plan (see section 16.4), ULDMP (see section 16.5) and the Cultural Monitoring Plan (see below).
- Identifies and (if possible) nominates traditional names along the Project alignment, noting there may be formal statutory processes outside the Project that apply to any decision-making process.

The desired outcomes for management of potential effects on cultural sites, landscapes and values identified in the Cultural Advisory Report will be discussed with Manawhenua and those outcomes reflected in the relevant management plans where practicable.

Development of other Management Plans

Manawhenua will be invited to participate in the development of the ULDMP to provide input into relevant cultural landscape and design matters as outlined above. Additionally, the Historic and Archaeological Management Plan will be prepared in consultation with Manawhenua.

Cultural Monitoring Plan

Prior to the start of construction works or enabling works, a Cultural Monitoring Plan will be prepared. The objective of the Cultural Monitoring Plan is to identify methods for undertaking cultural monitoring. The Cultural Monitoring Plan will include:

- Requirements for formal dedication or cultural interpretation to be undertaken prior to start of Construction Works in areas identified as having significance to Mana Whenua;
- Requirements and protocols for cultural inductions for contractors and subcontractors;
- Identification of activities, sites and areas where cultural monitoring is required during particular Construction Works;
- Identification of personnel to undertake cultural monitoring, including any geographic definition of their responsibilities; and
- Details of personnel to assist with management of any cultural effects identified during cultural monitoring, including implementation of any Accidental Discovery Protocol.

16.3.3 Cultural Summary

The Project team have worked closely with Manawhenua throughout the Project lifecycle and have taken their values and concerns into consideration, including on ecological values, water quality and cultural heritage. In particular, the indicative design has responded to avoid impact to the CMA and marine SEA on the northern side of the Ngakoroa Stream Bridge.

Overall the indicative design of the Project and future design and construction management measures proposed will respond positively to the matters raised by manawhenua and is consistent with the values they identified during Project design and engagement processes.

16.4 Historic Heritage

An assessment of effects on historic heritage, included in Volume 4 assesses the potential effects on historic heritage resulting from the future construction and operation of the Project. The report assesses the potential effects on any identified recorded historic heritage sites and unidentified subsurface archaeological remains that might be exposed during future construction.

16.4.1 Positive Effects

The assessment has created research opportunities which have discovered several new previously unrecorded archaeological sites, which improves the historic heritage record. Should new historic evidence be identified during works, this provides an opportunity to present the information to the community through information boards and other displays as the historic heritage of the area is currently not well understood.

16.4.2 Construction Effects

16.4.2.1 Jesmond Road FTN Upgrade Section

The assessment concluded there will be no adverse effects on known historic heritage sites from the Project within the Jesmond Road FTN Upgrade section.

Aroha Cottage is a scheduled Historic Heritage Extent of Place (HHEP) in the AUPOIP, running adjacent to the proposed designation at 201 Jesmond Road. The house has been relocated into its current position and, while the HHEP covers the property, only the building itself is protected by the provisions of the HNZPT Act. The site and surrounds are scheduled in the AUPOIP. Most of the site has been avoided through the design and the proposed designation footprint, and only a small portion will extend into the HHEP for driveway regrading. It is not expected that any significant impact to heritage will occur because the 1863 cottage is not in its original location.

There is reasonable cause to suspect pre-1900 historic heritage deposits could be present with the Project area. Without mitigation, any potential sites could be adversely affected due to damage/destruction during the removal of the sites during the construction phase of the Project.

16.4.2.2 Bremner Road FTN Upgrade

The Bremner Road FTN Upgrade section intersects with, or is adjacent to several recorded historic heritage sites (see Figure 16-1). These include:

- St Johns Church and Cemetery (HHEP 707) (standing) – outside of (adjacent to) the proposed designation boundary.
- Scheduled extent of Commissariat Redoubt (HHEP 2173) on the northern side of Bremner Road – outside of (adjacent to) the proposed designation boundary. southern portion of the Commissariat Redoubt R12/756, not scheduled in the AUPOIP (no surface evidence) is within the proposed designation boundary;
- Wharves and Bridges and potential subsurface extents associated to Runciman's Homestead R12/1131 (no visible evidence) are within the proposed designation boundary;
- Waka tauranga in the same vicinity as R12/1131 (no surface evidence) is within the proposed designation boundary;
- Unnamed building R12/1151 (demolished, no surface evidence) is within the proposed designation boundary;
- Unnamed bridge R12/1152 (demolished, no surface evidence) is within the proposed designation boundary;
- Unnamed buildings R12/1149 (demolished, no surface evidence) is within the proposed designation boundary;
- Unnamed buildings at R12/1143 (demolished, no surface evidence) is within the proposed designation boundary;
- Former Drury Cheese and Casein Factory (CHI site 15102) (standing) is within the proposed designation boundary;
- Drury Post Office (CHI site 15880)(demolished, no surface evidence) is within the proposed designation boundary.

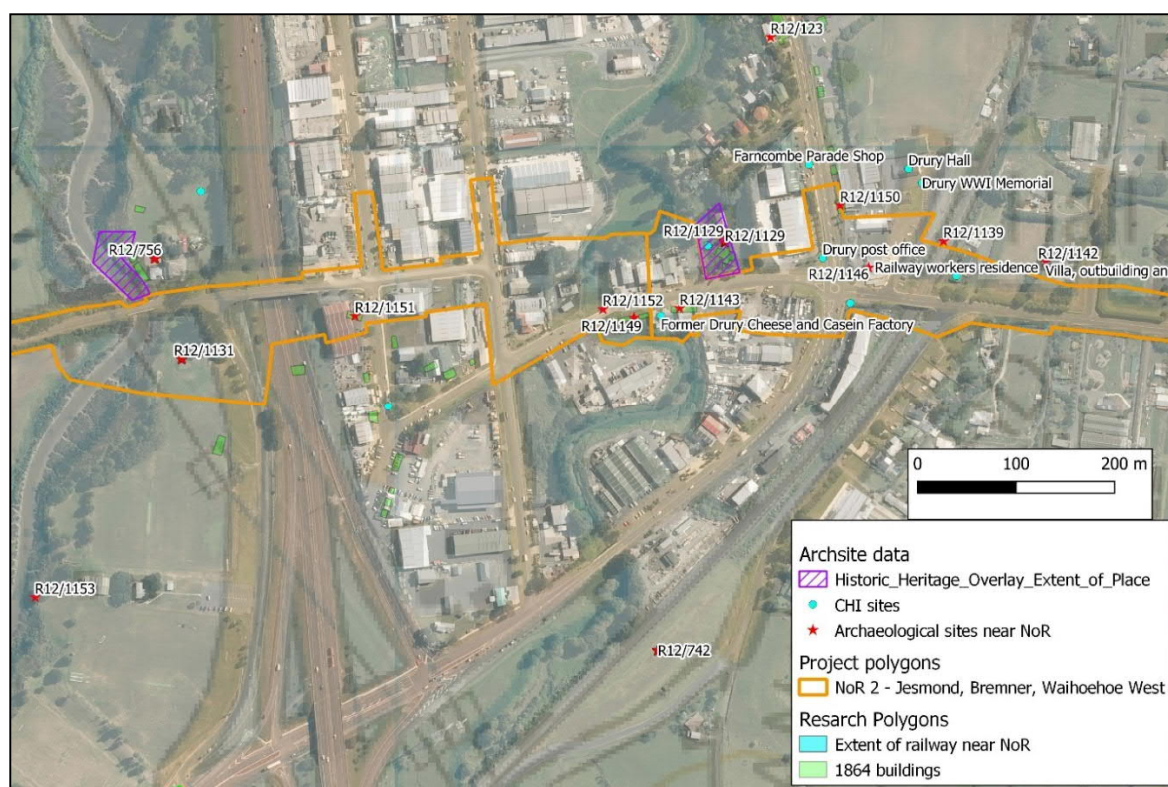


Figure 16-1: Map showing all recorded SRS, CHI, and HHEP sites within or near Bremner Road and Waihoehoe Road sections of NoR D2

It can be assumed that any sites which fall within any proposed ground disturbance areas will be damaged and/or destroyed during the construction phase of the works. The specific potential adverse effects of the construction works to known sites are set out in Table 16-1.

There is also potential that previously unrecorded historic heritage deposits will be found within the Project footprint, many of which are likely to be from the 19th century township occupation, although it cannot be ruled out if precontact Māori period sites are also present. Without mitigation, any such sites uncovered would likely be adversely affected due to damage/destruction during ground disturbance works during the construction phase of the Project.

Table 16-1: Bremner Road - Summary of potential effects on known historic heritage sites

Site	Potential Effects
St Johns Church and Cemetery (HHEP 707, R12/1129)	Through the alternatives assessment processes, an alignment that avoids the scheduled extent of St. John's Church has been identified. While there is reasonable cause to suspect that unmarked graves will be associated with the church and cemetery on the eastern side of the church, these are highly unlikely to extend into the road reserve and proposed designation footprint.
Commissariat Redoubt and Slippery Creek wharf (HHEP 2173, R12/756)	The scheduled portion of the wharves is not at risk of damage from the works, during the options assessment and design process, an alignment has been identified that avoids the known extent of the redoubt. However, based on old plan drawings of the site extent, it is believed that the site extends further to the south, on the southern side of Bremner Road. Widening of the existing road and the bridge spanning the Ngakoroa Stream and associated construction works may encounter unrecorded evidence. The overall values of the site are moderate, and the original

Site	Potential Effects
	ground surface is not visible, so that the condition of these potential deposits cannot be assessed. There is some potential for adverse effects on unidentified subsurface archaeological remains exposed during construction. Works to upgrade the bridge crossing the Ngakoroa Stream adjacent to the stream banks may also uncover unrecorded evidence related to the historic use of Ngakoroa Stream, and there may also be structural remains of the pre-1900 bridge. The condition of these deposits is unknown, but it is likely that there are subsurface deposits intact. The Papakura to Drury South Waka Kotahi (New Zealand Upgrade Programme) project is proposing to reconstruct the bridge over the Ngakoroa Stream in the near future (once statutory approvals have been granted). It is likely that some of this area, either side of the Bremner Road, will be disturbed prior to works being undertaken for this Project. However, at the time of writing this report, the extent of works is unknown.
Runciman's homestead (R12/1131)	The likely location of the site is within the proposed designation footprint. The true extent of the homestead and its associated deposits are unknown. However, from research it is thought that the site is located further to the east than recorded. This site is impacted because the AUPOIP scheduled Commissariat Redoubt and Slippery Creek wharf site on the northern side of Bremner Road, described above, will be avoided. The fill works, road widening, bridge and construction compound and work zone, abutment wall, vegetation removal and retaining wall, as well as any ground disturbance on or near the site could expose deposits typically found at homesteads. As noted above, with reference to the Papakura to Drury South Project, it is likely that some of this area in this location will be disturbed prior to works being undertaken for the Project.
Unnamed historic building (R12/1151) - demolished	The known location of the former building is within the proposed designation footprint. The building has been removed and the condition of subsurface deposits is unknown. The true extent of the building and its associated deposits are unknown. The overall values of the site are considered to be moderate. There may be subsurface extents of the site which are located within the fill batter zone and road widening area. Deposits exposed may include rubbish deposits, structural evidence, and similar deposits seen in 19th century buildings.
Unnamed historic bridge (R12/1152) - demolished	The surface evidence of the original pre-1900s bridge has been removed and the condition of any potential subsurface deposits associated with the original bridge is unknown. The overall values of the site are considered to be moderate. The existing Norrie Road bridge will be removed once the new bridge crossing the Hingaia Stream further north is operational. It is possible that evidence of the former bridge remains adjacent to and within the stream.
Unnamed historic buildings (R12/1149) - demolished	The known location of this former building is within the proposed designation footprint. The building has been removed and the condition of subsurface deposits is unknown. The true extent of the associated deposits is unknown. The overall values of the site are considered to be moderate. There may be subsurface extents of the site which are located within road widening areas and cut works and bridge construction zones, and there may be some subsurface extents that are exposed during works. Deposits exposed may include structural evidence and similar deposits seen in other 19th century buildings. Because the AUPOIP Scheduled Extent of Place of St. John's Church, which has high heritage value, has been

Site	Potential Effects
	avoided, impact on this site is unavoidable. There is potential for adverse effects on unidentified subsurface archaeological remains exposed during construction.
Unnamed historic buildings (R12/1143) - demolished	The site of this now demolished building is within the proposed designation footprint, including road widening and cut works. There may be some subsurface extents that are exposed during works. The true extent of the associated deposits is unknown. The overall values of the site are considered to be moderate. Because the AUPOIP Scheduled Extent of Place St. John's Church, which has high heritage value, has been avoided, impact on this site is unavoidable. There is potential for adverse effects on unidentified subsurface archaeological remains exposed during construction. The deposits could include rubbish pits, paths, structural foundations, and other similar deposits seen at these type of sites.
Former Drury Creamery and Casein factory (CHI site 15102)	This site is within the proposed designation footprint. Impact to this site is likely unavoidable because part of this site is required to accommodate the road upgrade, while avoiding AUPOIP Scheduled Extent of St. John's Church, which has high heritage. It is very likely that the building will be removed/demolished to provide for widening of the road (on the southern side). The true extent of the subsurface deposits of the site are unknown. The overall values of the site are considered to be moderate. There is some potential for adverse effects on unidentified subsurface historic heritage remains exposed during construction.
Former Drury Post Office (CHI site 15880) - demolished	This site is within the proposed designation footprint. The true extent and location of the site and its associated deposits are unknown, but the building has been demolished and it is unknown what the condition of any subsurface remains are. The overall values of the site are considered to be moderate. There is potential for adverse effects on previously unidentified subsurface deposits associated with the post-office which may be exposed during construction.

16.4.2.3 Waihoehoe West FTN Upgrade

This section of the proposed designation intersects with, or is adjacent to several recorded sites. These include:

- Drury Railway Station R12/1139 (may have subsurface deposits which extend into the Project footprint);
- The Railway Hotel R12/1146 (demolished, no surface evidence) – within the proposed designation boundary;
- The Drury coal tram/railway R12/1222 (no surface evidence) – partly within the proposed designation boundary;
- Drury commercial buildings (demolished, no surface evidence) – partly within the proposed designation boundary; and
- Railway Worker's Residences (one standing, three have been removed) – within the proposed designation boundary.

The proposed works may have potential adverse effects on these sites by damaging or destroying any subsurface deposits that are present. The specific potential adverse effects of the construction works to known sites are set out in Table 16-2.

There is also a high likelihood that previously unrecorded historic heritage deposits may be found within the footprint, many of which are likely to be from the 19th century township occupation, although the presence of precontact Māori period sites cannot be ruled out.

While many sites across the wider NoR will be avoided, the cumulative adverse effects of the Project on many sites along Norrie Road (previously Old South Road), land near the NIMT on Great South Road, and Waihoehoe Road include effects on the historic heritage landscape of Drury's pre-1900 European land use. If these sites cannot be avoided, other efforts will be made to record the loss of heritage along the area, including systematic archaeological investigations and opportunities for interpretation to the public (i.e. through information signage).

Table 16-2: Waihoehoe Road West Summary of potential effects on historic heritage sites

Site	Potential Effects
The Drury Railway Station, (R12/1139) - demolished	This site is located outside of the proposed designation footprint however it may have subsurface deposits which extend into the Project footprint. Should these be present, they will be adversely impacted by their removal during the earthworks phase of the Project.
Drury tramway/mineral railway (R12/1222)	Some of this site is within the proposed designation footprint. There is some potential for adverse effects on unidentified subsurface archaeological remains exposed during construction as a result of removing these deposits. The overall values of the site are moderate, and any remaining intact deposits of the site in this portion of the roading are subsurface.
Drury Commercial Buildings (CHI item 15109) - demolished	Some of this site is within the proposed designation boundary. The true extent of these buildings and their associated deposits are unknown. The buildings have been demolished and any site remains will be subsurface. The overall value of the site is moderate. Proposed ground disturbance works may damage and/or destroy any parts of the site which are within the proposed designation boundary.
Railway worker's residences (CHI site 22288)	The remaining house of the railway worker's residences is within the proposed designation boundary at 18 Waihoehoe Road. The true subsurface extent of the residences and its associated deposits are unknown. Some of the site is intact and the removal of building is likely to be required for road widening, bridge construction, and the bridge construction works area. The overall value of the site is moderate.
Railway Hotel (R12/1146) - demolished	The known location of the former hotel is within the proposed designation boundary. The building is no longer standing. The true extent of the hotel and its associated deposits are unknown, so the potential for damage to the site is also unknown. As the building has been removed, any intact deposits will be subsurface. The overall value of the site is moderate. The site compound, bridge construction area, road widening, and similar works will adversely impact the site by removing these deposits during the earthworks.

16.4.3 Operational Effects

For NoR D2 it is possible the operation of the transport network could have an adverse effect on the information, heritage, and context of some sites by modifying the wider landscape they belong to (recognising the known sites are adjacent to existing roads, therefore the widening of the road has not fundamentally changed the site's context). This has a risk of diminishing the understanding of the heritage of what is already a poorly recorded and understood area. However, the Drury-Ōpāheke area

will undergo substantial change over the coming years as the area urbanises and the Project is just one aspect of the wider changing landscape.

16.4.4 Mitigation Measures

16.4.4.1 Construction Effects

As a proposed condition of the designation, a HAMP will be prepared prior to the start of construction. The HAMP will:

- Set out the methods for the identification and assessment of historic heritage within the designation to inform detailed design.
- Identify the known and potential historic heritage sites within the designation
- Set out the HNZPTA authority requirements for any pre-1900 sites

Specific recommendations for detailed design and construction works include:

- Wherever possible, known sites should be avoided.
- Where sites are suspected of extending into the works area, further research including non-invasive techniques and possible Section 56 authority investigations under the HNZPT Act should be undertaken to clarify site extents and effects of construction. should be undertaken for Runciman's Homestead (R12/1131) in particular.
- Any temporary construction works areas, such as lay downs, silt fencing, water bunds and spoil heaps, should avoid known site extents if there are alternative locations available.
- Known site extents adjacent to construction areas should be protected through fencing.
- Any areas of known site extents that will be used for construction laydown, but not otherwise earth worked, should be isolated with geotechnical cloth and 250 mm of GAP 25 or similar
- Vegetation removal in known site extents should, where practicable, be cut to stump and avoid ripping the roots out as a means to protect site deposits.
- For the Former Drury Creamery and Casein Factory, a built heritage assessment will be carried out to determine the level of heritage significance and the building's current condition.
 - If the factory is assessed as being of significant heritage value, and if its condition permits, it will be relocated on the property or elsewhere within the Drury area prior to the start of works.
 - Should relocation not be achievable, the deconstruction of the building will be undertaken with a buildings archaeologist on site to record and investigate the building. This will be undertaken regardless of its construction date. Any materials could be reused if they are of heritage value.
- Any information gained during all pre- and post-construction works regarding the factory should be presented to the community, such as in an information board from the path side, or in the Papakura Museum exhibitions which showcase local history or similar.
- For the former Railway worker's residences (CHI site 22288), a built heritage assessment will be carried out to determine the level of heritage significance and its current condition. This will determine the values of the site and the appropriate level of mitigation for any adverse effects on these values.

Since archaeological survey cannot always detect sites of traditional significance to Māori, or wāhi tapu, the appropriate mana whenua authorities will be consulted regarding the possible existence of such sites, and the recommendations in this report.

Any potential adverse effects on previously unrecorded archaeological deposits that are exposed during the works can be mitigated by obtaining a precautionary HNZPTA authority. This authority will be sought prior to construction of the Project.

16.4.4.2 Operational Effects

Any operational effects of the transport corridor will be mitigated by providing information on any recorded sites (from the construction of the Project), for example an information board along a walking or cycle route. Any information shared, if at all, will be at the discretion of mana whenua.

16.4.5 Summary of Effects on Historic Heritage

The Project will impact on known sites during the construction the works. Further desktop and field research will help determine the appropriate forms of mitigation, undertaken as a requirement of the HAMP, which will be prepared to inform detailed design before construction commences. A HNZPTA authority will be applied for to manage the damage to pre-1900 sites. Post-1900 sites which still hold some heritage value will be managed with research and opportunities for interpretation to the public (i.e. through information boards). The HAMP will:

- Set out the methods for the identification and assessment of historic heritage within the designation to inform detailed design. This will include:
 - non-invasive techniques or exploratory investigation to clarify the extent of the Runciman's Homestead site (R12/1131)
 - built heritage assessments for the former Drury Cheese and Casein Factory (CHI site 15102) and the former railway workers residence (CHI site 22288);
- Identify the known and potential historic heritage sites within the designation
- Set out the HNZPTA authority requirements for any pre-1900 sites.

Additionally, site specific mitigation measures are proposed as outlined in the sections above. With the mitigation measures described above put in place, the potential adverse effects of the Project on historic heritage values will be managed appropriately.

16.5 Landscape and Visual

The Assessment of Landscape and Visual Effects, included in Volume 4, assesses the potential effects on landscape character, natural character and visual effects associated with the construction and operation of the Project and recommends ways of mitigating these effects. The effects were assessed in the following two categories:

Temporary Effects (Construction Effects): Describes the anticipated impacts on the bio-physical elements and features of the landscape resource (landform, vegetation and hydrology) resulting from the construction of the Project. It also includes visual amenity effects for both public and private viewing audiences from construction works.

The construction activities required to implement the Project are categorised under the following broad headings:

- **Site enabling works** - site establishment, demolition and vegetation clearance;
- **Project formation works** - bulk earthworks and formation of new road surface and batter slopes, culvert upgrades, stormwater wetlands, private driveway regrades and bridge construction;

- **Finishing works** - lighting, signage, footpath/cycleway details and line markings, streetscape elements and landscaping (including street trees, mitigation planting and riparian/wetland planting (to be determined by detailed design through the ULDMP and by regional resource consents)).

Permanent Effects (Operational Effects): Describes the effects on the landscape of completed works (including integrated landscape mitigation measures), the significance of physical landscape change and ultimately the resulting effects of the Projects on landscape character, natural character and visual amenity for both public and private viewing audiences. This section summarises the potential effects and mitigation measures proposed. The summary below should be read in conjunction with the report.

16.5.1 Positive Effects

A number of positive landscape and visual effects are anticipated as a result of the operation of the Project (including proposed mitigation as detailed in 16.5.4). Positive effects are likely to include:

- A streetscape to match the emerging urban form within adjacent land;
- Improved and/or new opportunities for active modes of transport and the ability to generate better connectivity with open space areas such as the Drury Sports Complex and the esplanade reserves associated with Ngakoroa and Hingaia Streams. The Project also provides the ability to tie into the proposed Greenways and recreational corridors anticipated by the Drury-Ōpāheke Structure Plan, Blue-Green Network;
- Net increase in green infrastructure within the Project area associated with new street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences.
- Slower speed limits adjacent to existing dwellings and commercial activities, improving on the experiential qualities of the corridor for users as well as private properties situated adjacent to the road;
- Improved form and function of the proposed bridges over the Ngakoroa and Hingaia Streams, SH1 and the NIMT, reducing flood risk and potential adverse effects on natural character values. The Project also provides the opportunity to visually integrate new bridge structures and generate sense of place values through site-specific design.

16.5.2 Construction Effects

16.5.2.1 Physical Landscape Effects

During construction, potential adverse effects on the physical landscape include construction laydown areas, extent of vegetation clearance, the scale and location of proposed cut and fill slopes (noting the scale anticipated may reduce as a result of urban development prior to the construction of the Project), construction of the proposed stormwater wetlands and bridge construction.

Indicative site compound and construction areas will temporarily occupy land as follows:

- Within the Jesmond Road section: pastoral land that is already somewhat modified by existing rural land uses.
- Within the Bremner Road section: land that is already somewhat modified by existing land use (including industrial land), and outside of the CMA and SEA areas.
- Within the for the Waihoehoe Road West section: suburban and industrial land that is already somewhat modified by existing land use.

All areas will be grassed (reinstated) at the completion of the construction period. Mitigation planting is likely to be implemented within the bridge construction areas adjacent to the Ngakoroa and Hingaia Streams as part of a future resource consents process. The physical landscape effects resulting from establishment and use of the construction work areas within the NoR D2 Project area are low to moderate-low.

Broad areas of street-side vegetation and private garden plantings and localised areas of terrestrial vegetation are proposed to be removed during construction. Overall, the physical landscape effects likely to arise from vegetation clearance within the Project area during construction will be temporary and will be low to moderate-low.

The Project will include a range of structures (including bridges and retaining walls) and earthworks associated with construction of the structures and the final road form. Proposed bridge works include:

- A **new bridge** within the Jesmond to Bremner Link at the Ngakoroa Stream tributary
- Widening of the **Ngakoroa Stream Bridge and associated retaining walls** (informed by the bridge design proposed as part of the Papakura to Drury South Project). The proposed bridge is likely to be elevated to a height of approximately 5m above natural ground level at the terrestrial margins of the stream. Proposed retaining walls will significantly reduce the physical impacts of the works on marine and terrestrial SEAs, ensure the works avoid the CMA and reduce physical impacts on existing properties directly north of the bridge (31 and 37 Bremner Road).
- Widening of the existing **SH1 Bridge** (informed by the bridge design proposed as part of the Papakura to Drury South Project)
- Removal of the existing **Norrie Road Bridge** over the Hingaia Stream
- A new 70m **bridge crossing the Hingaia Stream** elevated approximately 4m above natural ground level at the terrestrial margins of the stream.
- Widening of the **NIMT bridge and associated retaining walls** within a heavily modified existing NIMT corridor. The retaining walls along the southern side of Waihoehoe Road West are proposed to preserve existing housing adjacent to the Project area. The bridge will raise the existing road profile by approximately 2.5m on the western side and approximately 4m on the eastern side.

The construction process of bridges over streams is likely to require temporary staging platforms to be constructed within the terrestrial margins of the stream which will have a temporary effect on the existing landform of the riparian environment. Landscape impacts will be remedied through riparian landform and native reinstatement planting, measures which will be confirmed as part of a future resource consent process.

Overall, impacts on the physical landscape to implement the proposed bridge crossings are likely to be low to moderate-low, acknowledging the avoidance of the CMA, the general setting of the coastal environment and the presence of terrestrial and marine SEAs within and proximate to the construction footprint of the Ngakoroa Bridge.

The Project involves a range of cut and fill slopes varying in scale from very small (1m wide) to large (40m wide), and will alter the existing modified landform (including into adjacent industrial properties) and pastoral areas of the landscape with some fill slopes to be integrated into the Drury Sports Complex and the riparian margins of the Ngakoroa Stream. All cut and fill slopes will be integrated with the surrounding landscape and will be absorbed within the existing modified landform, road environment and pastoral landform adjacent to the proposed and existing road corridors. There is also potential cut and fill slopes could be integrated with development as land is urbanised in the future.

On Jesmond Road, the proposed earthworks will result in a carriageway that is approximately 0.5m to 1.5m above existing ground level. The proposed earthworks through the new section of road in the Jesmond to Bremner Link will result in a carriageway between 1.8m to 6m below natural ground level. The road corridor between CH700 – CH1100 – Auranga 'Road 1' will be constructed through the ongoing Auranga Development activities and two additional lanes will be retrofitted into the road reserve in the future. On Waihoehoe Road West, proposed earthworks will result in a new road surface level roughly 0.5m – 1m above existing levels. Overall, impacts on the physical landscape to implement the proposed earthworks are anticipated to be low.

Potential effects on private properties within and adjacent to the Project area during the construction period will be moderate-low and can be adequately remedied from a landscape perspective with mitigation measures proposed in section 16.5.4. Potential effects include:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;
- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences;
- Potential construction of retaining walls; and
- Removal of existing dwellings and ancillary buildings on properties to be partially required.

Site finishing works to be determined at detailed design will occur within the already modified areas of the Project. Resulting physical landscape effects are expected to be negligible.

16.5.2.2 Temporary Visual Effects

The construction of the Project sections are anticipated to be completed in the following timeframes and zones (for Bremner Road):

- Jesmond Road: 12-18 months
- Bremner Road: 3 to 3.5 years in two zones
- Waihoehoe Road West: 2 to 2.5 years

Visual effects are anticipated to occur progressively through the Project section areas and zones (where applicable) during the construction period. Some vantage points within the Project area are likely to witness heightened adverse visual effects through the construction phase due to the magnitude of vegetation removal and/or earthworks proposed. Additionally, within the Bremner Road section, the overall scale of temporary adverse visual effects arising from the range of construction 'nodes' located in close proximity are likely to give rise to some moderate adverse visual effects during the construction period of the Project.

Adverse visual effects for the public viewing audience are likely to be very low to moderate-low through the construction phase. For the private viewing audience, directly adjacent to the road corridor, adverse visual effects are likely to be heightened on the basis of more direct and prolonged engagement with the construction activities of the Project.

The nature and significance of the potential adverse visual effects will be moderated through the Project area by the following aspects:

- Road works and construction activities can generally be expected to occur within existing roads;
- The presence of existing bridges and the likelihood of maintenance works being carried out from time to time;

- The existing dynamic nature of the land use activities and urban development within and proximate to the Project area;
- Existing construction activities associated with the Auranga Development and the likelihood of future development within the balance areas of the Drury 1 precinct area will contribute to the existing construction activities within the local landscape.
- Generally low visual amenity through the existing Drury commercial/industrial area;
- Elevated bridge sections are visually contained within the local street composition. Wider views shafts were tested along Great South Road (through the Hingaia Stream riparian corridor), but views to the bridge crossing are intercepted by foreground buildings and trees.
- The existing Waihoehoe Road West carriageway and NIMT crossing are already dominant elements within the visual landscape, and visual amenity is relatively low within the industrial landscape.

Therefore, visual effects for transient viewing audiences will be low to moderate low and visual effects for private viewing audiences are likely to range from moderate-low to moderate during construction.

16.5.3 Operational Effects

16.5.3.1 Natural Character Effects

Jesmond Road FTN Upgrade Section

Potential effects on natural character arise from localised earthworks and limited vegetation clearance within riparian areas associated with the proposed culvert outlets (which will be subject to a future resource consent phase). As the detailed design progresses and resource consents are sought, the full extent of proposed works and impacts on indigenous vegetation will be determined. It is anticipated that reinstatement and mitigation planting at the completion of works will assist with mitigating any landscape and natural character effects arising from the culvert outlets. Mitigation measures are outlined in section 16.5.4.

On the basis of the above (allowing for future landscape mitigation of riparian areas), adverse natural character effects are likely to be very low.

Bremner Road FTN Upgrade Section

The proposed two lane extension to the southern side of the existing Ngakoroa bridge is anticipated to bring about localised landform modification and subsequent clearance of wetland, riparian and terrestrial vegetation within the construction footprint of the Project works (subject to future any resource consent approvals required). These types of impacts have the potential to temporarily or permanently alter the natural character of waterbodies by heightening the impression of further human modification. Adverse natural character effects are likely to be moderate-low within the Ngakoroa Stream environment, acknowledging the heightened levels of natural character associated with the Project area and wider coastal environment.

Landform modification and very limited vegetation loss (also subject to future resource consent approvals) is anticipated for the minor tributaries of the Ngakoroa and Hingaia Streams. Given that these features are already heavily modified by rural and industrial land use (respectively), potential natural character effects are anticipated to be very low within these two hydrological environments.

Reconstruction and raising of the Ngakoroa Stream bridge is likely to have a positive impact on the long-term natural character values of the Ngakoroa and Hingaia Streams, by reducing flood risk (flooding events can have adverse impacts on natural character forming processes).

As the detailed design progresses and resource consents are sought, the full extent and type of indigenous vegetation affected (within the Ngakoroa and Hingaia Stream environments) will be determined. Given the existing level of modification within the stream environments and the success of recent restoration efforts throughout the Ngakoroa catchment, reinstatement and mitigation planting at the completion of works is expected to adequately mitigate the landscape and natural character effects arising from this Project. Mitigation measures are outlined in section 16.5.4.

Waihoehoe Road West FTN Upgrade Section

There are no natural character effects associated with the construction of the Waihoehoe West section.

16.5.3.2 Visual Amenity Effects

Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to proximity to the corridor. These include:

- For existing properties set back from the Project area, the visual amenity effects will be a small incremental increase in existing effects from the road corridor.
- While low, residual adverse visual effects are anticipated for some private residential and industrial properties, whereas a direct result of the Project, viewers may experience some level of material change to the visual composition and amenity of the road corridor.
- Impacted properties may experience heightened visual amenity and residential character effects as a direct result of driveway regrading, potential loss of yard space and by the greater proximity of the carriageway and footpaths/cycleways to private dwellings however, it is considered appropriate when viewed in the context of a medium-high density urban environment in the long term.
- Public viewing audiences will continue to engage with a similar transport environment, within the backdrop of an increasingly urban neighbourhood character. Over time visual amenity and appeal for users will improve, due to an improved streetscape design, maturing street trees and berm plantings, and greater accessibility to active modes of transport.

Based on the above, visual effects within the Project area are likely to be very low to low and moving to beneficial for public viewing audiences through the operational phase of the Project. For the private viewing audience, the visual effects are likely to be moderate-low to low, reducing over an extended period of time.

16.5.3.3 Landscape Character Effects

The principal elements of the Project (including the road form, driveway regrading, batter slopes, stormwater wetlands and structures) will permanently alter the character of the existing road corridors, greenfield areas and adjacent landscape. It is recognised that existing rural character within the Jesmond Road, Jesmond to Bremner Link and Waihoehoe Road West will likely change to a more urban area prior to construction of the Project as proposed private plan changes are already signalling urbanisation of the area. Additionally, further progress of the Auranga Development will occur which might include additional enhancement to the Ngakoroa Esplanade and stream adjacent to the Drury Sports Complex. The Drury-Ōpāheke industrial area and open space areas within the Bremner Road section are not anticipated to change from a land use perspective which means the Hingaia Stream is likely to remain in its existing modified state for the foreseeable future.

Within the proposed designation, broad areas of street-side vegetation are proposed to be removed through the Project works. While most of this vegetation is not considered significant on an individual basis, collectively it contributes to the visual amenity of the road corridor and provides a degree of screening and privacy for properties adjacent to the road. If not mitigated, removal of this vegetation will have adverse effects on the landscape character of the existing road corridor. Mitigation measures are outlined in section 16.5.4.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport, reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features are expected to improve landscape and urban amenity within the future corridor. The Project is anticipated operate within the context of increased urbanisation as adjacent FUZ land is progressively live-zoned and urbanised. On that basis, the magnitude and nature of landscape change proposed by the Project is considered to accord with that which will occur throughout the localised landscape over time.

Based on the above considerations and recommended mitigation measures, adverse landscape character effects are assessed as very low.

16.5.4 Mitigation Measures

To address the modification to the landscape arising from the Project, prior to construction, an Urban and Landscape and Design Management Plan (ULDMP) will be prepared. The ULDMP will include the following matters which address the principal elements of the Project that are likely to give rise to temporary and permanent adverse effects on landscape character, natural character and visual amenity:

1. **Construction and site compound areas** – reinstate these areas by removing any left-over fill and shaping ground to integrate with surrounding landform. Reinstate with grass at the completion of works.
2. **Bridges and structures:** demonstrate visual integration and sense of place considerations for the proposed bridge structures over Ngakoroa Stream and tributary CH600, SH1, Hingaia Stream and the NIMT. This will involve relating the structures to the character and scale of surrounding future urban form and proposed landscape treatments, with potential for the Ngakoroa bridge to celebrate the gateway context and associative values of the landscape through architectural design.
3. **Active transport connectivity:** investigate opportunities to integrate active transport facilities with existing and future open space within the proposed designation, including Ngakoroa esplanade reserve, Drury Sports Complex, the proposed central park (within the Auranga Development at CH600), Hingaia esplanade reserve and future open space proposed within the Green-Blue Network.
4. **Planting design details:** landscape design and planting design details will be prepared for the Project that demonstrate the following:
 - a. Street trees along the full length of the proposed corridor in conjunction with shrubs and ground cover species appropriate for the use within stormwater treatment areas and berms. Species and tree stature should be selected to correspond with adjacent land use and blue-green areas, in accordance with the 9 key principles outlined in the Auckland's Urban Ngahere (Forest) Strategy,
 - b. Identification of existing trees and vegetation that will be retained. Where practicable, mature trees and indigenous vegetation should be retained

- c. Identification of areas where top soil may be re-used within the project area
- d. Reinstatement planting within private property boundaries in consultation with property owners
- e. Shape and treatment of fill slopes and residual land, to integrate with adjacent land use and areas where the Project intersects with the proposed Blue-Green Network.
- f. Stormwater wetland design and planting
- g. Integration of Mana Whenua preferred design principles in relation to planting, structures and hard landscape elements.
- h. Site preparation, implementation and maintenance requirements for all planting typologies.

The general location of recommended mitigation measures is illustrated in Appendix 1. Landscape Plans and Images: Maps 18-25 within the Assessment of Landscape and Visual Effects (Volume 4). The proposed mitigation measures will, where practicable, be integrated with any revegetation requirements of future resource consent processes. Opportunities for integration of landscape mitigation works with the proposed Blue-Green Network, indicated by the Drury – Ōpāheke Structure Plan will also be considered.

16.5.5 Summary of Landscape and Visual Effects

Overall landscape and visual effects range from very low to moderate for the construction phase and very low to moderate-low for the operational phase. Future development of FUZ areas on adjacent land will substantially change the scale and character of the adjacent landscape as experienced from within the road, and will absorb the landscape and visual changes proposed within the Project.

With the proposed mitigation measures in place, potential adverse effects on landscape, natural character and visual amenity (implemented through an ULDMP) will be addressed, and the proposed features and scale of the Project will appropriately integrate into the existing and future landscape.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport (improving connectivity), reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features and the resulting streetscape are expected to improve landscape and urban amenity within the future corridor.

16.6 Ecology

The Assessment of Ecological Effects, included in Volume 4, assesses the potential ecological effects of the Project on the environment, where these relate to ecological values that are subject to district plan controls in the AUPOIP. Those ecological matters that trigger Regional plan and/or Freshwater NES resource consent applications will be assessed and consents sought at a later date for the Project, with any required mitigation assessed fully at that time. However, potential ecological effects of the activities likely requiring resource consents and/or wildlife permits at a later stage of the Project were considered in the report to inform alignment and design options and to inform the proposed designation boundary for the Project. The ecological assessment of effects follows the Environment Institute of Australia and New Zealand (EIANZ) Guidelines. These were used to assess the ecological value of identified ecological features and evaluate the magnitude and level of potential effects that the Project could have on these features. The report should be read in conjunction with the summary set out below.

16.6.1 Positive Effects

A positive ecological effect currently anticipated as a result of the Project is a net increase in green infrastructure and associated habitats within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands.

16.6.2 Construction Effects

16.6.2.1 Summary of Potential Construction Effects, Prior to Mitigation

The proposed construction activities have the potential to cause adverse on ecological features within or adjacent to the Project area, without mitigation. Potential construction effects that relate the activities authorised by the proposed designation are:

- Vegetation removal leading to the permanent loss of terrestrial habitats; and
- Construction activities causing light, noise and vibration leading to the disturbance and displacement of indigenous fauna.

16.6.2.2 Magnitude of Construction Effects

The magnitude of construction effects listed above on affected ecological features are discussed in the following sections.

Terrestrial Habitats

A number of trees and groups of trees were identified within the Project area which are subject to district plan controls and will be removed or affected due to the Project. These are outlined in the Assessment of Ecological Effects and Assessment of Arboricultural Effects, both provided in Volume 4. With the exception of the large pine trees in the Drury Sports Reserve, the majority of trees/vegetation in the Project area that are protected under the district plan provisions are young or isolated and exotic. However, these trees/vegetation do provide important vegetated habitat in a predominantly urban landscape for fauna and the support of ecosystem services.

As outlined in the Assessment of Landscape and Visual Effects, there will be a net increase in green infrastructure and associated habitats within the Project area as a result of the Project, including street trees, berm and stormwater plantings and planted stormwater wetlands. This is considered to be embedded mitigation.

Overall, the vegetation being removed is considered to be of low ecological value botanically, but could provide potential habitat for common native birds and lizards and potentially bats. Bats were not detected during the Project surveys, however, they have been recorded in desktop records within 4 km of the Project, in the Hunua Ranges. Although the habitats are considered to be of low value for bats, the potential presence of roosting bats during removal should not be discounted in the Pine trees to be removed from the Drury Sports Complex. The trees at this location have been identified to have moderate bat roost potential and would require management under the Wildlife Act (1953).

Any nesting native birds or native copper skink that could be injured during tree or vegetation removal will also require management under the Wildlife Act (1953).

Overall, the scale and type of habitat loss is not substantial and can be replaced in the short term. As such the magnitude of effect will be low.

Species

Bats

Bats have not been detected within or adjacent to the Project area therefore, it is unlikely that construction activities (including light spill, noise and vibration) would result in the disturbance or displacement of individuals or their roosts because they are likely infrequent visitors to the area. As such, the magnitude of effect on bats is considered to be low.

Birds

Noise, vibration and lighting disturbance caused by construction activities could potentially displace indigenous birds from suitable nesting and foraging habitat within and adjacent to the Project area.

Coastal wetland bird habitat:

Many of the coastal bird species which occur or are likely to occur within the Ngakoroa Stream wetlands adjacent to the Project area are Threatened or At Risk species. Habitats used by these birds include the open water, intertidal mudflats and coastal wetland habitats. The majority of coastal and wetland birds such as gull, shag and tern species use the stream corridor for foraging but have no known breeding habitat or specific roost sites. However, the Sea rush and oioi upper estuarine zone and Oioi restiad rushland/reedland directly adjacent to the Project area provides high value habitat for banded rail, fern bird and spotless crane (all At Risk - Declining), which may use these areas for foraging and breeding.

Figure 16-2 identifies the proposed bridge site lay down areas (red) and bridge footprint (blue) in relation to the high value bird habitat. The birds identified above are unlikely to nest within the Project area, as the habitat directly within the construction footprint is suboptimal due to the existing road infrastructure and has degraded due to surrounding development. Temporary bridge staging is however likely to encroach into high value habitat and therefore potential adverse effects will need to be managed to avoid adverse effects. The disturbance caused by construction noise, vibration and lighting directly adjacent to breeding habitat also has the potential to adversely affect the breeding success of these At Risk species.

The locations of the proposed bridge site lay-down areas are largely unavoidable as an all-weather construction yard will be required for bridge construction and staging will be required from the southern side of the bridge. The construction compound will house a bridge construction satellite office construction plant, equipment and materials. Typically, a 20 m wide temporary accessway will be required next to the bridge footprint to allow for the temporary staging, including the construction and dismantling of existing and new bridges. During construction of the Project, night works may be required and site compounds are likely to be lit overnight.

Existing buffer vegetation, such as exotic scrub, exotic treeland and planted vegetation (see Figure 16-2) occur within the Project area. Although the vegetation is unsuitable for breeding At Risk – Declining wetland birds, these habitats buffer for adjacent habitat from existing disturbance and will also buffer disturbance from construction if retained. Where practicable, e.g. along the both banks of Ngakoroa Stream, there is an opportunity to retain these vegetation buffers during construction by creating wetland setback buffers. Where removal of buffer vegetation is unavoidable, e.g. bridge staging areas, this should be reinstated and restored following construction where practicable, with native wetland and coastal scrub planting.

Background noise and lighting is likely to increase with urbanisation of the FUZ areas surrounding the Ngakoroa Stream. Construction disturbance caused by the Project to breeding birds will be localised to areas of the stream adjacent to the bridge, but is a key concern. Birds are sensitive to disturbance from light, noise and vibration, which may cause displacement and nest abandonment if construction were to coincide with the breeding season (September to February).

Overall, the magnitude of effect of the Project on the coastal habitat used by the local bird population within the immediate vicinity of the Ngakoroa Stream is considered to be moderate. This is based upon the regional importance of some of the affected bird species, the relative frequency of construction effects and the reasonable likelihood of those effects to occur on the local coastal wetland bird population.

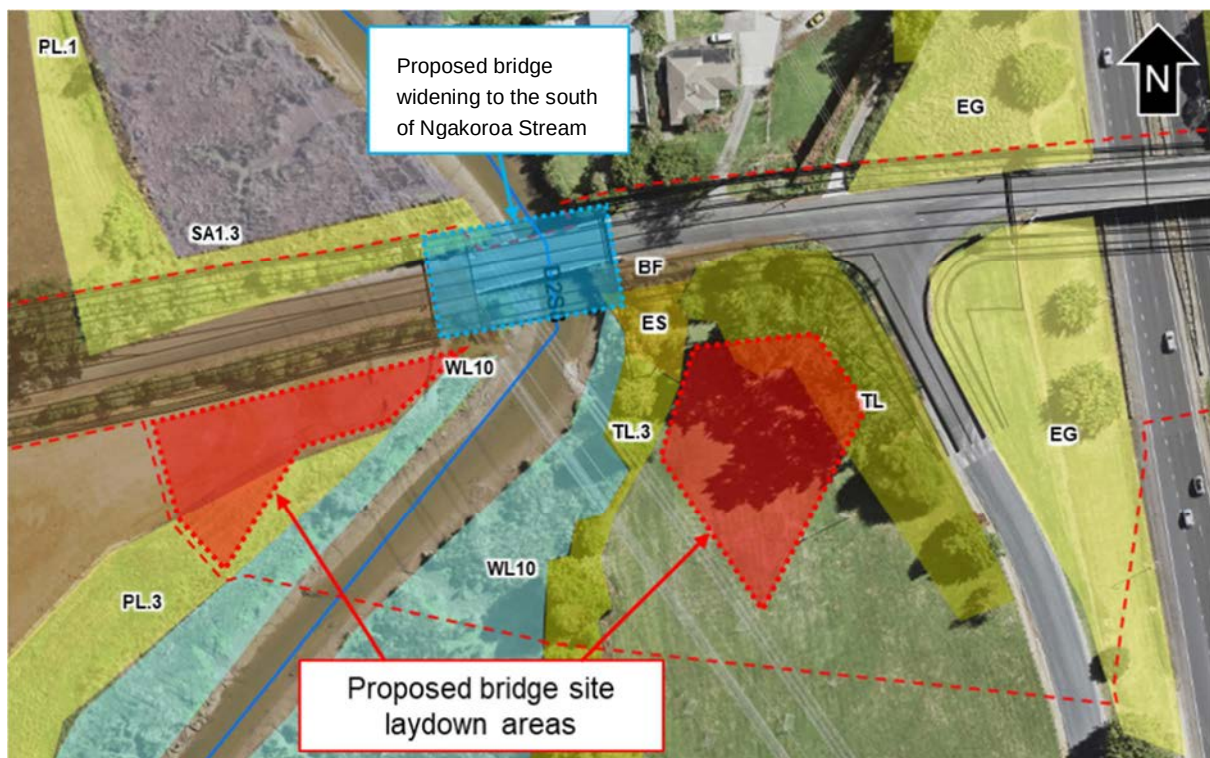


Figure 16-2: Showing the Sea rush and oioi upper estuarine zone (SA1.3) to the north of Bremner Bridge and Oioi restiad rushland/reedland (WL10) to the south. The new bridge footprint is highlighted in blue crossing the Ngakoroa Stream the proposed bridge site laydown areas highlighted in red. 20 m wide temporary staging areas will likely be required either side of the bridge, which could cause temporary effects to coastal wetland bird habitat

Freshwater wetland bird habitat:

Although not observed at the time of survey, the New Zealand dabchick (At Risk- Recovering) and spotless crane (At Risk – Declining) may use the online ponds directly adjacent to Jesmond Road for foraging habitat. They are unlikely to breed at this locality due to lack of suitable vegetation, caused by livestock grazing. Construction effects including noise, vibration and light may temporarily displace these species in habitat adjacent to the road, however given the availability of contiguous habitat that will not be affected by the Project activities, the magnitude of effects are low.

Forest bird habitat:

The birds which occur in the remainder of the Project area are common in the local area (modified agricultural land, exotic vegetation and exotic wetland) and habitat is considered to be of low

ecological value. These birds are adapted to human modified environments, and suitable foraging habitat of equal or better quality will remain adjacent to the Project area during construction. Therefore, the magnitude of effects from the Project on the local bird population is considered to be low.

16.6.2.3 Level of Construction Effects

Table 16-3 below summarises the overall level of ecological effects for each key ecological feature and fauna group. Section 16.6.4.1 discusses the mitigation measures required to minimise any residual effects associated with construction activities.

Table 16-3: NoR D2 Summary of potential ecological effects (prior to mitigation) during construction based on ecological value and magnitude of the effect

Ecological Feature	Ecological Value	Magnitude of Construction Effects	Level of Ecological Effect (prior to mitigation)
Terrestrial habitat – district matters	Low	Low	Very low
Bats	Low	Low	Very low
Birds – coastal wetland	High	Moderate	High
Birds – forest habitat	Low	Low	Very low
Birds – Freshwater wetland	Moderate	Low	Low

The assessment identified that the level of potential ecological effects from the construction of the Project on the majority of ecological features are very low or low with the exception of coastal wetland birds, where the level of effect is High. In accordance with the EIANZ Guidelines mitigation measures are proposed for those effects which are moderate and above and as such mitigation is required for the Project construction effects on coastal wetland birds. These measures are outlined in Section 16.6.4.1.

16.6.3 Operational Effects

16.6.3.1 Summary of Potential Operational Effects, Prior to Mitigation

The Project involves upgrading an existing road from two lanes to four and although some adverse effects may occur from the current baseline, many operational effects such as, fragmentation and noise and lighting are likely to be pre-existing effects of the operation of the existing road. In general, potential operational effects from the Project on indigenous fauna that relate to the activities authorised by the proposed designation are:

- Loss in connectivity to indigenous fauna (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and

- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

16.6.3.2 Magnitude of Operational Effects

Bats

As bats have not been recorded within or adjacent to the Project area, it is considered unlikely that the operation of the Project (including noise and vibration from traffic and light from the road) would result in the disturbance or displacement of individuals or their roosts. As such, the magnitude of effect on bats is considered to be low.

Birds

The potential operational effects from the Project from noise and vibration are likely to be reduced from the existing baseline due to improved bridge design and reduced speed limits along the widened road corridor.

Additionally, any coastal wetlands birds currently utilising the Ngakoroa Stream are potentially habituated to existing light levels or may already avoid the existing corridor. Furthermore, potential gradual incremental changes in habitat, caused by surrounding urbanisation of the Project area, such as increased light spill into the high value wetland areas, could, discourage nesting and therefore reducing viability of native fauna persisting over time.

As operational effects from the road are likely to reduce in regard to noise and vibration and assuming that the future operational lighting effects are designed to ensure the effects on coastal birds do not change (or preferably, are improved), then the magnitude of operational effects from the Project on coastal birds is considered to be low. Where practicable, lighting along stream corridors should be minimised as described above, to reduce potential effects on coastal wetland birds.

The forest bird species present in the Project area are common, not threatened and adapted to use habitats modified by humans. As such, the magnitude of effects from the Project on forest birds is considered to be low.

Although not recorded at the time of survey, the At Risk New Zealand dabchick (At Risk – Recovering) and spotless crane (At Risk – Declining) may forage in the artificial ponds adjacent to the Project area (Jesmond Road). Jesmond Road is currently unlit, and noise and vibration is likely to increase from the existing baseline along the upgraded road. Direct adverse effects on habitat for these species will be avoided. Although birds may be locally displaced due to increased disturbance, the habitat adjacent to the Project is unsuitable for key life stages such as breeding and suitable foraging habitat is available further downstream. Where practicable retaining or replanting the buffer of existing trees between this habitat and the Project will minimise overall disturbance. The magnitude of operational effects on freshwater wetland birds are therefore considered to be low.

Herpetofauna

Records of At Risk indigenous lizard have been identified in the wider landscape, but no suitable habitat was found within the Project area for these species. Suitable 'surrogate' habitat (exotic scrub, exotic forest edge and rank grassland) was identified within the Project area which could potentially support native (Not Threatened) copper skink.

Native lizards require vegetated corridors (such as riparian stream corridors) to facilitate natural dispersal. The Project generally includes upgrading existing roads and bridges with a new road proposed to the west of Auranga Road 1 within the Jesmond to Bremner link. Within this section a bridge is proposed over the unnamed stream which will maintain connectivity for these species where suitable habitat is retained. Therefore the Project is not considered to create any additional barriers to movement or dispersal of lizards. During detailed design/resource consent, opportunities should be sought to enhance/retain vegetated corridors under bridges or include ledges within culverts or under bridges to allow for lizard connectivity.

Native lizards are likely to be habituated to existing disturbance such as noise, vibration and lighting but the final design will ensure that these effects will not increase due to operation of the Project.

It is considered that the magnitude of operational effects on indigenous lizards will be low.

16.6.3.3 Level of Operational Effects

Table 16-4 below summarises the overall level of operational ecological effects for each key ecological feature and fauna group. The assessment identified that the level of ecological effects from the operation of the Project on all of the ecological features were very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required to address the Project operational effects.

Table 16-4: NoR D2 Summary of potential ecological effects during operation based on ecological value and magnitude of the effects

Ecological Feature	Ecological Value	Magnitude of Operational Effects	Level of Ecological Effect
Bats	Low	Low	Very low
Birds – coastal Wetland	High	Low	Low
Birds – forest	Low	Low	Very low
Birds – Freshwater wetland	Moderate	Negligible	Very Low
Herpetofauna	Low	Low	Very low

16.6.4 Mitigation Measures

16.6.4.1 Construction Effects

The only aspect that requires mitigation is construction activities on Threatened or At-Risk wetlands birds in the Ngakoroa Stream wetlands. The wetland habitats (associated with Threatened or At-Risk wetland birds) within and adjacent to the Project area, specifically wetland D2W5 associated with the Ngakoroa Stream will be resurveyed at the same time as resource consent approvals are sought in order to confirm the ecological value of the wetlands for Threatened or At-Risk wetland birds, whether the Project will or may have a moderate or greater level of ecological effect on Threatened or At-Risk wetland birds and their habitat, and whether mitigation measures detailed in this section are still required.

If the wetland bird survey confirms that the Project will or may have a moderate or greater level of ecological effect on Threatened or At Risk Wetland birds, construction activities and compounds will be planned to reduce noise, vibration and light effects on Threatened or At-Risk wetland birds. The following management controls are recommended to form the basis of a BMP.

- Where practicable, construction works should commence prior to the bird breeding season (September to February) in order to discourage bird nesting.
 - Prior to any construction works (including establishment of site yards) taking place within a 50m radius of the Ngakoroa wetlands a nesting bird survey of Threatened or At-Risk wetland birds should be undertaken by a SQEP. Surveys should be repeated at the beginning of each bird breeding season and following periods of construction inactivity.
 - Protection and buffer measures if nesting Threatened or At-Risk Wetland birds are identified within 50m of any construction area (including laydown areas). This could include:
 - A. a 20 m buffer area around the nest location and retaining vegetation. The buffer areas should be demarcated where necessary to protect birds from encroachment. This might include the use of marker poles, tape and signage;
 - B. monitoring of the nesting Threatened or At-Risk wetland birds by a Suitably Qualified and Experienced Person. Construction works within the 20m nesting buffer areas should not occur until the Threatened or At-Risk wetland birds have fledged from the nest location (approximately 30 days from egg laying to fledging) as confirmed by a Suitably Qualified and Experienced Person; and
 - C. minimising the disturbance from the works if construction works are required within 50 m of a nest, as advised by a Suitably Qualified and Experienced Person;
- A.
- Where practicable, a 10m wetland setback shall be created between the edge of the Ngakoroa Stream wetlands and the construction area (along the edge of the stockpile/laydown area). This should be achieved by retaining existing vegetation and/or additional planting with native coastal forest/riparian/wetland species (as appropriate). Signage or marker poles shall also be used to clearly delineate the wetland area to prevent encroachment.
 - Any light spill from construction areas into the Ngakoroa Stream wetlands should be minimised as far as practicable.

The BMP should be consistent with any ecological management measures to be undertaken in compliance with conditions of any regional resource consents granted for the Project.

If the mitigation detailed above were implemented it is considered that the magnitude of construction effects from the Project on coastal wetland birds within and adjacent to the Project area would be reduced to low.

16.6.4.2 Operational Effects

The assessment identified that the level of ecological effects from the operation of the Project on all of the ecological features were very low or low. In accordance with the EIANZ Guidelines, mitigation measures are only proposed where effects are moderate and above and as such mitigation measures are not required for the operational effects of the Project on ecology.

16.6.5 Summary of Effects on Ecology

Table 16-5 summarises the ecological values, magnitude of operational and construction effects and subsequent level of effect for each ecological feature for NoR D2. The construction and operation of the Project were assessed to have a negligible or low level of effect on the majority of relevant habitat and fauna species (bats, birds and lizards). However, the indigenous wetland habitat (D2W5) within and directly adjacent to the Project area has been highlighted for its potential importance to support a range of threatened and at risk wetland bird species. There is potential that during construction of the Project, the disturbance (noise, vibration and light) caused by activities within the construction areas and during the replacement of the existing Bremner Bridge could adversely affect breeding birds such as banded rail, fernbird and spotless crane. A BMP is therefore recommended to reduce the potential adverse level of effects of construction from moderate to low.

Table 16-5: Ecological values, magnitude of effect and level of effects summary table for NoR D2

Feature	Value	Construction prior to Mitigation		Construction with Mitigation		Operation prior to Mitigation		Operation with Mitigation	
		Magnitude	Level of Effect	Magnitude	Level of Effect	Magnitude	Level of Effect	Magnitude	Level of Effect
Terrestrial habitat (district matters)	Low	Low	Very low						
Bats	Low	Low	Very Low			Low	Low		
Birds – coastal wetland	High	Moderate	High	Low	Low	Low	Low		
Birds – forest	Low	Low	Very Low			Low	Very Low		
Birds – freshwater wetland	Moderate	Low	Low			Negligible	Very Low		
Herpetofauna	Low					Low	Very Low		

16.7 Arboriculture

The Assessment of Arboricultural Effects, included in Volume 4, assesses the potential effects of the Project on existing trees protected by the AUPOIP district plan and recommends ways of mitigating these effects. Any trees that trigger regional plan consenting requirements were considered to inform design and alignment choices, however effects on these trees will be further assessed and managed through a future resource consent process. Due to the changing nature of the environment and plan rules applicable to tree protection in rural vs urban land zoning, a detailed re-assessment of protected trees and their status under the AUPOIP will be undertaken closer to the time of construction. Potential effects on arboriculture during construction and operation of the Project and proposed mitigation measures are described in the following sections.

16.7.1 Positive Effects

Construction of the new road with road-side berms provides an opportunity to establish street trees within the new road environment. The establishment of street trees within the road corridor will provide opportunities for trees to exist over large portions of the road corridor where currently few exist.

16.7.2 Construction Effects

16.7.2.1 Jesmond Road FTN Upgrade Section

Within the Jesmond Road FTN Upgrade section, there is one group of trees protected under the district plan provisions. These are a row of Japanese cedar trees within the scheduled heritage extent of place for Aroha Cottage (201 Jesmond Road). The trees are likely to have no historical value due to the cottage being relocated to the site. If the trees remain in the future, it is likely they will be able to be retained and this should be investigated at detailed design.

A number of good quality trees within the existing road reserve provide amenity to the rural road and may contribute other functions, such as stormwater amelioration and soil erosion protection. The loss of these trees will contribute to adverse effects on the immediate local environment.

16.7.2.2 Bremner Road FTN Upgrade Section

The Bremner Road FTN Upgrade will result in the removal of trees protected by district plan provisions on open space land and in the road. Works may also occur in the root zone of trees protected by the district plan provisions. This includes:

- 20 trees in the Drury Sports Complex
- 22 individual trees and one group of trees in the road reserve
- Two trees within St John's Church HHEP

Drury Sports Complex

Protected trees are required to be removed at the northern end of the Drury Sports Complex, where earthworks are required for the bridge over Ngakoroa Stream. There are adverse effects from removing these pine trees in particular as they are mature and large. However, these trees have a short useful life expectancy and low arboricultural value generally.

Adverse effects on other trees in the Drury Sports Complex may be able to be avoided through implementation of tree protection measures as outlined in section 16.7.4.

Saint John's Anglican Church

Trees within the Saint John's Anglican Church historic heritage extent of place overlay are protected by the District Plan provisions. While the 'extent of place' overlay has been avoided by the proposed designation the rootzone of these trees may be affected by the works. Protection of these trees according to the recommendations of a Tree Management Plan will be required as a condition of the proposed designation to avoid adverse effects on these protected trees during the construction.

Street Trees and Hingaia Open Space Trees

Protected trees are also present on the unformed road and open space zoned land around Hingaia Stream, where the new road and bridge alignment require tree removal. These trees are likely to be removed for the works. The trees here are generally low quality.

16.7.2.3 Waihoehoe Road West FTN Upgrade Section

A group of three protected English oak trees on the approach to the Waihoehoe Road rail bridge contribute significant amenity values to the town centre of Drury. It is likely that the trees will be impacted by the construction of the bridge over the NIMT rail line. The effects on these trees from construction activities in close proximity may mean that the trees require removal (to be determined at detailed design). The removal of these trees would have adverse effects that will require mitigation through the Tree Management Plan detailed in section 16.7.4.

16.7.3 Operational Effects

Once the road has been constructed, no further effects on trees are anticipated. Ongoing maintenance of street trees and trees retained adjacent to the road corridor is a standard operational requirement that does not generate adverse environmental effects. Street tree planting will have positive effects (as discussed in section 16.7.4) as it will result in more trees in the public realm and an enhanced road environment in the long term, which will be positive effects.

16.7.4 Mitigation Measures

As a proposed condition of the designation, a Tree Management Plan will be developed prior to construction to identify the existing trees protected under the District Plan, confirm the construction methods and impacts on each tree and detail methods for all work within the rootzone of trees that will be retained. The Tree Management Plan will include:

- Confirmation that protected trees identified in the Assessment of Arboricultural Effects still exist;
- Advice on how the design and location of works can avoid, remedy or mitigate effects on the existing trees;
- Recommended planting to replace protected trees that require removal;
- Establishing tree protection zones and specifying tree protection measures such as protective fencing, ground protection and physical protection of roots, trunks and branches;
- Detailing methods for all work within the rootzone of trees that are to be retained in line with appropriate arboricultural standards.

- Where good quality trees in the road reserve are identified for removal consideration of tree transplanting will be included in the Tree Management Plan. An assessment of the quality of the trees and the feasibility of transplantation will form part of the plan.

The effects of tree loss can be mitigated by comprehensive planting within berms in the new road layout. Replacement planting will be decided through a planting plan for the Project under the ULDMP. The ULDMP will also include methodologies to establish new trees within the road reserve, including creation of quality below ground environments, correct planting methods and appropriate maintenance. Replanting of the stream embankment and road reserve will mitigate potential effects on amenity, ecology, stormwater and land stability.

The Tree Management Plan will be limited to the identification of those trees identified in the Arboricultural Assessment as currently protected under the District Plan, as trees protected under Regional Plan provisions will be addressed as part of a future resource consent process.

Replacement planting procedures should be developed with ecological input for the replacement of trees (on open space and roads) in the riparian margin of the Hingaia Stream and Ngakoroa Stream embankments.

16.7.5 Summary of Arboricultural Effects

Relatively few protected trees within the proposed designation footprint will need to be removed. Those trees protected by the district plan provisions are within open space land, historic heritage extent of place overlays and in the road reserve. This will reduce the tree cover at individual locations and will result in loss of the many functions and benefits that the trees provide. The implementation of a Tree Management Plan will address construction methodologies and mitigation measures for works affecting all protected trees that exist at the time of construction to avoid and mitigate adverse arboricultural effects. The effects of tree loss can be mitigated by comprehensive planting within the Project area including within the berm, open space and riparian margins such that long-term effects, once replanting matures, are considered to be minor.

16.8 Natural Hazards - Flooding

The Assessment of Flood Hazard Effects, included in Volume 4, assesses the potential flood hazard effect of the proposed transport corridor during its construction and operational phases on the flood extents and levels in the surrounding area. Effects of stormwater quantity, quality and effects on streams will be considered as part of a future consent process. This assessment focusses on flood hazard effects which is a district plan matter under the AUPOIP.

16.8.1 Positive Effects

The proposed Jesmond Road upgrade provides the opportunity to upgrade existing culvert capacities where the flood model identifies existing and/or future flooding of properties. Overland flow currently crosses Jesmond Road in several locations and it is expected that the works will include upgrades to better manage overland flow across the road.

The new bridge over Ngakoroa Stream on Bremner Road decreases the flooding upstream by 0.16m due to its wider span.

The new Hingaia Stream Bridge will provide significantly reduced upstream flood risk and improved freeboard and resilience. The existing Norrie Road Bridge over Hingaia Stream overtops during a 100 year rainfall event. Existing flood levels upstream of the bridge are about half a metre higher than downstream due to the head losses from the bridge deck obstructing the flow. The existing 100 year ARI flood plain extends to the surrounding properties and Firth Street and floods a number of buildings. Even in the 10 year rainfall event, a number of buildings are flooded. The Bremner Road FTN Upgrade section crosses the Hingaia Stream in a different location which creates the opportunity to design a new bridge above flood levels and allow for a minimum freeboard of 0.6 m between the 100 year flood level and bridge soffit to provide a 100 year ARI level of flood freeboard to traffic. With the removal of the Norrie Road Bridge flood levels are reduced by 0.34 m upstream and 0.07 m downstream in the 100 year rainfall event, thereby reducing the flood risk to a number of buildings and roads.

Water levels for the Hingaia upstream, at the rail crossing at Flanagan Road, are 9.59 m and 9.49 m for the pre and post-Project development scenarios. The new bridge over Hingaia Stream results in a decrease in water depth of 100 mm and therefore has a positive effect on the existing flooding affecting the rail transport corridor.

16.8.2 Construction Effects

16.8.2.1 Jesmond Road FTN Upgrade Section

The main risks associated with flooding during construction is a combination of insufficient temporary drainage or blockage of overland flows close to adjacent buildings, namely:

- Earthworks associated with raising the road low point at about chainage 2100 near 16 Jesmond Road
- Earthworks associated with raising the road low point at about chainage 2700, constructing Jesmond Wetland 1 and insufficient downstream drainage near 125 Jesmond Rd
- Earthworks associated with wetland 2 potentially blocking the overland flow paths at about chainage 3160

A construction yard and stockpile site are proposed on 256 Jesmond Road which is outside flood plains and major overland flow paths. It therefore does not present increased flood hazard risks.

Various culverts need to be installed or upgraded. There could be increased flood levels or new flow paths created during construction if adequate flow diversions are not provided.

Overall the potential flooding effects are considered to be relatively minor, except where there are nearby habitable buildings close to existing flooding at 125 Jesmond Rd.

16.8.2.2 Bremner Road FTN Upgrade Section

The construction of this section includes four new bridge crossings (three over streams, one over SH1) and removal of the existing Norrie Road Bridge crossing over the Hingaia Stream. These construction activities will require diversions and flow management to mitigate flood hazard effects.

The new bridges over the unnamed stream, Ngakoroa Stream and Hingaia Stream will likely require temporary staging platforms for piling rigs and cranes to be constructed on the banks and possibly over the stream bed. The existing Norrie Road Bridge will be closed at the beginning of the work and used for construction traffic until the completion of the new Hingaia Stream Bridge.

The main risks associated with flooding during construction will be a combination of insufficient temporary diversions or constriction of stream flows, namely:

- Earthworks associated with creating the new road (in the Jesmond to Bremner link) low point and bridge at about chainage 600
- Earthworks associated with forming the western Ngakoroa Stream Bridge abutments and/or temporary staging causing a constriction to Ngakoroa Stream flows
- Earthworks associated with forming the Hingaia Stream Bridge abutments and/or temporary staging causing a constriction to Hingaia Stream flows, particularly prior to removal of the existing Norrie Road Bridge

Temporary platforms may be constructed on the banks and over the bed using driven steel piles or the existing bridge could be used as a platform. Piling rigs will sit on top of the platforms to construct the bridge piers.

These platforms could cause a constriction to flood flows and cause a backwater effect, raising upstream flood levels. The new Ngakoroa Stream Bridge has an overall span of 40 m and the new Hingaia Stream Bridge has an overall span of 70 m which is long enough to bridge over the stream bed and avoid effects from siting piers on the stream bed and channel. This avoids the potential for diverting flow in the deepest and fastest flowing section of stream, which consequently reduces the risk of erosion and blockage of the main stream flow path during construction.

No properties that may be impacted by flooding have been identified upstream of the Ngakoroa bridge crossing. Several industrial properties are sited in a flood plain upstream of the Hingaia Stream Bridge crossing. The combination of a temporary constriction at the bridge and an extreme flood means there is conceptually an elevated risk of flooding to those properties for the duration of the temporary works being in place.

A number of construction yards are proposed along the corridor and in general these are outside floodplains so no adverse effects on flooding are expected. A construction yard proposed on the northern side of the Hingaia Stream is within the 100 year flood level, which may cause a constriction to flood flow.

16.8.2.3 Waihoehoe Road West FTN Upgrade

A tributary of Hingaia Stream runs 200 m to the south of Waihoehoe Road and a tributary of Waihoehoe Stream 700 m to the north of the road. No major construction effects on these existing streams and overland flow paths are expected as Waihoehoe Road West section is located on a ridge, with no culvert or bridge crossings for either of these streams, tributaries or their associated overland flow paths.

A construction yard and stockpile site are proposed at the corner of Great South Road and Waihoehoe Road roundabout which is outside flood plains and major overland flow paths. It therefore does not present any increased flood hazard risks.

Overall negligible risks associated with flooding during the construction phase have been identified.

16.8.3 Operational Effects

Operational effects have been assessed through flood modelling at key crossings to consider the flooding effects. The assessment also considers the extents of flooding on existing properties due to the Project.

16.8.3.1 Jesmond Road FTN Upgrade

Operational effects have been assessed through flood modelling to consider the flooding extents at existing and new culvert crossings.

Existing and new culverts

Based on the indicative design, the results for the 100 year ARI post-Project development scenario show some increase in water levels at the existing and new culverts (generally less than a 0.50m increase). The increases in water levels are due to raising the vertical alignment of the road and the existing overland flow path having to build up more depth upstream before it overtops the road.

The main potential effect of the road upgrade is to change the level of the overland flow running across the road due to the increased height of the road at the sag point on the vertical transport corridor, which then changes the location of the overland flow on the downstream side.

The increase in water level could affect development potential as both sides of Jesmond Road are zoned FUZ and a range of residential typologies are expected in the future.

Property Assessment

From modelled results, the properties where flooding levels have changed due to the potential changes to the road's vertical alignment are listed in the table below. These changes in flood levels are considered potential effects as the road levels are only preliminary and there are a number of ways that they can be mitigated.

Table 16-6 Properties where flooding levels have changed from the Project

Property address	Affected area	Water level difference for 100 year post minus pre-Project development	Assessment
64 Jesmond Road, Drury	Parking area, no habitable floors. FUZ	+ 210 mm	Increase in flood level 50mm to 500mm; minor effect.
16 Jesmond Road, Drury	Rural land, no habitable floors. FUZ	+ 560 mm	Due to change in road sag point level
119, 125, 131 Jesmond Road, Drury	Building / houses. FUZ	- 0 mm	Decrease in flood level at culvert outlet. But levels may increase nearby - note berm levels and wetland require an overland flow path and channel to manage potential effects.

Property address	Affected area	Water level difference for 100 year post minus pre-Project development	Assessment
84 Jesmond Road, Drury	Driveway. FUZ	+ 00 mm	Increase in flood level 50mm to 500mm; minor effect.
Flooding area in rural land opposite 125 Jesmond Rd	Rural land, no habitable floors. FUZ	+ 250 mm	Increase in flood level 50mm to 500mm; minor effect
201 Jesmond Road, Drury	Driveway, buildings/houses sited at RL 17.5 to 18.5m. FUZ	+ 90 mm	Increase in flood level 50mm to 500mm; minor effect

16.8.3.2 Bremner Road FTN Upgrade

Operational effects have been assessed through flood modelling the three bridges that cross streams.

Bridge crossing the unnamed stream (new section of road within Jesmond to Bremner Link)

There is a potential increase in flood levels greater than 0.5m and creation of a flood prone area if a culvert was used for a stream crossing of the proposed transport corridor at chainage 600 on the link road. A bridge is recommended at this location as the upstream catchment is 115 ha (generating large flows) and a culvert alternative would be long and large (with consequent ecological effects).

Bremner Road Ngakoroa Bridge

The bridge that is currently in place has no freeboard and will overtop during an extreme rainfall event. The existing Bremner Road Bridge over the Ngakoroa Stream is proposed to be replaced as part of the SH 1 widening works for Waka Kotahi's Papakura to Drury South project (a NZUP Project). In the future, when Bremner Road is upgraded as part of the Jesmond to Waihoehoe Road West FTN Upgrade, the existing bridge will either be widened or a new bridge constructed alongside it to provide two additional lanes. However, existing Transpower overhead 220kv lines limit how much the vertical alignment of the bridges can be raised to address flood risk. The bridge proposed as part of NoR D2 will be higher than the existing one and have improved flood resilience with less frequent overtopping on the western approach and have a smaller part of the bridge support structure submerged. Flood flow velocity is relatively low at the bridge and by using a span of 40m for the bridge there will be a 160 mm drop in flood levels upstream during the 100 year ARI rainfall event.

Hingaia Stream Bridge

The proposed Hingaia Stream Bridge is within the Hingaia catchment just downstream of the existing Norrie Road Bridge. The results for the 100 year ARI pre-Project development scenario show that the water level upstream of the existing Norrie Road Bridge is RL 8.20 m and RL 7.74 m downstream - with flooding extending over the industrial properties and nearby streets with depths ranging between

0.5 m and > 2 m. The Norrie Road Bridge top deck itself overtops by 2 m and forms a significant obstruction to flood flows. The existing bridge also overtops in the 10 year rainfall event.

The proposed Hingaia Stream Bridge provides a significant improvement on the existing scenario by improving upstream flood levels and resilience. In general, the 100 year event is reduced by some 0.25 to 0.3m upstream of the new crossing up to Great South Rd. At Great South Road, the depth of flooding overtopping the road reduces by about 0.13 m. In the 10 year event, the depth of flooding is 30 mm lower than the existing case.

The land adjacent to the crossing is zoned Business – Light Industry Zone. The decrease in the height of flooding in this area benefits existing properties and provides a safer environment for the public and business owners by reducing the level and hence the consequences of extreme floods.

The Bremner Road/Firth St intersection is subject to flooding in both pre and post development scenarios for the 10 and 100 year ARI rainfall events.

Property Assessment

The properties where flooding levels have changed due to the potential changes to the road's vertical alignment are listed in the table below. These changes in flood levels all show a decrease and result in positive effects.

Figure 16-3: Properties where flooding levels have changed from the Project

Property address	Affected area	Water level difference for 100 year post minus pre-project development	Comments
38 Burberry Road, Drury	Rural land, house sited at RL11.5 to 12.0m. FUZ	-20mm	Decrease in flood level; positive effect
16 Norrie Road, Drury	Industrial buildings sited at RL 6.5 to 7.0	-240mm	Decrease in flood level; positive effect
Upstream of Great South Road Bridge	Undeveloped land, and industrial properties at gl RL 7.0 to 8.0m.	-90mm	Decrease in flood level; positive effect
54 Flanagan Road, Drury	Industrial, commercial buildings. Future rail station.	-1mm	Small decrease in flood level; positive effect
108 Flanagan Road, Drury	Open space both sides of Hingaia stream	-20mm	Small decrease in flood level; positive effect

16.8.3.3 Waihoehoe Road West FTN Upgrade

There are no culvert or bridge crossings over streams on Waihoehoe Road West and therefore will be no effects arising from constrictions or diversion of flow paths. The upgrade of Waihoehoe Road West to a four lane FTN arterial with active transport facilities will increase impervious area and cause some increase in peak runoff from the upgraded transport corridor.

There may be different requirements for flow attenuation depending upon whether flows are discharged to the Hingaia catchment or to the Waihoehoe catchment. It is assumed that flows will be discharged south to the Hingaia catchment and therefore flood flow attenuation is not required (to allow the local peak to be discharged prior to the main catchment peak arriving).

Stormwater discharge locations and any mitigation requirements will be undertaken at the detailed design phase as part of resource consents to integrate with the wider area to the south which will be redeveloped for the Drury Central Rail Station (NZUP project) and urban development.

16.8.4 Mitigation Measures

16.8.4.1 Construction

Potential flood hazard effects during the construction phase will be addressed in a CEMP which is included as a condition of the proposed designation. Key considerations to manage effects are:

- siting construction yards and stockpiles outside the flood plain
- 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 high flow events, and
- methods to reduce the conveyance of materials and plant that is considered necessary to be stored or sited within the flood plain (e.g. actions to take in response to the warning of heavy rainfall events)

16.8.4.2 Operation

Jesmond Road FTN Upgrade

There are a range of methods available to mitigate the potential flooding effects identified. Slight changes to the vertical alignment of the road design to match existing road levels could be used to lower the water level at the road sag points. Alternatively, culverts under the road could be upsized to cater for 100 year flows and direct them to downstream channels. On the downstream side of the road, open channels can be installed to collect overland flow and direct it to appropriate discharge locations. These are matters that can be addressed at a future stage of design. The risk of flooding from culvert blockage could be addressed within the proposed designation through methods such as overland flow paths, upsizing culverts and secondary inlets and this should be considered further at detailed design. There is sufficient space within the proposed designation boundary to undertake these measures.

Wetland 1 at 131 Jesmond Road could obstruct overland flow and exacerbate nearby flooding if it, or ancillary works, was constructed above existing ground level. Therefore, it is recommended that an overland flow path be excavated from the low point on the transport corridor, past the southern side of the proposed wetland to collect flood water, lower the driveway at 131 Jesmond Road and discharge it to the watercourse channel to the north - so as to drop existing flood levels in the area. As the sag

point in the road may change at detailed design, it is also recommended that an open channel be constructed along the frontage of 119 and 125 Jesmond Road to collect overland flow off the road and direct it safely around those two properties to the eastern side of the proposed wetland. A condition will be included on the proposed designation identifying key outcomes to be achieved at the detailed design phase. This will ensure the above measures are implemented or are no longer required at the detailed design phase.

Bremner Road FTN Upgrade

A condition of the proposed designation will require the existing Norrie Road Bridge be fully removed, once the construction phase is over and the new bridge over Hingaia Stream is operational, so that the reduction in upstream flooding is realised. The Bremner Road/Firth St intersection is subject to flooding in both pre and post development scenarios for the 10 and 100 year ARI rainfall events. No new mitigation measures are required. Temporary, infrequent road closure may be required during these events, as it is in the pre development scenario.

Overall Recommendations for NoR D2

The following measures and outcomes to manage flood risk are proposed for detailed design and these are proposed as conditions on the designation:

1. Detailed design should demonstrate:

- That the unnamed tributary of the Ngakoroa Stream is crossed by a bridge
- That the existing Norrie Road Bridge crossing the Hingaia Stream is removed when the new bridge crossing the Hingaia Stream is operational

2. It is recommended that during detailed design, the flood modelling of the pre Project and post Project 100 year ARI levels (both for MPD land use and including climate change) is carried out and measures 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 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)
- that there is no more than a 10% average increase of flood hazard (defined as flow depth times velocity) for main access to authorised habitable dwellings.
- Where the above outcomes can be achieved through alternative measures outside of the designation such as flood stop banks, flood walls and overland flow paths, this may be agreed with the affected property owner and Auckland Council.

16.8.5 Summary of Flooding Effects

The overall effect of NoR D2 on flooding is positive or can be adequately mitigated within the proposed designation with the measures described above implemented. Measures or outcomes to be achieved at detailed design have been included as conditions on the proposed designation. This

includes addressing flood risk hazard during construction through the CEMP, specific design requirements (for example to include bridges instead of culverts) and outcomes for future flood modelling at detailed design.

16.9 Noise and Vibration

The Assessment of Construction Noise and Vibration Effects, included in Volume 4, contains predictions for construction noise carried out using the method recommended in NZS 6803 in accordance with the AUPOIP. The methodology included modelling inputs in regard to a reasonable worst case scenario. Vibration emission radii were also calculated to provide a reasonable worst case estimate at receivers.

The Assessment of Traffic Noise and Vibration Effects, included in Volume 4, contains predictions of road traffic noise carried out using the method recommended in NZS 6806 in accordance with rule E25.6.33 of the AUPOIP. The assessment of effects undertaken was two-fold: in accordance with NZS 6806 and in relation to the predicted noise level changes comparing the future traffic noise levels with and without the Projects.

Four scenarios are assessed in accordance with NZS 6806:

- The “Existing scenario” which is the current road network with current traffic volumes, i.e. the existing environment as it is experienced at the time of assessment
- A “Do Nothing” scenario (the likely future environment without the project), which represents the current road network with future traffic volumes, assuming a full build out of the area. This is a theoretical scenario that would not occur in reality. This is because; the current road network could not cope with the future traffic volumes, and future development in the area would not occur without the prior establishment of the new or upgraded roads. Therefore, while the predictions suggest a significant increase in noise level in the Do Nothing scenario compared with the Existing scenario, this would not be a feasible option
- A “Do Minimum” scenario, (likely future environment with the project) which represents the proposed future road network, incorporating NoRs D1 to D5 and other transport projects in the area (refer to the discussion on Assessment Assumptions in the Assessment of Traffic Noise and Vibration Effects in Volume 4). This scenario assumes a full build out of the area, and the transport infrastructure to enable the development. This is a realistic scenario at a point in time when all proposed Projects within the Drury Package are operational. .
- “Mitigation” scenarios, which represent the traffic noise levels at the PPFs at the design year with various specific noise mitigation options implemented with the aim of achieving the noise criteria categories.

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

The summary below should be read in conjunction with both reports.

16.9.1 Construction Noise and Vibration

16.9.1.1 Potential Construction Noise Levels

Model predictions assuming the works along the proposed designation boundary indicate there are 55 buildings (25 residential and 30 commercial) where the relevant noise criteria would be exceeded without mitigation. Distances of receivers from the proposed designation boundary vary greatly along the road alignment with the closest receptor approximately 4m from drainage works. With 9 buildings (4 residential and 5 commercial) location within the 73m radii of the minimum set back distance required for day time compliance of 70 dB L_{Aeq} for piling works.

Model predictions indicate the closest receivers could experience noise levels of around 90 - 95 dB L_{Aeq} during drainage and pavement construction works, based on the noisiest item of plant (plate compactor) operating in the closest position to the receiver along the proposed designation boundary, without mitigation. Operation of construction equipment will be intermittent in nature and works in the worst-case location typically latest around 3 days. Whilst plate compactors have been identified as the noisiest equipment, they will only be used as part of drainage works and pavement construction. Similarly, piling is carried out during bridge construction only and for limited durations. Other equipment with lower sound powers will generate lower noise levels under the worst-case location and overall average noise levels will be lower for most of construction duration.

These results should be treated as the highest possible noise levels likely to be emitted from the respective equipment. These noise levels would occur infrequently, if at all, as equipment and activities move along the alignment and are not continuously operational. The noise levels provide an indicative prediction of the scale of potential effects based on one possible construction methodology.

16.9.1.2 Construction Noise Effects

The construction noise criteria are predicted to be exceeded at a number of receivers due to their close proximity to the potential areas of work. Closest receivers are 4m from the proposed designation boundary for earthworks and predicted noise levels are around 90 -95 dB L_{Aeq} with the noisiest equipment being loader and plate compactor.

However, the use of these items of equipment will likely be intermittent in nature during the relevant construction activities. Although the worst-case situations are not expected to be frequent, due to the setback distances to the majority of the proposed works, these noise levels could result in loss of concentration and annoyance without mitigation.

Night time works at these noise levels are generally not acceptable at residential properties and the use of noisy equipment should be avoided to prevent sleep disturbance. If these night works are required, mitigation measures are described below.

16.9.1.3 Potential Construction Vibration Levels

Two scheduled heritage buildings have been identified by the Project Team at 9 Cameron Place (Saint John's Anglican Church and Cemetery) and 201 Jesmond Road (Aroha Cottage). Both may experience vibration levels above 2.5 mm/s PPV exceeding the building damage criteria for historical / sensitive properties. To control and minimise vibration levels at these buildings, the use of smaller or low vibration equipment should be considered.

Nine dwellings may experience vibration levels above 5mm/s PPV exceeding the building damage criteria for residential properties and 12 buildings may experience vibration levels above 10mm/s PPV exceeding the DIN criteria for commercial properties. Predictions indicate a total of 62 buildings may receive vibration levels above the amenity criterion of 2 mm/s PPV.

It should be noted that the vibration generating equipment will not be operating all of the time and may not operate right at the boundaries of the area of works, therefore, predictions are worst case.

It is not expected high level vibratory works such as the use of roller compactors will be carried out at night-time. If night-time works are required extensive consultation and management plans will be essential.

16.9.1.4 Construction Vibration Effects

Initial predictions indicate that the Project building damage criteria may be exceeded at two historic buildings, nine dwellings and 12 commercial buildings, in particular when the vibratory roller compactor is proposed for use during the earthworks phase. At buildings in close proximity to proposed designation boundary areas, there is the potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. A building condition survey should therefore be carried out before (during detailed design) and after construction works, at properties where predictions indicate the relevant building damage criteria may be approached, to determine if any damage is shown to have been caused by construction by the Project Team. Consultation and communications should be undertaken for all buildings where the criteria are predicted to be exceeded. Mitigation measures are described in section 16.9.3.1.

16.9.2 Traffic Noise and Vibration

In accordance with NZS 6806, the Project consists of a combination of New and Altered roads which have different assessment specifications under NZS 6806. The New and Altered section are identified in Figure 16-4.



Figure 16-4: NoR D2 new and altered roads

16.9.2.1 Altered Roads

Road Traffic Noise Model Results Analysis

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

Under the likely future scenario without the Project, predictions show a higher traffic noise level range between 51 – 72 dB $L_{Aeq(24hr)}$ with ten PPFs in Category C and eight PPFs in Category B due to an increase in traffic volumes.

The likely future scenario with the Project (and surrounding proposed transportation projects)) showed a slightly lower predicted range compared to the likely future scenario without the Project of 46 – 68 dB $L_{Aeq(24hr)}$ due to the reduced traffic speed from 80 km/h to 50 km/h with five PPFs remaining in Category C and six PPFs in Category B. In accordance with NZS 6806, mitigation options should be considered for the 10 PPFs that are predicted to receive noise levels within Category B and C. Mitigation through the use of low noise road surface such as AC-14 is discussed in section 16.9.3.

Assessment of Traffic Noise Effects

all PPFs are predicted to receive noise level reductions, with 57 PPFs receiving noticeable to significant reductions, and 11 PPFs predicted to experience 1 – 2 dB decrease which is negligible and not perceptible. This is a result of reduced road speeds with slightly reduced traffic flow along

Jesmond Road and significantly reduced traffic flow along Bremner Road due to the redistribution of traffic across the wider new network when compared to the Do Nothing scenario (likely future environment without the Project)

16.9.2.2 New Road

The Jesmond to Bremner link has been assessed as a new road. Existing scenario predictions show the noise level within the Project area is between 38- 47 dB $L_{Aeq}(24hr)$ with all PPFs in Category A.

The Project will result in increased noise levels with a predicted range of 50 – 65 dB $L_{Aeq}(24hr)$ with one PPF changing to Category C and three PPFs in Category B. It is generally expected that a new road in a rural area will increase the ambient noise levels. Mitigation measures are described in section 16.9.3.

All PPFs are predicted to experience a noise level increase of 3 dB or more, with 12 PPFs predicted to experience a 6 – 15 dB increase due to the Project. These are significant changes and will be clearly noticeable. Noise level increases of 10 dB and higher will be perceived as a doubling of loudness at least. In addition, the new road will introduce a noise source that is not currently present for these dwellings.

Such noise increase will be significant to the residents, if they still reside in the area at the time of the road opening. Although the area is currently in rural use, it is planned to be urbanised. , The resultant noise levels of 45 – 60 dB $L_{Aeq}(24h)$ are appropriate for residential use and not unexpected in an urban environment.

It is noted that some PPFs may not exist anymore at the time of road construction particularly given the recent rezoning of land (Plan Change 6) to residential. Therefore, the predicted effects may not be experienced by current residents. This is not applicable for any PPFs included as part of the Auranga Development (currently under construction) which will remain.

16.9.3 Mitigation Measures

16.9.3.1 Construction Noise and Vibration

Specific mitigation measures will be identified within a Construction Noise and Vibration Management Plan (CNVMP) which will be completed prior to construction. The CNVMP will provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction. The Assessment of Construction Noise and Vibration Effects outlines the inclusions required in the CNVMP, in line with the minimum level of information that must be provided in a CNVMP. This includes:

- Description of the works and anticipated equipment/processes;
- Hours of operation, including times and days when construction activities would occur;
- The construction noise and vibration standards for the Project;
- Identification of receivers where noise and vibration standards apply;
- Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved;
- Methods and frequency for monitoring and reporting on construction noise and vibration, including:
 - Updating the predicted noise and vibration levels based on the final methodology and construction activities;
 - Confirming which buildings are to be subject to a pre and post building condition survey;

- Identifying appropriate monitoring locations for receivers of construction noise and vibration;
- Procedures to respond to complaints received on construction noise and vibration, including methods to monitor and identify noise and vibration sources;
- Procedure for responding to monitored exceedances; and
- Procedures for monitoring construction noise and vibration and reporting to the Auckland Council Consent Monitoring officer.
- Procedures for maintaining contact with stakeholders, notifying of proposed construction activities, the period of construction activities, and handling noise and vibration complaints
- Contact details of the site supervisor or Project manager and the Requiring Authority's Project Liaison Person (phone, postal address, email address);
- Procedures for the regular training of the operators of construction equipment to minimise noise and vibration as well as expected construction site behaviours for all workers;
- Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction Noise and/or Vibration Management Schedule will be required
- Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys.
- Procedures and timing of reviews of the CNVMP.

To control and minimise vibration levels at the two identified scheduled heritage buildings (Aroha Cottage on Jesmond Road and St Johns Church on Norrie Road), the use of smaller or low vibration equipment should be considered as part of the CNVMP.

In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.

In managing noise and vibration effects within the above mechanisms, a hierarchy of mitigation measures will be considered and a best practicable option for mitigation will be implemented, whilst avoiding undue disruption to the community.

If night-time works are required, consultation and mitigation measures will be essential which may include an offer of temporary relocation for the most affected receivers to manage and mitigate adverse effects.

With effective mitigation and management measures in place, such as construction noise barriers along active construction areas within the vicinity of receivers and enclosures around noisy machinery, noise levels can be reduced by up to 10dB at receivers on the ground floor. Resulting worst case noise levels could be reduced to 80– 85 dB with mitigation implemented and number of receivers exceeding the criteria reduced to 35.

In addition, the road construction is linear, and each receiver would only be affected for part of the overall construction duration. A CNVMP with site specific mitigation as required (as described above) sets out how to control noise levels and reduce adverse impacts on receivers.

As construction will occur several years in the future, receivers may have changed by then, with new and additional receivers in the vicinity due to increased development. Construction noise and vibration effects will be reassessed at the time of construction and managed at the receivers that are present at the time of construction.

16.9.3.2 Traffic Noise and Vibration

The following mitigation measures are proposed for the Project:

Altered Roads

Asphalted concrete (AC-14) is recommended to be applied to all road surfaces. The use of this road surface is predicted to reduce noise levels at all PPFs so these dwellings are in Category A, with the majority of PPFs predicted to experience a 1-3 dB reduction.

Significant noise level decreases (9 dB decrease or more) will be experienced at 22 PPFs as a result of the Project (and the wider proposed transport projects) with the mitigation applied, including, where applicable, the removal of minor dwellings closest to the road at PPF addresses with multiple dwellings. Of the 22 PPFs, three of the PPFs along Bremner Road are predicted to experience a 14 dB and 13 dB decrease respectively due to the significant reduction in traffic volumes with the Project implemented and the redistribution of traffic across the wider new transport network; mitigation measure of low road surface applied; and the new road alignment resulting in the road being elevated above the receiver level. These changes will be noticeable and will result in significant positive effects for those PPFs.

New Road

As a BPO, asphalted concrete (AC-14) is recommended to be applied to all new road surfaces. This will reduce noise levels at all PPFs with a direct line of sight to the new alignment by 4-6 dB resulting in all but two PPFs (at 6 Auranga Stage 2 development (actual address unknown at this stage) and 235 Jesmond Road) receiving noise levels within Category A. BPO considerations for the remaining two PPFs are set out within the Assessment of Traffic Noise and Vibration Effects and no additional mitigation was found to be practicable.

The anticipated resultant noise levels of 45-60 dB $L_{Aeq(24h)}$ is appropriate for residential use and is expected in urban residential environments.

Reassessment at Detailed Design

Whilst mitigation in the form of low-noise road surface material (Asphaltic concrete) is recommended for both the Altered roads and New road alignments along Jesmond Road, Bremner Road, Bremner Road Link and Waihoehoe Road West, reassessment of the road traffic noise at PPFs will be carried to determine if the mitigation recommended is still BPO to meet the categories as set out in the Traffic Noise and Vibration Assessment in Volume 4. For the Altered road sections the PPFs are all Category A. For the New road sections, 13 are Category A and two in Category B. The PPFs and categories are set out in the Traffic Noise and Vibration Assessment in Volume 4 and are included as a condition on the proposed designation.

16.9.4 Summary of Noise and Vibration Effects

Effects of construction noise will need to be reassessed at the time of construction. However, adverse construction noise and vibration effects can be appropriately managed through the proposed CNVMP. This includes a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction.

For operational effects of the Altered roads, with proposed mitigation in place, the predicted road traffic noise levels will decrease at all PPFs as a result of the Project and overall network improvements, resulting in a positive effect on the future noise environment.

For operational effects of the New road section, with the proposed mitigation in place, all but two PPFs remain in Category A with noise levels below 57 dB $L_{Aeq(24h)}$. It is considered the resultant noise levels of 45-60 dB $L_{Aeq(24h)}$ are appropriate for residential use and not unexpected in an urban environment.

16.10 Network Utilities

16.10.1 Construction Effects

A number of utilities, including major utilities, are located within and around the proposed designation. Relocation, diversion or protection of these may be required and short term disruptions may occur. Table 16-7 summarises the known existing and proposed utilities within and around the proposed designation, and the implication the Project is likely to have on these.

Table 16-7 NoR D2 Anticipated Effects on existing utilities of other providers

Utility Provider	Asset	Designation	Potential Effect
First Gas	Gas Transmission Line	N/A	Within the Bremner Road FTN Upgrade section, pipe re-alignment, strengthening works, and/ or protection works may be required where the pipe crosses the proposed alignment near Auranga Development at CH700.
Transpower	Overhead Transmission lines and Pylons	N/A	Pylon (asset) specifically for the Ngakoroa Stream crossing on Bremner Road to the west of SH1 where both the 110KV and 220kV overhead lines cross. Transpower advised on clearance distances for working under and around the lines. The Project has incorporated feedback from Transpower on clearance requirements for these lines. Protective measures and/ or special construction techniques will be required to facilitate the safe construction of the new Ngakoroa Bridge underneath the transmission line.
Watercare	Waikato 1 Watermain	N/A	The impact of the embankment fill at the NIMT rail line bridge western abutment may require realignment or strengthening works on the existing pipeline. This has been discussed with Watercare.
	Other assets	N/A	Assets such as water supply, wastewater pipeline, access chambers, hydrants and others will require protection or relocation to the new road alignment.

Utility Provider	Asset	Designation	Potential Effect
Vector	Gas Medium Pressure distribution lines	N/A	Existing lines will likely require relocation (or replacement) into the proposed road service corridor or removal.
Counties Power	Underground and overhead power lines including high and medium voltage lines.	N/A	Lines will be required to either be relocated underground, or new overhead poles installed in the new alignment within the carriageway service corridor. Short term disruptions may occur.
	Fibre cables	N/A	Existing fibre cables will need to be relocated and/or protected during construction
Chorus	Communication lines	N/A	Communication lines running underground will likely need to be relocated.
KiwiRail	NIMT Rail line	6302	Grade separation of the NIMT Rail line from the road is proposed. This will have a positive effect on the safety of the rail network through grade separation. Some disruption is likely during construction works. Permission to work within the rail corridor will be sought from KiwiRail for the bridge construction activities and the bridge demolition. Deconstruction of the bridge may be carried out during a weekend rail shutdown if required.
Waka Kotahi	SH1	6706	In consultation with Waka Kotahi, traffic management will be required on the motorway to facilitate the construction of the abutments and the central pier. This may include reducing the speed limit, night works and associated detours, installing traffic barriers, or lane reconfigurations.

16.10.2 Mitigation Measures

Engagement with network utility operators has been ongoing throughout the Project as detailed in section 5.2.2.6 Network Utilities. Engagement will be ongoing throughout the detailed design and construction of the Project.

As a proposed condition of the designation, a Network Utilities Management Plan (NUMP) will be prepared prior to construction of the Project. The NUMP will set out a framework for protecting, relocating and working in proximity to existing network utilities. The NUMP will be prepared in consultation with the relevant network utility operators and will include methods to:

- Provide access for maintenance at all reasonable times, or emergency works at all times during construction activities;

- Manage the effects of dust and any other material potentially resulting from construction activities and able to cause material damage, beyond normal wear and tear to overhead transmission lines in the Project area;
- Demonstrate compliance with relevant standards and Codes of Practice including, where relevant, the NZECP 34:2001 New Zealand Electrical Code of Practice for Electrical Safe Distances 2001; and AS/NZS 4853:2012 Electrical hazards on Metallic Pipelines.

Prior to construction, Network Utility Operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for the following activities:

- operation, maintenance and urgent repair works
- minor renewal works to existing network utilities necessary for the on-going provision or security of supply of network utility operations
- minor works such as new service connections
- the upgrade and replacement of existing network utilities in the same location with the same or similar effects as the existing utility.

16.10.3 Summary of Effects on Network Utilities

Through the implementation of the NUMP and in consultation with network utility operators, any potential adverse effects on network utilities can be managed appropriately.

16.11 Community Effects

16.11.1 Positive Effects

The Jesmond to Waihoehoe Road West FTN Upgrade will provide the necessary transport infrastructure required to support the planned urban zoning of land in Drury West and Drury East (and the wider Drury-Ōpāheke growth area) which is accelerating as a result of numerous private plan changes being lodged with Auckland Council. The proposed designation will ensure that the upgrade is planned and integrated (and identified in the AUPOIP) to meet the feasible development capacity targets over the next 30 years to support the growing communities in Drury-Ōpāheke.

The Project will provide dedicated active transport facilities, public transport connections and corridor reliability between the planned Drury Central and West Centres and train stations and in the wider community it will improve community connectivity, cohesion and accessibility. It will provide options for active transport and more efficient public transport to existing shops and future developments, accessing schools, employment, recreational areas and proposed centres and will provide alternative commuting options for existing employees within the industrial area and the future urban community.

The provision of safer signalised intersections will improve the safety conditions and will provide health and safety benefits to the community that navigate these intersections. Improved roading connections will improve transport conditions and support business movement for businesses within the industrial area.

Provision of active transport facilities also contributes to health and wellbeing of the community providing active mode alternative transport options. The Drury Sports Complex, Drury Domain and open space planned by Auranga will become more accessible via public transport and active transport modes.

16.11.2 Construction Effects

There is potential impact on the existing businesses within the industrial area and Drury Village from the Project. Some businesses will move due to the Project, changing the business community in terms of service offerings and interdependencies. However, this will also be reflective of the changing area surrounding the industrial area and Drury Village as Drury urbanises.

During construction access may be limited which may decrease patronage to local shops and decrease business efficiency in the industrial area, particularly for those reliant on deliveries or dispatch.

There may be disruptions to the way people use the public spaces as construction may reduce the recreation amenity of the Drury Sport Complex due to construction activities in the northern extent. However, the Drury Sports Complex sports fields will not be impacted and access to the park will be retained.

Residents may experience temporary disruptions to traffic and access restrictions or diversions due intersection upgrades and bridge works. This may impact the way they travel to work, existing and proposed schools (including those proposed within Auranga Development), recreation and around the community.

The amenity of residential areas and social uses including the Saint John's Anglican Church (a quiet environment) may be temporarily affected due to dust and noise during construction.

16.11.3 Operational Effects

As identified within the positive effects discussed above, the Project will provide the necessary transport infrastructure required to support planned urban growth in the Drury-Ōpāheke growth area supporting growing communities. In summary (with further detailed provided in section 16.11.1) the Project will:

- Improve community connectivity, cohesion and accessibility
- Provide options for active transport walking and cycling and more efficient public transport to existing shops and future developments, accessing schools, employment, recreational areas and proposed centres
- Provide alternative commuting options for existing employees within the industrial area and the future urban community.
- Improve the safety conditions providing health and safety benefits to of the community
- Improve roading connections and transport conditions supporting business movement for businesses within the industrial area; and
- Provide active transport facilities that will contribute to improvements to the health and wellbeing of the community providing active mode alternative transport options.

The Project will increase future community use of the Drury Sports Complex with the provision of safe active transport facilities that improve access and connectivity to the Complex.

Overall, the Project is anticipated to have significant positive effects on the future community in which it will operate.

16.11.4 Mitigation Measures

16.11.4.1 Construction Effects

It is anticipated that all community effects during the construction of the Project will be temporary and can be minimised. A Stakeholder and Communication Management Plan (SCMP) will be prepared prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the Construction Works. Ongoing communication with the business community and Drury Sports Complex will occur to meet business and recreation requirements and manage potential impacts.

Access and trip disruption including measures to avoid disruptions at peak travel times or school pickups and drop-offs will be managed by the CTMP and SCMP proposed as conditions of the proposed designation. This will allow the contractors to identify movement and access requirements of residents and businesses along the corridor and enable alternate access or access at peak times and minimise trip disruption where practicable. Access to community resources including Saint John's Anglican Church and Drury Sports Complex will be maintained.

Construction effects on amenity values of property and recreation areas can be managed by engagement with corridor residents and stakeholders (identified through the SCMP), noise management (CNVMP), and the overall CEMP to manage potential effects.

16.11.4.2 Operational Effects

Significant positive effects are anticipated from the operation of the Project therefore no mitigation is required. However, through the implementation of the ULDMP a range of measures will be implemented to ensure the Project is appropriately integrated into the surrounding landscape and urban context.

16.11.5 Summary of Effects on the Community

The Project will provide significant positive effects to the community in which it will operate. It is considered that overall the Project will have significant benefits for the community (existing and future). The works support planned urban growth and will have significant safety and transport benefits providing a safe and resilient connection that provides for active transport and public transport connections. The Project will also improve community cohesion and access to community resources.

Any potential construction effects can be managed with the development and implementation of the appropriate management plans outlined above and communication with the community and affected land owners / occupiers. However, disruption will still occur particularly within the industrial area and ongoing communications will assist to manage these as they occur.

16.12 Property, Land Use and Business Effects

The Jesmond to Waihoehoe Road West FTN Upgrade has sought to reduce potential adverse effects on existing private properties and businesses through alignment and Project design, where practicable, while acknowledging the planned urban growth and change in the area balancing these drivers. This has included specific consideration of the potential property and business impacts in the assessment of alternatives as discussed in sections 4.2 and 15 and detailed in Appendix A and through design refinement and defining the proposed designation boundary.

Where impacts on property, land use and businesses cannot be avoided, the potential discussed in this section relate to directly affected properties and landowners. Potential effects on properties and businesses affected by proximity to the Project have been discussed in 16.11.

The proposed designation requires land to provide a sufficient footprint to enable the construction and operation of the Jesmond to Waihoehoe Road West FTN Upgrade. 60 private properties will be directly affected. These properties are primarily rural, rural-residential, open space/reserve land and commercial/industrial land use.

A description of the existing land use of the Project area is provided in section 14.2. In summary land directly affected by the Jesmond to Waihoehoe Road West FTN Upgrade includes the following:

- Private farmland. The land is primarily used for grazing with low density rural residential dwellings.
- Rural based businesses including Red Shed Palazzo Café (16 Jesmond Road), Makomako Plant Centre (64 Jesmond Road) and horticultural businesses (including Jesmond Hybrids at 123 Jesmond Road). Land proposed to be designated for these businesses is generally the frontage adjacent to Jesmond Road, with the exception of one horticulture business where a construction compound is proposed on the site.
- The Drury Sports Complex passive recreation area and esplanade reserve.
- Light industrial and commercial businesses within the Drury industrial area and Drury Village. This includes entire sites and frontages of businesses on Bremner, Norrie and Great South Road.
- Auranga Development is currently under construction and four private plan changes have been submitted to Auckland Council for land adjacent to or near the Jesmond to Waihoehoe Road West FTN Upgrade showing that the area is in the progression of being urbanised. The timing of this urbanisation relative to implementation of the Project is not confirmed. The private plan changes include:
 - PC 48 (Private): Drury Centre Precinct
 - PC 49 (Private): Drury East Precinct
 - PC 50 (Private): Waihoehoe Precinct
 - Waipupuke Private Plan Change (not yet referenced).

The potential pre-construction, construction and post construction effects on directly affected properties is discussed in the following sub-sections.

16.12.1 Pre-Construction

The proposed designation has a lapse duration of 15 years to provide a sufficient timeframe which enables construction of the Jesmond to Waihoehoe Road West FTN Upgrade in response to the progressive urbanisation of Drury. While the length of the lapse date reflects the need to provide long term certainty regarding the alignment of the Project, this has the potential to result in 'planning blight'

from the restrictions to development resulting from the proposed designation, if not appropriately managed.

The proposed designation will not preclude the continued (unchanged) use of any directly affected properties prior to construction. However, in accordance with section 176(1)(b) of the RMA, anyone (other than a requiring authority with an earlier designation) is restricted from carrying out work on the designated land that would prevent or hinder the designated work without first obtaining the requiring authority's consent. The purpose of the Jesmond to Waihoehoe Road West FTN Upgrade is to support urban growth in the Drury-Ōpāheke growth area. Sections of the proposed Jesmond to Waihoehoe Road West FTN Upgrade are located within the existing road corridor in a rural greenfield area which is currently, and will continue to experience a high level of change as the area transitions from rural to urban land use. As the proposed corridor will not be implemented until further planned development occurs the Project is unlikely to affect the current land surrounding the Project in greenfield areas until such a time that the area starts to develop.

It is likely urban development will continue to occur in greenfield areas adjacent to, or within the proposed designation before the future arterial is required. This is already beginning to be evident with four private plan changes to live zone land for urban development submitted to Auckland Council. It is at this point the proposed designation may have adverse effects on the development of private property. Any potential land development issues would be addressed through the construction and operation of the Project (further discussed in sections 16.12.2 and 16.12.3). The existing open space and industrial/business zoned areas are expected to have a lesser scale of development change as they are zoned in line with their existing uses. There is potential that intensification could occur surrounding Drury Village.

As discussed, development is not precluded within the proposed designation area, and AT has actively engaged, or sought to engage, with landowners through the Project development and adapt where practicable. AT will work with land owners and developers under the process in section 176(1)(b) to provide written consent for earthworks, interim road upgrades (or new roads), integrated stormwater solutions and development within the designations – provided those works will not prevent or hinder the work authorised by the proposed designation.

As there may be some time between the proposed designation being confirmed and before construction starts, a Project website (or equivalent virtual information source) will be set up with information on the Project. This will include the anticipated construction timeframes and contact details for enquiries. The website will continue to be updated during construction works.

16.12.2 Construction

The proposed designation includes land required for temporary and permanent works. During construction, the Project will temporarily require land to enable construction activities (detailed in section 13.4). If only temporary occupation of the land is required, it will be leased. Potential effects from the temporary lease / use of land within the proposed designation include disruption to farm activities and business, temporary loss of grazing pasture, stock-proof fencing, disruption to access, changes to driveway gradient, loss of vegetation and temporarily affected amenity.

The measures to mitigate these effects will be developed with the directly affected landowners or occupiers. On completion of the works, the designation boundary will be reviewed and may be removed from any land not required for the on-going operation, maintenance or mitigation of effects of the Project.

Potential adverse effects from construction activities are addressed throughout section 16 with appropriate mitigation identified to avoid or minimise effects on properties in proximity to the works. Particular mitigation measures for residential property and business disruption during construction include:

- Implementation of a SCMP prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the Construction Works. Including:
 - Determine adequate notice periods for the commencement of construction activities and works that affect access to properties;
 - Inform parties of the expected timing, duration and staging of works and regular updating of progress; and
 - Provide feedback, inquiries and complaints during the construction process.
- Implementation of a CTMP to manage construction traffic and disruption to the local transport network (section 16.2.4), including methods to:
 - Maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be; and
 - Communicate traffic management measures to affected parties.
- Implementation of a CNVMP to provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction and to manage any adverse construction noise and vibration effects on sensitive receivers (section 16.9.3), including methods to:
 - Communicate and engage with nearby residents and stakeholders; and
 - Minimise construction disruption for affected properties during construction.
- In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.
- Implementation of an overall CEMP to manage potential construction effects.

These measures will appropriately minimise disruption to affected properties and allow the continued use of properties where possible. Potential effects will generally be temporary and therefore it is considered that they will be less than minor.

The conditions also require the Requiring Authority to show how flood risk measures will be implemented at detailed design (or that they are no longer required) at specific properties at 119, 125 and 131 Jesmond Road. If these mitigation measures are required, they will be discussed with the land owner and implemented during construction works.

16.12.3 Post Construction

The proposed designation includes land required for temporary and permanent works. The land required for the Project is shown in the designation plans included with the NoR (see Volume 1). Land required for the permanent work will be purchased and following the review of the designation boundary on completion of the works any land not required for the permanent work or for the on-going operation, maintenance or mitigation of effects of the Project will be reinstated in coordination with directly affected landowners or occupiers. This will include:

- Reinstatement of construction areas and reintegrating with the surrounding landform
- Reinstatement of driveways, accessways, fences and gardens.

- Integration of batters and cut/fill slopes with the landscape.

Therefore the post-construction effects on the use of land will be no more than minor on these landowners.

16.13 Urban Design Evaluation

An Urban Design Evaluation (provided within Volume 4) has been undertaken for the Jesmond to Waihoehoe Road West FTN Upgrade, based on the Design Framework (included in the Urban Design Evaluation in Volume 4) established for the Project. The Urban Design Evaluation provides urban design focused commentary on the indicative design of the proposed corridors and recommends urban design outcomes that should be considered in future design stages through the implementation of the ULDM proposed as a condition on the designation. The design principles that make up the Design Framework seek that transport corridors contribute positively to existing and new communities, the environment and the social and economic vitality of Auckland.

The specific outcomes intended for the Project are shown in blue in Figure 16-5 to Figure 16-7 below. The measures to achieve these outcomes will be confirmed at detailed design and form part of the ULDM as a condition on the proposed designation. The outcomes include:

- 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.
- Legibility, modal priority for active modes and connectivity demands are addressed at intersections.
- A corridor urban identity and placemaking approach that identifies;
 - the cultural significance of 27 Bremner Road (site of significance to Manawhenua outside the proposed designation) and the Ngakoroa Stream
 - the heritage significance of the Aroha Cottage, the Commissariat Redoubt / Ōtūwairoa Stream Wharf and St John's Anglican Church and Cemetery
 - the heritage significance of multiple historic heritage sites on Great South Road adjacent to the railway, concentrated around Norrie Road and the eastern side of Ngakoroa Stream
- The identification of urban and landscape design drivers related to the Ngakoroa Stream, Ngakoroa Reserve, the Drury Sports Complex and the Drury Domain and how the corridor has responded to and integrated with these character drivers.
- An urban interface approach within the transport corridor (road reserve) that;
 - provides an appropriate interface to the proposed Drury East centre and enables buildings and spaces to positively address and integrate with the corridor,
 - responds to the spatial character of the town centre environment by supporting quality public realm infrastructure, ample pedestrian footpath widths, frequent pedestrian crossing points and providing street trees for shade and amenity,
 - recognises the transition from Main Centre to THAB zoned areas 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.
 - considers the interface of bridging structures to built form particularly around the proposed Drury East centre and the adjacent THAB zoned areas
- In future design stages, Manawhenua will be invited to provide input into relevant cultural landscape and design matters including how desired outcomes reflect their identity and values.

- A landscape plan that considers recommendations from the landscape and visual, arboricultural and ecological assessments including street tree and stormwater wetland planting, construction compound and private property reinstatement and treatment of batter slopes. Also, to integrate with the Ngakoroa Stream, Hingaia Stream and SEAs at future resource consents where the corridor intersects with the proposed Blue-Green Network. The landscape outcomes should reinforce the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider active transport network.
- An integration of the Jesmond Road stormwater 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. Further urban design opportunities in the Project area have also been identified in Figure 16-5 to Figure 16-7 and shown in orange. These opportunities could be considered by AT or other parties at future stages of design and development but are not required to mitigate effects of the Project.

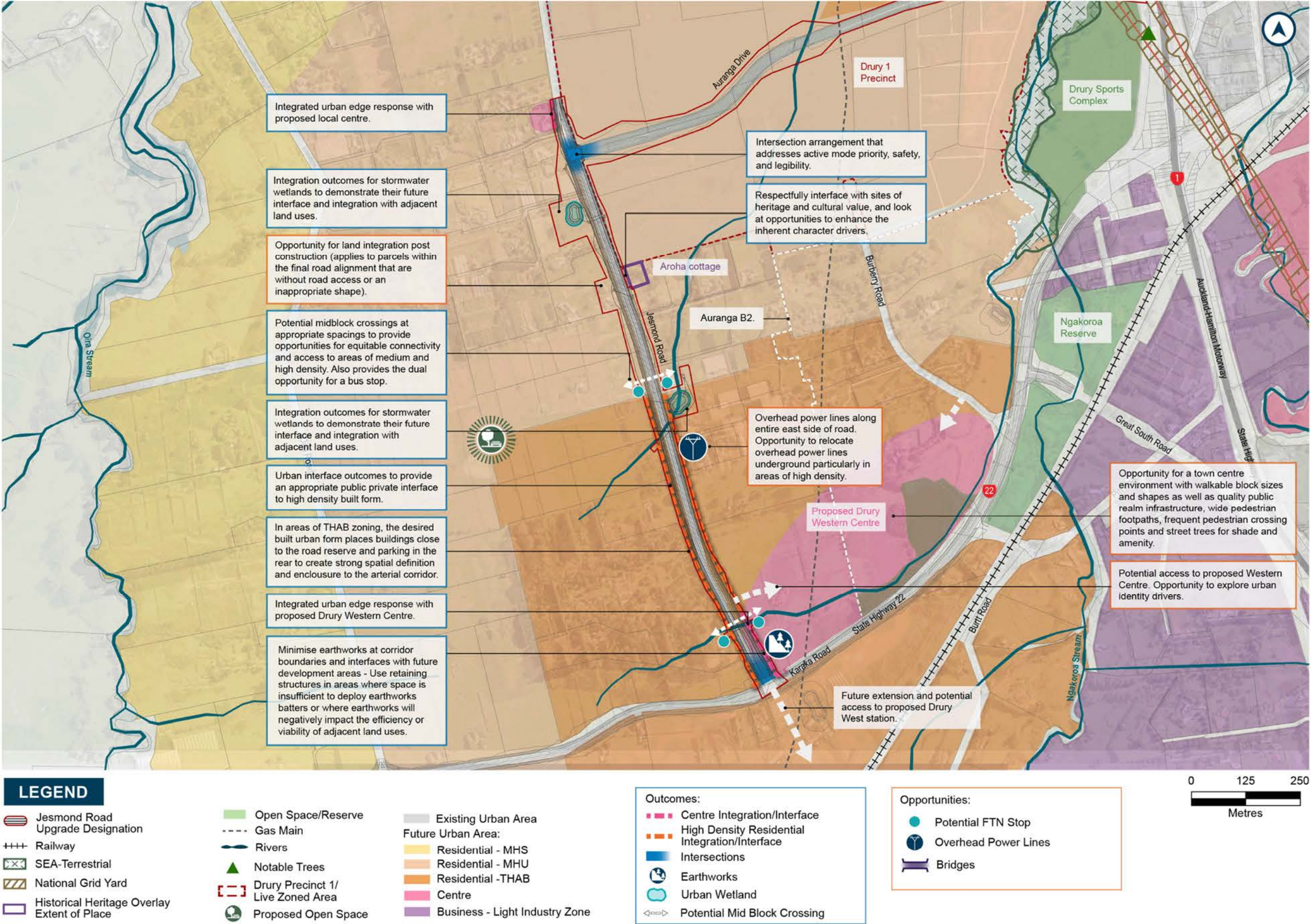


Figure 16-5: Jesmond Road FTN Upgrade urban design outcomes and opportunities

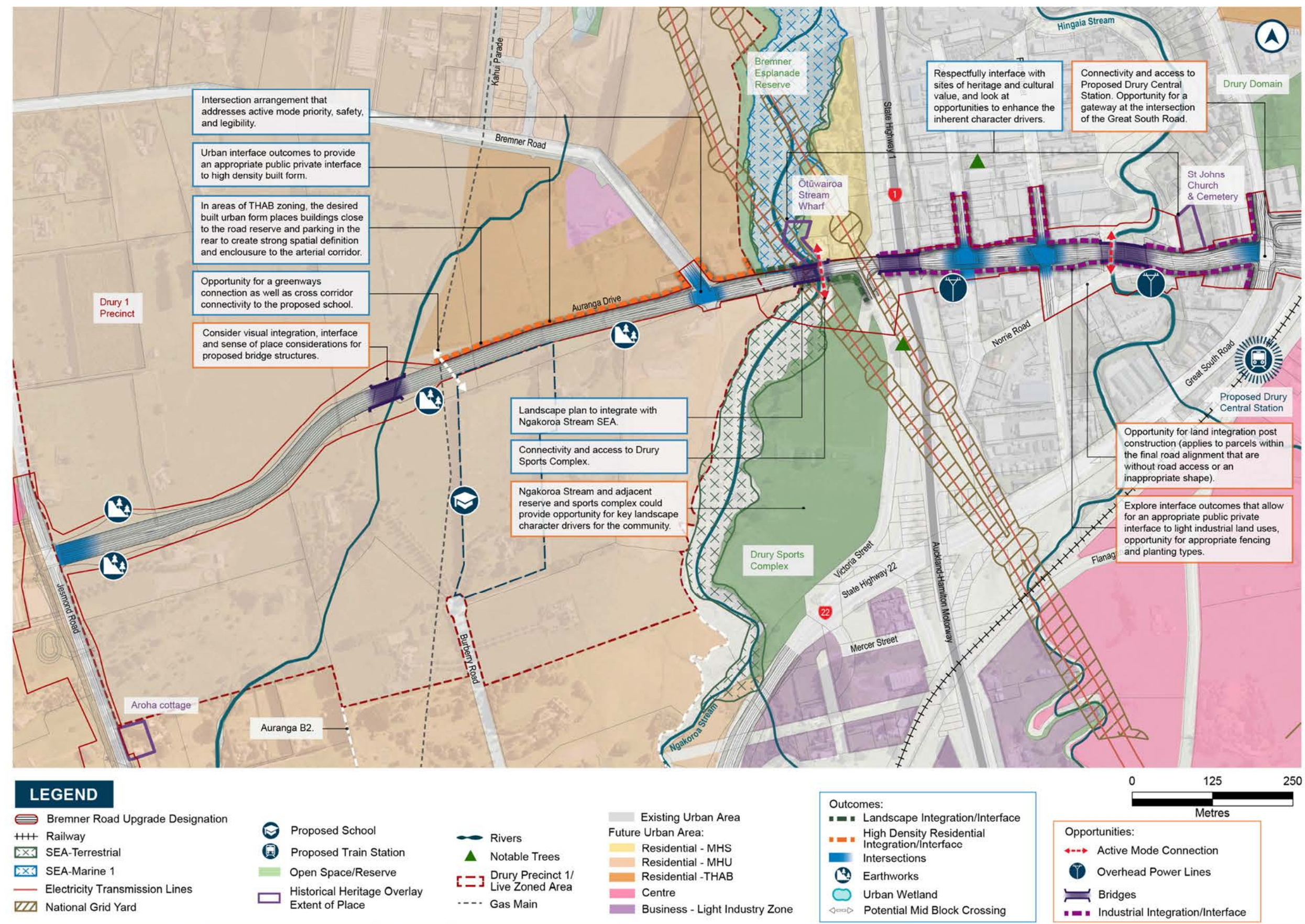


Figure 16-6: Bremner Road FTN Upgrade urban design outcomes and opportunities

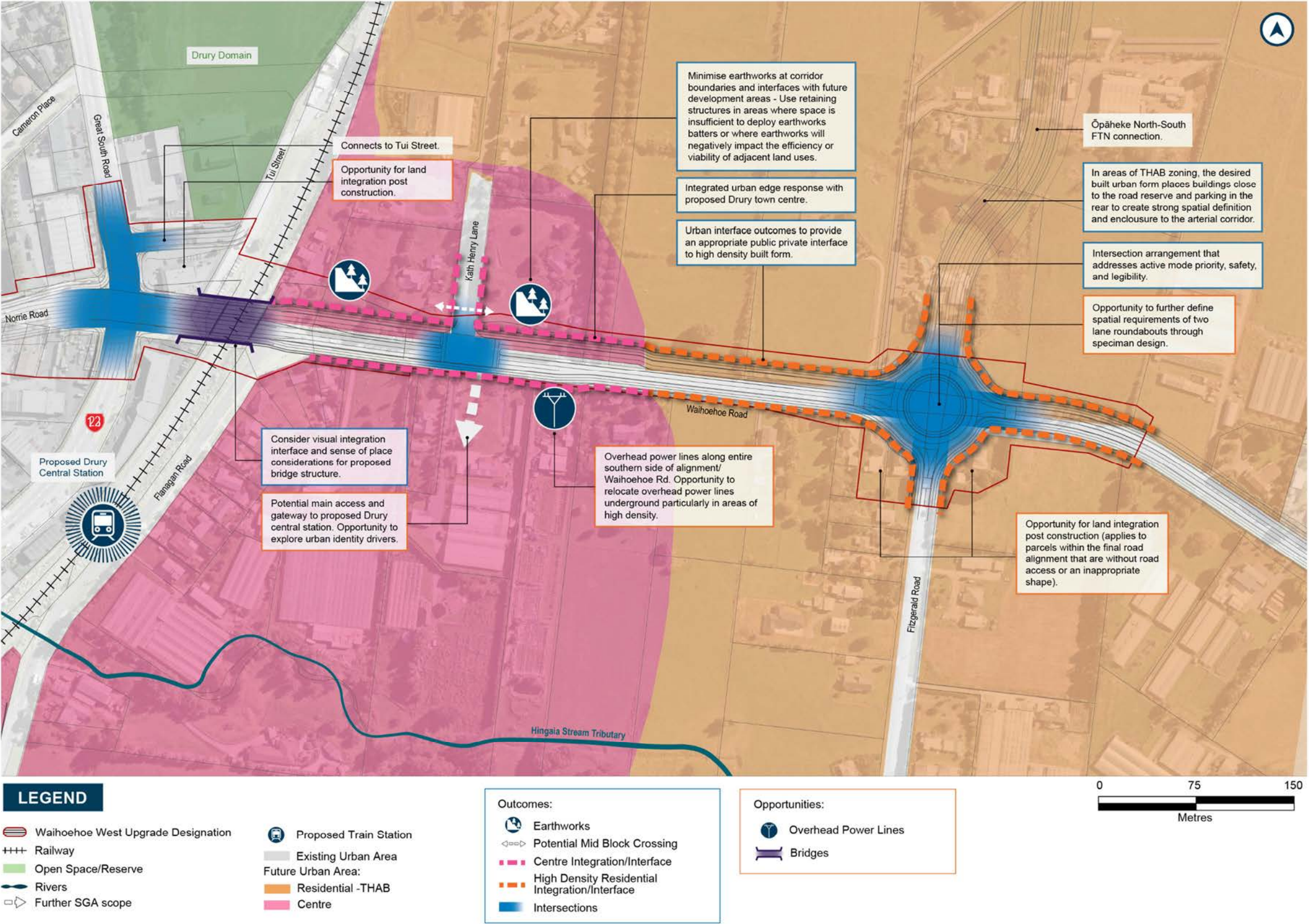


Figure 16-7: Waihoehoe Road West FTN Upgrade urban design outcomes and opportunities

17 Jesmond to Waihoehoe Road FTN Upgrade: Summary of Measures to Manage Adverse Effects

The positive effects of the Project are set out in section 16.1 of this AEE.

In the first instance, adverse effects have been avoided and mitigated via alignment decisions and design choices. In addition, a range of measures are proposed for the Project to avoid, remedy or mitigate the potential adverse effects identified in this AEE. These measures are summarised in Table 17-1 below.

The measures will be implemented during the development of the detailed design, prior to and during construction, and once the permanent works are completed. These proposed measures are reflected in the proposed designation conditions included with the NoR.

Table 17-1: NoR D2 Summary of measures to avoid, remedy or mitigate potential adverse effects

AEE Section	Topic	Measures	Mechanism to Implement Measures
16.2	Construction Traffic	- Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. - Methods to manage the effects of temporary traffic management. - Measures to ensure the safety of all transport users. - Methods to manage traffic congestion and manage vehicular and pedestrian traffic near schools. - Identification of site access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors. - Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads. - Methods to manage vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be. - The approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads. - Methods to communication of traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services).	CTMP

AEE Section	Topic	Measures	Mechanism to Implement Measures
16.3	Cultural Values	• Involvement of Manawhenua during Project design and construction. • Identifying cultural matters and principles that should be considered in the development of other management plans (e.g. ULDMP and HAMP). • Ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle. • Establishment of protocols for cultural monitoring during construction works.	• Cultural Advisory Report • Cultural Monitoring Plan
16.4	Historic Heritage	• Confirm the methods for the identification and assessment of historic heritage within the designation to inform detailed design. • Non-invasive techniques or exploratory investigation to clarify the extent of the Runciman's Homestead site (R12/1131). • Built heritage assessments to inform mitigation of the former Drury Cheese Factory and former railway workers residence. • Confirm the known and potential historic heritage sites within the designation. • Set out the HNZPTA authority requirements for any pre-1900 sites.	• HAMP
16.5, 16.13	Landscape, Visual, Urban Design and Amenity	• Demonstrate how the Project is designed to integrate with adjacent urban (or proposed urban) and landscape context. • Provide appropriate walking and cycling connectivity to, and interfaces with, existing or proposed adjacent land uses, and walking and cycling connections. Promote inclusive access (where appropriate). • Promote a sense of personal safety. • A concept plan and explanation of the rationale for the landscape and urban design proposals • Developed design concepts, including principles for walking and cycling facilities and public transport. • Urban design and landscape details covering: • road design; • roadside elements; • architectural and landscape treatment of major structures and noise barriers • landscape treatment of permanent stormwater wetlands and swales; • integration of passenger transport; • pedestrian and cycle facilities; • heritage items; and	• ULDMP

AEE Section	Topic	Measures	Mechanism to Implement Measures
		- re-instatement of construction and site compound areas, driveways, accessways and fences. - Planting design details including: - identification of existing trees and vegetation that will be retained and any planting requirements. Where practicable, mature trees and native vegetation should be retained; - street trees, shrubs and ground cover suitable for berms; - treatment of fill slopes to integrate with adjacent land use, streams, riparian margins and open space zones; - planting of stormwater wetlands; - integration of any planting requirements required by conditions of any resource consents for the Project; and - reinstatement planting of construction and site compound areas as appropriate. - Detailed specification relating to weed control and clearance, pest animal management, mulching, plant sourcing and planting, including hydroseeding and grassing. - A planting programme and maintenance plan. —	
16.6	Ecology	Methods to minimise impacts from construction activities on at-risk and threatened wetland birds in the Ngakoroa wetlands.	- Pre-construction survey - Bird Management Plan
0	Arboriculture	- Confirmation that protected trees under the district plan provisions identified in the Assessment of Arboricultural Effects still exist. - How the design and location of works can avoid, remedy or mitigate effects on the existing trees. - Recommended planting to replace trees that require removal. - Establishing tree protection zones and specifying tree protection measures such as protective fencing, ground protection and physical protection of roots, trunks and branches. - Detailing methods for all work within the rootzone of trees that are to be retained in line with appropriate arboricultural standards.	Tree Management Plan
16.8	Natural Hazards – Flooding	Methods to mitigate flood hazard effects such as siting stockpiles out of floodplains, minimising	- CEMP - Flood risk outcomes to be achieved at

AEE Section	Topic	Measures	Mechanism to Implement Measures
		obstruction to flood flows and actions to respond to warnings of heavy rain. - Design outcomes relating to bridging specific streams. - A design that achieves flood risk outcomes relating to flood levels and freeboard for existing habitable floors, flood levels on land zoned for urban or future urban development where there is no existing dwelling, flood prone areas and access.	detailed design (demonstrated through the Outline Plan(s))
16.9	Construction Noise and Vibration	- Confirming construction works and anticipated equipment/processes; hours of operation, noise and vibration standards. - Identification of receivers where noise and vibration standards apply. - Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved. - Methods and frequency for monitoring and reporting on construction noise and vibration. - Procedures for maintaining contact with stakeholders, contact details of site supervisor and liaison person. - Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction Noise and/or Vibration Management Schedule will be required. - Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys.	- CNVMP - CNVMS
16.9	Operational Noise and Vibration	Confirmation of achieving noise categories at PPFs and confirmation of BPO.	Noise Mitigation Plan
16.10	Network Utilities	- In consultation with network utility operators, protect, relocate and work in proximity to existing network utilities. - Network utility operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for some activities.	Network Utility Management Plan (NUMP)
16.11	Community	- Methods to regularly communicate with the community, stakeholders and land owners/occupiers during construction, including timeframes. - Identification of a Project liaison person.	- SCMP - CNVMP - CNVMS - CTMP - CEMP
16.12	Property, Land use and Business		

AEE Section	Topic	Measures	Mechanism to Implement Measures
		• Method to formalise a complaints and response process (and monitoring thereof). • Links to other communication methods in other management plans. • S176(1)(b) approval process for land owners and developers to enable development (whilst not preventing or hindering the work authorised for Project).	• S176(1)(b) RMA approval process

18 Jesmond to Waihoehoe Road FTN Upgrade: Statutory Assessment

An assessment of the statutory matters that are relevant to the Project under section 171(1) of the RMA has been undertaken and is presented in Part I, Statutory Assessment.

With reference to those matters, and based on the assessment of effects summarised above, the proposed designation is generally consistent with the relevant provisions of National Policy Statements, the Regional Policy Statement and the relevant objectives and policies of the AUPOIP. Adequate consideration has been given to alternative sites, routes and methods of undertaking the Project, and the Project will avoid, remedy or mitigate any adverse effects on the environment. The proposed work and the proposed designation are also reasonably necessary for achieving the objectives of AT for the Project.

19 Jesmond to Waihoehoe Road FTN Upgrade: Conclusion

The wider Drury-Ōpāheke area in the south of Auckland has been signalled to undergo significant urban growth in the next 30 years. The Drury-Ōpāheke area will experience significant change over the coming years as the existing rural environment develops into a new urban area. This is accelerating as private plan changes are lodged with Auckland Council. The Project will provide critical transport infrastructure to support and integrate with the planned future growth in Drury-Ōpāheke and the wider south Auckland growth areas.

While some adverse effects will be generated during construction and operation of the Project, these can be mitigated by the management plans and other measures which are proposed as conditions of the proposed designation. The Project will have significant positive effects, and provide for the social, economic and cultural wellbeing of communities.

The Project is consistent with the relevant planning documents and statutory tests, thereby satisfying the requirements necessary for Auckland Council to recommend confirmation of the NoR on the basis of the conditions proposed by AT.



PART F: NOR D3

Waihoehoe Road East Upgrade

20 Waihoehoe Road East Upgrade: Description of Project and Proposed Works

20.1 Project Description

The Waihoehoe Road East Upgrade (NoR D3) consists of the widening an approximately 1.8km section of Waihoehoe Road to a two-lane arterial with active transport facilities from the proposed intersection with Ōpāheke North-South FTN Arterial and Fitzgerald Road in the west, to Drury Hills Road in the east. The functional intent of the Project is to provide strategic east-west connectivity between the strategic north-south corridors (Great South Road, the Ōpāheke N-S FTN Upgrade (NoR D4) and Mill Road), providing multi-modal access to the wider network for the planned growth area as well as providing access to the existing Drury township and proposed rail station (a NZUP project). The Location of the Project in a wider context is shown in Figure 20-1.

The proposed widening of Waihoehoe Road East to a two-lane arterial with active transport facilities will support urbanisation of the Drury area, resulting in improved connectivity and urban outcomes. The upgrades will provide a safe and attractive multi-modal access to the proposed Drury centre and planned strategic public transport network and will also provide greater transport choice and access to economic and social opportunities for those living and/or working in the Drury area.

The eastern extent of the Project will tie into the future Mill Road corridor which forms a separate NZUP project. Roundabouts are proposed at the intersections with Appleby Road and Cossey Road. At its western extent the Project ties into the proposed four-lane Waihoehoe Road West FTN Upgrade. Widening along Waihoehoe Road East is generally to the north, tapering south to the east of Cossey Road. The road will be an urban arterial with a likely reduced speed limit of 50kph.

An overview of the design is provided in Figure 20-1 and an indicative cross-section of the proposed corridor upgrade is provided in Figure 20-2.

A new AT designation is proposed to allow sufficient land for the road widening plus tie ins with existing roads, intersections, batter slopes and retaining and for other construction related activities including construction compounds and laydown areas, construction traffic manoeuvring and the re-grade of driveways.

The key features of the proposed upgrade include:

- Widening of Waihoehoe Road from its current general width of 20m to enable a 24m wide two-lane cross-section including separated active transport facilities
- Localised widening around the existing intersections to accommodate for the two proposed roundabouts
- Batter slopes to enable widening of the corridor, and associated cut and fill activities.
- Vegetation removal along the existing road corridor
- Areas for construction related activities including site compounds, construction laydown, the re-grade of driveways and construction traffic manoeuvring.

The works described for the Project could be carried out in stages as urban development occurs surrounding the Project area.

Indicative design drawings are provided in Volume 3 of this AEE and the Project design standards and details further described in Section 4.2.7

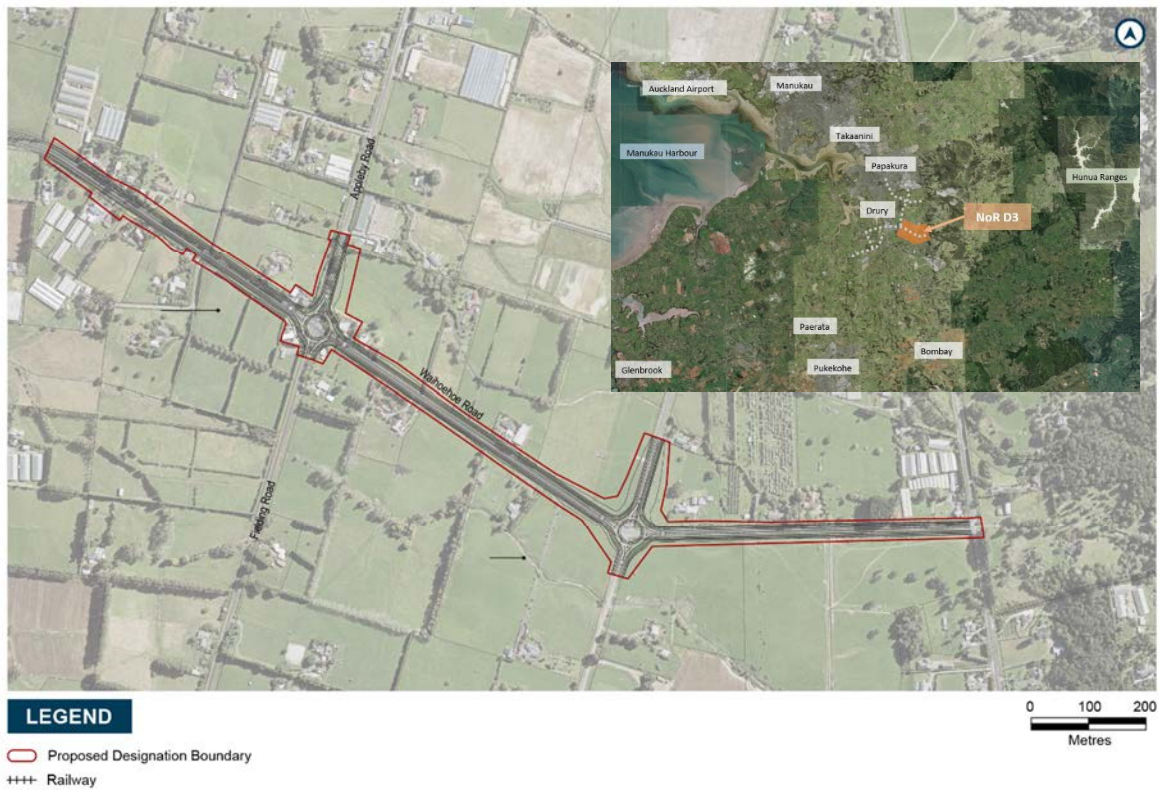


Figure 20-1: Proposed Waihoehoe Road East Upgrade

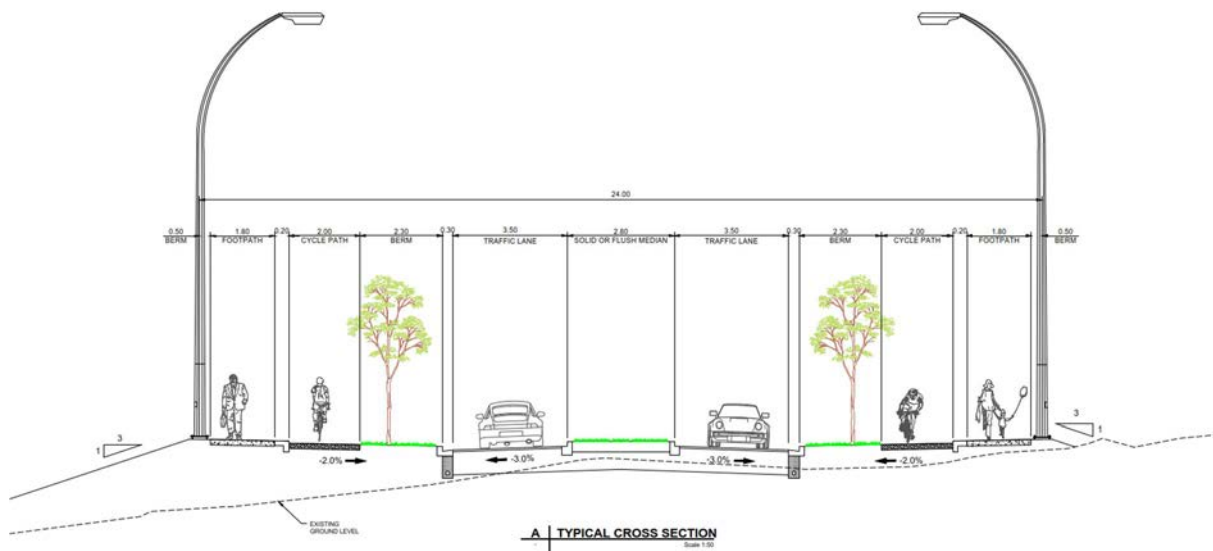


Figure 20-2: NoR D3 Typical Cross Section

20.2 Project Objectives

The Project Objectives reflect the transport outcomes that were identified for the Southern Growth Area (in the IBC) and specifically the Drury Arterial Network (in the DBC). The Project Objectives for the Waihoehoe Road East Upgrade are:

1. Provide a transport corridor that connects key destinations in Drury East and to support and integrate with urban growth in Drury
2. Provide a transport corridor that is safe for all users
3. Contribute to mode shift by providing a choice of transport options including active transport.

20.3 Lapse

A lapse period of 15 years is proposed for NoR D3.

20.4 Indicative Construction Methodology

The general construction methodology for the Project is outlined in Section 4.4 and further detail is outlined in the sections below. The indicative construction methodology, including the working room areas specified in Table 4-2, have informed the proposed designation boundary.

20.4.1 Construction Overview

Construction of the Project will include earthworks, service relocation works, drainage and pavement construction. The works will also include the construction of two new roundabouts. The proposed works for the Project are likely to be constructed in a single construction zone as the works along the alignment are similar in nature with regard to geography and complexity of the works.

20.4.2 Indicative Construction Programme and Sequencing

The Project is estimated to take 2 to 2.5 years to construct. The implementation timeframe for the Project has yet to be confirmed and will respond to timing of urban development as well as funding availability. However, it is currently anticipated that it will be implemented by approximately 2028. In addition, urban development that may occur ahead of the proposed upgrade has the potential to change the detail of construction requirements than what would be required in the existing environment. The proposed designation provides for construction in the existing environment acknowledging this may change in the future.

A summary of the indicative construction sequence and methodology is outlined in Figure 20-3.

Enabling Works

1. Site establishment, including: property demolition or modification including fence realignment and driveway relocations
2. Service relocation or protection works
3. Implement environmental controls including silt fencing and temporary sediment retention ponds
4. Install temporary traffic management controls to realign traffic and establish work areas

Stage 1 – Eastbound Carriageway

1. Earthworks (during summer months) including topsoil strip, embankment foundations and construction of embankment to subgrade formation
2. Install stormwater infrastructure
3. Construct new pavement works
4. Construct new cycleways and footpaths
5. Complete tie-in works, footpath, cycle paths, lighting and landscaping
6. Divert traffic onto newly constructed pavement

Stage 2 – Westbound Carriageway

Same Process as Stage 1

Stage 3 – Finishing Works

1. Complete outstanding pavement works. Remove temporary works
2. Install median kerbing, line marking and street lighting
3. Complete road finishing works including streetlighting, landscaping, footpaths and cycleways and line marking

Figure 20-3: NoR D3 Indicative Construction Sequencing Summary

20.4.3 Indicative Construction Methodology

20.4.3.1 Site Establishment

Site Facilities

A construction site compound and laydown areas will be required; the indicative location of the compound is at the corner of Appleby Road and Waihoehoe Road and an indicative laydown at the corner of Cossey Road and Waihoehoe Road as shown in Figure 20-4. Other laydown is likely to be required along the length of the site but can generally be accommodated adjacent to the proposed alignment within the designation footprint.

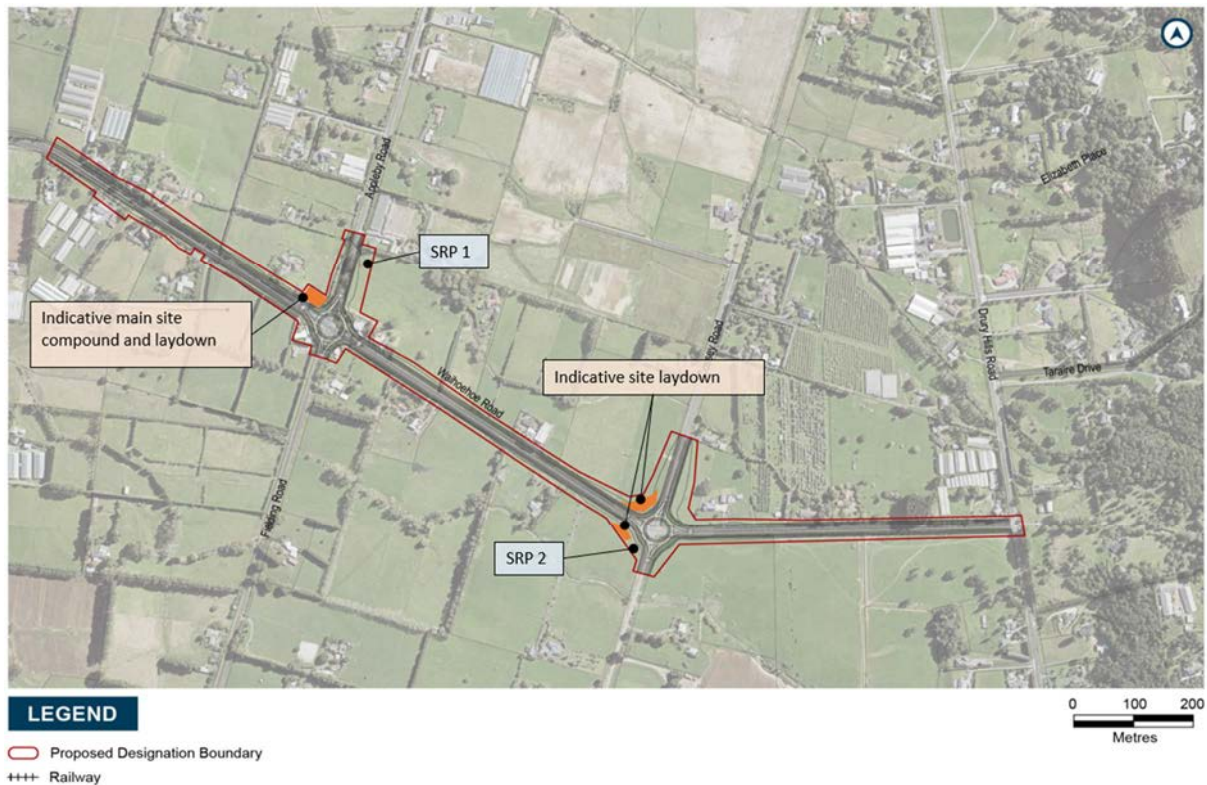


Figure 20-4: NoR D3 Indicative Construction Areas, Compounds, Laydowns and SRPs

Sediment Controls

Proposed sediment controls and discharges are subject to future resource consents. Surface water from the construction work area will need to be treated prior to discharge. It is not anticipated works will involve large earthworks areas. Therefore, it is anticipated localised erosion and sediment control measures will be implemented within these sites. Localised measures can include minimising open earthworks areas by using cut and cover method, installing silt fencing, filter cloth around drains, sandbags, or hay bales near discharge points to filter out the sediments.

The larger cut and fill areas at Cossey Road and Appleby Road will likely require sediment retention ponds to treat the surface water runoff prior to discharge. Figure 20-4 and Figure 20-5 identify the indicative sediment retention pond locations.

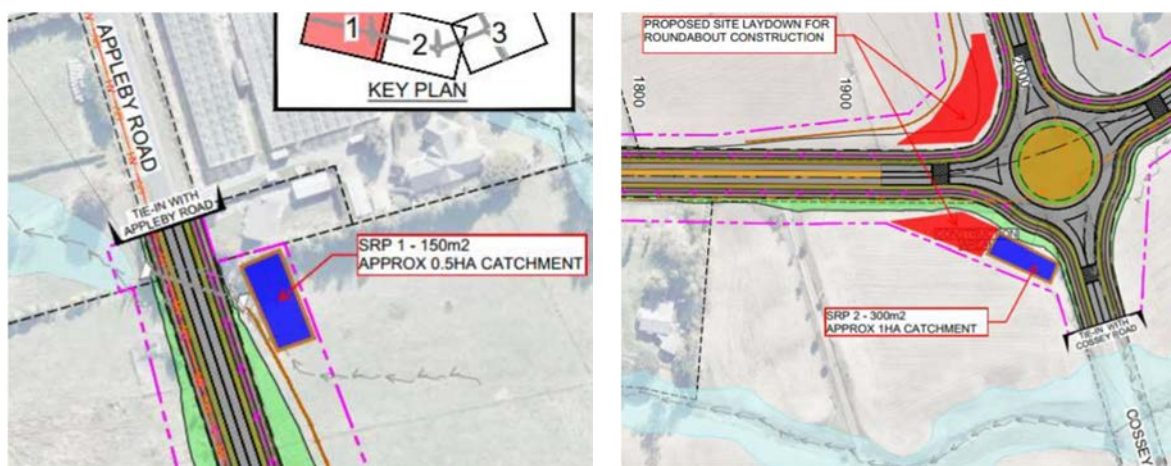


Figure 20-5: NoR D3 indicative areas identified for Erosion and Sediment Control treatment– indicative SRP locations

Traffic Management and Access

Construction of the Project involves disruptions to the existing road network and property access. Access along Waihoehoe Road will largely be maintained, however it is anticipated some closures will be needed for critical activities at night or on weekends with a diversion along Great South Road, Quarry Road and Drury Hills Road.

20.4.3.2 Network Utilities

The Project requires the relocation or realignment of a number of network utilities including gas transmission and distribution, overhead electricity transmission, and telecommunications. Works to network utilities will be confirmed at detailed design and may include the following:

- **Vector Gas Medium Pressure distribution lines** along the northern side of Waihoehoe Road will be realigned into the new carriageway service corridor. Installation of the new gas line will be carried out using a combination of open trench excavation and directional drilling methods. The existing gas pipe is likely to require removal or grout filling where removal is not practicable.
- **First Gas Transmission Line:** the line bisects the alignment at 211 Waihoehoe Road. The exact scope will be finalised in the detailed design phase and in consultation with First Gas to assess the impact to the pipeline. The existing pipeline under the proposed widening may not be designed to cope with the additional loading hence a pipe relocation, strengthening or protection works may be required.
- **Counties Power Overhead and underground distribution lines:** overhead power lines running on the southern verge of the proposed alignment will likely need to be relocated underground to provide space for the new footpath and cycle paths. New cables will be installed by direct bury or directional drill methods and the power switched to the new lines. Some short-term disruption to the affected properties may occur during the cutover operation.
- **Chorus:** the existing cables running underground along both sides of Waihoehoe Road will need to be relocated to their final design location. Temporary cabling is likely required to be put in place outside the earthworks area until the final cabling can be installed.

20.4.3.3 Earthworks

The widening works predominantly follow the existing elevation and therefore do not involve large amounts of cut and fill. The Project is estimated to generate approximately 33,000m³ of excavated (cut) material assumed suitable to be used as direct structural fill material and 42,500m³ of fill, with a total volume of material moved estimated at 75,500m³. Final earthwork volumes will be confirmed during detailed design.

The majority of the fill is required on the northern leg of Appleby Road, and bulk of the cut is required on the northern leg of Cossey Road. There is an opportunity reduce the extent of these earthworks during detailed design.

The cut material from Cossey Road would ideally be used as the fill material required at Appleby Road. Further geotechnical investigations will be required during detailed design to confirm this method. Subgrade improvement techniques may also be required such as undercutting any localised soft spots, or cement and lime stabilising. The fill material required will need to be of suitable standard to meet the specified design. Access to low cost material close to the site will be a significant factor in limiting haulage requirements and associated impacts.

20.4.3.4 Drainage and Stormwater

Stormwater infrastructure will be confirmed at detailed design. Space has been included within the indicative cross section and proposed designation boundary for stormwater infrastructure and it is proposed the drainage is integrated with future urban development. No stormwater wetlands are required.

Resource consents for diversion and discharge of stormwater and any stream works will be sought as part of future resource consent processes. These works and activities will be undertaken in accordance with applicable management and mitigation measures and resource consent conditions.

21 Waihoehoe Road East Upgrade: Existing and Likely Future Environment

This section provides a description of the human, physical and natural features of the existing environment, and the likely future environment within which the Project will be constructed, operated and maintained. It draws on information from a number of sources including the technical assessments included in Volume 4. The potential effects of the Project on this environment and measures proposed to manage these effects are detailed in Section 23 of this report.

21.1 Planning Context

Table 21-1: NoR D3 Planning Context

Existing AUPOIP Zoning and Potential Future Zoning (Drury-Ōpāheke Structure Plan) 8	Existing Zoning: • Future Urban Zone Potential Future Zoning • Residential – Terraced Housing and Apartment Zone • Residential – Mixed Housing Urban Zone • Residential – Mixed Housing Suburban Zone
Overlays and Controls	Overlays • High-Use Aquifer Management Areas Overlay [rp] • Quality-Sensitive Aquifer Management Areas Overlay [rp] Controls • Macroinvertebrate Community Index
Designation(s) and other notations	• Designations - 9104, Pukekohe to East Tamaki Gas Pipeline, Designations, First Gas Limited
Other Non-Statutory Features	• Flood Plains • Flood Prone Areas • Overland Flow Paths



Figure 21-1: NoR D3 Planning Context (AUPOIP)

21.2 Human Environment

Table 21-2: NoR D3 Summary of Existing and Likely Future Human Environment

Land Use and Urban Form	Existing Environment The existing land use surrounding Waihoehoe Road West is semi-rural with low density housing/lifestyle blocks, light industry (roofing company, blind company, machining), horticultural and farming activity (see Figure 21-2). Likely Future Environment The land surrounding the proposed alignment in Drury East is mostly zoned FUZ and forms part of the southern growth area and Drury-Ōpāheke Structure Plan area. The area is planned to undergo significant growth and change in the future. The likely future land use environment in which NoR D3 will operate is assumed to be an urban or developing urban environment. Based on the Drury-Ōpāheke Structure Plan, and proposed private plan changes the land use pattern surrounding the Project is planned to be largely medium to high density residential (see Figure 21-3). Passive recreation uses are also proposed within the structure plan at the western and eastern extents of the alignment. At the time of writing this report, three plan changes had been lodged with Auckland Council to urbanise a large area of Drury East. The Waihoehoe Road East Upgrade is located at the northern extent of the private plan change 49 – Drury East by Fulton Hogan. The final urban form of the existing FUZ area has yet to be confirmed but the land use outcomes in the area, as anticipated by the AUPOIP zoning proposed throughout the Drury Ōpāheke Structure Plan is summarised below.							
	Table 21-3: NoR D3 Anticipated Urban Form <table> <tr> <th>Zone</th><th>Anticipated Outcomes</th></tr> <tr> <td>Residential – Terraced Housing and Apartment Building</td><td>Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.</td></tr> <tr> <td>Residential – Mixed Housing Urban</td><td>Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.</td></tr> <tr> <td>Residential – Mixed Housing Suburban</td><td>Development is typically two storey detached and attached housing in a variety of types and sizes.</td></tr> </table>	Zone	Anticipated Outcomes	Residential – Terraced Housing and Apartment Building	Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.	Residential – Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.	Residential – Mixed Housing Suburban
Zone	Anticipated Outcomes							
Residential – Terraced Housing and Apartment Building	Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.							
Residential – Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.							
Residential – Mixed Housing Suburban	Development is typically two storey detached and attached housing in a variety of types and sizes.							



Figure 21-2: NoR D3 Existing Environment – Land Use and Urban Form



Figure 21-3: NoR D3 Likely Future Environment – Land Use and Urban Form

Transport

The following text provides a summary of the existing and likely future transport environment relating to the Waihoehoe Road East Project Upgrade. A more detailed description of the transport environment is provided within the Assessment of Transport Effects within Volume 4 of this Document set.

Existing Environment

The existing road network within the Project area can be summarised as follows:

- Waihoehoe Road (80kph) is a primary collector road with no active transport facilities which provides key east-west connections within Drury East
- At the eastern end, Waihoehoe Road intersects with Drury Hills Road, a two-lane secondary north-south collector road
- There are no public transport facilities
- Most of the intersections within the Project extent are priority T-junctions with 'give-way' or 'stop' controls. They have limited crossing facilities and safety measures for vulnerable road users.
- There are existing safety issues on the corridor.
- The existing daily traffic flow along Waihoehoe Road and the intersecting roads are relatively low and reflect the primary rural access function of the road.
- The existing properties adjacent to Waihoehoe Road East have access either to side roads connected to Waihoehoe Road, or directly onto Waihoehoe Road itself. Given the current land uses, the number of access points to Waihoehoe Road is relatively low
- Waihoehoe Road East is not classified to have a high freight function and is not on the current Waka Kotahi over-dimension vehicle route or overweight route.

Likely Future Environment

The planned growth in the Project area, and the transition from a rural to an urban land use environment, will put significant strain on the existing transport infrastructure. A number of planned future transport projects are identified in the Drury-Ōpāheke Structure Plan (subject to planning and funding approvals) and NZUP and will form part of the future transport network that will enable the planned growth to be realised. These are:

- New rail stations at Drury Central and Drury West *
- New Mill Road Corridor*
- SH 1 Papakura-to-Bombay Upgrade **
- SH 22 Drury-to-Paerata**
- Additional rail capacity between Pukekohe and Papakura**
- Regional north-south cycle route between Drury and Pukekohe***
- New rail station at Paerata***
- New Pukekohe Expressway ***
- The other components of the Drury Package Arterial Network (proposed within this report) noting that there may be interim transport infrastructure provided by developers within the Drury Arterial Network (for example a local road built by developers which is later upgraded to an arterial) ***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas are urbanised.

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

Historic Heritage and Archaeological Values	The following text provides a summary of the existing and likely future environment as it relates to historic heritage and archaeological values. A more detailed description of the environment identified through research and site surveys is provided within the Assessment of Historic Heritage Effects within Volume 4 of this Document set. Existing Environment There are no recorded sites within 200 m of the proposed designation. There is reasonable cause to suspect previously unrecorded historic heritage sites may be present within the Project area. This is primarily based on streams and waterways present either side of the road which are areas of higher risk for both pre-European Māori and pre1900 European historic heritage deposits. It is likely this is the route that the pre1900 bullock drawn coal was transported. While there is a risk of historic heritage deposits being exposed, it is low in terms of historic heritage deposits being present. Likely Future Environment The existing environment as it relates to historic heritage and archaeological values is likely to remain the same in the future. However, there is a possibility that unknown sites could be uncovered during development of the area prior to construction of the transport corridor which would add to the historical understanding of the area.
Cultural Values	There are no identified Sites of Significance to Manawhenua identified under the AUP OIP within or in close proximity to the Project area. The cultural values identified by Manawhenua within the Project area highlights the importance of maintenance and enhancement of water quality and ecological values, particularly areas of high indigenous values.
Community and Recreational Facilities	Existing Environment The sole recreational facility near NoR D3 is a private aqua fitness centre for the local community (and further afield). Waihoehoe Road East is on the outskirts of Drury Village with the closest schooling, public recreational and other community facilities accessed in Drury or Papakura. Likely Future Environment Existing recreational and community activities in the wider area (within Drury) could remain unchanged and it is likely additional community facilities will be provided as development occurs and the population in the surrounding area grows. The Drury-Ōpāheke Structure Plan identifies potential new suburb parks at the southern side of the western extent of the corridor and at Fitzgerald Road.
Ambient Noise	The ambient noise environment is reflective of a rural environment where low noise levels are experienced with limited road traffic noise. Noise monitoring was carried out at 235 Jesmond Road and 116 Waihoehoe Road (as these sites were considered to be representative of the existing noise environment of the Project Areas) over seven days with noise levels recorded ranging between 46 - 49 dB LAeq(24hr). This ambient noise level is likely to change as the surrounding environment urbanises. Although no measurements were taken from an urban location (to reflect the noise environment within the Drury Village and industrial area), computer noise modelling of

Utilities	existing noise levels has been shown to be generally accurate (within +/- 2 dB) and effective, particularly in the vicinity of existing roads.
	Existing Environment Major utilities in the Project area include: • The First Gas underground gas transmission line (designation 9104) crosses the road at 211 Waihoehoe Road. The Gas transmission line runs in the north-south direction and is connected to the substation on the southern side of Waihoehoe Road at this location. • An existing overhead Counties Power MV cable runs along the southern side of Waihoehoe Road. At the Appleby Road roundabout, an existing Counties Power MV and HV line runs in the north-south direction; • Vector Gas Medium Pressure distribution lines cross and run along Waihoehoe Road, generally on the northern side of the road; and • Chorus lines run along both sides of Waihoehoe Road. Likely Future Environment As the areas surrounding the Project urbanises in the future it can be expected that existing utilities will remain, it is likely additional utilities will be added. Existing overhead powerlines may be undergrounded as part of new development.
	Property Details • 33 privately owned properties directly affected totalling approximately 58,281m²

21.3 Natural and Physical Environment

Table 21-4: NoR D3 Summary of Existing and likely Future Natural and Physical Environment

Geology	Existing Environment The area surrounding the Project is mapped as being underlain by Puketoka Formation and basalt lava of the South Auckland Volcanic Field. Although mapped as being underlain by basalt lava, a layer of weathered basalt and volcanic ash is anticipated to overlie the basalt, described within geological maps as consisting of soft silty clay. NoR D3 is located approximately 750m south of the Glenbrook Fault, which is described as being downthrown to the south by approximately 200m. The site sits within the associated Glenbrook Depression, with greywacke bedrock described as being at an extremely low elevation. At the eastern end of the alignment, Waihoehoe Road is approximately 400m from the Drury Fault, which is downthrown to the west approximately 2,700m in this area, running approximately perpendicular to the alignment. Likely Future Environment The geological conditions are not anticipated to significantly vary in the future.

Hydrology and Natural Hazards

Existing Environment

As shown in Figure 21-4 the Waihoehoe Road East corridor crosses no known watercourses. Streams are located either side of the alignment. The corridor lies on a ridge with several overland flow paths draining either north or south, away from the road. There are no significant floodplains identified near the road.

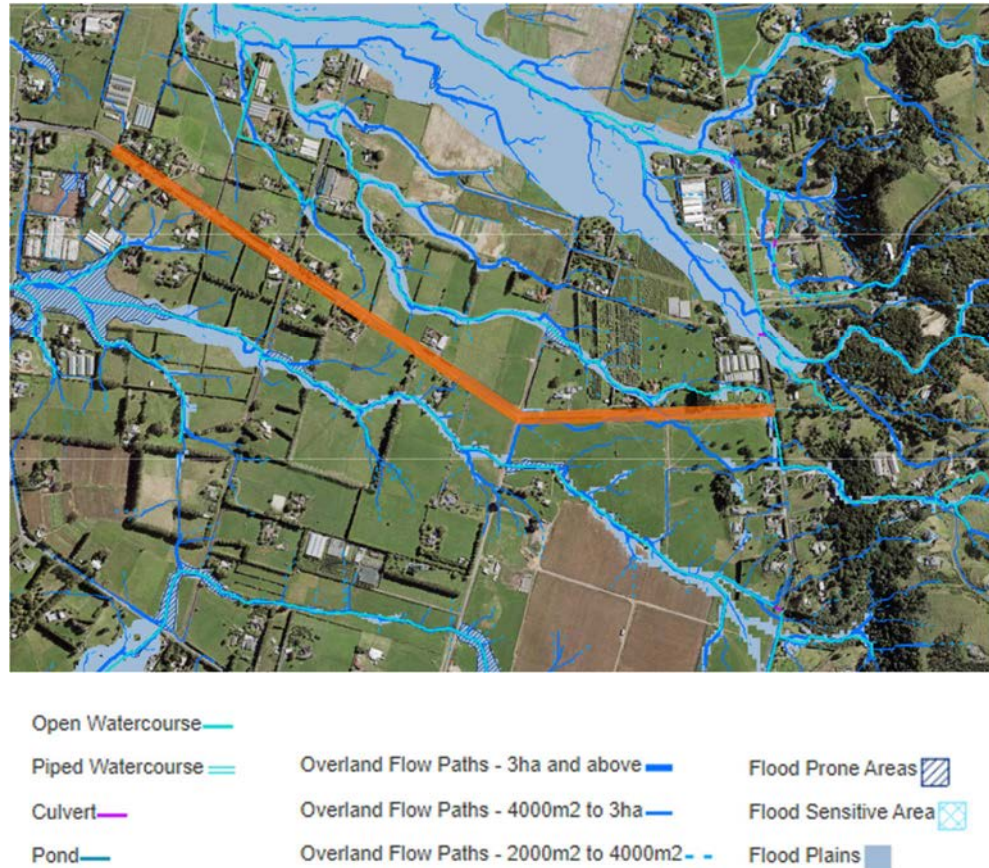


Figure 21-4 Hydrology and Natural Hazards surrounding Waihoehoe Road East Upgrade (Source: Auckland Council GeoMaps, 2020)

Likely Future Environment

Although urban development is anticipated the hydrological environment and natural hazard conditions are not expected to significantly vary in the future.

Terrestrial Ecology

The following text provides a summary of the existing and likely future environment as it relates to ecological features and values. A more detailed description of the environment is provided within the Assessment of Ecological Effects within Volume 4 of this Document set.

Existing Environment

The existing environment surrounding the Project area includes a number of habitats (including terrestrial, freshwater and wetland) and species.

Habitats

The existing terrestrial habitats are dominated by agricultural land, exotic grassland and amenity planting (gardens and parks) with small areas of exotic wetlands, treeland and exotic planted vegetation. Where natural habitat remains, SEAs are identified through the AUPOIP. There are no SEAs identified within the proposed designation boundary.

	The freshwater habitat within the Project area includes three tributaries of the Hingaia Stream and Waihoehoe Stream. Two of these streams are classified as ephemeral and in part within existing culverts. The third stream (Waihoehoe Stream Tributary, D3S3) is intermittent and has been highly modified by adjacent agricultural practice. It has low ecological value. Wetland habitat present within in the Project area includes one area of exotic wetland to the north of Appleby Road, dominated by exotic plant species and severely degraded through factors such as vegetation removal, artificial drainage and grazing and pugging from livestock. Species Automatic bat monitor (ABM) surveys were undertaken within the wider Drury Package area including within the Project area. The ABM survey results suggested that bats are not frequent visitors to the area during their mating and breeding seasons. No mature trees with suitable roosting features were identified within or adjacent to the Project area. No suitable habitat exists in the Project area for Threatened or At-Risk bird species. However, common, Not Threatened, native forest species are likely to use the surrogate habitat (exotic vegetation) present within the Project area for breeding and foraging. Habitat availability for the Not Threatened copper skink was confirmed during site investigations, however no other suitable habitat for native lizards was found or considered likely within the Project area. No indigenous lizards were identified as incidental observations. However, the introduced plague skink was identified. During the site investigations, no indigenous frogs were identified as incidental observations and it is highly unlikely that native frog species would occur within the Project area due to lack of suitable habitat. No dedicated fish surveys were undertaken as this will be subject to a future resource consent phase. Likely Future Environment It is assumed that in a future urbanised scenario, stream corridors will largely be avoided, retained and enhanced. It is also assumed that stormwater design will be integrated into the proposed 'Blue Green Network' and sediment and pollutants will be controlled at source. If for example riparian habitat restoration is implemented appropriately, it is therefore considered that in a future scenario many of the features of ecological value could be similar or in some cases enhanced.
Vegetation (Trees)	The following text provides a summary of the existing and likely future environment as it relates to trees. A more detailed description of the environment is provided within the Assessment of Arboricultural Effects within Volume 4 of this Document set. Existing Environment There are no trees that are protected by District Plan provisions identified in the Project area. Likely Future Environment The trees in the Project area provide a range of cultural, amenity, landscape and ecological values. These values will generally remain constant or increase in the timeframes that may apply to the proposed designation. However, the future environment for trees in the Project area is likely to be very different as the land use pattern and zoning changes from rural and FUZ to urban. This change is likely to result in removal of trees that are not protected by the current plan framework. Removal of trees can therefore be expected to occur as the land use changes from a rural environment to an urban environment in the future. The planting of new trees would also occur as part of an urban landscape.

Topography and Landscape Context

The following text provides a summary of the existing and likely future environment as it relates to landscape features and values. A more detailed description of the environment is provided within the Assessment of Landscape and Visual Effects within Volume 4 of this Document set.

Existing Environment

The Project area is situated within the existing road corridor and extends into adjacent land that is characterised by lowland floodplains north of the corridor and flat to gently undulating landform to the south, both having a modified rural landscape character. There are no regionally or nationally significant landscapes (ONLs, ONFs or ONCs) within or immediately adjacent to the proposed designation boundary.

The Hunua Ranges foothills provide a pleasant backdrop to the existing corridor and that in combination with the elevated undulating topography adds to the landscape values of the local setting. While the ecological features of the Project area are limited, the visual amenity aspects of the corridor are relatively heightened.

Likely Future Environment

The land within the Project area will witness a significant change in land use over the coming decades from rural to urban particularly as developers seek the rezoning of FUZ land in Drury East to allow for urban development. It is anticipated that most of the existing vegetation patterns (within private properties) will make way, or be absorbed into new urban development, which will likely include street tree plantings, public open space design and planting within private yards. The proposed Mill Road project, which has funding under the NZUP programme and will intersect with the Project in the east, represents a substantial infrastructure project that is likely to further delineate the landscape character of the rural land in the area.

22 Waihoehoe Road East Upgrade: Consideration of Alternatives

A detailed assessment of alternatives was undertaken for the Project to identify the proposed route (process is described in Section 4.2 and further outlined in the Alternatives Assessment Report attached at Appendix A). The following sections provide an overview of the alternatives assessment process through the corridor assessment (IBC Phase) to the route refinement assessment (DBC and NoR Phase). This summary should be read in conjunction with the full assessment, including the process undertaken and outcomes reached, provided in the Alternatives Assessment Report attached at Appendix A.

22.1 Corridor Alternatives Assessment

TFUG did not recommend upgrading Waihoehoe Road, instead recommended upgrading Fitzgerald Road with a connection to Mill Road south.

A number of arterials were investigated in Drury West during the corridor assessment, and as part of that investigation, upgrading Waihoehoe Road was reconsidered. Ultimately, the Waihoehoe Road upgrades scored slightly higher through the MCA assessment than upgrading Fitzgerald Road. Upgrading Waihoehoe Road provides a greater people and public transport movement function than upgrading Fitzgerald Road, so Fitzgerald Road was discounted.

During the assessment it was indicated that upgrading Waihoehoe Road could have potential improvements to freight movements and provide a link between centres, the existing Drury township and proposed rail stations. Upgrading of Waihoehoe Road was generally supported in public consultation. Upgrading Waihoehoe Road was considered to increase accessibility and connect strategically into Drury central, providing a good catchment to proposed employment and residential catchments. The figures below show the long list and short list options considered.

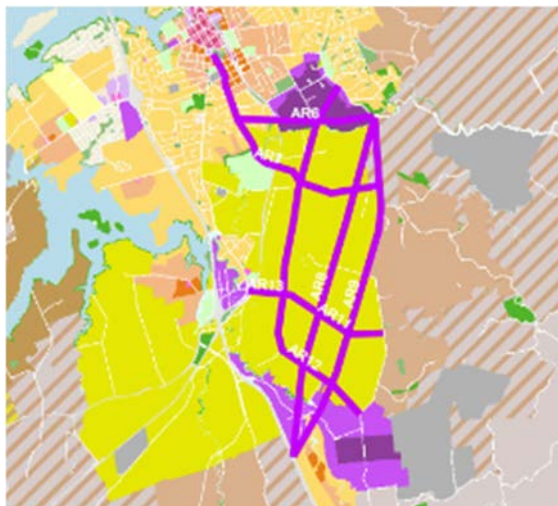


Figure 22-1: IBC Drury East Long List Options

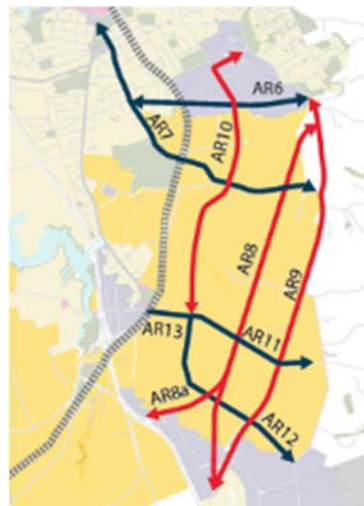


Figure 22-2: IBC Drury East Short List Options

22.2 Route Refinement Alternatives Assessment

22.2.1 Option Development

Route refinement for the Waihoehoe Road East Upgrade included specialist assessment of three options:

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road

The three options for the Waihoehoe Road East Upgrade are shown in Figure 22-3.

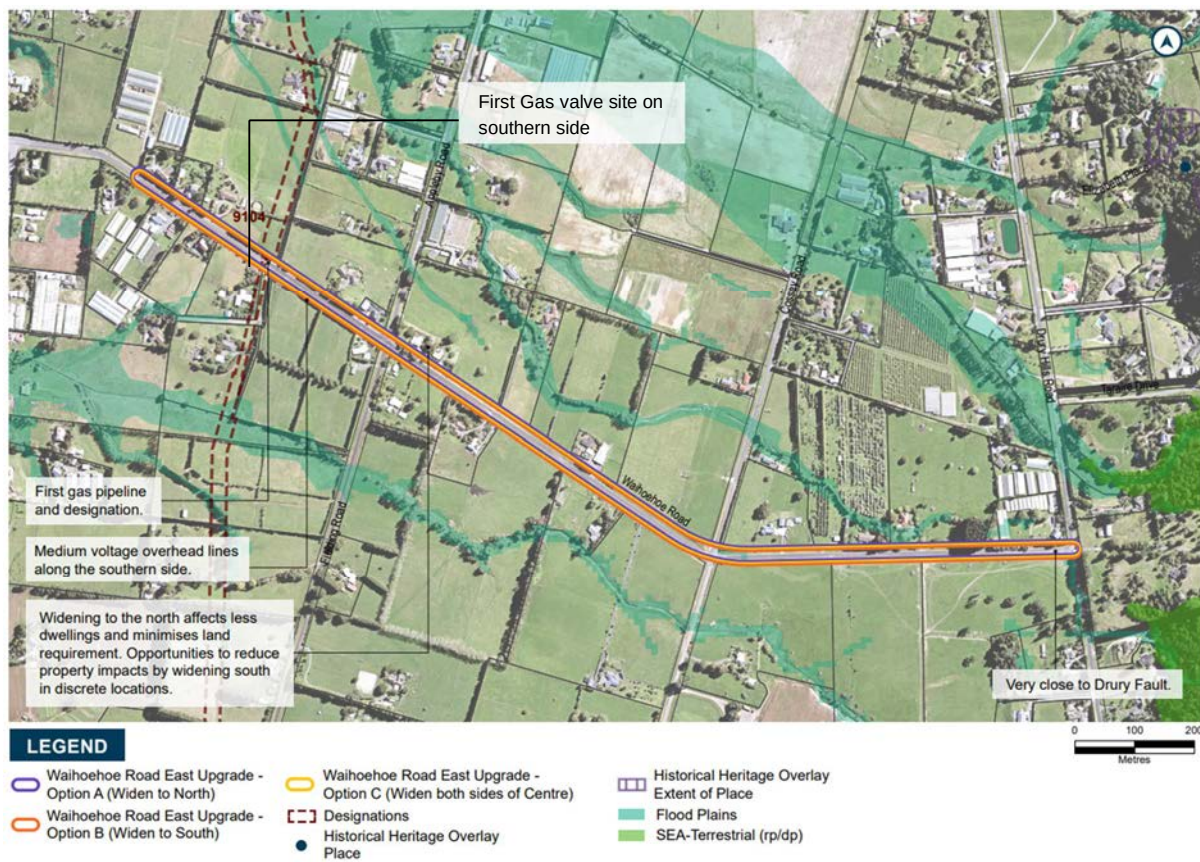


Figure 22-3: Waihoehoe Road East Upgrade Options for route refinement showing constraints and considerations

22.2.2 Assessment

The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 22-3. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners, stakeholders and landowners.

22.2.2.1 Preferred Option

The preferred option (a combination of Option A and Option B) was, west of Cossey Road, to widen generally to the north of the existing road corridor and east of Cossey Road, to widen generally to the south of the existing road corridor. The preferred option was chosen because:

- This combination of options has less property impacts overall as less dwellings are impacted due to the alignment adjoining larger parcels used for farming and/or existing dwellings are sufficiently set back from the road and proposed works.
- This option has reduced impacts on a First Gas valve site at 211 Waihoehoe Road.

Although, not a deciding factor, widening to the north at the western end of the alignment does have additional benefits of consistency in which side of the road is widened with the preferred option for the Waihoehoe Road West FTN Upgrade.

All route refinement options provided the same level of achievement against the transport outcomes.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the Project has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

22.2.2.2 Discounted Options

Option C was discounted because:

- Impact on the First Gas valve site.
- Temporary traffic management during construction more complex

22.2.2.3 Intersection Form

- Along this corridor, there are four intersections to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future:

Waihoehoe Road / Appleby Road: Roundabout preferred because:

- Roundabout works better for single lane approaches as an overall design
- **Waihoehoe Road / Cossey Road:** Roundabout preferred because:
 - Roundabout works better for single lane approaches as an overall design
- **Ōpāheke N-S FTN Arterial / Waihoehoe Road / Fitzgerald Road:** Roundabout as discussed within the Waihoehoe Road West Corridor (section 15.3.2.5).

22.2.3 Summary

The preferred option for Waihoehoe Road East Upgrade was, west of Cossey Road, to widen generally to the north of the existing road corridor and east of Cossey Road, to widen generally to the south of the existing road corridor (a combination of Option A and Option B).

Through the intersection form assessment it was recommended that roundabouts be implemented at the Waihoehoe Road intersections with Ōpāheke N-S, Appleby Road and Cossey Road.

23 Waihoehoe Road East Upgrade: Assessment of Effects on the Environment

This section provides summarises the actual and potential effects of the construction, operation and maintenance of the Waihoehoe Road East Upgrade, including whether these effects are positive or adverse and the scale, duration and location of effects.

Key transport outcomes, land use integration and the avoidance of adverse effects on areas or features of high value have been key drivers for the identification and selection of the proposed designation corridor and the subsequent refinement of the corridor. Where avoidance has not been possible, measure to remedy or mitigate significant adverse effects have been proposed. Details of these are included in Section 24 and reflected in proposed designation conditions.

23.1 Positive Effects

The Project will generate a range of positive effects. The nature and degree of these positive effects are discussed in subsequent sections of the AEE, but in summary:

- The Project will provide transport infrastructure necessary to support and integrate with the planned urban growth in Drury-Ōpāheke. The Project will unlock development capacity in the southern growth area where development pressure is accelerating. This is evident from recent private plan changes being lodged with Auckland Council.
- The Project will provide a safe, reliable arterial corridor that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improves access to employment and social amenities. This will improve the way people live in terms of daily commutes and connecting to the community. In particular, it will:
 - Significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport and will significantly reduce the risk of DSIs;
 - Serve as a key enabler to achieve mode shift targets and will provide a critical east-west active transport connection to the proposed Mill Road corridor for longer inter-regional routes and to the proposed Drury Central Station and the town centre;
 - Integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.
- Predicted traffic noise level changes during operation of the Project are generally expected to reduce compared to the likely future environment without the Project due to: reduced traffic volumes as a result of redistribution of traffic within the new transport network; reduced speeds and slight changes to topography resulting in PPFs being slightly lower than the road height.
- Slower speed limits adjacent to existing dwellings and an improved streetscape will improve the experiential qualities of the corridor for users and private properties adjacent to the road corridor.
- Net increase in green infrastructure within the Project area associated with street trees, berm and stormwater plantings. This will improve visual amenity for road users and adjacent audiences.
- The Project will provide health and wellbeing benefits to the wider community through providing new active mode facilities.

- Opportunities to present any new historic information identified during the works to the community through information boards and other displays as the historic heritage of the area is currently not well understood.

23.2 Traffic and Transportation

The potential effects of the Project on traffic and transportation have been assessed in the Assessment of Transport Effects report, provided in Volume 4. The effects assessment has been assessed on the likely future environment, based on the full build out of the southern growth areas in 2048+, and taking into account relevant wider infrastructure upgrades. This methodology is outlined in the Assessment of Transport Effects Report. The potential effects are summarised below and should be read in conjunction with that report.

23.2.1 Positive Effects

The Project will have significant positive traffic and transportation effects. It will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improves access to employment and social amenities. The Project will significantly improve transport facilities, resulting in improved safety for those that travel by car and active modes.

The Project will serve as a key enabler to achieve mode shift targets and will provide a critical east-west active transport connection to the proposed Mill Road corridor for longer inter-regional routes and to the proposed Drury Central Station and town centre. Additional segregated active transport facilities will also result in significant improvements to safety for vulnerable users and will significantly reduce the risk for DSIs.

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

The positive effects of the Project are also discussed in further detail in the assessment of operational effects below.

23.2.2 Operational Effects

The existing Waihoehoe Road East is not fit for purpose to support the planned future urban growth, due to the high-speed environment, narrow carriageway and significant increase in conflicts between through traffic, accessing/turning movements and vulnerable road users. These increases in conflicts will lead to increases in DSIs, and significant adverse effects are expected if future growth progresses and the existing Waihoehoe Road East infrastructure remains the same.

The current Waihoehoe Road East environment is a high-speed rural connector with no walking and cycling facilities, resulting in high conflict and unsafe conditions between general traffic and vulnerable road users. It is anticipated that the number of pedestrians and cyclists will increase significantly when the area is urbanised, and the Drury Central station is completed and operational (NZUP expected timeframe is 2024).

Potential adverse effects as a result of the existing infrastructure are increased safety risks for all users, hostile and unsafe environments for active modes, and decreased reliability for general traffic. This will lead to several undesirable transport and land use integration outcomes.

23.2.2.1 General Traffic Effects

The upgrade consists of widening the existing alignment from the proposed Ōpāheke N-S FTN Arterial (NoR D4) to Drury Hills Road, and will tie into the proposed Mill Road corridor. As the surrounding area is urbanised over time, the Project enables the function of Waihoehoe Road East to transition from an existing rural two-lane collector road to an urban two-lane arterial catering for general traffic and active modes.

The Project will reduce conflicts and crash exposure between general traffic and vulnerable road users. The proposed design includes separated active transport facilities on both sides of the road, and a central median (either flush or raised) to separate the two directions of traffic movements. It also includes a reduction of the speed to a 50 km/hr urban arterial standard.

Modelling results show there will be an increase in traffic volumes between 2016 and 2048+ (full build out of the southern growth areas), but that two lanes for general traffic will be adequate based on the general traffic forecasts. The proposed intersections are also predicted to have ample supply during the peak periods under a 2048+ scenario. The Project is therefore considered to provide ample corridor and intersection capacity to cater for future growth. It will also improve integration with the proposed Drury Central Station and the future urban areas.

23.2.2.2 Safety Effects

The Project has been designed with consideration of the latest safety guidance, including AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrades that comprise NoR D3 are expected to result in positive effects on safety including:

- Providing for separated and protected walking and cycling facilities to improve the safety for existing and future road users
- Changing the form of existing intersections to roundabouts which will provide better give-way control, improve visibility, reduce the speed of approaching vehicles and provide safer walking and cycling crossing facilities
- Reducing the speed environment from 80km/h to the more appropriate urban speed of 50km/h
- Providing appropriate vehicle lane widths and buffer space for planting/design features between facility type, to reinforce the urban road speed environment and provide for additional separation between modes
- Providing a centre media (flushed and raised) to separate the two directions of traffic and prevent head-on crashes.

Overall, the Project will provide a much safer transport system which will significantly reduce the number of DSIs and result in positive effects for all road users. Further complementary measures to achieve the safety outcomes identified will also be identified as part of detailed design.

23.2.2.3 Walking and Cycling Effects

The Project proposes to repurpose Waihoehoe Road East to an urban arterial and provide segregated walking and cycling facilities on both sides of the road to support growth, enable sustainable travel choice and combat expected safety concerns. Walking and cycling are key components to the future environment surrounding NoR D3, with several key attractors which suggest walking and cycling will significantly increase as growth progresses in the Drury area. These include

connections to the proposed Mill Road corridor, Drury Central Station and town centre, and the urban growth signalled by the underlying zoning of the area.

The Project is anticipated to have a number of significant positive effects on walking and cycling including:

- Significant reductions in the likelihood and exposure to potential crashes by providing safe movement for vulnerable road users along and across Waihoehoe Road East
- Good integration with the future walking and cycling network, especially between the future Mill Road and Drury East
- Reductions in the reliance on vehicle trips due to the higher number of active mode trips which will result in positive environmental and health benefits
- Good integration with the proposed Drury Central Station and FTN routes (Ōpāheke N-S FTN Arterial (NoR D4) and Waihoehoe Road West (NoR D2).
- Improvements to existing and likely future safety and network severance issues
- Supporting urban growth of the surrounding areas by providing for a safe walking and cycling connection between key destinations.

23.2.2.4 Public Transport Effects

The Project will serve as a key enabler to achieve mode shift targets and will provide a critical east-west active transport connection to the proposed Mill Road corridor for longer inter-regional routes and to the proposed Drury Central Station and the town centre. It will reduce the reliance on private vehicle trips which will result in positive environmental and health benefits.

The exact location of bus stops and/or interim routes will be defined at later stage, as part of detailed design for the Project. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined.

23.2.2.5 Effects on Access

Based on average ADT of 6,600 vehicles per day along the corridor, direct property access onto Waihoehoe Road East is not recommended given the negative safety implications. The traffic volume will undermine Vision Zero as vehicles using driveways will conflict with other modes, in addition to driver safety and active modes being compromised by merging on to the road. As properties develop, they will typically be designed to have access via the local and collector road rather than directly onto this arterial.

The specific details for each site will depend on the timeframe of the Project and development of each site. In general, it is proposed that any such direct access will only be permitted if no other options were readily available and will likely be subject to movement control (such as banning of right turns). The design of the wider network means such restrictions may be accommodated with limited diversion. The Project will also provide walking and cycling access from these properties where generally, none currently exists.

23.2.3 Construction Effects

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works. In terms of construction effects, there are several potential temporary adverse effects mainly associated traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property

access). Potential adverse effects on transport during the construction of the Project can be summarised as follows:

- **Temporary traffic management** will be required to facilitate the construction activities. The scale of temporary traffic management is largely dependent on the various stages and requirements of the construction activities. It is expected that short-term temporary road closures for nights and weekends may be required for some specific activities such as pavement surfacing and traffic switches. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work
- **Construction traffic movements** to accommodate the movement of earthworks will likely result in the increase of traffic volume on construction routes used during the construction period of the Project.
- **Construction vehicles** will include truck movements (heavy), light delivery and staff/contractor vehicle movements (light). The total estimated trips associated with construction works are approximately 16,400 heavy truck movements staged over two to two and a half years, and approximately 100 light vehicles per day.
- **Road safety** impacts from site access points, posted speed and sight lines for construction vehicles.
- **Pedestrian and cyclist safety:** provision of walking facilities and cycle diversions if demand exists at the time of construction. The analysis of the crash data did not show any current or historic incidents involving pedestrians and cyclists. Therefore, it is expected that the additional construction traffic will be unlikely to have any notable impact to existing active transport modes. Construction effects on pedestrians and cyclists should be assessed again prior to construction, when a greater level of detail is available about surrounding facilities and land use activities.
- **Existing driveways** that remain during construction will be required to have temporary access provision through temporary traffic management controls.

It is recommended the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction. Adverse effects can be adequately managed through the implementation of a CTMP discussed in section 23.2.4.

23.2.4 Mitigation Measures

23.2.4.1 Operational effects

Based on the assessment of effects, as summarised above, the Project will have significant positive effects on the operation of the transport system. There are no anticipated adverse effects that require mitigation.

23.2.4.2 Construction effects

To address the potential construction effects identified above, a Construction Traffic Management Plan (CTMP) will be prepared prior to the start of construction. Any CTMP prepared will be submitted to Council for information ten working days prior to the start of works. Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. The objective of the CTMP is to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP will include:

- Methods to manage the effects of temporary traffic management activities on traffic;
- Measures to ensure the safety of all transport users;
- The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
- Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
- Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
- The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads;
- Methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

If required, SSTMP will be developed to manage constraints on access to affected properties.

23.2.5 Summary of Transport Effects

The existing Waihoehoe Road East is not fit for purpose to support the planned future urban growth. Significant adverse effects are anticipated if infrastructure remains the same, including increased safety risks for all users, unsafe environments for active modes and decreased reliability for general traffic.

The Project will have significant positive operational effects. It will provide a safe, reliable arterial network that supports growth, sustainable travel choice, combats safety concerns and significantly improves access to employment and social amenities.

The Project will significantly improve transport facilities, resulting in improved safety for those that travel by car and active modes. The Project will serve a key enabler to achieve mode shift targets and will provide a critical east-west walking and cycling connection to the proposed Mill Road corridor, and to the Drury Central Rail Station and town centre. The upgrade will also significantly improve safety for vulnerable users and will significantly reduce the risk of DSIs. The Project is not expected to have any adverse operational effects that require mitigation.

In terms of construction effects, some potential adverse effects are anticipated but these are mainly linked to temporary traffic management, and can be managed appropriately through the implementation of a CTMP.

23.3 Cultural

23.3.1 Discussion

This section presents our understanding of the cultural values and issues of significance to Manawhenua in respect of the Project. This section draws from our engagement with Manawhenua and inputs provided by Manawhenua during Project development. Ngāi Tai ki Tāmaki, Ngāti Maru, Ngāti Tamaoho, Ngāti Te Ata Waiohū, Te Ahiwaru, Ngāti Whanaunga and Te Ākitai Waiohū have been actively involved in the development of the Drury Arterial Network.

The Project corridor does not affect any identified Sites of Significance to mana whenua under the AUP, wāhi tapu, other taonga or Māori land. However, in developing the Project, recognition has been given to both the relationship of Tangata Whenua to their lands, culture and traditions in this area and the commitment to partnership between Manawhenua and AT. The partnership approach that has been taken in delivering the Project with Manawhenua is discussed further in respect to engagement in section 5.2.1.1 Ngā Manawhenua of this AEE.

Manawhenua involvement has included participation in all Project phases through options assessment, design refinement and effects assessment of the preferred corridor. Engagement with these iwi groups has included site walkovers to identify and address any culturally significant effects, as well as discussion of the approach to cultural impact assessments which could accompany the NoRs. Ngāti Tamaoho, Ngāi Tai Ki Tāmaki, Te Ākitai Waiohū and Ngāti Te Ata Waiohū confirmed their intent to prepare a Cultural Impact Assessment (CIA) for inclusion with this NoR documentation, these were unable to be completed to date. A Historic Summary was prepared by Ngāti Tamaoho (included in Volume 4) which has been used as a reference by the Project team.

This partnership with Manawhenua highlighted the following matters of importance:

- **Water quality:** the importance of maintenance and enhancement of water quality, particularly through stormwater treatment.
- **Ecology:** the importance of maintenance and enhancement of ecological values, particularly areas of high indigenous values.
- **Cultural heritage:** the importance of imposing an appropriate accidental discovery protocol for undiscovered archaeological sites. Manawhenua identified the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage.

The Project has also recognised Manawhenua cultural values, particularly with regards to the mauri of, and the relationships of Manawhenua with natural and physical resources including freshwater, land and air resources. Significant adverse effects on these values have been avoided, remedied or mitigated as appropriate. In particular, sufficient land has been included within the proposed designation to provide appropriate stormwater discharge treatment (subject to future resource consenting processes) and wetlands and waterways have been avoided where practicable. They also expressed a strong preference for reducing infrastructure within floodplains.

23.3.2 Mitigation

A number of workshops were held with Manawhenua to work collaboratively on the draft condition set. The conditions that relate to ongoing Manawhenua involvement in the Project were developed and agreed with Manawhenua. The proposed designation conditions include the following measures to ensure ongoing involvement of Manawhenua in Project design and construction and ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle.

Cultural Advisory Report

Manawhenua will be invited to prepare a Cultural Advisory Report prior to the start of detailed design of the Project. The objective of the Cultural Advisory Report is to assist in understanding and identifying Ngā Taonga Tuku Iho ('treasures handed down by our ancestors') affected by the Project, to inform their management and protection. To achieve the objective, AT will invite Manawhenua to prepare a Cultural Advisory Report that:

- Identifies the cultural sites, landscapes and values that have the potential to be affected by the construction and operation of the Project;
- Sets out the desired outcomes for management of potential effects on cultural sites, landscapes and values;
- Identifies traditional cultural practices within the area that may be impacted by the Project;
- Identifies opportunities for restoration and enhancement of identified cultural sites, landscapes and values within the Project area;
- Taking into account the outcomes of the above, identifies cultural matters and principles that should be considered in the development of the Historic and Archaeological Management Plan (see section 23.4.3), ULDMP (see section 23.5) and the Cultural Monitoring Plan (see below).
- Identifies and (if possible) nominates traditional names along the Project alignment, noting there may be formal statutory processes outside the Project that apply to any decision-making process.

The desired outcomes for management of potential effects on cultural sites, landscapes and values identified in the Cultural Advisory Report will be discussed with Manawhenua and those outcomes reflected in the relevant management plans where practicable.

Development of other Management Plans

Manawhenua will be invited to participate in the development of the ULDMP to provide input into relevant cultural landscape and design matters as outlined above. The HAMP will be prepared in consultation with Manawhenua.

Cultural Monitoring Plan

Prior to the start of construction works or enabling works, a Cultural Monitoring Plan will be prepared. The objective of the Cultural Monitoring Plan is to identify methods for undertaking cultural monitoring. The Cultural Monitoring Plan will include:

- Requirements for formal dedication or cultural interpretation to be undertaken prior to start of Construction Works in areas identified as having significance to Mana Whenua;
- Requirements and protocols for cultural inductions for contractors and subcontractors;
- Identification of activities, sites and areas where cultural monitoring is required during particular Construction Works;

- Identification of personnel to undertake cultural monitoring, including any geographic definition of their responsibilities; and
- Details of personnel to assist with management of any cultural effects identified during cultural monitoring, including implementation of any Accidental Discovery Protocol.

23.3.3 Cultural Summary

The Project team have worked closely with Manawhenua throughout the Project lifecycle and have taken their values and concerns into consideration, including on ecological values, water quality and cultural heritage. Overall the indicative design of the Project and future design and construction management measures proposed will respond positively to the matters raised by Manawhenua and is consistent with the values they identified during Project design and engagement processes.

23.4 Historic Heritage

The Assessment of Effects on Historic Heritage, included in Volume 4, assesses the potential effects on historic heritage resulting from the future construction and operation of the Project. The report assesses the potential effects on any identified recorded historic heritage sites and unidentified subsurface archaeological remains that might be exposed during future construction. The report should be read in conjunction with the summary set out below.

23.4.1 Construction Effects

The assessment found no recorded historic heritage sites or deposits within the footprint of the Project. There is a possibility that previously unrecorded historic heritage deposits could be found within the footprint during construction, many of which are likely to be from the 19th century occupation, although it cannot be ruled out that pre-European Māori period sites could also be present. However, the likelihood is generally low.

Without mitigation, the proposed works could have an adverse effect to these potential sites by damaging or destroying deposits if discovered.

23.4.2 Operational Effects

There will be no adverse operational effects of the Project on historic heritage.

23.4.3 Mitigation Measures

As a proposed condition of the designation, a HAMP will be prepared prior to the start of construction. The HAMP will:

- Set out the methods for the identification and assessment of historic heritage within the designation to inform detailed design
- Identify the known and potential historic heritage sites within the designation
- Set out the HNZPTA authority requirements for any pre-1900 sites identified for a precautionary authority.

Since archaeological survey cannot always detect sites of traditional significance to Māori, or wāhi tapu, the appropriate mana whenua authorities will be consulted regarding the possible existence of such sites, and the recommendations in this report.

Any potential adverse effects to potential previously unrecorded archaeological deposits that are exposed during the works will be mitigated by obtaining a precautionary HNZPTA authority. This authority will be sought prior to construction of the Project.

23.4.4 Summary of Effects on Historic Heritage

There is reasonable cause to suspect the proposed works could expose potential previously unrecorded historic heritage deposits. With the mitigation measures described above put in place, the potential adverse effects of the Project on historic heritage values will be managed appropriately.

23.5 Landscape and Visual

The Assessment of Landscape and Visual Effects, included in Volume 4, assesses the potential effects on landscape character, natural character and visual effects associated with the construction and operation of the Project and recommends ways of mitigating these effects. The effects were assessed in the following two categories:

Temporary Effects (Construction Effects): Describes the anticipated impacts on the bio-physical elements and features of the landscape resource (landform, vegetation and hydrology) resulting from the construction of the Project. It also includes visual amenity effects for both public and private viewing audiences from construction works.

The construction activities required to implement the Project are categorised under the following broad headings:

- **Site enabling works** - site establishment, demolition and vegetation clearance;
- **Project formation works** - bulk earthworks and formation of new road surface and batter slopes, culvert upgrades, stormwater wetlands, private driveway regrades and bridge construction;
- **Finishing works** - lighting, signage, footpath/cycleway details and line markings, streetscape elements and landscaping (including street trees, mitigation planting and riparian/wetland planting (to be determined by detailed design through the ULDMP and by regional resource consents)).

Permanent Effects (Operational Effects): Describes the effects on the landscape of completed works (including integrated landscape mitigation measures), the significance of physical landscape change and ultimately the resulting effects of the Projects on landscape character, natural character and visual amenity for both public and private viewing audiences.

This section summarises the potential effects and mitigation measures proposed. The summary below should be read in conjunction with the report.

23.5.1 Positive Effects

A number of positive landscape and visual effects are anticipated as a result of the operation of the Project (including proposed mitigation as detailed in 23.5.4). Positive effects are likely to include:

- A streetscape to match the emerging urban form within adjacent land;

- Net increase in green infrastructure within the Project area associated with street trees, berm and stormwater attenuation plantings (within berms). This will improve visual amenity for road users and adjacent audiences.
- Slower speed limits adjacent to existing dwellings improving on the experiential qualities of the corridor for users and private properties adjacent to the road corridor.

23.5.2 Construction Effects

23.5.2.1 Physical Landscape Effects

During construction, potential adverse effects on the physical landscape include construction laydown areas, extent of vegetation clearance and the scale and location of proposed cut and fill slopes (noting the scale anticipated may reduce as a result of urban development prior to the construction of the Project). Indicative site compound and construction areas will temporarily occupy modified residential and pastoral land. All areas will be reinstated (grassed) at the completion of the construction period. The physical landscape effects resulting from establishment and use of the construction work areas within the Project area will be low.

Broad areas of street-side vegetation are proposed to be removed during construction to accommodate the wider road corridor and batter slopes. This includes trees and shrubs, exotic pasture, planted amenity vegetation (native and exotic), some shelterbelt plantings and food crops. Overall, the physical landscape effects likely to arise from vegetation clearance within the Project area during construction will be temporary and will be low.

The proposed cut and fill slopes range in scale from very small (1m wide) to moderate (20m wide), and will alter the existing modified landform of the road corridor and adjacent land adjacent to the road corridor. In all cases, the fill slopes will be shaped to integrate into the adjacent landform. The proposed corridor will generally maintain existing ground levels with filled sections reaching no greater than 1m above existing road surface levels. Overall, impacts on the physical landscape to implement the proposed earthworks will be low.

Potential effects on private properties within and adjacent to the Project area will be moderate-low and include:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;
- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences; and
- Removal of existing ancillary buildings.

Site finishing works to be determined at detailed design will occur within the already modified areas of the Project. Resulting physical landscape effects are expected to be negligible.

23.5.2.2 Temporary Visual Effects

It is anticipated that the proposed construction activities will generally be consistent in nature and scale to road works and infrastructure activities commonly experienced by transient viewing audiences within a main transport corridor. Another important consideration is that landscape change by way of vegetation removal and land modification (on private property), albeit at a lesser scale, forms part of the expected backdrop of the rural environment. The nature and significance of the

potential adverse visual effects is considered to be moderated through the Project area by the following aspects:

- Road works and construction activities can generally be expected to occur within the road;
- The existing Waihoehoe Road carriageway is already a dominant element within the visual composition of Project area; and
- The proposed cut and fill batters are at a scale that will be easily integrated into the adjacent modified pastoral landscape or future development.

23.5.3 Operational Effects

23.5.3.1 Natural Character Effects

The local landform north and south of the Project area is influenced by the drainage catchment associated with Waihoehoe Stream in the north and Hingaia Stream in the south. The landscape features surrounding the Project area are almost devoid of indigenous vegetation and are heavily modified by rural and residential land use. On that basis, natural character effects are considered negligible within these hydrological environments.

As the detailed design progresses and resource consents are sought, the full extent and type of indigenous vegetation affected will be determined. It is anticipated mitigation planting at the completion of works will assist with mitigating any landscape and natural character effects arising from project impacts on these features.

23.5.3.2 Visual Amenity Effects

Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to proximity to the corridor. These include:

- For existing properties set back from the Project area, the visual amenity effects will be a small incremental increase in existing effects from the road corridor.
- As a direct result of the Project, residents may experience some level of material change to the visual composition and residential amenity of the road corridor as perceived from private property.
- Impacted properties may experience heightened visual amenity and residential character effects as a direct result of the construction impacts including driveway regrading, potential loss of yard space and by the greater proximity of the carriageway and footpaths/cycleways to private dwellings however, it is considered appropriate when viewed in the context of a medium density urban environment in the long term.
- Public viewing audiences will continue to engage with a similar transport environment, within the backdrop of an increasingly urban neighbourhood character. Over time visual amenity and appeal for users will improve, due to an improved streetscape design, maturing street trees and berm plantings and greater accessibility to active modes of transport.

Based on the above, visual effects within the Project area are likely to be low and moving to beneficial for public viewing audiences through the operational phase of the Project. For the private viewing audience, the visual effects are likely to be low to moderate-low, reducing over an extended period of time.

23.5.3.3 Landscape Character Effects

The principal elements of the Project (including the road form, driveway regrading and batter slopes) will permanently alter the rural character of the existing Waihoehoe Road corridor and adjacent landscape. It is recognised that this rural character will likely change to a more urban area prior to construction of the Project as proposed private plan changes are already signalling urbanisation of the area. Within the proposed designation, broad areas of street-side vegetation are proposed to be removed. While most of this vegetation is not considered significant on an individual basis, collectively it contributes to the visual amenity of the road corridor and provides a degree of screening and privacy for properties adjacent to the road. If not mitigated, removal of this vegetation will have adverse effects on the landscape character of the existing road corridor. Mitigation measures are outlined in section 23.5.4.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the active modes of transport, reduced speed limit, structured street tree plantings and integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features are expected to improve landscape and urban amenity within the future corridor. The Project is anticipated to operate within the context of increased urbanisation as adjacent FUZ land is progressively live-zoned and urbanised. On that basis, the magnitude and nature of landscape change proposed by the Project is considered to accord with that which will occur throughout the localised landscape over time. Based on the above considerations and recommended mitigation measures, adverse landscape character effects are assessed as very low.

23.5.4 Mitigation Measures

To address the modification to the landscape arising from the Project, prior to construction, an Urban and Landscape and Design Management Plan (ULDMP) will be prepared. The ULDMP will include the following matters which address the principal elements of the Project that are likely to give rise to temporary and permanent adverse effects on landscape character, natural character and visual amenity:

1. **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
2. **Active transport connectivity:** investigate opportunities within the proposed designation to integrate active transport facilities with future open space proposed within the Green-Blue Network.
3. **Planting design details:** landscape design and planting design details will be prepared for the Project that demonstrate the following:
 - a. Use of street trees, shrubs and ground cover species that are appropriate for stormwater treatment areas and berms. Species and tree stature should be selected to correspond with adjacent land use and blue-green areas, in accordance with the 9 key principles outlined in the Auckland's Urban Ngāhere (Forest) Strategy (an Auckland Council document)
 - b. Identification of existing trees and vegetation that will be retained. Where practicable, mature trees and indigenous vegetation should be retained
 - c. Identification of areas where top soil may be re-used within the project area
 - d. Reinstatement planting within private property boundaries in consultation with property owners

- e. Slope and treatment of fill slopes and residual land, to integrate with adjacent land use and areas where the Project intersects with the proposed Blue-Green Network.
- f. Stormwater wetland design and planting
- g. Integration of Mana Whenua preferred design principles in relation to planting, structures and hard landscape elements.
- h. Site preparation, implementation and maintenance requirements for all planting typologies.

The general location of these recommended mitigation measures is shown in Appendix 1. Landscape Plans and Images: Maps 27-29 within the Assessment of Landscape and Visual Effects (Volume 4). The proposed mitigation measures will, where practicable be integrated with any revegetation requirements of future resource consent processes. Opportunities for integration of landscape mitigation works with the proposed Blue-Green Network, indicated by the Drury – Ōpāheke Structure Plan will also be considered.

23.5.5 Summary of Landscape and Visual Effects

Overall landscape and visual effects range from low to moderate-low for the construction phase and negligible to moderate-low for the operational phase. Future development of FUZ areas on adjacent land will substantially change the scale and character of the adjacent landscape as experienced from within the road, and will absorb the landscape and visual changes proposed within the Project area.

With the proposed mitigation measures in place to address effects on landscape, natural character and visual amenity (implemented through an ULDMP), the proposed features and scale of the Project are able to be appropriately integrated into the existing and future landscape adequately to remedy the potential adverse effects arising from the Project.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport (improving connectivity), reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features and the resulting streetscape are expected to improve landscape and urban amenity within the future corridor.

23.6 Ecology

The Assessment of Ecological Effects, included in Volume 4, assesses the potential ecological effects of the Project on the environment, where these relate to ecological values that are subject to district plan controls in the AUPOIP. Those ecological matters that trigger Regional plan and/or Freshwater NES resource consent applications will be assessed and consents sought at a later date for the Project, with any required mitigation assessed fully at that time. However, potential ecological effects of the activities likely requiring resource consents and/or wildlife permits at a later stage of the Project were considered in the report to inform alignment and design options and to inform the proposed designation boundary for the Project. The ecological assessment of effects follows the Environment Institute of Australia and New Zealand (EIANZ) Guidelines. These were used to assess the ecological value of identified ecological features and evaluate the magnitude and level of potential effects that the Project could have on these features. The report should be read in conjunction with the summary set out below.

23.6.1 Positive Effects

A positive ecological effect currently anticipated as a result of the Project is a net increase in green infrastructure and associated habitats within the Project area associated with street trees and berm plantings.

23.6.2 Construction Effects

23.6.2.1 Summary of Potential Construction Effects, Prior to Mitigation

The proposed construction activities have the potential to cause adverse effects on ecological features of value within or adjacent to the Project area, without mitigation. Potential construction effects that relate to the activities authorised by the proposed designation are:

- Vegetation removal leading to the permanent loss of terrestrial habitats; and
- Construction activities causing light, noise and vibration leading to the disturbance and displacement of indigenous fauna.

23.6.2.2 Magnitude of Construction Effects

The magnitude of construction effects on impacted ecological features are discussed in the following sections.

Terrestrial Habitat

The Project will not remove any trees/vegetation identified that are subject to district plan controls, as such the magnitude of effects is considered to be negligible.

Species

Bats

There is no suitable habitat for long-tailed bats in the Project area and bat presence was not detected during surveys. As such the magnitude of effect from construction is not relevant for consideration as part of this effects assessment.

Birds

Noise, vibration and lighting disturbance caused by construction activities could displace indigenous birds from suitable nesting and foraging habitat within and adjacent to the Project area.

The birds which occur in the Project area are common in the local area (which comprises agricultural land and private gardens). They are adapted to human modified environments, and suitable foraging habitat of equal or better quality will remain adjacent to the Project area during construction.

Therefore, the magnitude of effects from the Project construction activities on the local bird population is considered to be low.

23.6.2.3 Level of Construction Effects

In accordance with EIANZ Guidelines Table 23-1 below summarises the overall level of potential construction ecological effects for each key ecological feature and fauna group related to the Project. The assessment identified that the level of ecological effects from the construction of the Project on all

of the ecological features were very low or negligible. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project construction effects.

Table 23-1: NoR D3 Summary of potential ecological effects during construction based on ecological value and magnitude of the effect

Ecological Feature	Ecological Value	Magnitude of Construction Effects	Level of Ecological Effect
Terrestrial habitat – district matters	Low	Low	Very Low
Bats	Negligible	N/a	Negligible
Birds – forest	Low	Low	Very Low

23.6.3 Operational Effects

23.6.3.1 Summary of Potential Operational Effects, Prior to Mitigation

The Project involves upgrading an existing road by 4m for active transport. No additional vehicle lanes are being added. Although some effects may occur from the current baseline (i.e. street lighting), many operational effects, such as fragmentation and noise, are likely to be pre-existing effects from operation of the existing road. In general, potential operational effects from the Project on indigenous fauna that relate to activities authorised by the proposed designation are:

- Loss in connectivity to indigenous fauna (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

23.6.3.2 Magnitude of Operational Effects

Bats

There is no suitable habitat for long-tailed bats in the Project area and bat presence was not detected during surveys. As such the magnitude of effects from operation of the Project is not relevant for consideration as part of this effects' assessment.

Birds

Birds are unlikely to be disturbed or habitat fragmented from Project operations. Suitable habitat for common native forest birds include planted vegetation associated with private gardens, within and adjacent to the Project area. The species present are those species which have adapted to use habitats modified by humans and as such, the magnitude of effects from the Project are considered to be low.

Herpetofauna

There is no suitable habitat for Threatened indigenous lizard species within or adjacent to the Project area. There is the potential that copper skink (Not Threatened) are present within suitable 'surrogate' habitat (planted vegetation and rank grassland) within the Project area.

Native lizards require vegetated corridors (such as riparian stream corridors) to facilitate natural dispersal. The Project is upgrading existing roads and culverts and therefore is not considered to create any additional barriers to movement or dispersal of lizards. During detailed design/resource consent, opportunities should be sought to enhance/retain vegetated corridors under bridges or include ledges within culverts or under bridges to allow for lizard connectivity.

Native lizards are likely to be habituated to existing disturbance such as noise, vibration and lighting but the final design will ensure that this will not increase for the operation of the Project. It is considered that the magnitude of operational effects will be low, without mitigation.

23.6.3.3 Level of Operational Effects

Table 23-2 below summarises the overall level of operational ecological effects for each key ecological features and fauna groups. The assessment identified that the level of ecological effects from the operation of the Project on all of the ecological features will be very low or negligible. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project operational effects.

Table 23-2: NoR D3 Summary of potential ecological effects during operation based on ecological value and magnitude of the effects

Ecological Feature	Ecological Value	Magnitude of Operational Effects	Level of Ecological Effect
Bats	Negligible	N/a	Negligible
Birds – forest habitat	Low	Low	Very low
Herpetofauna	Low	Low	Very low

23.6.4 Mitigation Measures

The assessment identified that the level of ecological effects from the construction and operation of the Project on all of the ecological features were very low or negligible. Therefore, in accordance with the EIANZ Guidelines, mitigation measures are not required for the Project's effects.

23.6.5 Summary of Effects on Ecology

Construction and operation of the Project were assessed to have negligible or low level effects on the relevant habitat and fauna species (bats, birds and lizards) therefore no mitigation is required.

23.7 Arboriculture

The Assessment of Arboricultural Effects, included in Volume 4, assesses the potential effects of the Project on existing trees protected by the AUPOIP district plan provisions and recommends ways of mitigating these effects. Any trees that trigger regional plan consenting requirements were considered to inform design and alignment choices, however effects on these trees will be further assessed and managed through a future resource consent process. Due to the changing nature of the environment and plan rules applicable to tree protection in rural vs urban land zoning, a detailed re-assessment of protected trees and their status under the AUPOIP will be undertaken closer to the time of construction. Potential effects on arboriculture during construction and operation of the Project and proposed mitigation measures are described in the following sections.

23.7.1 Positive Effects

Construction of the road with road-side berms provides an opportunity for street trees to be established within the new environment. The establishment of street trees within the road corridor will provide opportunities for trees to exist over large portions of the road corridor where currently few exist.

23.7.2 Construction Effects

There are no trees within the proposed designation boundary that are protected by District Plan provisions.

23.7.3 Operational Effects

Once the road has been constructed, no effects on trees are anticipated. Ongoing maintenance of street trees and trees retained adjacent to the road corridor is a standard operational requirement that does not generate adverse environmental effects. Street tree planting will have positive effects and will result in more trees in the public realm and an enhanced road environment in the long term which will be positive effects.

23.7.4 Mitigation Measures

No effects associated with the construction and operation of the Project are anticipated on trees protected by the district plan, therefore, no measures are required to avoid, remedy or mitigate effects.

Any trees protected by Regional Plan provisions that are to be retained will be addressed as part of a future resource consent process.

23.7.5 Summary of Arboriculture Effects

The Project contains no trees that are protected under the District Plan provisions and therefore there are no arboricultural effects.

23.8 Natural Hazards - Flooding

The Assessment of Flood Hazard Effects, included in Volume 4, assesses the potential flood hazard effects of the Project on the flood extents and flood levels in the surrounding area. Effects of stormwater quantity, quality and effects on streams will be considered under future resource consents. This assessment focusses on flood hazard effects which is a district plan matter under the AUPOIP.

23.8.1 Construction Effects

No construction effects on streams and overland flow paths are expected.

A construction yard and stockpile site are proposed at the north west corner of Waihoehoe Road and Appleby Road intersection which is outside flood plain areas and major overland flow paths. It therefore does not present increased flood hazard risks.

Overall, construction of the Project is not expected to generate any adverse flooding effects.

23.8.2 Operational Effects

No operational effects were identified. Flood hazard effects will be checked at detailed design based on the confirmed corridor geometry. The section below outlines the flood risk outcomes to be achieved at detailed design.

23.8.3 Mitigation Measures

23.8.3.1 Construction

Flood hazards will be considered for the works in the proposed CEMP. This will include consideration of the effects of temporary works, earthworks, storage of materials and temporary diversion and drainage on flow paths, flow depth and velocity.

23.8.3.2 Operation

It is recommended that during detailed design, the flood modelling of the pre project and post project 100 year ARI levels (both for MPD land use and including climate change) is carried out and measures 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 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)
- that there is no more than a 10% average increase of flood hazard (defined as flow depth times velocity) for main access to authorised habitable dwellings.

Where the above outcomes can be achieved through alternative measures outside of the designation such as flood stop banks, flood walls and overland flow paths, this may be agreed with the affected property owner and Auckland Council.

The above outcomes to manage flood risk are included as conditions on the proposed designation.

23.8.4 Summary of Flooding Effects

It is not anticipated that the construction and operation of the Project will result in flood hazard effects. Flood hazards for the construction works should be considered in the proposed CEMP once construction details are confirmed and operational flood hazard effects outcomes (as specified) met at detailed design.

23.9 Noise and Vibration

The Assessment of Construction Noise and Vibration Effects, included in Volume 4, contains predictions for construction noise carried out using the method recommended in NZS 6803, in accordance with the AUPOIP. The methodology included modelling inputs in regard to a reasonable worst case scenario. Vibration emission radii were also calculated to provide a reasonable worst case estimate at receivers.

The Assessment of Traffic Noise and Vibration Effects, also included in Volume 4, contains predictions of road traffic noise carried out using the method recommended in NZS 6806 in accordance with rule E25.6.33 of the AUPOIP.

Four scenarios are assessed in accordance with NZS 6806:

- The “Existing scenario” which is the current road network with current traffic volumes, i.e. the existing environment as it is experienced at the time of assessment
- A “Do Nothing” scenario (the likely future environment without the project), which represents the current road network with future traffic volumes, assuming a full build out of the area. This is a theoretical scenario that would not occur in reality. This is because; the current road network could not cope with the future traffic volumes, and future development in the area would not occur without the prior establishment of the new or upgraded roads. Therefore, while the predictions suggest a significant increase in noise level in the Do Nothing scenario compared with the Existing scenario, this would not be a feasible option
- A “Do Minimum” scenario, (likely future environment with the project) which represents the proposed future road network, incorporating NoRs D1 to D5 and other transport projects in the area (refer to the discussion on Assessment Assumptions in the Assessment of Traffic Noise and Vibration Effects in Volume 4). This scenario assumes a full build out of the area, and the transport infrastructure to enable the development. This is a realistic scenario at a point in time when all proposed Projects within the Drury Package are operational. .
- “Mitigation” scenarios, which represent the traffic noise levels at the PPFs at the design year with various specific noise mitigation options implemented with the aim of achieving the noise criteria categories.

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

The summary below should be read in conjunction with both reports.

23.9.1 Positive Effects

Predicted traffic noise level changes during operation of the Project indicate that the majority of PPFs will experience noise level decreases due to the redistribution of traffic across the new network, and will have minor to moderate positive noise effects. One PPF is predicted to experience a significant noise level decrease of 9dB or more which will be a noticeable change and result in positive effects.

23.9.2 Construction Noise and Vibration

23.9.2.1 Potential Construction Noise Levels

Model predictions which assume the works will occur along the proposed designation boundary indicate there are 16 residential properties where the relevant noise criteria would be exceeded without mitigation. Distances of receivers from the proposed designation area boundary vary greatly along the road alignment with the closest receptor approximately 7m from drainage and pavement construction works.

Model predictions indicate the closest receivers could experience noise levels of around 85 - 90 dB L_{Aeq} during earthworks, based on the noisiest item of plant (plate compactor) operating in the closest position to the receiver along the proposed designation boundary, without mitigation. Operation of construction equipment will be intermittent in nature and works in the worst-case location typically latest around three days. Whilst plate compactors have been identified as the noisiest equipment, they are only used as part of drainage and pavement construction works. Other equipment with lower sound powers will generate lower noise levels under the worst-case location and overall average noise levels will be lower for most of construction duration.

These results should be treated as the highest possible noise levels likely to be emitted from the respective equipment. These noise levels would occur infrequently, if at all, as equipment and activities move along the alignment and are not continuously operational. The noise levels provide an indicative prediction of the scale of potential effects based on one possible construction methodology.

23.9.2.2 Construction Noise Effects

The construction noise criteria are predicted to be exceeded at a number of receivers due to the close proximity to the potential areas of work. The closest receivers are 7m from the proposed designation boundary for drainage and pavement construction works and noise levels of around 85 -90 dB L_{Aeq} are predicted.

The use of noisy items of equipment will likely be intermittent in nature during the relevant construction activities. Although the worst-case situations are not expected to be frequent, due to the setback distances to the majority of the proposed works, these noise levels could result in loss of concentration, annoyance, and a reduction in speech intelligibility.

Night-time works at these noise levels are generally not acceptable at residential properties and the use of noisy equipment should be avoided to prevent sleep disturbance. If night-time works are required, mitigation measures will be essential which may include an offer of temporary relocation for the most affected receivers to manage and mitigate adverse effects.

In addition, the road construction is linear, and each receiver would only be affected for part of the overall construction duration. A CNVMP with site specific mitigation (described in section 23.9.4) as required will sets out how to control noise levels and reduce adverse impacts on receivers.

23.9.2.3 Construction Vibration Effects

Initial predictions indicate that the building damage criteria may be exceeded at two residential buildings, in particular during the earthworks phase when the vibratory roller compactor is proposed for use. At buildings in close proximity to the proposed designation boundary, there is the potential for cosmetic damage to buildings (such as cracking) and annoyance from perception of vibration. A building condition survey should therefore be carried out at those buildings before (during detailed design) and after construction works at receivers where predictions indicate the relevant building damage criteria may be exceeded. Mitigation measures are described in section 23.9.4.

23.9.3 Traffic Noise and Vibration

For this Project, changes to the road lanes are minimal and only occur at intersections. An increase in traffic volume would occur (due to growth in the area) irrespective of the proposed works, which generally provide for active transport facilities rather than additional traffic lanes. Therefore, the effects discussed are not strictly due to the Project.

Road Traffic Noise Model Results Analysis

Existing scenario predictions show the noise levels within the project area is between 44 – 65 dB $L_{Aeq}(24hr)$ with two PPFs within Category B and the remainder in Category A.

Under the likely future scenario (without the Project), predictions show an elevated traffic noise level range between 50 – 72 dB $L_{Aeq}(24hr)$ with nine PPFs in Category C and seven PPFs in Category B due to an increase in traffic volumes assuming a full development build out of the surrounding area and resultant traffic on the existing road network.

The likely future scenario with the Project showed a slightly lower predicted range of 46 – 70 dB $L_{Aeq}(24hr)$ due to the anticipated redistribution of traffic on the new road network. Only three PPFs remain in Category B and three PPFs remain in Category C. Predictions show noise levels at the Category B PPFs are above 64 dB $L_{Aeq}(24hr)$ but receive less than a 3 dB increase when compared to the likely future scenario without the Project, and Category C PPFs are above 68 dB $L_{Aeq}(24hr)$ but receive less than 1dB increase when compared to the likely future scenario without the Project. Therefore, this Project does not qualify as an Altered road under NZS 6806 and no further mitigation options are required.

Although no mitigation options are required to be considered in accordance with NZS 6806 it is good practice to consider mitigation at any Category C PPFs. The three Category C PPFs are 115 Waihoehoe Road, 1 Fitzgerald Road and 6 Fitzgerald Road. These PPFs have been identified as buildings within proposed designation NoR D2 and are proposed to be removed to construct the upgrade of Waihoehoe Road West FTN Upgrade. These two Projects are likely to be implemented around the same time and therefore it is unlikely that these PPFs will be present by the time the Project operates. Therefore, no additional mitigation measures have been considered.

Assessment of Traffic Noise Effects

All but one PPF are predicted to receive noise level reductions, with the majority of PPFs receiving noticeable to significant reductions. One PPF is predicted to experience a 1 dB increase which is negligible and not perceptible.

Significant noise level decreases (9 dB decrease or more) are experienced at one PPF (at 185 Waihoehoe Road) as a result a combination of the:

- reduced traffic volumes (14,000 AADT for Do Nothing to 6700 AADT for Do Minimum, which is due to the assumption that the proposed Drury Arterial Network has been completed and traffic is distributed across the new network;
- reduced traffic speeds (80 km/h to 50 km/h) along Waihoehoe Road and
- topography of the area resulting in the PPF being slightly lower than road height.

These changes would be clearly noticeable and would result in positive effects for that PPF.

It is noted that the noise level predictions along Project roads are based on assumptions of future traffic flow at a significant time in the future (2048). These traffic volumes rely on the urbanisation of the area. As such, even though modelling shows noise levels are likely to be similar or lower with the proposed Projects in place, the results are only indicative of a possible future scenario as the timeline of project implementation is uncertain. It is not possible to determine with certainty at this stage what the impact will be when the Projects are first built. Development of the surrounding areas will likely increase activity and associated noise levels. The future urban environment will also include a range of other noise sources, including new houses, a town centre and community facilities.

23.9.4 Mitigation Measures

23.9.4.1 Construction Noise and Vibration

Specific mitigation measures will be identified within a Construction Noise and Vibration Management Plan (CNVMP) which will be completed for the Project prior to construction. The CNVMP will provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction. The Assessment of Construction Noise and Vibration Effects outlines the inclusions required in the CNVMP, in line with the minimum level of information that must be provided in a CNVMP. This includes:

- Description of the works and anticipated equipment/processes;
- Hours of operation, including times and days when construction activities would occur;
- The construction noise and vibration standards for the Project;
- Identification of receivers where noise and vibration standards apply;
- Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved;
- Methods and frequency for monitoring and reporting on construction noise and vibration, including:
 - Updating the predicted noise and vibration levels based on the final methodology and construction activities;
 - Confirming which buildings are to be subject to a pre and post building condition survey;
 - Identifying appropriate monitoring locations for receivers of construction noise and vibration;
 - Procedures to respond to complaints received on construction noise and vibration, including methods to monitor and identify noise and vibration sources;
 - Procedure for responding to monitored exceedances; and
 - Procedures for monitoring construction noise and vibration and reporting to the Auckland Council Consent Monitoring officer.

- Procedures for maintaining contact with stakeholders, notifying of proposed construction activities, the period of construction activities, and handling noise and vibration complaints
- Contact details of the site supervisor or Project manager and the Requiring Authority's Project Liaison Person (phone, postal address, email address);
- Procedures for the regular training of the operators of construction equipment to minimise noise and vibration as well as expected construction site behaviours for all workers;
- Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction Noise and/or Vibration Management Schedule will be required
- Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys.
- Procedures and timing of reviews of the CNVMP.

Mitigation measures such as construction noise barriers along active construction areas near the vicinity of receivers and selecting the use of lower vibration emitting equipment wherever possible will be considered as part of a CNVMP to control and manage construction noise and vibration levels to meet the relevant criteria where practicable.

In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.

In managing noise and vibration effects within the above mechanisms, a hierarchy of mitigation measures will be considered and a best practicable option for mitigation will be implemented, whilst avoiding undue disruption to the community.

With effective mitigation and management measures in place, such as construction noise barriers along active construction areas within the vicinity of receivers and enclosures around noisy machinery, noise levels can be reduced by up to 10dB at receivers on ground floor. Resulting worst case noise levels could be reduced to 75– 80 dB with mitigation implemented and number of receivers exceeding the criteria reduced to 7.

As construction will occur several years in the future, receivers may have changed by then, with new and additional receivers in the vicinity due to increased development. Construction noise and vibration effects will be reassessed at the time of construction and managed at the receivers that are present at the time of construction.

23.9.4.2 Operational Noise and Vibration

Although no mitigation is recommended for Waihoehoe Road East, at detailed design before reassessment of the road traffic noise at PPFs (identified in the Traffic Noise and Vibration Assessment in Volume 4) will be carried out to determine if the categories are still achieved without mitigation and to determine BPO mitigation if required. The PPFs and categories to be met are included as conditions on the proposed designation.

23.9.5 Summary of Noise and Vibration Effects

Predicted traffic noise levels during operation of the Project are generally expected to reduce compared to the likely future scenario without the Project resulting in an overall positive effect.

Adverse construction noise and vibration effects can be appropriately managed through the proposed mitigation measures.

23.10 Network Utilities

23.10.1 Construction Effects

A number of utilities, including major utilities, are located within and around the proposed designation. Relocation, diversion or protection of these utilities may be required and short term disruptions may occur. Table 23-3 summarises the known existing and proposed utilities within and around the proposed designation, and the implication the Project is likely to have on these.

Table 23-3 NoR D3 Anticipated Effects on existing utilities of other providers

Utility Provider	Asset	Designation	Potential Effect
First Gas	Gas Transmission Line	9104	Pipe re-alignment, strengthening works, and/ or protection works may be required where the pipe and designation crosses the proposed alignment. Existing designation will be overlapped and approval will be required from First Gas for works within their designation.
Vector	Gas Medium Pressure distribution lines	N/A	Distribution lines will need to be realigned onto the new carriageway service corridor.
Counties Power	Underground and overhead power lines	N/A	Overhead lines will be required to either be relocated underground, or new overhead poles installed in the new alignment within the carriageway service corridor. Short term disruptions may occur
Chorus	Communication lines	N/A	Communication lines will need to be relocated to the new verge

23.10.2 Mitigation Measures

Engagement with Network Utility Operators has been ongoing throughout the Project as detailed in section 5.2.2.6 Network Utilities. Engagement will be ongoing throughout the detailed design and construction of the Project.

As a proposed condition of the designation, a Network Utilities Management Plan (NUMP) will be prepared prior to construction of the Project. The NUMP will set out a framework for protecting, relocating and working in proximity to existing network utilities. The NUMP will be prepared in consultation with the relevant network utility operators and will include methods to:

- Provide access for maintenance at all reasonable times, or emergency works at all times during construction activities;

- Manage the effects of dust and any other material potentially resulting from construction activities and able to cause material damage, beyond normal wear and tear to overhead transmission lines in the Project area;
- Demonstrate compliance with relevant standards and Codes of Practice including, where relevant, the NZECP 34:2001 New Zealand Electrical Code of Practice for Electrical Safe Distances 2001; and AS/NZS 4853:2012 Electrical hazards on Metallic Pipelines.

Prior to construction, Network Utility Operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for the following activities:

- operation, maintenance and urgent repair works
- minor renewal works to existing network utilities necessary for the on-going provision or security of supply of network utility operations
- minor works such as new service connections
- the upgrade and replacement of existing network utilities in the same location with the same or similar effects as the existing utility.

23.10.3 Summary of Effects on Network Utilities

Through the implementation of the NUMP and in consultation with network utility operators, any potential adverse effects on network utilities can be managed appropriately.

23.11 Community Effects

23.11.1 Positive Effects

The Waihoehoe Road East Upgrade will provide the necessary transport infrastructure required to support the planned urban zoning of land in Drury East (and the wider Drury-Ōpāheke growth area) which is accelerating as a result of numerous private plan changes being lodged with Auckland Council. The proposed designation will ensure that the upgrade is planned and integrated (and identified in the AUPOIP) to meet the feasible development capacity targets over the next 30 years to support the growing communities in Drury-Ōpāheke.

The provision of active transport facilities will provide alternative opportunities to connect the community in terms of accessing schools, employment, recreational areas, Drury Village and generally moving around the community (existing and future). The Project will allow alternate ways to commute to education and work. This will positively impact both the health and wellbeing, way of life (way people work, play and live) and the environment (amenity).

23.11.2 Construction Effects

Potential social impacts during construction include disruption to connectivity and way of life due to delays in commutes (work and education) and increased disruptions to moving around the area due to road works and access restrictions. There are also potential impacts to health and wellbeing and amenity due to construction dust and noise.

23.11.3 Operational Effects

As identified within the positive effects discussed above, the Waihoehoe Road East Upgrade will provide the necessary transport infrastructure required to support planned urban growth in the Drury-

Ōpāheke growth area supporting growing communities. In summary, the Project will provide active transport facilities that will contribute to improvements to the way people live and the health and wellbeing of the community. Overall, the Project is anticipated to have significant positive effects on the future community in which it will operate.

23.11.4 Mitigation Measures

23.11.4.1 Construction Effects

It is anticipated that all community effects from construction will be temporary and can be minimised. A Stakeholder and Communication Management Plan (SCMP) will be prepared prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the Construction Works.

Access and trip disruption will be managed by the CTMP and SCMP proposed as conditions of the designation. This will allow the contractors to identify movement and access requirements of residents and any future businesses along the corridor and enable alternate access or access at peak times and minimise trip disruption where practicable.

Construction effects on amenity values can be managed by engagement with corridor residents and stakeholders (identified through the SCMP), noise management (CNVMP), and the overall CEMP to manage potential effects.

23.11.4.2 Operational Effects

Significant positive effects are anticipated from the operation of the Project therefore no mitigation is required. However, through the implementation of the ULDMP a range of measures will be implemented to ensure the Project is appropriately integrated into the surrounding landscape and urban context.

23.11.5 Summary of Effects on the Community

The Project will provide significant positive effects to the community in which it will operate. It is considered that overall, the community (existing and future) will benefit from the changes made to the corridor including community connectivity and health and wellbeing. Any potential construction effects can be managed with the development and implementation of the appropriate management plans and communication with the community and affected land owners / occupiers.

23.12 Property, Land Use and Business Effects

The Waihoehoe Road East Upgrade has sought to reduce potential adverse effects on existing private properties and businesses through alignment and project design, where practicable, while acknowledging the planned urban growth and change in the area balancing these drivers. This has included specific consideration of the potential property and business impacts in the assessment of alternatives as discussed in sections 4.2 and 22 and detailed in Appendix A and through design refinement and defining the proposed designation boundary.

Where impacts on property, land use and businesses cannot be avoided, the potential effects discussed in this section relate to directly affected properties and landowners. Potential effects on properties and businesses affected by proximity to the Project have been discussed in section 23.11.

The proposed designation requires land to provide a sufficient footprint to enable the construction and operation of the Waihoehoe Road East Upgrade. 33 private properties will be directly affected. These properties are primarily rural and rural-residential, with some commercial land use.

A description of existing land use is provided in section 21.2. In summary land directly affected by the Waihoehoe Road East Upgrade includes the following:

- The majority of land within the proposed designation boundary (i.e. beyond of the existing road reserve) is currently private farmland. The land is primarily used for grazing with low density rural residential dwellings.
- Horticultural land use (160, 171, 185, 215 and 496 Waihoehoe Road) and Happy Blinds (business at 185 Waihoehoe Road). Land proposed to be designated for these businesses is generally the frontage adjacent to Waihoehoe Road.
- Private plan changes have been submitted to Auckland Council for land adjacent to Waihoehoe Road showing that the area is in the process of being urbanised. The timing of this urbanisation relative to implementation of the Project is not confirmed. The private plan changes include:
 - PC 48 (Private): Drury Centre Precinct
 - PC 49 (Private): Drury East Precinct
 - PC 50 (Private): Waihoehoe Precinct

The potential pre-construction, construction and post construction effects on directly affected properties is discussed in the following sub-sections.

23.12.1 Pre-Construction

The proposed designation has a lapse duration of 15 years to provide a sufficient timeframe which enables construction of the Upgrade in response to the progressive urbanisation of Drury. While the length of the lapse date reflects the need to provide long term certainty regarding the alignment of the Project, this has the potential to result in 'planning blight' from the restrictions to development resulting from the proposed designation, if not appropriately managed.

The proposed designation will not preclude the continued (unchanged) use of any directly affected properties prior to construction. However, in accordance with section 176(1)(b) of the RMA, anyone other than a requiring authority with an earlier designation is restricted from carrying out work on the designated land that would prevent or hinder the designated work without first obtaining the requiring authority's consent. The purpose of the Project is to support urban growth in the Drury-Ōpāheke growth area. The Project is located within the existing Waihoehoe Road corridor in a rural greenfield area zoned for future urban development and planned to transition from rural to urban land use. As the proposed corridor will not be implemented until planned development occurs the Project is unlikely to affect the current land use of Drury East until such a time that the area starts to develop.

It is likely urban development will start occurring adjacent to the proposed designation before the future arterial is required. This is already evident with three private plan changes to live zone land for urban development adjacent to Waihoehoe Road submitted to Auckland Council. It is at this point the proposed designation may have adverse effects on the development of private property. Any potential land development issues would be addressed through the construction and operation of the Project (further discussed in sections 23.12.2 and 23.12.3).

As discussed, development is not precluded within the designation area, and AT has actively engaged, or sought to engage, with landowners through the Project development and adapt where

practicable. AT will work with land owners and developers under the process in section 176(1)(b) to provide written consent for earthworks, interim road upgrades (or new roads), integrated stormwater solutions and development within the designations – provided those works will not prevent or hinder the work authorised by the proposed designation.

As there may be some time between the proposed designation being confirmed and before construction starts, a Project website (or equivalent virtual information source) will be set up with information on the Project. This will include the anticipated construction timeframes and contact details for enquiries. The website will continue to be updated during construction works.

23.12.2 Construction

The proposed designation includes land required for temporary and permanent works. During construction, the Project will temporarily require land to enable construction activities (detailed in section 20.4). If only temporary occupation of the land is required, it will be leased. Potential effects from the temporary lease/use of land within the proposed designation include disruption to farm or business activities, temporary loss of grazing pasture, stock-proof fencing, disruption to access, changes to driveway gradient, loss of vegetation and temporarily affected amenity.

The measures to mitigate these effects will be developed with the directly affected landowners or occupiers. On completion of the works, the designation boundary will be reviewed and may be removed from any land not required for the on-going operation, maintenance or mitigation of effects of the Project.

Potential adverse effects from construction activities are addressed throughout section 23 with appropriate mitigation identified to avoid or minimise effects on properties in proximity to the works. Particular mitigation measures for residential property and business disruption during construction include:

- Implementation of a SCMP prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the Construction Works. Including:
 - Determine adequate notice periods for the commencement of construction activities and works that affect access to properties;
 - Inform parties of the expected timing, duration and staging of works and regular updating of progress; and
 - Provide feedback, inquires and complaints during the construction process.
- Implementation of a CTMP to manage construction traffic and disruption to the local transport network (section 23.2.4), including methods to:
 - Maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be; and
 - Communicate traffic management measures to affected parties.
- Implementation of a CNVMP to provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction and to manage any adverse construction noise and vibration effects on sensitive receivers (section 23.9.4), including methods to:
 - Communicate and engage with nearby residents and stakeholders; and
 - Minimise construction disruption for affected properties during construction.

- In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.
- Implementation of an overall CEMP to manage potential construction effects.

These measures will appropriately minimise disruption to affected properties and allow the continued use of properties where possible. Potential effects will generally be temporary and therefore it is considered that they will be less than minor.

23.12.3 Post Construction

The proposed designation includes land required for temporary and permanent works. The land required for the Project is shown in the designation plans included with the NoR (see Volume 1). Land required for the permanent work will be purchased and following the review of the designation boundary on completion of the works any land not required for the permanent work or for the on-going operation, maintenance or mitigation of effects of the Project will be reinstated in coordination with directly affected landowners or occupiers. This will include:

- Reinstatement of construction areas and reintegrating with the surrounding landform
- Reinstatement of driveways, accessways, fences and gardens.
- Integration of batters and cut/fill slopes with the landscape,

Therefore the post-construction effects on the use of land will be no more than minor on these landowners.

23.13 Urban Design Evaluation

An Urban Design Evaluation (provided within Volume 4) has been undertaken for the Waihoehoe Road East Upgrade, based on the Design Framework (included in the Urban Design Evaluation in Volume 4) established for the Project. The Urban Design Evaluation provides urban design focused commentary on the indicative design of the proposed corridors and recommends urban design outcomes that should be considered in future design stages through the implementation of the ULDMP proposed as a condition on the designation. The design principles that make up the Design Framework seek that transport corridors contribute positively to existing and new communities, the environment and the social and economic vitality of Auckland.

The specific outcomes intended for the Project are shown in blue in Figure 23-1 below. The measures to achieve these outcomes will be confirmed at detailed design and form part of the ULDMP as a condition on the proposed designation. The outcomes include:

- Permeability of the corridor for active modes that addresses cross corridor connectivity (midblock crossings), modal priority and permeable access to destinations such as open spaces and community facilities and between areas of high density.
- Legibility, modal priority for active modes and connectivity demands are addressed at intersections.
- The identification of urban and landscape design drivers related to the Hunua Ranges, Drury Hills Esplanade Reserve, the proposed open space at the intersection of Cossey Road Complex and how the corridor has responded to and integrated with these character drivers.

- In future design stages, Mana Whenua shall be invited to provide input into relevant cultural landscape and design matters including how desired outcomes reflect their identity and values.
- An urban interface approach within the transport corridor (road reserve) that recognises the transition of densities from THAB to mixed housing urban to mixed housing suburban. The urban interface approach should enable the final road corridor to respond to the changing built form interface, respond to the spatial character of adjacent development and demonstrate permeable pedestrian access.
- 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.

Further urban design opportunities in the Project area have also been identified in Figure 23-1 and shown in orange. These opportunities could be considered by AT or other parties at future stages of design and development.

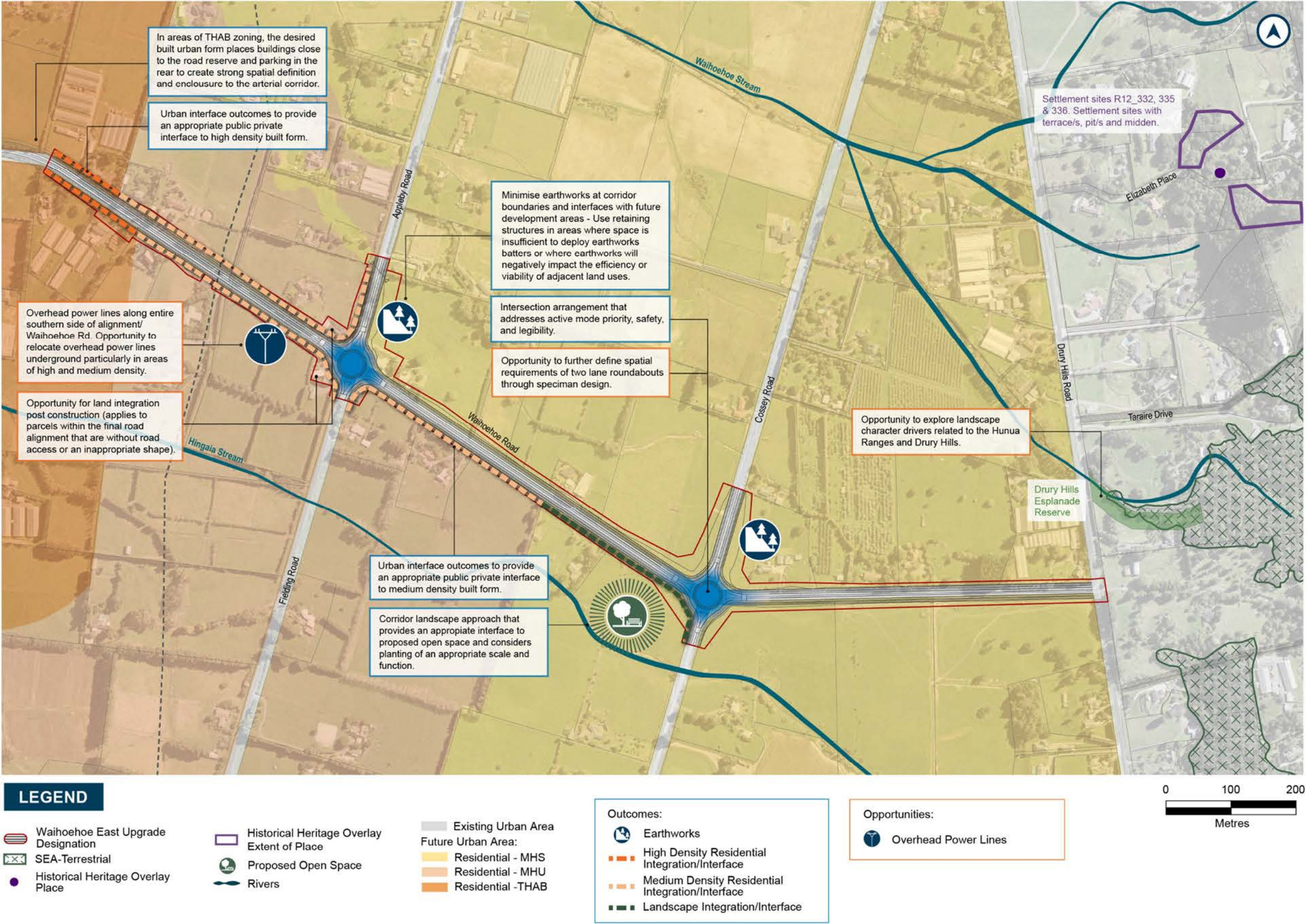


Figure 23-1 Waihoehoe Road East Upgrade urban design outcomes and opportunities

24 Waihoehoe Road East Upgrade: Summary of Measures to Manage Adverse Effects

The positive effects of the Project are set out in section 23.1 of this AEE.

In the first instance, adverse effects have been avoided and mitigated via alignment decisions and design choices. In addition, a range of measures are proposed for the Project to avoid, remedy or mitigate the potential adverse effects identified in this AEE. These measures are summarised in Table 24-1 below.

The measures will be implemented during the development of the detailed design, prior to and during construction, and once the permanent works are completed. These proposed measures are reflected in the proposed designation conditions included with the NoR.

Table 24-1: NoR D3 Summary of measures to avoid, remedy or mitigate potential adverse effects

AEE Section	Topic	Measures	Mechanism to Implement Measures
23.2	Construction Traffic	- Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. - Methods to manage the effects of temporary traffic management. - Measures to ensure the safety of all transport users. - Methods to manage traffic congestion and manage vehicular and pedestrian traffic near schools. - Identification of site access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors. - Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads. - Methods to manage vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be. - The approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads. - Methods to communication of traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services).	Construction Traffic Management Plan

AEE Section	Topic	Measures	Mechanism to Implement Measures
23.3	Cultural Values	• Involvement of Manawhenua in Project design and construction. • Identifying cultural matters and principles that should be considered in the development of other management plans (e.g. ULDMP and HAMP see below). • Ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle. • Establishment of protocols for cultural monitoring during construction works.	• Cultural Advisory Report • Cultural Monitoring Plan
23.4	Historic Heritage	• Confirm the methods for the identification and assessment of historic heritage within the designation to inform detailed design. • Confirm the known and potential historic heritage sites within the designation. • Set out the HNZPTA authority requirements for any pre-1900 sites.	• Heritage and Archaeology Management Plan
23.5 23.13	Landscape, Visual, Urban Design and Amenity	• Demonstrate how the Project is designed to integrate with adjacent urban (or proposed urban) and landscape context • Provide appropriate walking and cycling connectivity to, and interfaces with, existing or proposed adjacent land uses, and walking and cycling connections • Promote inclusive access (where appropriate). • Promote a sense of personal safety. • A concept plan and explanation of the rationale for the landscape and urban design proposals • Developed design concepts, including principles for walking and cycling facilities and public transport. • Urban design and landscape details covering: • road design; • roadside elements; • architectural and landscape treatment of major structures and noise barriers • landscape treatment of permanent stormwater wetlands and swales; • integration of passenger transport; • pedestrian and cycle facilities; • heritage items; and • re-instatement of construction and site compound areas, driveways, accessways and fences. • Planting design details including: • street trees, shrubs and ground cover suitable for berms;	• Urban and Landscape Design Management Plan

AEE Section	Topic	Measures	Mechanism to Implement Measures
		• where practicable, mature trees and native vegetation should be retained; • treatment of fill slopes to integrate with adjacent land use, streams, riparian margins and open space zones; • planting of stormwater wetlands; • integration of any planting requirements required by conditions of any resource consents for the Project; and • reinstatement planting of construction and site compound areas as appropriate. • Detailed specification relating to weed control and clearance, pest animal management, mulching, plant sourcing and planting, including hydroseeding and grassing. • A planting programme and maintenance plan.	
23.8	Natural Hazards – Flooding	• Methods to mitigate flood hazard effects such as siting stockpiles out of floodplains, minimising obstruction to flood flows and actions to respond to warnings of heavy rain. • A design that achieves flood risk outcomes relating to flood levels and freeboard for existing habitable floors, flood levels on land zoned for urban or future urban development where there is no existing dwelling, flood prone areas and access.	• CEMP • Flood risk outcomes to be achieved at detailed design (demonstrated through the Outline Plan(s))
23.9	Construction Noise and Vibration	• Confirming construction works and anticipated equipment/processes; hours of operation, noise and vibration standards. • Identification of receivers where noise and vibration standards apply. • Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved. • Methods and frequency for monitoring and reporting on construction noise and vibration. • Procedures for maintaining contact with stakeholders, contact details of site supervisor and liaison person. • Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction Noise and/or Vibration Management Schedule will be required. • Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys.	• CNVMP • CNVMS

AEE Section	Topic	Measures	Mechanism to Implement Measures
23.9	Operational Noise and Vibration	Confirmation of achieving noise categories at PPFs and, if required, confirmation of BPO.	Noise Mitigation Plan
23.10	Network Utilities	- In consultation with network utility operators, protect, relocate and work in proximity to existing network utilities. - Network utility operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for some activities.	Network Utility Management Plan (NUMP)
23.11	Community	- Methods to regularly communicate with the community, stakeholders and land owners/occupiers during construction including timeframes. - Identification of a Project liaison person. - Method to formalise a complaints and response process (and monitoring thereof). - Links to other communication methods in other management plans. - S176(1)(b) approval process for land owners and developers to enable development (whilst not preventing or hindering the work authorised for the Project).	- SCMP - CNVMP - CNVMS - CTMP - CEMP - S176(1)(b) RMA approval process
23.12	Property, Land use and Business		

25 Waihoehoe Road East Upgrade: Statutory Assessment

An assessment of the statutory matters that are relevant to the Project under section 171(1) of the RMA has been undertaken and is presented in Part I, Statutory Assessment.

With reference to those matters, and based on the assessment of effects summarised above, the proposed designation is generally consistent with the relevant provisions of National Policy Statements, the Regional Policy Statement and the relevant objectives and policies of the AUPOIP. Adequate consideration has been given to alternative sites, routes and methods of undertaking the Project, and the Project will avoid, remedy or mitigate any adverse effects on the environment. The proposed work and the proposed designation are also reasonably necessary for achieving the objectives of AT for the Project.

26 Waihoehoe Road East Upgrade: Conclusion

The wider Drury-Ōpāheke area in the south of Auckland has been signalled to undergo significant urban growth in the next 30 years. The Drury-Ōpāheke area will experience significant change over the coming years as the existing rural environment develops into a new urban area. This is accelerating as private plan changes are lodged with Auckland Council. The Project will provide critical transport infrastructure to support and integrate with the planned future growth in Drury-Ōpāheke and the wider south Auckland growth areas.

While some adverse effects will be generated during construction and operation of the Project, these can be mitigated by the management plans and other measures which are proposed as conditions of the proposed designation. The Project will have significant positive effects, and provide for the social, economic and cultural wellbeing of communities.

The Project is consistent with the relevant planning documents and statutory tests, thereby satisfying the requirements necessary for Auckland Council to recommend confirmation of the NoR on the basis of the conditions proposed by AT.



PART G: NOR D4

Ōpāheke North-South FTN Arterial

27 Ōpāheke N-S FTN Arterial: Description of Project and Proposed Works

27.1 Project Description

The Ōpāheke North South FTN Arterial includes a new 3.5km long, four-lane FTN arterial with separated active transport facilities between Hunua Road in the north and Waihoehoe Road in the south. The new transport corridor will be an urban arterial with a likely speed limit of 50kph. The functional intent of the Project from a transport perspective is to increase connectivity and provide for good people-movement and public transport function through the planned growth area. The Project will also support SH1, Great South Road and the proposed Mill Road corridor by providing a new transport corridor which will cater more to local north-south trips in Drury. The road traverses greenfields currently zoned FUZ, crossing areas of flood plain and streams to connect the planned growth areas with a new north-south connection between Drury and Papakura. The location of the Project in a wider context is shown in Figure 27-1.

The proposed new four-lane N-S FTN arterial through the Drury-Ōpāheke growth area (currently relying on Great South Road) will provide greater connectivity for communities to existing and proposed centres and employment areas. The new arterial will respond to the rapid growth expected in the area by providing attractive north-south transport choices in the Ōpāheke/Drury East area, which will increase travel choice and access to social opportunities for those living and/or working in the Drury-Ōpāheke area.

In the north, the Project ties in at a signalised intersection with Hunua Road and Boundary Road. South of Hunua Road a new north-south road is formed, bridging over Waipokapū Stream. Continuing south, the road ties into Walker Road at a proposed roundabout. A roundabout is proposed to tie the Project into Ponga Road. Further south a bridge is proposed over the Waihoehoe Stream and floodplain. At its southern extent the corridor ties into a roundabout at Waihoehoe Road and Fitzgerald Road. Along the alignment four stormwater wetlands are proposed. An overview of the design is provided in Figure 27-1 and an indicative cross-section of the proposed corridor upgrade is provided in Figure 27-2.

A new AT designation is proposed to allow sufficient land for the new transport corridor plus land for tie ins with existing roads, stormwater infrastructure, batter slopes and retaining and for other construction related activities including construction compounds and laydown areas, construction traffic manoeuvring and the re-grade of driveways.

The key features of the proposed upgrade include:

- A new transport corridor to provide for 30m wide four-lane cross section including bus lanes and separate active transport facilities
- Localised widening around intersections with existing roads to accommodate for vehicle queuing and tie-ins and active transport facilities/crossings
- New culverts
- Four proposed stormwater wetlands
- Two proposed bridges over Waipokapū Stream (approximately 120m) and Waihoehoe Stream and floodplain (approximately 265m)

- Batter slopes and retaining to enable construction of the corridor, and associated cut and fill activities (noting the indicative design of these are based on the existing land form and urban development adjoining these areas may change the work requirements).
- Vegetation removal
- Areas for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring.

The works described for the Project could be carried out in stages as urban development occurs surrounding the Project area.

Indicative design drawings are provided in Volume 3 of this AEE and the Project design standards and details further described in Section 4.2.7

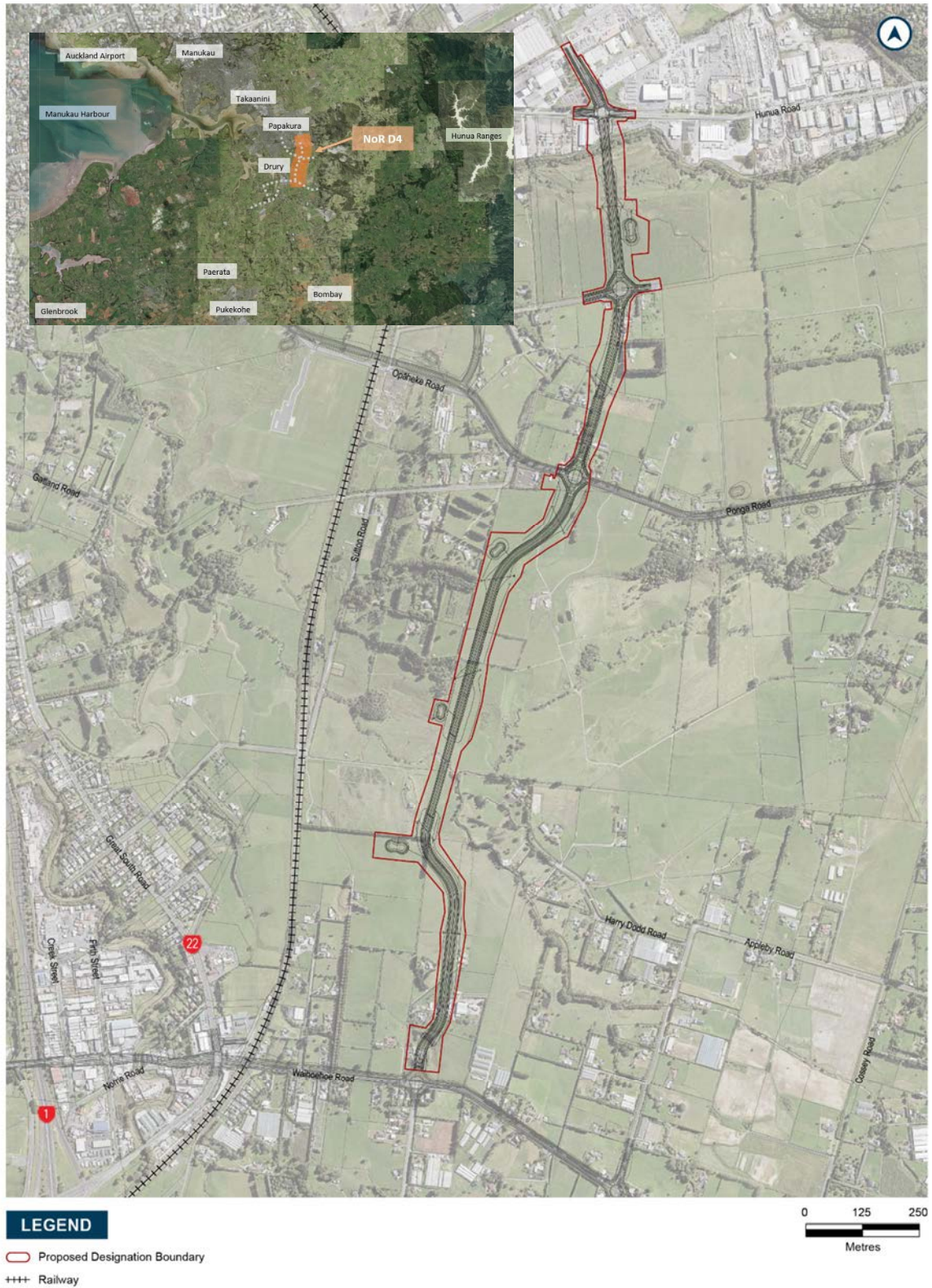


Figure 27-1: Proposed Ōpāheke N-S FTN Arterial

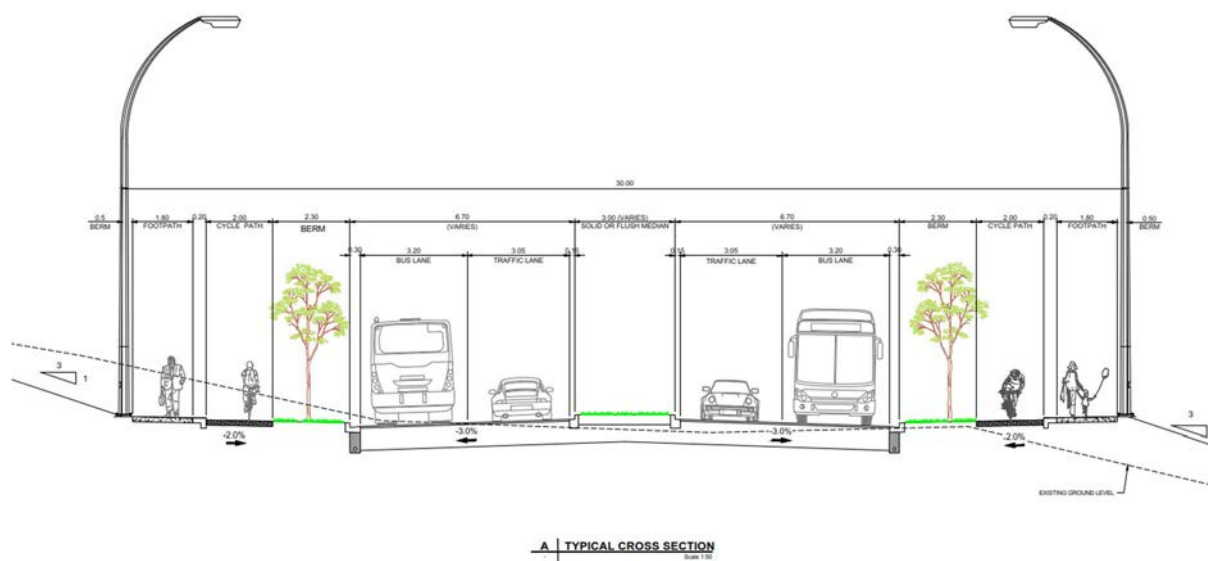


Figure 27-2: Typical Cross Section

27.2 Project Objectives

The Project Objectives reflect the transport outcomes that were identified for the Southern Growth Area (in the IBC) and specifically the Drury Arterial Network (in the DBC). The Project Objectives for the Ōpāheke N-S FTN Arterial are:

1. Provide a new north south transport corridor between Drury and Papakura that improves network resilience to support and integrate with the urban growth in Drury-Ōpāheke
2. Provide a transport corridor that is safe for all users
3. Contribute to mode shift by prioritising frequent and reliable public transport and provides a choice of transport options including active transport
4. Provide for long term identification and protection of the transport corridor to support urban growth in Drury-Ōpāheke.

27.3 Lapse

A lapse period of 20 years is proposed for NoR D4.

27.4 Indicative Construction Methodology

The general construction methodology for the Project is outlined in Section 4.4 and further detail is outlined in the sections below. The indicative construction methodology, including the working room areas specified in Table 4-2, have informed the proposed designation boundary.

27.4.1 Construction Overview

Construction of the Project will include earthworks, construction of bridges, pavement, drainage and stormwater wetlands, and service relocation. The works will also include the construction of one new signalised intersection, two roundabouts and other tie ins with existing roads.

To facilitate the construction works the site has been broken into three indicative construction zones. The construction zones are based on the nature and scope of the works. The three zones are shown in Figure 27-3 and include:

- Zone 1 – Boundary Road/ Hunua Road intersection works and Bridge 1
 - Includes the Boundary Road, Hunua Road, and Bridge 1 works. The majority of works are located in a brownfield environment, with significant presence of services and interface with the adjoining businesses and traffic.
- Zone 2 – South of Bridge 1 to Ponga Road/ Ōpāheke Road intersection
 - Includes Walker Road and Ōpāheke Road/ Ponga Road roundabouts and Bridge 2 works. This zone is generally a mixture of greenfield works in a rural environment, with some interface with live services, traffic, and local residents.
- Zone 3 – South of Ponga Road/ Ōpāheke Road intersection to Waihoehoe Road
 - Includes works south of the Ponga Road/ Ōpāheke Road intersection to Waihoehoe Road and includes Bridge 3. It has minimal interface with services, traffic, and residents.



Figure 27-3: NoR D4 Indicative Project Construction Zones

27.4.2 Indicative Construction Programme and Sequencing

The Project is estimated to take 3.5 to 4 years to construct. The implementation timeframe for the Project has yet to be confirmed and will respond to timing of urban development as well as funding availability. However, it is currently anticipated that it will be implemented by approximately 2038. In addition, urban development that may occur ahead of the proposed upgrade has the potential to change the detail of construction requirements than what would be required in the existing environment. The proposed designation provides for construction in the existing environment acknowledging this may change in the future. A summary of the construction sequence and methodology is outlined in Figure 27-4.

Zone 1 Enabling Works	Zone 1 Construction Works
1. Site establishment, including: site access construction, tree removal and vegetation clearance, remove footpath, streetlights and grass verge berm and property/ building modification or demolition, including fencing, driveways, and gates. 2. Implement environmental controls including silt fencing 3. Implement traffic management to establish the construction zones in offline areas 4. Service relocation and/ or protection works	1. Minor earthworks including cut and fill and removing verge and preparing subgrade formation 2. Construct new longitudinal drainage 3. Construct new pavement, widening works in available areas 4. Move traffic to newly constructed pavement areas and continue with the remaining widening works. i.e. pavement reconstruction or reconfiguration of existing road furniture. 5. Complete tie in works, footpaths, cycleways, lighting and landscaping 6. Asphalt new road, carry out finishing works, and
Zone 2 & 3 Enabling Works	Zone 2 & 3 Construction Works
1. Site establishment, including: site access construction, tree removal and vegetation clearance, remove footpath, streetlights and grass verge berm and property/ building modification or demolition, including fencing, driveways, and gates. 2. Implement environmental controls including silt fencing and construction of temporary sediment ponds 3. Service relocation and/ or protection works 4. Construct access tracks/ haul roads to culverts and bridge sites	1. Construct permanent stormwater wetlands 2. Construct new culverts including rip rap and headwalls 3. Bulk earthworks (summer months) a. Ground improvements, undercuts, embankment foundations b. Predominantly fill works along the alignment to formation level, including preload if required. c. Remove preload upon settlement completion, and subgrade preparation. 4. Construct new longitudinal drainage and connect to wetlands 5. Construct new pavement (including intersection works in stages) including granular layers, kerb and channels, new road seal and line marking 6. Road finishing including streetlighting and traffic signals, landscaping and footpaths and cycleways
Bridge Works	
1. Site compound and establishment of plant and materials 2. Environmental controls 3. Bridge construction including abutment construction, piling, pier, and headstock construction and installing bridge beams and decking 4. Bridge finishing works including barriers, settlement slabs, footpaths and cycleways and landscaping and anti-graffiti	

Figure 27-4: NoR D4 Indicative Construction Sequencing Summary

27.4.3 Indicative Construction Methodology

27.4.3.1 Site Establishment

Site Facilities

Site facilities and services are required to support construction along the proposed alignment. A main site compound and several satellite compounds will be required. The main site compound will be used as office facilities for project and administration staff. The satellite offices along the alignment will be used for specific construction crews such as earthworks, drainage, and bridge crews. Construction site compounds and laydowns will be required at a number of indicative locations as shown in Figure 27-5. They include:

- **Site Compound 1** indicatively located off Boundary Road near the junction with Hunua Road. This site can be used as the main site office due to its strategic location in Papakura and ease of accessibility. It will also likely be used to support the intersection upgrade and Bridge 1 works in Zone 1.
- **Site Compound 2** indicatively located off Walker Road and will be required to support the intersection works and Bridge 2. This compound will likely be used as a small satellite site office and temporary earthworks material laydown area.
- **Site Compound 3** indicatively located off Ponga Road and will be used to support the intersection works at Ponga Road, Ōpāheke Road, and Ōpāheke N-S FTN. This compound will likely be used as a small satellite office and earthworks material laydown area.
- **Site Compound 4** indicatively located near Bridge 3 to support its construction. A temporary access track will need to be constructed off Waihoehoe Road to the site.
- **Site Compound 5** indicatively located off Waihoehoe Road and will primarily be used to support the civil works in Zone 3 and tie in works. This compound will likely be used as a small satellite office and earthworks material laydown area.

Satellite site compound will also allow sufficient space for laydown of materials or stockpile areas as required. The use of these compounds will only be required during the construction period and the site will be reinstated upon completion of the works.

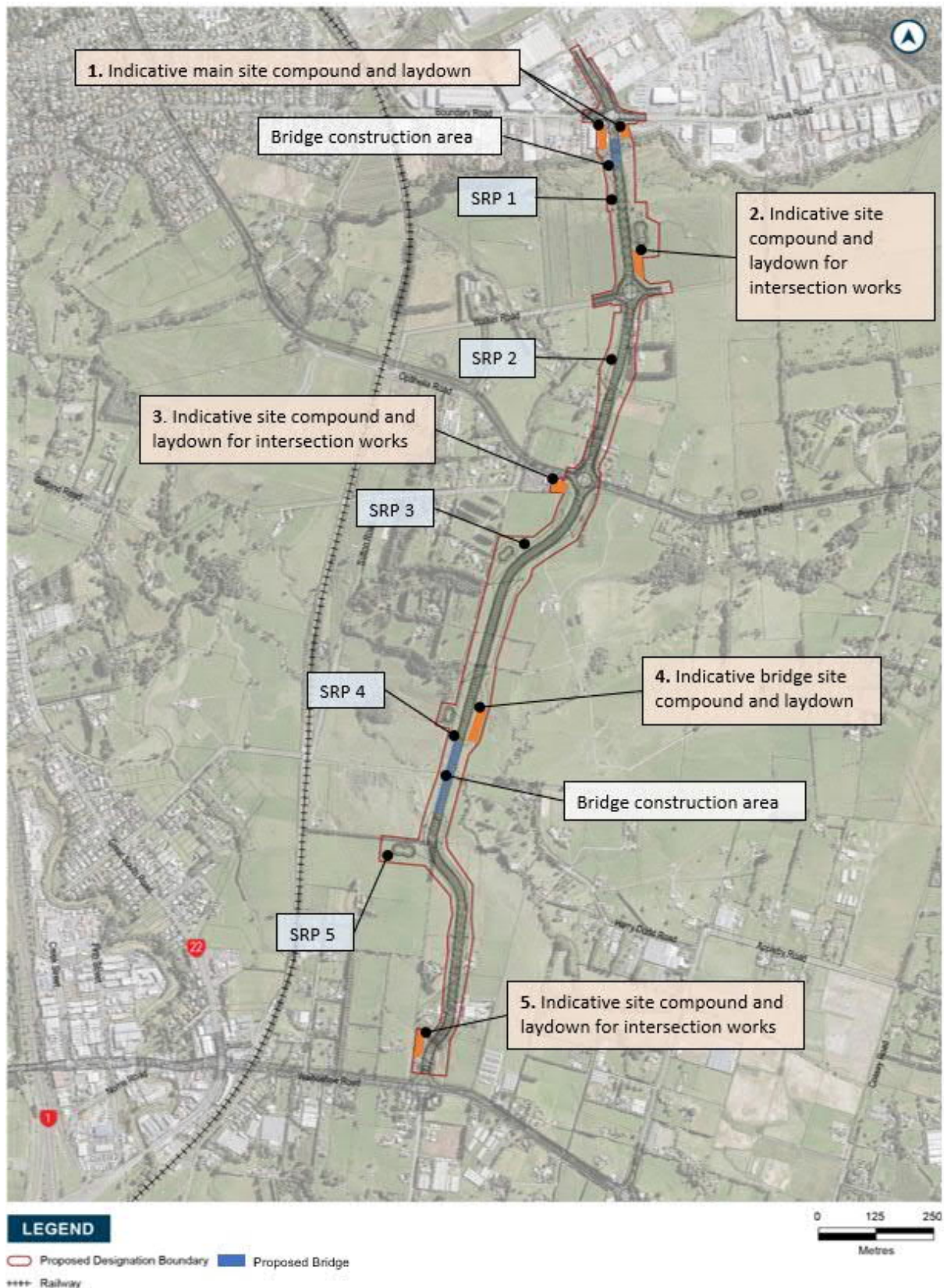


Figure 27-5: NoR D4 Indicative Construction Areas, Compounds, Laydowns and SRPs

Sediment Controls

Surface water running through earthwork sites will need to be treated prior to discharge, subject to future resource consents. The typical method for doing this is to contain the water from the earthworks zones and channel it into temporary sediment retention ponds. The number and location of these ponds is dependent on the topography and construction sequence to be confirmed at detailed design. Figure 27-5 and Figure 27-6 identify the indicative SRP locations.

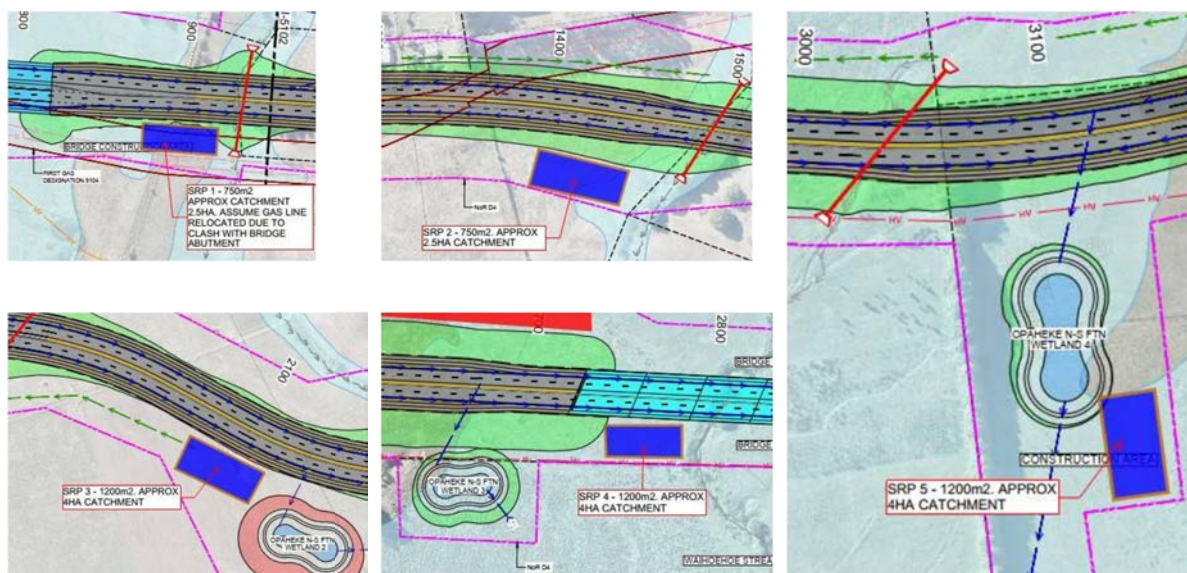


Figure 27-6: NoR D4 areas identified for Erosion and Sediment Control treatment– indicative SRP locations

Traffic Management, Access and Haul Roads

The Project works include a relatively small section to be constructed on existing roads, this includes the intersection at Boundary Road and Hunua Road, Walker Road, Ponga Road, and tie in works at Waihoehoe Road. At these locations, it is anticipated the construction of the Project involves disruptions to the existing road network and property access.

Access at these locations will largely be maintained, however it is anticipated some closures will be needed for critical activities at night or on weekends. Road closures on Hunua Road and Boundary Road will likely require a detour route along Dominion Road, Settlement Road, and Ōpāheke Road. Road closures on Ponga Road will likely require a detour via Ponga Road, Hunua Road, Boundary Road, and Ōpāheke Road. Alternative routes could also utilise the proposed Mill Road corridor (which is expected to be implemented before Ōpāheke N-S FTN Arterial).

Haul roads for the movement of people, plant and materials will be required along the proposed alignment. These haul roads provide access and connectivity to critical work sites such as the culverts, bridge sites, and main cut and fill sites. The proposed designation boundary has allowed for the construction of these haul roads.

27.4.3.2 Network Utilities

The Project requires the relocation or realignment of a number of network utilities including gas transmission and distribution, overhead electricity transmission, and telecommunications. Works to network utilities will be confirmed at detailed design and may include the following:

- **First Gas – Transmission Line:** the line runs parallel to the new alignment from Boundary Road/ Hunua Road intersection to the Ponga Road intersection. The gas line intersects the proposed alignment at four locations:
 - Boundary Road and Hunua Road intersection works; restrictions when working above the pipeline may be enforced, such as installation of protection above the pipe, stand over requirements, and/ or maximum compaction equipment size.
 - Northern abutment of Bridge 1; this conflict over the bridge structure will likely require the pipeline to be relocated or realigned.
 - Walker Road intersection; restrictions when working above the pipeline may be enforced, such as installation of protection above the pipe, stand over requirements, and/ or maximum compaction equipment size.
 - South of Walker Road; this crossing is at an acute angle to the alignment which is typically not acceptable and will likely require relocation or realignment.
- **Counties Power Overhead High Voltage Line:** high voltage lines and pylons connecting to the substation on Ponga Road, conflicting with the proposed alignment will likely require relocation. New pylons will need to be constructed, with any earthworks at the new location to be done prior to the pylons installation, such as access track construction, foundation preparation, or small laydown/ work area. The existing power lines may be relocated, or new lines installed, and a cut over undertaken to switch the power over. The disruption to the network is likely to be minimal as the cut over will be programmed to occur over a low demand period.
- **Vector Gas Medium Pressure distribution lines:** these lines are to be realigned on to the new carriageway service corridor. Installation of the new gas line will be carried out using a combination of open trench excavation and directional drilling methods. The existing gas pipe is likely to require removal where practicable.
- **Overhead power distribution lines:** If required, lines will either be relocated underground or new overhead poles installed in the new alignment within the carriageway service corridor.
- **Watercare assets:** such as water supply, wastewater pipeline, access chambers, hydrants and others will require protection or relocation to the new road alignment. Access to the proposed Waikato Booster Pump Station can either be retained or realigned (as discussed with Watercare).
- **Chorus** lines along the alignment will be relocated to the new verge according to the new design alignment.

27.4.3.3 Culverts and Related Stream Works

The Project requires new culverts to accommodate road construction. Resource consents will be sought for culverts and associated stream works at detailed design. These culverts will be constructed at the initial phase of the construction works to ensure surface water flow can be directed through the construction zone without becoming contaminated from the earthwork activities.

Works on new culvert construction may require flow diversion or over pumping. Further investigations will be required during the detailed design and resource consenting phase to confirm the flow volumes and ecological requirements for the diversions.

27.4.3.4 Earthworks

The Project is estimated to generate approximately 9,800m³ of excavated (cut) material assumed suitable to be used as fill material and 233,300m³ of fill, with a total volume of material moved at 243,100m³. Final earthwork volumes will be confirmed during detailed design.

Additional fill material will be required to complete the earthworks scope based on the current indicative alignment. This fill material would ideally be sourced from a borrow site within the proposed designation. Alternatively, the Project will need to import the fill material from an external borrow source. Soil improvement measures, such as cement or lime stabilisation may be required to improve the soil parameters from the cut materials.

The height of fill material required is indicated to be upwards of seven meters in places along the alignment. Although no detailed geotechnical investigation has been undertaken, it is likely that sections of fill will require a settlement period and potentially preloading. This quantity is assumed to be in the order of 100,000m³ to 150,000m³ in addition to the fill material. Works may be staged to recycle preloading material, or additional preloading material may need to be imported to expedite the construction works.

27.4.3.5 Drainage and Stormwater

New stormwater drains will be required on both sides of the new road corridor to direct the stormwater to the four proposed wetlands. In addition, new discharge lines are required from the proposed stormwater wetlands to a suitable discharge point. Discharge points for each of the wetlands have been identified and designated accordingly.

Stormwater will discharge to, and works will be required within existing water ways. Resource consents for diversion and discharge of stormwater and stream works will be sought as part of future resource consent processes. These works and activities will be undertaken in accordance with applicable management and mitigation measures and resource consent conditions.

27.4.3.6 Bridges and Structures

The Project includes the construction of the following bridges:

- Bridge 1 – over Waipokapū Stream, at approximately Chainage 750 is a four-span, 120m long bridge
- Bridge 2 – over Waihoehoe Stream, at approximately Chainage 2840 is an eight-span, 265m long bridge

The bridges will typically follow conventional bottom up bridge construction techniques.

It is anticipated temporary all-weather access will be provided using indicative construction haul roads from both directions to enable the construction of the bridges. Due to the width of the bridges, a 20m wide temporary access way will be required on either side of the bridge which has been included in the proposed designation boundary. Temporary staging will likely be required on either side of the bridges. Once the bridge structures are complete, the temporary staging and accessways can be removed. The sections below outline specific scope or construction requirements to consider for the respective bridges.

Bridge 1 – over Waipokapū Stream

A four-span bridge over Waipokapū Stream will likely have piers adjacent to the stream bank (to be confirmed during detailed design). Works within watercourses will be assessed as part of the future application for resource consents from Auckland Council. Temporary staging and access will be required across the stream to facilitate the substructure works.

Restrictions due to the bridge proximity to the First Gas transmission line and Counties Power overhead high voltage line will add additional constraints to the bridge construction methodology. The full scope of these restrictions will be addressed during detailed design in consultation with First Gas and Counties Power, respectively.

Bridge 2 – over Waihoehoe Stream

An eight-span bridge over Waihoehoe Stream will require an all-weather access and working platform along the length of the bridge. A temporary staging/bridge will be required to temporarily cross the stream to facilitate the substructure works. Stream banks may need to be protected to facilitate the construction of the bridge piles either side of the stream.

28 Ōpāheke N-S FTN Arterial: Existing and Likely Future Environment

This section provides a description of the human, physical and natural features of the existing environment, and the likely future environment within which the Project will be constructed, operated and maintained. It draws on information from a number of sources including the technical assessments included in Volume 4. The potential effects of the Project on this environment and measures proposed to manage these effects are detailed in Section 30 of this report.

28.1 Planning Context

Table 28-1: NoR D4 Planning Context

Existing AUPOIP Zoning and Potential Future Zoning (Drury-Ōpāheke Structure Plan) 9	Existing Zoning: • Future Urban Zone • Business – Heavy Industry Zone • Open Space – Conservation Zone Potential Future Zoning • Residential – Terraced Housing and Apartment Zone • Residential – Mixed Housing Urban Zone • Residential – Mixed Housing Suburban Zone • Business – Centre Zone • Business – Light Industry Zone • Business – Heavy Industry Zone • Open Space – Conservation Zone
Overlays and Controls	Overlays • High-Use Stream Management Areas Overlay [rp] • High-Use Aquifer Management Areas Overlay [rp] • Quality-Sensitive Aquifer Management Areas Overlay [rp] Controls • Macroinvertebrate Community Index
Designation(s) and other notations	• Airspace Restriction Designations - ID 200, Ardmore Airport - Height Restrictions, Ardmore Airport Ltd • Designations - 9104, Pukekohe to East Tamaki Gas Pipeline, Designations, First Gas Limited
Other Non-Statutory Features	• Flood Plains • Flood Prone Areas • Overland Flow Paths

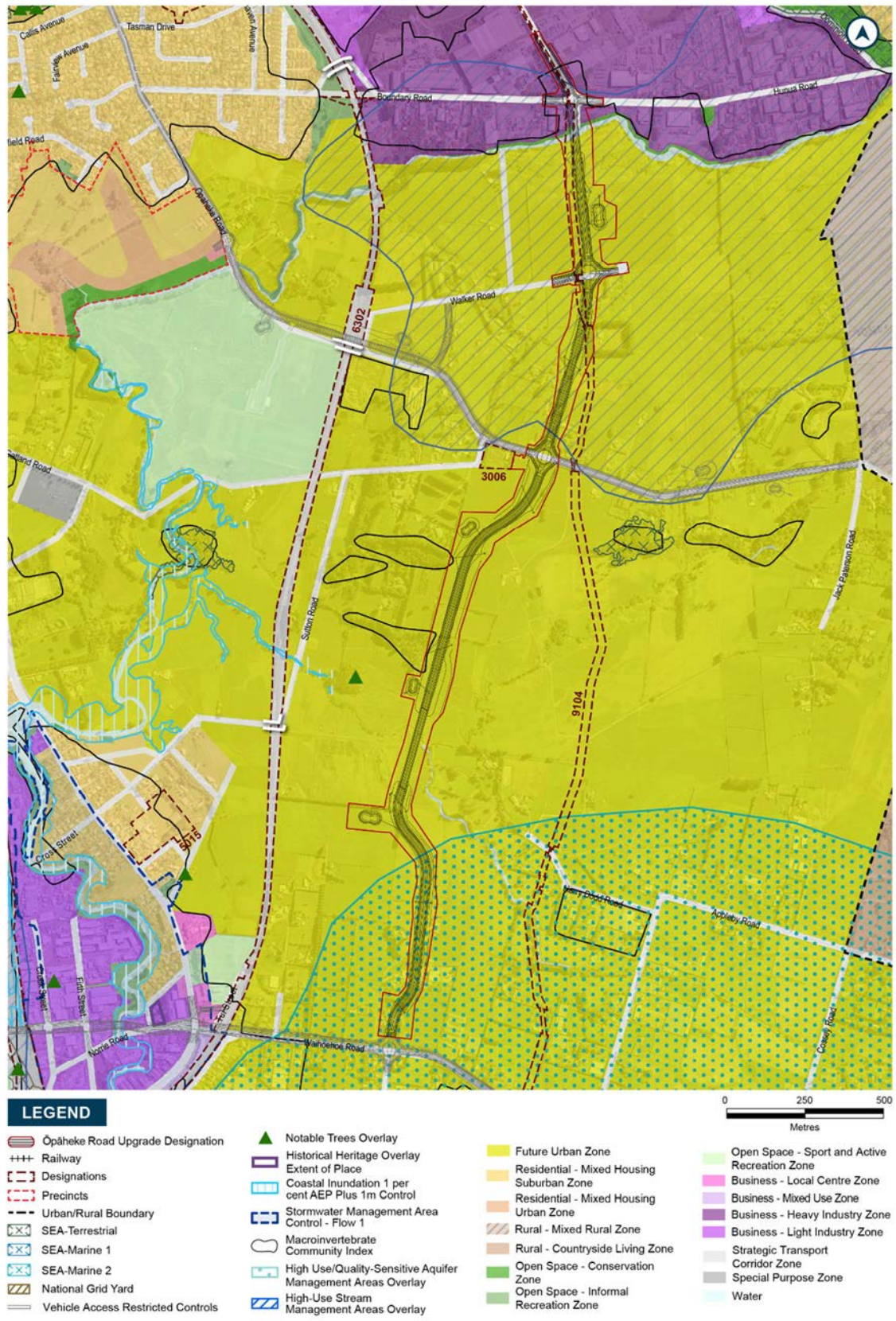


Figure 28-1: NoR D4 Planning Context (AUPOIP)

28.2 Human Environment

Table 28-2: NoR D4 Summary of Existing and Likely Future Human Environment

Land Use and Urban Form	Existing Environment The existing land use surrounding NoR D4 is largely rural farming consisting of low density rural residential dwellings and greenfields / farmland with a few rural based businesses including accommodation (homesteads/ cottages), engineering and utility facilities (see Figure 28-2). At the northern extent of the proposed designation land use is heavy industrial with business types including manufacturing and engineering. Likely Future Environment The land surrounding the proposed alignment in Drury East and Ōpāheke is mostly zoned FUZ and forms part of the southern growth area and Drury-Ōpāheke Structure Plan area. The area is planned to undergo significant growth and change in the future. At the north of the alignment in Papakura, the environment is an existing urban industrial area with a low likelihood of significant change in urban form. The likely future land use environment in which NoR D4 will operate is assumed to be an urban or developing urban environment. Based on the existing zoning and Drury-Ōpāheke Structure Plan and proposed private plan changes, the land use pattern surrounding the Project is planned to be largely medium to high density residential, with an industrial centre in the north, a small centre at Ponga Road and connecting to Waihoehoe Road adjacent to the main Drury centre (see Figure 28-3). The existing industrial land use is anticipated to remain as existing, expanding south to support the expanding urbanised area. At the time of writing this report, three plan changes had been lodged with Auckland Council to urbanise a large area of Drury East. The proposed Ōpāheke N-S FTN Arterial is located within the area of private plan change 50 - Waihoehoe by Oyster Properties. The final urban form of the existing FUZ area has yet to be confirmed but the land use outcomes in the area, as anticipated by the zoning proposed throughout the Drury-Ōpāheke Structure Plan is summarised below. Based on the Structure Plan, it is anticipated that land in the FUZ that is impacted by the Slippery Creek floodplain is likely to stay rural or open space in the future. Table 28-3: NoR D4 Anticipated Urban Form <table> <tr> <th>Zone</th><th>Anticipated Outcomes</th></tr> <tr> <td>Residential – Terraced Housing and Apartment Building</td><td>Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.</td></tr> <tr> <td>Residential – Mixed Housing Urban</td><td>Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.</td></tr> <tr> <td>Residential – Mixed Housing Suburban</td><td>Development is typically two storey detached and attached housing in a variety of types and sizes.</td></tr> <tr> <td>Business –Centre</td><td>Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a</td></tr> </table>	Zone	Anticipated Outcomes	Residential – Terraced Housing and Apartment Building	Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.	Residential – Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.	Residential – Mixed Housing Suburban	Development is typically two storey detached and attached housing in a variety of types and sizes.	Business –Centre	Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a
Zone	Anticipated Outcomes										
Residential – Terraced Housing and Apartment Building	Provides for urban residential living in the form of terrace housing and apartments. Buildings are enabled up to five, six or seven storeys.										
Residential – Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.										
Residential – Mixed Housing Suburban	Development is typically two storey detached and attached housing in a variety of types and sizes.										
Business –Centre	Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a										

		focus for commercial activities and growth. Depending on the final centre zone provisions vary, but typically enable buildings up to eight storeys (in a town centre zone).
	Business – Light Industry	Anticipates industrial activities that do not generate objectionable odour, dust or noise. This includes manufacturing, production, logistics, storage, transport and distribution activities.
	Business – Heavy Industry	Anticipates large scale industrial activities that may produce objectionable odour, dust and noise emissions.

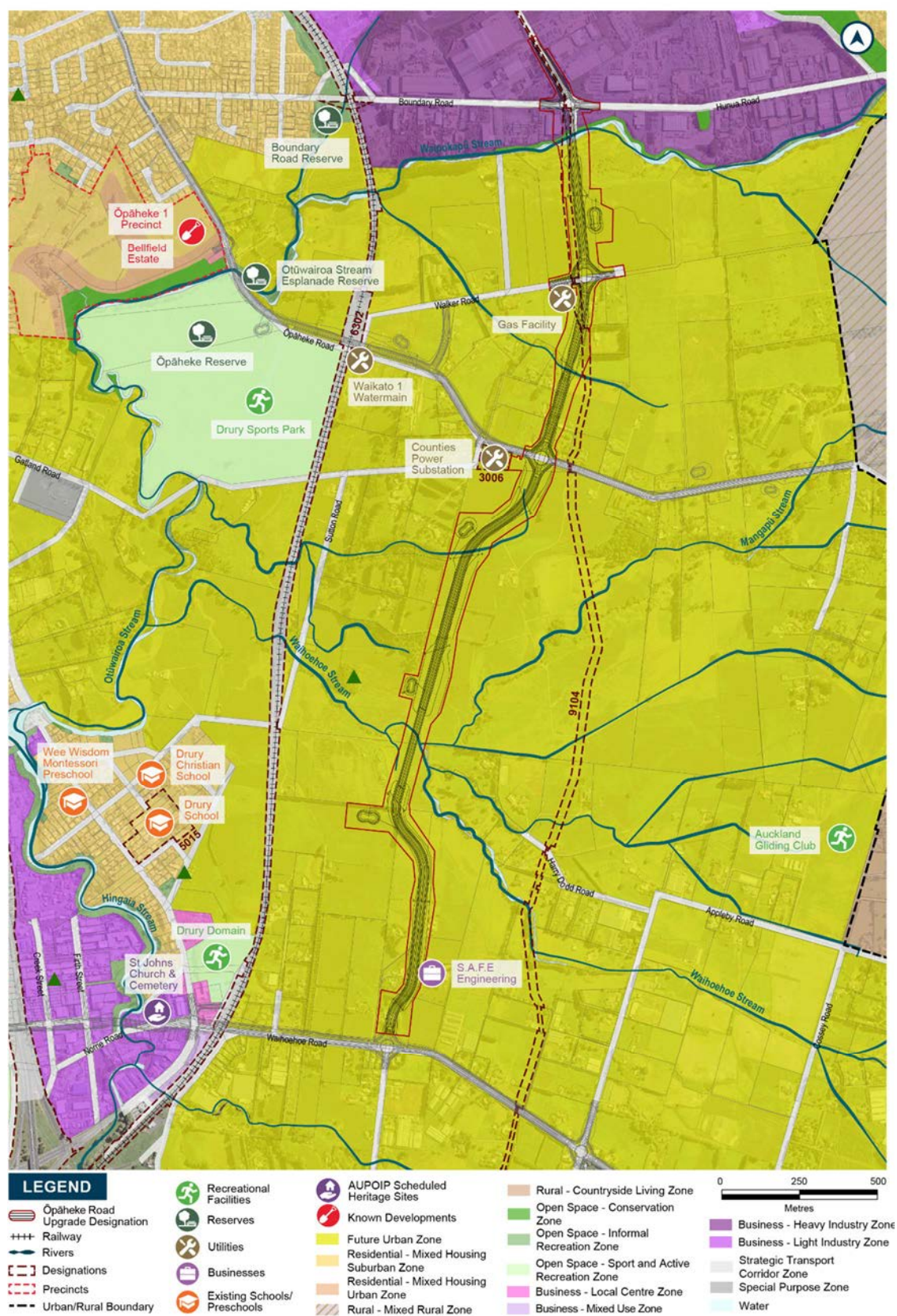


Figure 28-2: NoR D4 Existing Environment

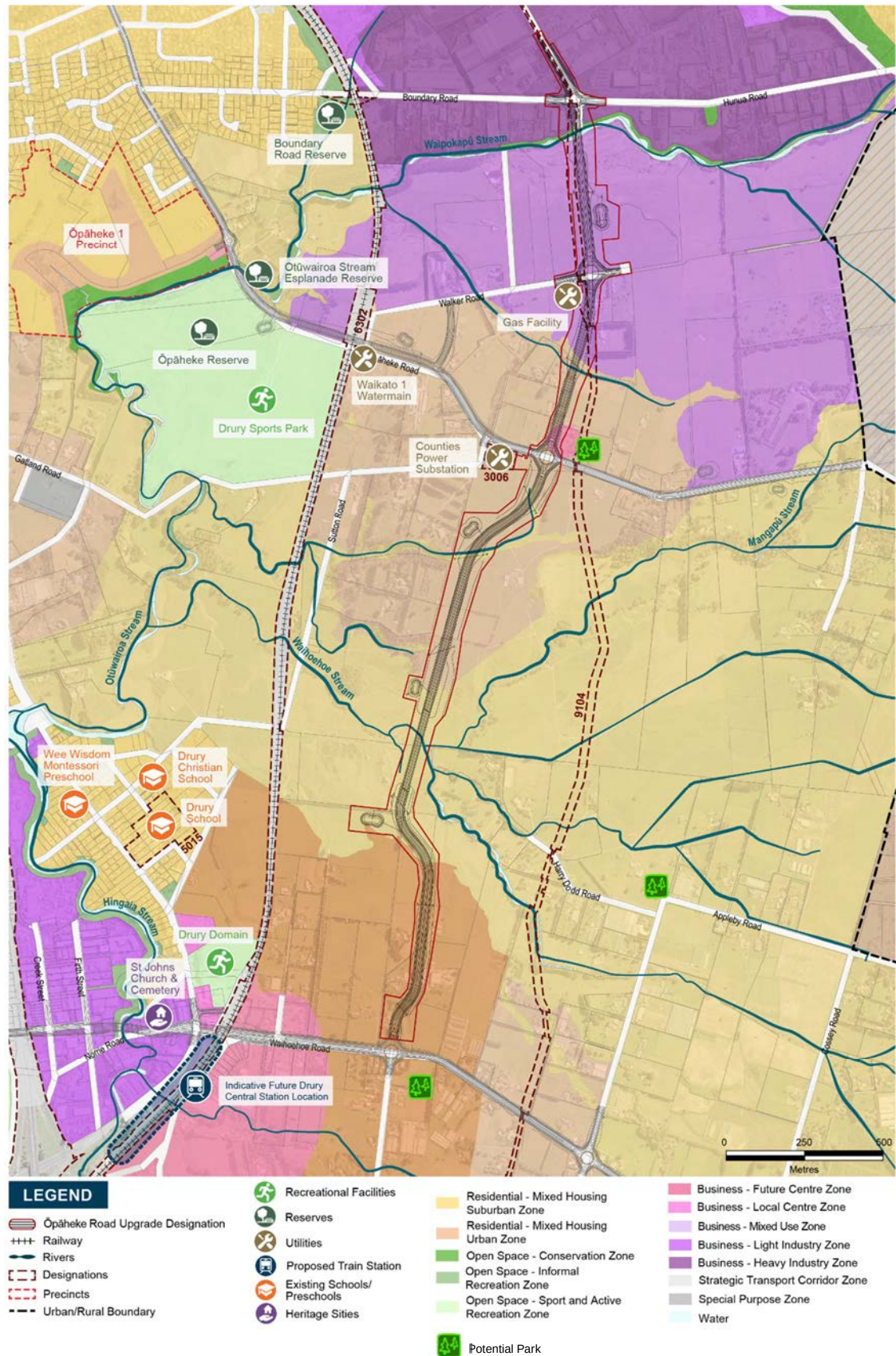


Figure 28-3: NoR D4 Likely Future Environment

Transport

The following text provides a summary of the existing and likely future transport environment relating to the Ōpāheke N-S Project. A more detailed description of the transport environment is provided within the Assessment of Transport Effects within Volume 4 of this Document set.

Existing Environment

The existing transport network surrounding the Ōpāheke N-S FTN Arterial Project can be summarised as follows:

- The north-south connectivity between Waihoehoe Road and Hunua Road is poor, with Great South Road and Sutton Road the only local corridors connecting Drury and Papakura
- Sutton Road is a two lane primary collector west of the rail crossing and a secondary collector road east of the rail crossing with a posted speed of 80kph with no active transport facilities or public transport facilities. It also intersects with the NIMT rail line at an at-grade rail crossing.
- Great South Road is a two-lane arterial road with a posted speed limit ranging between 50kph and 70kph with dedicated walking facilities and no cycling facilities to protect vulnerable users. The public transport facilities along the corridor are limited bus stops but does not have any mid-block priority for public transport.
- As Ōpāheke N-S FTN Arterial is a proposed new arterial there is no data on historic crash patterns, SH1 and Great South Road are operating close to or near capacity and experience significant delays. Sutton Road presents significant safety and capacity issues related to the at-grade rail crossing.
- The existing properties adjacent to the proposed corridor have access to the surrounding rural road network. The high-speed environment in the surrounding rural road network does present a safety concern to existing properties.

Likely Future Environment

The planned growth in the Project area, and the transition from a rural to an urban land use environment, will put significant strain on the existing transport infrastructure. A number of planned future transport projects are identified in the Drury-Ōpāheke Structure Plan (subject to planning and funding approvals) and NZUP and will form part of the future transport network that will enable the planned growth to be realised. These are:

- New rail stations at Drury Central and Drury West *
- New Mill Road Corridor*
- SH 1 Papakura-to-Bombay Upgrade **
- SH 22 Drury-to-Paerata **
- Additional rail capacity between Pukekohe and Papakura**
- Regional north-south cycle route between Drury and Pukekohe ***
- New rail station at Paerata, and associated park and ride facilities ***
- New Pukekohe Expressway***
- The other components of the Drury Package Arterial Network (proposed within this report) noting that there may be interim transport infrastructure provided by developers within the Drury Arterial Network (for example a local road built by developers which is later upgraded to an arterial) ***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas are urbanised.

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

Historic Heritage and Archaeological Values	The following text provides a summary of the existing and likely future environment as it relates to historic heritage and archaeological values. A more detailed description of the environment identified through research and site surveys is provided within the Assessment of Historic Heritage Effects within Volume 4 of this Document set. Existing Environment There is one existing historic site within the proposed designation boundary. This is a utility Building (CHI item 22281) assessed as having little historic value. There is reasonable cause to suspect previously unrecorded historic heritage sites may be present within the proposed designation. This is primarily based on the density of pre1900 European sites recorded for the Drury township, coupled with the presence of the many tributaries of the Drury Stream which is a known pre-European Māori transport channel. Land near waterways are commonly areas of high risk for previously unrecorded historic heritage deposits. All unrecorded archaeological sites are protected under provisions of the HNZPT Act. Likely Future Environment The existing environment as it relates to historic heritage and archaeological values may change in the future. As the site identified in the project area is not protected through the AUPOIP or other legislation it is possible that overtime, as the existing rural area develops, the site could be adversely impacted or destroyed prior to construction of the transport corridor. In addition, there is a possibility that unknown sites could be uncovered during development of the area prior to construction of the transport corridor which would add to the historical understanding of the area.
Cultural Values	There are no identified Sites of Significance to Manawhenua identified under the AUPOIP within or in close proximity to the Project area. The cultural values identified by Manawhenua within the Project area highlights the importance of maintenance and enhancement of water quality and ecological values, particularly areas of high indigenous values. The proximity of the Project to Ōtūwairoa Stream, Waihoehoe Stream and Waipokapū Stream and their tributaries means the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage with the potential to uncover undiscovered archaeological sites. The Ōtūwairoa Stream and its tributaries (which includes Waipokapū Stream, Mangapū Stream and Waihoehoe Stream) are Ngāti Tamaoho statutory acknowledgement areas (Ngāti Tamaoho Deed of Settlement 30 April 2017).
Community and Recreational Facilities	Existing Environment As the corridor is a greenfield project, there are no existing public recreational or community facilities along the Ōpāheke N-S alignment, nor provided at the Project extents or intersections. There is one private recreational facility, Wet Fit, located off Waihoehoe Road. Nearby recreation facilities include Ōpāheke Reserve to the west of the alignment and Drury Domain in the southwest. Drury Village to the southwest and Papakura to the north are the closest villages / centres that provide some community amenities including halls, local shops, recreational facilities and libraries. The closest existing schools to the west of the corridor are Drury School and Drury Christian School, both off Great South Road. To the north several schools are nearby to the corridor including Edmund Hillary

	School, Ōpāheke School, Papakura Intermediate School, Red Hill Primary School and Red Hill Kindergarten. Likely Future Environment Existing recreational and community activities will remain unchanged and facilities will continue to be provided within Drury Village and Papakura. It is possible additional community facilities will be provided as development occurs and the population in the surrounding area grows. The Drury-Ōpāheke Structure Plan identifies potential new suburb parks at the southern extent on Waihoehoe Road and on Ponga Road.
Ambient Noise	The ambient noise environment is reflective of a rural environment where low noise levels are experienced with limited road traffic noise. Noise monitoring was carried out at 235 Jesmond Road and 116 Waihoehoe Road (as these sites were considered to be representative of the existing noise environment of the Project Areas) over seven days with noise levels recorded ranging between 46 - 49 dB LAeq(24hr). This ambient noise level is likely to change as the surrounding environment urbanises. Although no measurements were taken from an urban location (to reflect the noise environment at the northern extent of the Project area), computer noise modelling of existing noise levels has been shown to be generally accurate (within +/- 2 dB) and effective, particularly in the vicinity of existing roads.
Utilities	Existing Environment Major utilities in the Project area include: • The Watercare Waikato 1 Watermain traverses through Boundary Road towards the Ōpāheke N-S FTN intersection and heads north to Hunua Road. Watercare propose a booster pump station for Waikato 1 at 72 Hunua Road. • The First Gas transmission pipeline runs along the Project area. The existing underground line traverses underneath Hunua Road towards the Boundary road intersection. The gas pipeline crosses the proposed Waipokapū Stream . South of the Waipokapū Stream , the gas pipeline travels on the western side of the Project area until it reaches the First Gas substation at 101 Walker Road, where the pipeline crosses to the eastern side of the Project area. • Multiple Counties Power overhead MV and HV lines run along the Project area. Overhead MV lines are located on the Hunua/Boundary Road intersection, and Ōpāheke/Ponga Road intersection. The MV line runs in the east-west direction for both intersections. An overhead HV line traverses along the western side of the southern quarter of the Project area and at the Waihoehoe/Fitzgerald Road intersection. Likely Future Environment As the areas surrounding the Project urbanises in the future it can be expected that existing utilities including the watermain and substation will remain and it is likely additional utilities may be added. Existing overhead powerlines may be undergrounded as part of new development.
Property Details	• 35 properties directly affected, including: • Council owned land: two properties totalling approximately 1,004m² • Privately owned land: 30 properties totalling approximately 303,283m² • Hydro: three properties totalling approximately 2,227m²

28.3 Natural and Physical Environment

Table 28-4: NoR D4 Summary of Existing and likely Future Natural and Physical Environment

Geology	Existing Environment The area surrounding the Project is mapped as being entirely underlain by Puketoka Formation. The alignment crosses the Waiau Fault and Glenbrook Fault. Within the alignment, the Waiau Fault is described as having downthrown >130m on the north, with the Glenbrook Fault having downthrown approximately 120m to the south. As result of these movements, alluvial deposits to the northern and southern ends of the alignment (within the Seagrove Graben and Glenbrook Depression, respectively) are likely to be much thicker, with shallower rock (within the Waiau Horst) between the two faults. Likely Future Environment The geological conditions are not anticipated to significantly vary in the future.
Hydrology and Natural Hazards	Existing Environment Key watercourses within the Ōpāheke N-S Project area include Waipokapū Stream , Waihoehoe Stream and several overland flow paths that join the eastern side into Ōtūwairoa Stream. The alignment crosses an existing pond north of Waihoehoe Road that discharges into a tributary of Waihoehoe Stream. As shown in Figure 28-4 Several overland flow paths and streams cross the site, and flood prone areas are evident at some of these crossings. The existing 100year ARI flood maps from the latest Auckland Council's Geomaps show an 80m wide floodplain over Waipokapū Stream and a ± 690 m wide floodplain over Waihoehoe Stream.

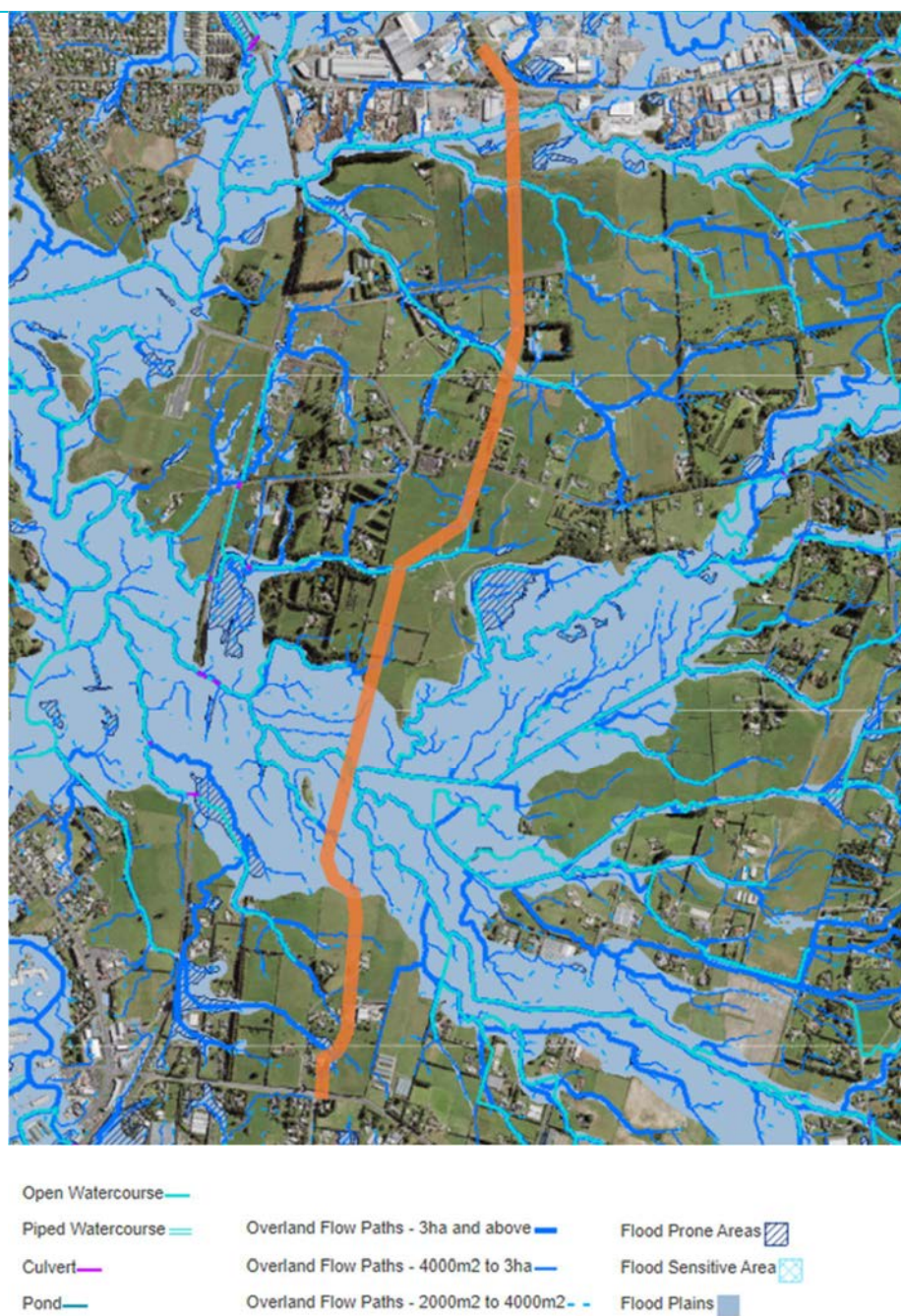


Figure 28-4 Hydrology and Natural Hazards surrounding Waihoehoe Road East Upgrade (Source: Auckland Council GeoMaps, 2020)

Likely Future Environment

Although urban development is likely in the future the hydrological environment and natural hazard conditions are not anticipated to significantly vary in the future. In particular, the permanent and intermittent streams are identified in the Drury-Ōpāheke Structure Plan with a 20 metre riparian margin. Floodplains are also identified.

Terrestrial Ecology

The following text provides a summary of the existing and likely future environment as it relates to ecological features and values. A more detailed description of the environment is provided within the Assessment of Ecological Effects within Volume 4 of this Document set.

Existing Environment

The existing environment surrounding the Project area includes a number of habitats (including terrestrial, freshwater and wetland) and species.

Habitats

The existing terrestrial habitats are highly modified and are dominated by agricultural land and dominated by exotic grassland and amenity planting (gardens and parks) with small areas of exotic forest, exotic scrub, wetlands, treeland and remnant forest fragments. Where natural habitat remains, SEAs are identified through the AUPOIP. There are no SEAs within the proposed designation boundary or directly adjacent to the Project.

The freshwater habitat within the Project area includes nine stream branches. All streams were representative of degraded systems primarily due to historical indigenous vegetation clearance which has then been compounded by agricultural practices. This degradation of riparian vegetation and increased nutrient inputs has also led to loss of bank stability, reduced shading and the proliferation of exotic macrophytes within the streams. Additionally, many streams have been physically altered, through dredging, reclamation and/or drainage of associated wetlands and/or channelization.

Exotic, low value wetland habitat was identified within the Project area. The wetland present is dominated by exotic plant species such as soft rush, willow weed and mercer grass and highly degraded through factors such as vegetation removal, artificial drainage and grazing and pugging from livestock.

Species

Automatic bat monitor (ABM) surveys were undertaken within the wider Drury Package area including within the Project area. The ABM survey results suggested that bats are not frequent visitors to the area during their mating and breeding seasons. However, despite bats not being detected within the area to date, the Project area does provide potential habitat features which would be suitable for use by foraging and commuting indigenous long-tailed bats.

No At-Risk or Threatened bird species were found in the site investigations. Three threatened bird species were identified that may occur in the Project area with the presence of suitable habitat. These include Dabchick (At Risk – Recovering), Spotless crane (At Risk – Declining) and North Island kākā (At Risk – Recovering).

The introduced plague skink was identified during site investigations. It is highly likely that the non-threatened copper skink could be present through the Project area in a wide variety of native and exotic habitats. There are several remnant stands of suitable native forest near the Project area which may provide stepping-stone habitat for native lizard species therefore there is a possibility that these species may occur in the Project area, however, no records of these species were identified during site investigations.

During the site investigations, no indigenous frogs were identified as incidental observations and it is highly unlikely that native frog species would occur within the Project area due to lack of suitable habitat.

No dedicated fish surveys were undertaken as this will be subject to a future resource consent phase.

	Likely Future Environment It is assumed that in a future urbanised scenario, permanent streams and areas of indigenous vegetation will generally be avoided and retained. Greater emphasis on the protection and enhancement of existing watercourses and areas of significant natural value, such as that surrounding Waihoehoe, Ōtūwairoa and Waipokapū Streams, is given in the AUPOIP, requiring these areas to be accommodated within the future urban environment. It is also assumed that stormwater design will be integrated into the proposed 'Blue Green Network' and sediment and pollutants will be controlled at source. For example, if riparian habitat restoration is implemented appropriately, it is considered that in a future scenario many of the features of ecological value could be similar or in some cases enhanced.
Vegetation (Trees)	The following text provides a summary of the existing and likely future environment as it relates to trees. A more detailed description of the environment is provided within the Assessment of Arboricultural Effects within Volume 4 of this Document set. Existing Environment There are no trees that are protected by District Plan provisions identified in the Project area. There is a group of AUPOIP scheduled notable trees at 205 Sutton Road that lies to the west of the Project which is a remnant kahikatea forest. These trees have actively been avoided through the alternatives assessment process. Another remnant group of trees containing kahikatea is adjacent to the Project on the same property. Likely Future Environment The future environment for trees in the Project area is likely to be very different as the land use pattern and zoning changes from rural and FUZ to urban. This change is likely to result in removal of trees that are not protected by the current plan framework. Removal of trees can therefore be expected to occur as the land use changes from a rural environment to an urban environment in the future. The planting of new trees would also occur as part of an urban landscape.
Topography and Landscape Context	The following text provides a summary of the existing and likely future environment as it relates to landscape features and values. A more detailed description of the environment is provided within the Assessment of Landscape and Visual Effects within Volume 4 of this Document set. Existing Environment The Project area comprises greenfield land that is characterised by lowland floodplains and gently rolling landform accommodating rural lifestyle land use. There are no regionally or nationally significant landscapes (ONLs, ONFs or ONCs) within or immediately adjacent to the proposed designation boundary. The Project area has limited vegetation cover (by comparison to local context) comprising exotic grassland, isolated areas of planted native vegetation, exotic treeland and planted vegetation (gardens, hedgerows and shelterbelts) associated with rural properties. The Hunua Ranges foothills provide an expansive and scenic backdrop to the lowland environment of the Project area. The landscape features attributed the highest values include the Waihoehoe Stream and associated floodplain and the Waipokapū Stream and associated floodplain.

Likely Future Environment

The Project area will undergo a significant change in land use over the coming decades from rural to urban particularly as developers seek the rezoning of FUZ land at the southern end of the Project area to allow for urban development.

It is likely that the Waihoehoe Stream flood plain will endure future development and perhaps even underpin much of the localised urban framework. The quality and natural character values of the extensive stream and floodplain environments are anticipated to be enhanced as urban development progresses. This will likely be in recognition of the challenging site conditions posed by the floodplain landscape for high density development, in combination with the policy direction of the AUPOIP which generally seeks to protect and enhance water bodies within the urban landscape.

Conversely, it's expected that the less defining vegetative features of the Project area and local landscape will make way for new urban and industrial development, which will likely include large lots, street tree plantings, public open space design and planting within private yards.

29 Ōpāheke N-S FTN Arterial: Consideration of Alternatives

A detailed assessment of alternatives was undertaken for the Project to identify the proposed route (process is described in Section 4.2 and further outlined in the Alternatives Assessment Report attached at Appendix A). The following sections provide an overview of the alternatives assessment process through the corridor assessment (IBC Phase) to the route refinement assessment (DBC and NoR Phase). This summary should be read in conjunction with the full assessment, including the process undertaken and outcomes reached, provided in the Alternatives Assessment Report attached at Appendix A.

29.1 Corridor Alternatives Assessment

TFUG recommended a new north south connection and FTN along a similar alignment to the IBC recommendation (AR10 as shown in Figure 29-2). The proposed Mill Road corridor was further to the west.

The IBC investigated multiple arterials in Drury. Two other north-south arterials were investigated at the long list and short list and were discounted at the short list. These were located on the more eastern side closer to the proposed Mill Road corridor and generally looked to upgrade existing roads. Alignments to the east were discounted at the IBC phase due to their proximity to Mill Road, and the desire to avoid both severance effects and rat running. The extent of floodplain needing to be crossed and the consequent reduction in developable land served is further reason not to move the corridor significantly to the east of the corridor recommended at the IBC.

The corridor recommended at the IBC phase spans a large section of floodplain and multiple bridges are proposed. Although a range of potential ecological impacts were noted because of stream crossings, which will require bridges, the IBC recommended option was preferred due to the increase in north south connectivity it would provide for general traffic and for its PT function as part of the FTN. The connection would provide good people and public transport movement function through the FUZ. The recommended option did not impact upon any recorded heritage sites. The figures below show the long list and short list options considered in the IBC.

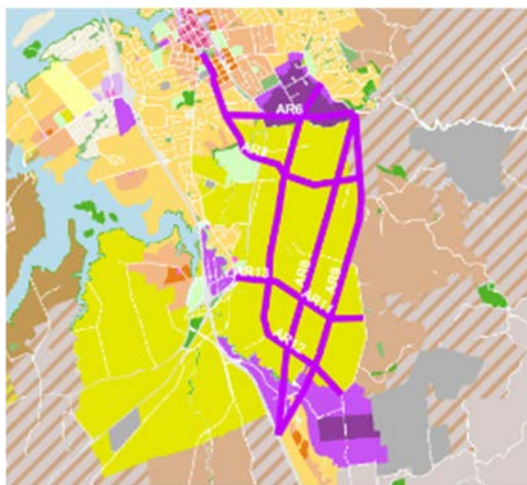


Figure 29-1: IBC Drury East Long List Options

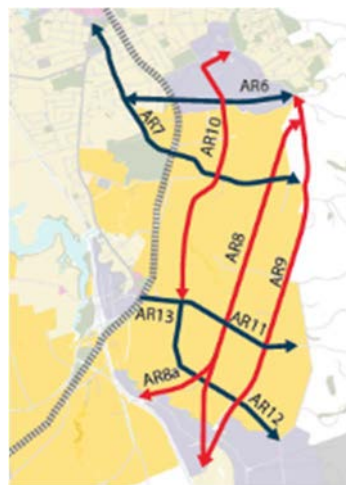


Figure 29-2: IBC Drury East Short List Options

29.2 Route Refinement Alternatives Assessment

29.2.1 Option Development

Route refinement for the Ōpāheke N-S FTN Arterial included specialist assessment of three options described below:

- Option A - central alignment
- Option B – western alignment
- Option C – eastern alignment.

The three options for the Ōpāheke N-S FTN Arterial section are shown in Figure 29-3.

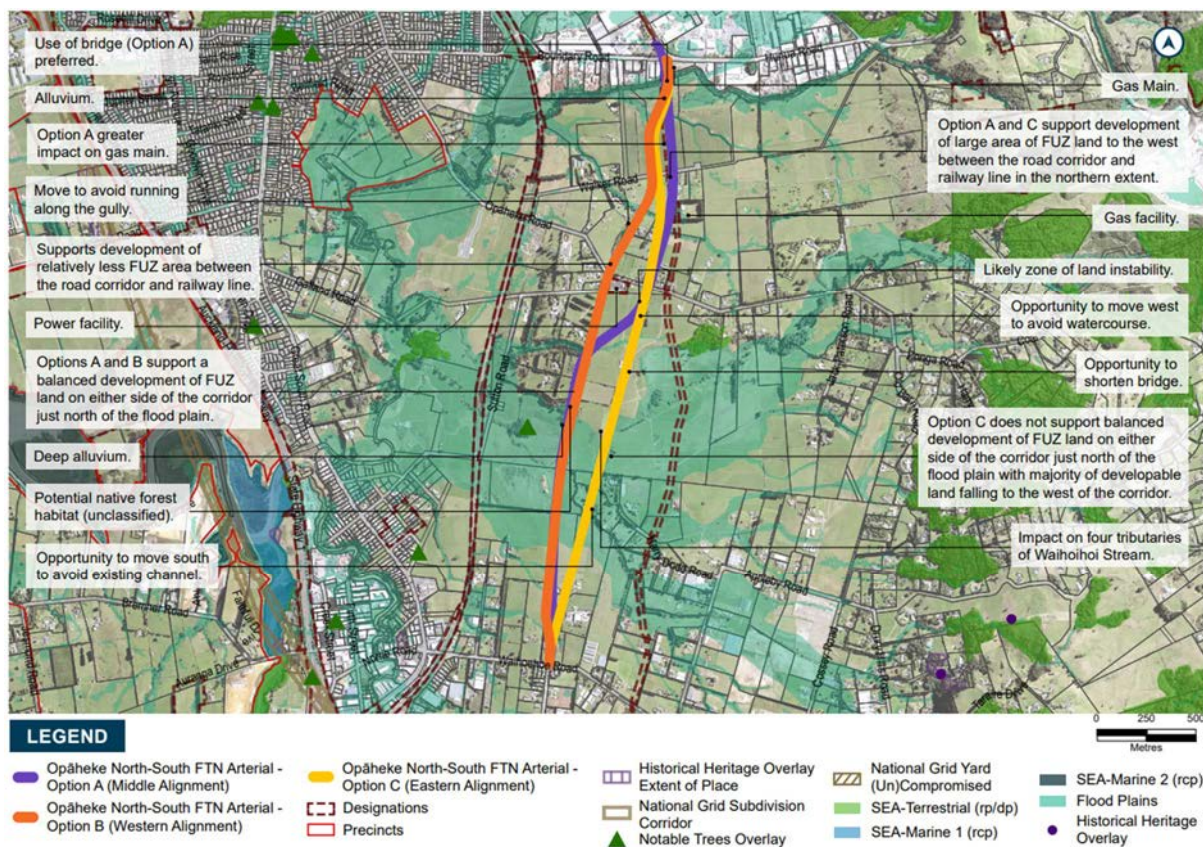


Figure 29-3: Ōpāheke N-S FTN Arterial Options for route refinement showing constraints and considerations

29.2.2 Assessment

The MCA framework was used to score these options, as it was thought that the scoring would help in differentiating the options, being a new greenfields alignment and with some of the options going outside of the corridor recommended during the corridor assessment.

The three options were assessed and scored against the MCA framework by each subject matter expert and reasons for the score recorded. Considerations made and constraints identified are shown in Figure 29-3.

29.2.2.1 Preferred Option

The preferred option (Option A) central alignment is recommended with some small design changes to be made during design refinement. The preferred option was chosen because:

- This option crosses the flood plain at the narrowest point and reduces some of the effects of filling this area (e.g. culverts).
- This option supports the development of a large and balanced area of future urban zoned land.
- This option reduces the number of tie ins required with existing roads.
- This option alignment integrates with the proposed local centre on Ponga Road.
- This option reduces impact on the Counties Power Substation.
- All route refinement options provided the same level of achievement against the transport outcomes.

Initial Design Refinement

During design refinement, specific consideration was made to bridge spans to minimise impacts on streams and existing utilities and avoid known poor ground conditions where possible. Changes to the alignment or design included:

- Alignment moved slightly to the east at the southern extent to reduce impacts on Counties Power transmission lines
- Alignment moved slightly east near the Counties Power substation to reduce impacts on this.
- Alignment moved slightly to the west at the northern extent to minimise some impacts on the Frist Gas transmission line
- Alignment moved to the west near the central section to reduce impacts on stream tributaries

National Policy Statement for Freshwater Management 2020

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the Project has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

Further Design Refinement

Following identification of the preferred option and initial design refinement, engagement with Oyster Capital Ltd (Oyster) was undertaken on the southernmost section of the proposed Ōpāheke N-S FTN Arterial which is within the proposed Waihoehoe Precinct Plan Change area (PC50). Oyster and the Project Team agreed that there was an opportunity to align the Ōpāheke N-S FTN Arterial with a collector road proposed by Oyster. This will better integrate with Oyster's development plans in the proposed PC50 area. The interim collector road within PC50 will be upgraded in the future to the four-lane FTN arterial when required.

Oyster and the Project Team agreed on an alignment within the properties that Oyster has an unconditional agreement to purchase. The realignment of this section of Ōpāheke N-S Arterial through the PC50 area is a minor deviation from the preferred Ōpāheke N-S FTN Arterial option (Option A).

This realignment was provided to the Project technical specialists to assess. Most of the technical specialists advised that there was no material change in effects from the initial preferred option. However, there were some improved environmental outcomes including through removing a stream crossing and minimising impacts on wetlands, as well as improved future land use integration with the development plans of Oyster for the proposed PC50. In addition, the realignment is entirely within land under agreement for purchase by Oyster and does not adversely impact any other property.

Based on the above assessment, the realigned southernmost section of Ōpāheke N-S FTN Arterial was recommended to be taken forward for route protection.

29.2.2.2 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 29-1: Discounted Options - Ōpāheke N-S FTN Arterial

Option	Reasons for discounting
Option B	- This option has greater impact on stormwater and flooding requiring increased fill and culverts - Geotechnical constraints may impact construction times for fill embankments. - This option would require extra traffic management/detours and construction staging - This option is aligned close to the electrical assets on the corner of Sutton/Ponga
Option C	- This option does not support the balanced development of future urban zoned land on either side of the corridor - This option has greater impact on stormwater and flooding requiring increased fill and culverts - This option crosses more tributary streams which would have additional environmental protection and controls working around and over streams - This option has geotechnical constraints that may impact construction times for fill embankments.

29.2.2.3 Intersection Form

Along this corridor, there are three intersections to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future:

- **Ōpāheke N-S FTN Arterial / Hunua Road:** Signalised intersection preferred because:
 - Proximity to industrial activity, higher freight movements will like trigger more in-roundabout conflict with other lane-users.
 - Roundabout presents major constraints. Would require significant realignment of Hunua Road (north leg) and impacts to properties.
 - High-quality bus priority North-South.
 - Special consideration should be considered land use context and gateway to strategic freight network.

- **Ōpāheke N-S FTN Arterial / Walker Road:** Roundabout preferred because:
 - High-quality bus priority North-South.
 - Provides east-west connectivity for existing properties and is part of the future collector network as indicated in the Drury-Ōpāheke Structure Plan.
- **Ōpāheke N-S FTN Arterial / Ponga Road:** Roundabout preferred because:
 - High-quality bus priority North-South.
 - Staging considerations as land transition between (semi-rural to FUZ).
- **Ōpāheke N-S FTN Arterial / Waihoehoe Road / Fitzgerald Road:** Included within the Waihoehoe Road West Corridor (section 15.3.2.5).

29.2.3 Summary

The preferred option for the Ōpāheke N-S FTN Arterial Upgrade was Option A (central alignment). Some small changes were made during design refinement to reduce impacts on streams and existing utilities, avoiding known poor ground conditions where possible, and to provide improved future land use integration (through the proposed PC50 area).

Through the intersection form assessment it was recommended that a signalised intersection be implemented with Hunua Road. Roundabouts were recommended at Walker Road and Ponga Road / Ōpāheke Road and Waihoehoe Road (included in NoR D2).

30 Ōpāheke N-S FTN Arterial: Assessment of Effects on the Environment

This section provides a summary of the actual and potential effects of the construction, operation and maintenance of the Ōpāheke N-S FTN Arterial, including whether these effects are positive or adverse and the scale, duration and location of effects.

Key transport outcomes, land use integration and the avoidance of adverse effects on areas or features of high value have been key drivers for the identification and selection of the proposed designation corridor and the subsequent refinement of the corridor. Where avoidance has not been possible, measures to remedy or mitigate significant adverse effects have been proposed. Details of these are included in Section 31 and reflected in proposed designation conditions.

30.1 Positive Effects

The Project will generate a range of positive effects. The nature and degree of these positive effects are discussed in subsequent sections of the AEE, but in summary:

- The Project will provide transport infrastructure necessary to support and integrate with the planned urban growth in Drury-Ōpāheke. The Project will unlock development capacity in the southern growth area where development pressure is accelerating. This is evident from recent private plan changes being lodged with Auckland Council.
- The Project will provide a safe, reliable arterial corridor that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improves access to employment and social amenities. This will improve the way people live in terms of daily commutes and connecting to the community. In particular, it will:
 - Significantly improve transport facilities for all modes in the Drury-Ōpāheke area, resulting in improved north-south connectivity for those that travel by car, active mode and public transport, as well as the movement of goods and services;
 - Provide access to east-west connections serving as a gateway to key destinations in Drury and Ōpāheke including new planned rail stations, centres and the strategic north-south PT network;
 - Provide a segregated north-south walking and cycling spine that will significantly improve safety for vulnerable users and will significantly reduce the risk for DSIs.
 - Significantly improve north-south capacity and resilience, with a more direct local connection that enables local traffic and freight to rely less on congested SH 1, Great South Road and the proposed Mill Road (which will be the only north-south alternatives in future);
 - Integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.
 - New opportunities for active modes of transport to link in with the Waihoehoe Stream and Waipokapū Stream riparian corridors, as envisaged by the proposed Blue-Green Network.
- Net increase in green infrastructure within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences.
- Eventual enhancement of natural character values within water bodies (subject to resource consent processes and mitigation planting).

- The Project will enable improvements to the way of life and health and wellbeing due to more efficient connections and active modes of transport.
- Opportunities to present any new historic information identified during the works to the community through information boards and other displays as the historic heritage of the area is currently not well understood.

30.2 Traffic and Transportation

The potential effects of the Project on traffic and transportation have been assessed in the Assessment of Transport Effects report, provided in Volume 4. The effects assessment has been assessed on the likely future environment, based on the full build out of the southern growth areas in 2048+, and taking into account relevant wider infrastructure upgrades. This methodology is outlined in the Assessment of Transport Effects Report. The potential effects are summarised below and should be read in conjunction with that report.

30.2.1 Positive Effects

The Project will have significant positive traffic and transportation effects. It will provide a safe, reliable north-south multi-modal arterial network that supports growth, enables sustainable travel choice, addresses safety concerns and improves access to employment and social amenities.

The Project will significantly improve transport facilities for all modes in the Drury-Ōpāheke area, resulting in improved north-south connectivity for those that travel by car, active mode and public transport, as well as the movement of goods and services. This will improve north-south movement between Drury and Papakura and reduce vehicle kilometres travelled daily. The Project will also significantly improve north-south capacity and resilience, with a more direct local connection that enables local traffic and freight to rely less on congested SH1, Great South Road and the proposed Mill Road corridor (which will be the only north-south alternatives in future).

The Project will improve north-south connectivity in the Drury-Ōpāheke area and will form an integral part of the future public transport network, providing access to east-west connections and north-south FTN corridors. It will also serve as a gateway to key destinations in Drury and Ōpāheke including new planned rail stations, centres and the strategic north-south PT network.

The Project will integrate well with surrounding land uses and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.

The positive effects of the Project are discussed in further detail in the assessment of operational effects below.

30.2.2 Operational Effects

The existing transport environment between Drury and Papakura has poor connectivity and is not fit for purpose to support the planned future urban growth. The average north-south traffic flows are expected to increase up to 138,000 veh/day by 2048, which is approximately three times the existing traffic in the area. The absence of direct connectivity and the scale of growth will trigger adverse effects on all modes. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same. These effects include increased safety risk for all users, significantly increased journey times for general traffic and public transport, and lack of direct north-

south connectivity. It will also lead to several undesirable transport and land use integration outcomes.

30.2.2.1 General Traffic Effects

The new Ōpāheke N-S FTN Arterial will support the urbanisation of the Drury-Ōpāheke area, resulting in improved connectivity and urban form outcomes. NoR D4 will provide a four-lane multimodal north-south spine between Drury, Ōpāheke and Papakura prioritising public transport with only two lanes allocated for general traffic.

The new alignment will significantly increase north-south connectivity, increase north-south capacity and provide a reliable local connection. Modelling results suggest that a large proportion of localised traffic would reroute from the surrounding collector network and the Mill Road corridor (which is proposed to be implemented before the Ōpāheke N-S FTN Arterial) as a result of the new connection, reducing the reliance on the collector network and strategic corridors to provide improved connectivity for localised traffic.

The new Ōpāheke N-S FTN Arterial will also significantly improve connectivity by providing a reliable alternative that reduces vehicle kilometres travelled and travel time. The new arterial will shorten the local connection between Drury, Ōpāheke and Papakura and reduce 43,270 vehicle kilometres travelled daily, when compared with the existing and likely future network (without the Project). This reduction in vehicle kilometres travelled will result in positive environmental and health benefits.

30.2.2.2 Safety Effects

The Project has been designed with consideration of the latest safety guidance, including AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrades that comprise NoR D4 are expected to result in positive effects on safety when compared with the existing and the likely future (without the Project) environment), including:

- It will significantly improve safety for vulnerable road users by providing segregated north-south walking and cycling facilities to connect Drury, Ōpāheke and Papakura
- It will significantly improve safety for all road users travelling between Drury and Ōpāheke by removing the need to rely on Sutton Road (unsafe) and Great South Road (congested) by providing a safe north-south alternative
- Segregated public transport priority lanes that provide a safe and reliable alternative for public transport users
- It will control vehicular movements and provide safe walking/cycling crossing facilities at Hunua/Boundary Roads (signalised intersection) and roundabouts at Walker Road, Ponga Road and Waihoehoe Road
- It will provide a centre median (flush or raised) to separate the two directions of traffic and prevent head on crashes, and will be designed to a safer speed of 50km/h.

Overall, the Project will provide a much safer transport system which will significantly reduce the number of DSIs and result in positive effects for all road users. Further complementary measures to achieve the safety outcomes identified will also be identified as part of detailed design.

Walking and Cycling Effects The average ADT for the Ōpāheke N-S FTN Arterial based on SATURN modelling is predicted to be between 10,500 ADT to 17,000 ADT based on the 2048+ scenario. These figures provide a low and high scenario.

The Project will provide a high-quality north-south transit spine for localised trips and the wider Drury – Ōpāheke area. The proposed new corridor provides a four-lane FTN arterial function with dedicated FTN facilities from Hunua Road to Waihoehoe Road. The dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for public transport users. The higher number of public transport trips reduces the reliance on vehicle trips, which will result in positive environmental and health benefits.

This corridor forms part of the future strategic transport network to enable access to economic and social opportunities for current and future residents in Drury growth areas. It will be the primary north-south public transport connection servicing the Drury-Ōpāheke area and will form an integral part of the future public transport network. In addition to the planned bus routes, Drury Central and Drury West rail stations are planned within the area (through a separate workstream), and it is anticipated that the bus routes will provide connectivity to both of these stations.

Overall, the Project will integrate with the future public transport network resulting in improved east-west and north-south connectivity. The higher number of public transport trips will reduce reliance on vehicle trips, resulting in positive environmental and health benefits, alongside the other positive public transport effects summarised above.

30.2.2.3 Effects on Access

Based on the predicted flow of traffic and multi-movement function along the corridor, with mixed elements of walking, cycling, and public transport demand, direct property access on to the network is not recommended given the negative safety implications. While there are no existing properties directly using the route given this is a new alignment, for any in proximity, it is recommended these be re-routed on to the collector road network as indicated in the Drury-Ōpāheke Structure Plan, where appropriate.

30.2.3 Construction Effects

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for each construction zone. In terms of construction effects, there are several potential adverse effects, mainly linked to staging of projects, traffic management (construction traffic routes, partial or full road closures, construction traffic, speed limits, vulnerable road users, driveways and property access). Potential adverse effects on transport during the construction of the Project can be summarised as follows:

- **Temporary traffic management** will be required to facilitate some of the construction activities. The larger part of works required for the Project will likely be in greenfield areas and will not be adjacent to live traffic. However, full road closures at intersections may be required for some specific activities, such as road surfacing, traffic switches and bridge beam installation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work.
- **Construction traffic movements** to accommodate the movement of significant earthworks will likely increase the traffic volume on routes used during the Project's construction. The activities associated with the construction traffic movements will be limited to sections of the network where alternative access is possible, and given this is a new road routing through a greenfield area, only a small section of the construction works will be on existing roads.
- **Construction vehicles** will include truck movements (heavy), light delivery and staff/contractor vehicle movements (light). The total estimated trips associated with construction works are

approximately 75,600 heavy truck movements staged over three and a half to four years, and approximately 550 light vehicles per day.

- **Road safety** impacts from site access points, posted speed and sight lines for construction vehicles.
- **Pedestrian and cyclist safety**, including the safety and operation of the future active modes on Waihoehoe Road, will be ensured by implementing temporary traffic management measures such as traffic cones and temporary signage.
- **Existing driveways** that remain during construction will require temporary access through temporary traffic management controls.

It is recommended that the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

30.2.4 Mitigation Measures

30.2.4.1 Operational effects

Based on the assessment of effects, as summarised above, the Project will have significant positive effects on the operation of the transport system. There are no anticipated adverse effects that require mitigation.

30.2.4.2 Construction effects

To address the potential construction effects identified, a Construction Traffic Management Plan (CTMP) will be prepared prior to the start of construction. Any CTMP prepared will be submitted to Council for information ten working days prior to the start of works. Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. The objective of the CTMP is to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP will include:

- Methods to manage the effects of temporary traffic management activities on traffic;
- Measures to ensure the safety of all transport users;
- The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
- Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
- Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
- The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads;
- Methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

If required, SSTMP should be developed to manage constraints on access to affected properties.

30.2.5 Summary of Transport Effects

The existing transport environment between Drury and Papakura has poor connectivity and is not fit for purpose to support the planned future urban. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same.

The Project will have significant positive operational effects. It will provide a safe, reliable north-south multi-modal arterial network that supports growth, enables sustainable travel choice, combats safety concerns and improves access to employment and social amenities. The Project is not expected to have any adverse operational effects that require mitigation.

In terms of construction effects, some potential adverse effects are anticipated but these are mainly linked to temporary traffic management. These can be managed appropriately through the implementation of a CTMP.

30.3 Cultural

30.3.1 Discussion

This section presents our understanding of the cultural values and issues of significance to Manawhenua in respect of the Project. This section draws from our engagement with Manawhenua and inputs provided Manawhenua during Project development. Ngai Tai ki Tāmaki, Ngāti Maru, Ngāti Tamaoho, Ngāti Te Ata Waiohua, Te Ahiwaru, Ngāti Whanaunga and Te Ākitai Waiohua have been actively involved in the development of the Drury Arterial Network.

The Ōtūwairoa Stream and its tributaries (which includes Waipokapū Stream, Mangapū Stream and Waihoehoe Stream) are Ngāti Tamaoho statutory acknowledgement areas (Ngāti Tamaoho Deed of Settlement 30 April 2017).

The Project does not affect any identified Sites of Significance to mana whenua under the AUPOIP, wāhi tapu, other taonga or Maori land. However, in developing the Project, recognition has been given to both the relationship of Tangata Whenua to their lands, culture and traditions in this area and the commitment to partnership between Manawhenua and AT. The partnership approach that has been taken in delivering the Project with Manawhenua is discussed further in respect to engagement in section 5.2.1.1 Ngā Manawhenua of this AEE.

Manawhenua involvement has included participation in all Project phases through options assessment, design refinement and effects assessment of the preferred corridor. Engagement with these iwi groups has included site walkovers to identify and address any culturally significant effects, as well as discussion of the approach to cultural impact assessments which could accompany the NoRs. Ngāti Tamaoho, Ngāi Tai Ki Tamaki, Te Ākitai Waiohua and Ngāti Te Ata Waiohua confirmed their intent to prepare a Cultural Impact Assessment (CIA) for inclusion NoR documentation, these were unable to be completed to date. A Historic Summary was prepared by Ngāti Tamaoho (included in Volume 4) which has been used as a reference by the Project team.

The partnership with Manawhenua highlighted the following matters of importance:

- **Water quality:** the importance of maintenance and enhancement of water quality, particularly through stormwater treatment.

- **Ecology:** the importance of maintenance and enhancement of ecological values, particularly areas of high indigenous values.
- **Cultural heritage:** the importance of imposing an appropriate accidental discovery protocol for undiscovered archaeological sites, particularly given the proximity of the works to the Waihoehoe Stream, Ōtūwairoa Stream, Waipokapū Stream and their tributaries. Manawhenua identified the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage.

The Project has also recognised Manawhenua cultural values, particularly with regards to the mauri of, and the relationships of Manawhenua with natural and physical resources including freshwater, land and air resources. Significant adverse effects on these values have been avoided, remedied or mitigated as appropriate. In particular, sufficient land has been included within the proposed designation to provide appropriate stormwater discharge treatment (subject to future resource consenting processes). SEAs, wetlands and waterways have been avoided where practicable. Manawhenua expressed a strong preference for bridges instead of culverts, or box culverts (that have no structure in the bed of the stream) and reducing infrastructure within floodplains.

30.3.2 Mitigation

A number of workshops were held with Manawhenua to work collaboratively on the draft condition set. The conditions that relate to ongoing Manawhenua involvement in the Project were developed and agreed with Manawhenua. The proposed designation conditions include the following measures to ensure ongoing involvement of Manawhenua in Project design and construction and ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle.

Cultural Advisory Report

Manawhenua will be invited to prepare a Cultural Advisory Report prior to the start of detailed design of the Project. The objective of the Cultural Advisory Report is to assist in understanding and identifying Ngā Taonga Tuku Iho ('treasures handed down by our ancestors') affected by the Project, to inform their management and protection. To achieve the objective, AT will invite Manawhenua to prepare a Cultural Advisory Report that:

- Identifies the cultural sites, landscapes and values that have the potential to be affected by the construction and operation of the Project;
- Sets out the desired outcomes for management of potential effects on cultural sites, landscapes and values;
- Identifies traditional cultural practices within the area that may be impacted by the Project;
- Identifies opportunities for restoration and enhancement of identified cultural sites, landscapes and values within the Project area;
- Taking into account the outcomes of the above, identify cultural matters and principles that should be considered in the development of the Historic and Archaeological Management Plan (see section 23.4.3), ULDMP (see section 23.5) and the Cultural Monitoring Plan (see below).
- Identifies and (if possible) nominates traditional names along the Project alignment, noting there may be formal statutory processes outside the Project that apply to any decision-making process.

The desired outcomes for management of potential effects on cultural sites, landscapes and values identified in the Cultural Advisory Report will be discussed with Manawhenua and those outcomes reflected in the relevant management plans where practicable.

Development of other Management Plans

Manawhenua will be invited to participate in the development of the ULDMP to provide input into relevant cultural landscape and design matters as outlined above. Additionally, the Historic and Archaeological Management Plan will be prepared in consultation with Manawhenua.

Cultural Monitoring Plan

Prior to the start of construction works or enabling works, a Cultural Monitoring Plan will be prepared. The objective of the Cultural Monitoring Plan is to identify methods for undertaking cultural monitoring. The Cultural Monitoring Plan will include:

- Requirements for formal dedication or cultural interpretation to be undertaken prior to start of construction works in areas identified as having significance to Mana Whenua;
- Requirements and protocols for cultural inductions for contractors and subcontractors;
- Identification of activities, sites and areas where cultural monitoring is required during particular construction works;
- Identification of personnel to undertake cultural monitoring, including any geographic definition of their responsibilities; and
- Details of personnel to assist with management of any cultural effects identified during cultural monitoring, including implementation of any Accidental Discovery Protocol.

30.3.3 Cultural Summary

The Project team have worked closely with Manawhenua throughout the Project lifecycle and have taken their values and concerns into consideration, including on ecological values, water quality and cultural heritage. Overall the indicative design of the Project and future design and construction management measures will respond positively to the matters raised by Manawhenua and is consistent with the values they identified during Project design and engagement processes.

30.4 Historic Heritage

The Assessment of Effects on Historic Heritage, included in Volume 4, assesses the potential effects on historic heritage resulting from the future construction and operation of the Project. The report assesses the potential effects on any identified recorded historic heritage sites and unidentified subsurface archaeological remains that might be exposed during future construction. The report should be read in conjunction with the summary set out below.

30.4.1 Construction Effects

The assessment identified one site, a Brick Utility Building (CHI site 22281) within the footprint of the Project. This site will be removed for construction purposes. The building is standing; however it has little value based on the AUP RPS values assessment. It is not protected by provisions of the HNZPT Act. The full extent of effects on reusing and relocating the building to a suitable local site will be determined following a built heritage assessment completed at detailed design.

It is possible that previously unrecorded historic heritage deposits are within the footprint, which could include deposits from 19th century domestic occupation or farming, although it cannot be ruled out that precontact Māori period sites are also present. Without mitigation, any potential sites uncovered will likely be adversely affected through damage and/or destruction as a result of the proposed works.

30.4.2 Operational Effects

There will be no adverse operational effects of the Project on historic heritage.

30.4.3 Mitigation Measures

As a proposed condition of the designation, a HAMP will be prepared prior to the start of construction. The HAMP will:

- Set out the methods for the identification and assessment of historic heritage within the designation to inform detailed design. This will include a built heritage assessment of the Brick Utility Building (31 Ponga Road, CHI site 22281).
- Identify the known and potential historic heritage sites within the designation (For example, should an interim upgrade of Ōpāheke North South Arterial be constructed first (for example, by a developer) the results of any archaeological surveys should feed into the HAMP and the need for an authority reassessed at the time).
- Set out the HNZPTA authority requirements for any pre-1900 sites identified for a precautionary authority.

Since archaeological survey cannot always detect sites of traditional significance to Māori, or wāhi tapu, the appropriate mana whenua authorities will be consulted regarding the possible existence of such sites, and the recommendations in this report.

While the Brick Utility Building is not protected by provisions of the HNZPT Act, discussion on reuse/relocation of the building to suitable local site following built heritage assessment and advice will be undertaken. The proposed methodology for investigating and recording the site will be a requirement of the HAMP.

Any potential adverse effects on previously unrecorded archaeological deposits that are exposed during the works can be mitigated by obtaining a precautionary HNZPTA authority. This authority will be sought prior to construction of the Project.

30.4.4 Summary of Effects on Historic Heritage

There is only one site identified within the proposed designation boundary. While it is not protected by provisions of the HNZPT Act, the site will be assessed appropriately as a requirement of the HAMP prior to construction. There is reasonable cause to suspect the proposed works could expose potential previously unrecorded historic heritage deposits. With the mitigation measures described above in place, the potential adverse effects of the Project on historic heritage values will be managed appropriately.

30.5 Landscape and Visual

The Assessment of Landscape and Visual Effects, included in Volume 4, assesses the potential effects on landscape character, natural character and visual effects associated with the construction and operation of the Project and recommends ways of mitigating these effects. The effects were assessed in the following two categories:

Temporary Effects (Construction Effects): Describes the anticipated impacts on the bio-physical elements and features of the landscape resource (landform, vegetation and hydrology) resulting from

the construction of the Project. It also includes visual amenity effects for both public and private viewing audiences from construction works.

The construction activities required to implement the Project are categorised under the following broad headings:

- **Site enabling works** - site establishment, demolition and vegetation clearance;
- **Project formation works** - bulk earthworks and formation of new road surface and batter slopes, culvert upgrades, stormwater wetlands, private driveway regrades and bridge construction;
- **Finishing works** - lighting, signage, footpath/cycleway details and line markings, streetscape elements and landscaping (including street trees, mitigation planting and riparian/wetland planting (to be determined by detailed design through the ULDMP and by regional resource consents)).

Permanent Effects (Operational Effects): Describes the effects on the landscape of completed works (including integrated landscape mitigation measures), the significance of physical landscape change and ultimately the resulting effects of the Projects on landscape character, natural character and visual amenity for both public and private viewing audiences. This section summarises the potential effects and mitigation measures proposed. The summary below should be read in conjunction with the report.

30.5.1 Positive Effects

A number of positive landscape and visual effects are anticipated as a result of the operation of the Project (including proposed mitigation as detailed in 30.5.4). Positive effects are likely to include:

- A streetscape to match the emerging urban form of adjacent land.
- New opportunities for active modes of transport to link in with the Waihoehoe Stream and Waipokapū Stream riparian corridors, as envisaged by the proposed Blue-Green Network.
- Net increase in green infrastructure within the Project area associated with new street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences.
- Provision of bridge structures to reduce flooding risks and adverse effects on the natural patterns and processes of the drainage floodplain.
- Eventual enhancement of natural character values within water bodies (subject to resource consent processes and mitigation planting).

30.5.2 Construction Effects

30.5.2.1 Physical Landscape Effects

During construction, potential adverse effects on the physical landscape include construction laydown areas, extent of vegetation clearance, the scale and location of proposed cut and fill slopes (noting the scale anticipated may reduce as a result of urban development prior to the construction of the Project), construction of the proposed stormwater wetlands and bridge construction.

Indicative site compound and construction areas will temporarily occupy land including within heavily modified floodplain and pastoral land environments and within industrial land. As these sites are already heavily modified the physical landscape effects resulting from establishment and use of the construction work areas within the Project area is assessed to be low.

Limited vegetation clearance is required for the Project due to the predominate land use being agricultural. Nevertheless, localised areas of indigenous terrestrial and riparian vegetation and some shelterbelt plantings, private gardens and mature trees, located on private property and within the road reserve will need to be removed. Overall, the physical landscape effects likely to arise from vegetation clearance during construction will be temporary and will be low.

The proposed Waipokapū Stream bridge has a central span of approximately 30m which is long enough to bridge over the stream bed and avoid effects from siting piers on the stream bed and channel. The Waihoehoe Stream bridge spans approximately 265 m across Waihoehoe Stream floodplain environment, immediately downstream of the junction with Mangapū Stream. The structure consists of 8 spans and spill through abutments and represents a notable construction project with inherent complexities associated with working within an extensive floodplain environment. Nevertheless, the receiving landscape is heavily modified and sparsely vegetated, therefore the temporary physical landscape effects associated with construction are assessed as low.

Culvert inlets and outlets will be planted in indigenous species to ameliorate any physical landscape effects likely to arise within the localised riparian corridor and to visually integrate the culvert wingwalls. The proposed cut and fill slopes range in scale from very small (1m wide) to large (30m wide), and will alter the low-lying and gently rolling pastoral landscape and existing modified landform. In all cases, the fill slopes will be shaped to integrate with the existing modified pastoral land and modified landform. Overall, impacts on the physical landscape to implement the proposed earthworks and structures will be low.

To construct the proposed stormwater wetlands, earthworks to re-shape the land and achieve optimal depths and edge profiles will be confirmed at detailed design. All of the proposed stormwater wetlands are positioned within open pastoral areas, outside of existing waterways, within land that is already modified by rural land use. On that basis, the physical landscape effects of constructing the proposed wetlands will be low.

Potential effects on private properties adjacent to the Project area during the construction period will be moderate-low and include:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;
- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences;
- Potential construction of noise mitigation measures and retaining walls;
- Removal of existing dwellings and ancillary buildings

Site finishing works to be determined at detailed design will occur within the already modified areas of the Project. Resulting physical landscape effects are expected to be negligible.

30.5.2.2 Temporary Visual Effects

The construction phase is anticipated to be staged over a period of 3.5 to 4 years. Construction through the proposed new corridor will be entirely offline, except for tie ins in with Waihoehoe Road, Ponga Road, Walker Road and Hunua Road. On that basis, the viewing audience will consist solely of existing private viewing audiences within the visual catchment of the Project area and a transient viewing audience at the tie ins. Some vantage points within the Project area are likely to witness heightened adverse visual effects through the construction phase.

Adverse visual effects for the transient public viewing audience are likely to be very low through the construction phase considering that the Project is proposed to be constructed offline and public vantage points will be limited. Visual effects are likely to be heightened for private viewing audiences within or directly adjacent to the Project area, on the basis of more direct and prolonged engagement with the Project's construction activities.

The nature and significance of the potential adverse visual effects is considered to be moderated through the Project area by the following aspects:

- Limited viewing audience through the central section of the designation.
- Public viewing audiences from the Industrial zone are not considered to be sensitive.
- The Project will be constructed largely offline.

Therefore, visual effects for transient viewing audiences will be very low and visual effects for private properties will be moderate-low.

30.5.3 Operational Effects

30.5.3.1 Natural Character Effects

Natural character forming elements, features and processes include the water body and terrestrial margins of the Waipokapū Stream and Waihoehoe Streams. These landscape features have been heavily modified by historic vegetation clearance and rural land use such that they remain in a state of degradation with no management.

Potential effects on natural character arise from landform modification and vegetation clearance associated with the bridge construction areas, retaining walls and fill slopes within the drainage landscape. As the detailed design progresses and resource consents are sought, the full extent and type of indigenous vegetation affected will be determined. It is anticipated that reinstatement and mitigation planting at the completion of works will assist with mitigating any landscape and natural character effects arising from the Waipokapū Stream and Waihoehoe Stream crossings. Mitigation measures are outlined in section 30.5.4. Based on the above considerations and recommended mitigation measures, adverse landscape character effects are assessed as low.

30.5.3.2 Visual Amenity Effects

Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to proximity to the corridor. These include:

- Very low residual adverse effects are anticipated from some private properties, where as a direct result of the Project, residents may experience some level of material change to the visual composition and residential amenity of the road corridor as perceived from private property.
- Impacted properties may experience heightened visual amenity and residential character effects as a direct result of the construction impacts of the new carriageway and footpaths/cycleways to property boundaries and the permanent loss of yard space however, it is considered appropriate when viewed in the context of a medium density urban environment in the long term.
- Over time visual amenity and appeal for users will improve, due to an improved streetscape design, maturing street trees and berm plantings and greater accessibility to active modes of transport.

Based on the above, visual effects within the Project area are likely to be very low and moving to beneficial for public viewing audiences through the operational phase of the Project. For the private viewing audience, the visual effects are likely to be moderate-low to low, reducing over an extended period of time.

30.5.3.3 Landscape Character Effects

The principal elements of the Project (including the road form, driveway regrading, batter slopes, stormwater wetlands and structures) will permanently alter the character of the existing rural Project area and adjacent landscape. It is recognised that this rural character will likely change to a more urban area prior to construction of the Project as proposed private plan changes are already signalling urbanisation of the area.

Within the proposed designation, some street-side vegetation is proposed to be removed through the Project works. While most of this vegetation is not considered significant on an individual basis, collectively it contributes to the visual amenity of the existing landscape and provides a degree of screening and privacy for properties adjacent to existing roads within the Project area. If not mitigated, removal of this vegetation will have adverse effects on the landscape character of the existing road corridor. Mitigation measures are outlined in section 30.5.4.

At the completion of the Project, the corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport, reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features are expected to improve landscape and urban amenity within the future corridor. The Project is anticipated to operate within the context of increased urbanisation as adjacent FUZ land is progressively live-zoned and urbanised. On that basis, the magnitude and nature of landscape change proposed by the Project is considered to accord with that which will occur throughout the localised landscape over time. Based on the above considerations and recommended mitigation measures, adverse character effects are assessed as low.

30.5.4 Mitigation Measures

To address the modification to the landscape arising from the Project, prior to construction, an ULDMP will be prepared. The ULDMP will include the following matters which address the principal elements of the Project that are likely to give rise to temporary and permanent adverse effects on landscape character, natural character and visual amenity:

1. **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.
2. **Waipokapū Stream Bridge and Waihoehoe Stream Bridge:** demonstrate visual integration and sense of place considerations based on Mana Whenua preferred design principles. Design in a manner that leverages the visual prominence within the localised setting and provides public views to the Hunua Ranges foothills.
3. **Active transport connectivity:** investigate opportunities within the proposed designation to integrate active transport facilities with future open space proposed within the Green-Blue Network, and with future urban developments that may be development prior to the construction of the Project.
4. **Planting design details:** landscape design and planting design details will be prepared for the Project that demonstrate the following:

- a. Street trees along the full length of the Ōpāheke N-S FTN Arterial corridor in conjunction with shrubs and ground cover species appropriate for use within stormwater treatment areas and berms. Species and tree stature should be selected to correspond with adjacent land use and blue-green areas, in accordance with the 9 key principles outlined in the Auckland's Urban Ngahere (Forest) Strategy,
- b. Identification of existing trees and vegetation that will be retained. Where practicable, mature trees and indigenous vegetation should be retained
- c. Identification of areas where top soil may be re-used within the project area
- d. Reinstatement planting within private property boundaries in consultation with property owners
- e. Shape and treatment of fill slopes and residual land, to integrate with adjacent land use and areas where the Project intersects with the proposed Blue-Green Network.
- f. Stormwater wetland design and planting
- g. Integration of Mana Whenua preferred design principles in relation to planting, structures and hard landscape elements.
- h. Site preparation, implementation and maintenance requirements for all planting typologies.

The general location of recommended mitigation measures is illustrated in Appendix 1. Landscape Plans and Images: Maps 33-37 within the Assessment of Landscape and Visual Effects (Volume 4). The proposed mitigation measures will, where practicable be integrated with any revegetation requirements of future resource consent processes. Opportunities for integration of landscape mitigation works with the proposed Blue-Green Network, indicated by the Drury – Ōpāheke Structure Plan will also be considered.

30.5.5 Summary of Landscape and Visual Effects

Overall landscape and visual effects range from very low to moderate-low for the construction phase and very low to moderate-low for the operational phase. FUZ development areas on adjacent land will overtime substantially change the scale and character of the adjacent landscape as experienced from within the road, and will absorb the landscape and visual changes proposed within the Project area.

With the proposed mitigation measures in place to address effects on landscape, natural character and visual amenity (implemented through an ULDMP), the proposed features and scale of the Project are able to be appropriately integrated into the existing and future landscape adequately to remedy the potential adverse effects arising from the Project.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport (improving connectivity), reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features and the resulting streetscape are expected to improve landscape and urban amenity within the future corridor.

30.6 Ecology

The Assessment of Ecological Effects, included in Volume 4, assesses the potential ecological effects of the Project on the environment, where these relate to ecological values that are subject to district plan controls in the AUPOIP. Those ecological matters that trigger Regional plan and/or Freshwater NES resource consent applications will assessed and consents sought at a later date for the Project,

with any required mitigation assessed fully at that time. However, potential ecological effects of the activities likely requiring resource consents and/or wildlife permits at a later stage of the Project were considered in the report to inform alignment and design options and to inform the proposed designation boundary for the Project. The ecological assessment of effects follows the Environment Institute of Australia and New Zealand (EIANZ) Guidelines. These were used to assess the ecological value of identified ecological features and evaluate the magnitude and level of potential effects that the Project could have on these features. The report should be read in conjunction with the summary set out below.

30.6.1 Positive Effects

A positive ecological effect currently anticipated as a result of the Project is a net increase in green infrastructure and associated habitats within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands.

30.6.2 Construction Effects

30.6.2.1 Summary of Potential Construction Effects, Prior to Mitigation

The proposed construction activities have the potential to cause adverse effects on ecological features of value within and adjacent to the Project area, without mitigation. Potential construction effects that relate the activities authorised by the proposed designation are:

- Vegetation removal leading to the permanent loss of terrestrial habitats; and
- Construction activities causing light, noise and vibration leading to the disturbance and displacement of indigenous fauna.

30.6.2.2 Magnitude of Construction Effects

The magnitude of construction effects listed above on impacted ecological features are discussed in the following sections.

Terrestrial Habitat

There are no trees/vegetation identified within the Project area that are subject to district plan controls that will be removed due to the Project, as such the magnitude of effects is considered to be negligible.

Species

Bats

Bats have not been detected within or adjacent to the Project area therefore, it is unlikely that construction activities (including light spill, noise and vibration) would result in the disturbance or displacement of individuals or their roosts because they are likely infrequent visitors to the area. As such, the magnitude of effect on bats is considered to be low.

Birds

Forest bird habitat:

The forest birds which occur within the Project area are common in the local area (modified agricultural land and exotic wetland) and the majority of habitat is considered to be of low ecological value. They are adapted to human modified environments, and suitable foraging habitat of equal or better quality will remain adjacent to the Project area during construction. The stand of native forest potentially suitable for At Risk – Recovering kākā is not considered key habitat and is far enough away from the Project for the magnitude of effects to be considered as low. Overall, the magnitude of effects from the Project construction activities on the local forest bird population is considered to be low.

Freshwater wetland bird habitat:

New Zealand dabchick (At Risk- Recovering) and spotless crane (At Risk- Declining) may frequent the online pond located at 116 Waihoehoe Road. This artificial pond will be removed to accommodate the Project and the surrounding wetland area will largely be retained. New Zealand dabchick or spotless crane were not identified at the time of survey and the habitat for these species is considered suboptimal. Assuming that conditions remain the same, it is assumed that New Zealand dabchick and spotless crane are unlikely to be breeding at this location and therefore, the magnitude of effects is considered to be low.

Herpetofauna

Indigenous copper skink (Not Threatened) are likely to be present throughout the Project area within any suitable surrogate habitat, such as rank grassland, treeland habitat along stream corridors and planted vegetation. There is also the potential for ornate skink to be present within similar habitat, although, ornate skink are only likely to be found along the key stream corridors where these habitat features are connected to adjacent stands of native forest habitat beyond the Project area.

Noise, vibration and lighting disturbance caused by construction activities could displace indigenous lizards locally during construction, however suitable habitat is present adjacent to the Project area and therefore the magnitude of effects from the Project on the local lizard population is considered to be low.

30.6.2.3 Level of Construction Effects

Table 30-1 below summarises the overall level of construction ecological effects for each key ecological feature and fauna group. The assessment identified that the level of ecological effects from the construction of the Project on all of the ecological features were very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project construction effects.

Table 30-1: NoR D4 Summary of potential ecological effects during construction based on ecological value and magnitude of the effect

Ecological Feature	Ecological Value	Magnitude of Construction Effects	Level of Ecological Effect
Terrestrial habitat – district matters	Low	Moderate	Low
Bats	Low	Low	Very Low
Birds – forest	Moderate and Low	Low	Low
Birds – freshwater (wetland D4W1)	Moderate	Low	Low
Herpetofauna	Moderate	Low	Low

30.6.3 Operational Effects

30.6.3.1 Summary of Potential Operational Effects, Prior to Mitigation

The Project involves the construction of a new 30m wide four-lane arterial route through greenfields with separated active transport paths. Currently the greenfield corridor has low levels of fragmentation, noise and lighting and therefore these effects are likely to change from the existing baseline as a result of the Project. These changes were considered when assessing the magnitude of effects on ecological features or species that would not necessarily be habituated to road infrastructure. In general, potential operational effects on indigenous fauna from the Project that relate to the activities authorised by the proposed designation are:

- Loss in connectivity to indigenous fauna (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

30.6.3.2 Magnitude of Operational Effects

Bats

As bats have not been recorded within or adjacent to the Project area, it is considered unlikely that the operation of the Project (including noise and vibration from traffic and light from the road) would result in the disturbance or displacement of individuals or their roosts. As such, the magnitude of effect on bats is considered to be low.

Birds

The potential operational effects from the Project on birds include displacement as a result of light spill and noise during operation of the road corridor and habitat fragmentation where the Project crosses known habitat corridors. Loss of connectivity through permanent habitat loss and disturbance such as operational noise/vibration and light can lead to an overall reduction in size and quality of bird foraging habitat.

The species present are those species which have adapted to use habitats modified by humans as such, the magnitude of effects from the Project are considered to be low. Additionally, in the Project area, potential gradual incremental changes in habitat, caused by surrounding urbanisation, such as increased light spill, could, discourage nesting reducing viability of native fauna persisting over time or cause native fauna to avoid the corridor.

New Zealand dabchick (At Risk - Recovering) and spotless crane (At Risk - Declining) may be present at the artificial pond located at 116 Waihoehoe Road, which will be removed to accommodate the Project. However, it is considered that the removal of the wetland due to the presence of the road will not cause any permanent loss in connectivity for New Zealand dabchick, as wetland value for the species is low. As such the magnitude of effects will be low.

Herpetofauna

Indigenous lizard species have been identified in the local area but there is the potential that:

- Copper skink (Not Threatened) could be present within suitable rank grassland, treeland and planted vegetation across the Project area; and
- Ornate skink could be present within vegetation along key stream corridors (Waipokapū Stream and Waihoehoe Stream).

Native lizards require vegetated corridors (such as riparian stream corridors) to facilitate natural dispersal. New roads and culverts could create barriers to the movement and dispersal of lizards along stream and terrestrial vegetated corridors. However, the proposed bridges at Waipokapū Stream and Waihoehoe Stream will maintain connectivity for these species where suitable habitat is retained. During detailed design, connectivity will be retained for lizards including appropriately vegetated corridors under bridges or include ledges within culverts or under bridges.

As the area will become increasingly urbanised any lizards may become habituated to existing light levels or may avoid the proposed road corridor. Overall it is considered that the magnitude of operational Project effects on indigenous lizards will be low.

30.6.3.3 Level of Operational Effects

Table 30-2 below summarises the overall level of operational ecological effects for each key features and fauna groups. The assessment identified that the level of ecological effects from the operation of the Project on all of the ecological features will be very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project's operational effects.

Table 30-2: NoR D4 Summary of potential ecological effects during operation based on ecological value and magnitude of effects

Ecological Feature	Ecological Value	Magnitude of Operational Effects	Level of Ecological Effect
Bats	Low	Low	Very low
Birds – forest habitat	Moderate and Low	Low	Low
Birds – freshwater (wetland D4W1)	Moderate	Low	Low
Herpetofauna	Moderate	Low	Low

30.6.4 Mitigation Measures

The assessment identified that the level of ecological effects from the construction and operation of the Project on all of the ecological features were very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required.

30.6.5 Summary of Effects on Ecology

Construction and operation of the Project was assessed to have very low or low levels of effect on all of the relevant habitat and fauna species (bats, birds and lizards) therefore no mitigation is required.

30.7 Arboriculture

The Assessment of Arboricultural Effects, included in Volume 4, assesses the potential effects of the Project on existing trees protected by the AUPOIP district plan provisions and recommends ways of mitigating these effects. Any trees that trigger regional plan consenting requirements were considered to inform design and alignment choices, however effects on these trees will be managed through a future resource consent process. Due to the changing nature of the environment and plan rules applicable to tree protection in rural vs urban land zoning, a detailed re-assessment of protected trees and their status under the AUPOIP will be undertaken closer to the time of construction. Potential effects on arboriculture during construction and operation of the Project and proposed mitigation measures are described in the following sections.

30.7.1 Positive Effects

Construction of the new arterial road with road-side berms provides an opportunity to establish street trees within the new environment. Establishing street trees within the road corridor will provide opportunities for trees to exist over large portions of the road corridor where currently few trees exist.

30.7.2 Construction Effects

There are no trees within the proposed designation boundary that are protected by District Plan provisions therefore, no effects.

30.7.3 Operational Effects

Once the road has been constructed, no effects on trees are anticipated. Ongoing maintenance of street trees and trees retained adjacent to the road corridor is a standard operational requirement that does not generate adverse environmental effects. Street tree planting will have positive effects and will result in more trees in the public realm and an enhanced road environment in the long term which will be a positive effect.

30.7.4 Mitigation Measures

No effects associated with the construction and operation of the Project are anticipated on trees protected by the district plan, therefore, no measures are required to avoid, remedy or mitigate effects.

Any trees protected by Regional Plan provisions that are to be retained will be addressed as part of a future resource consent process.

30.7.5 Summary of Arboriculture Effects

The Project will have no effects on protected trees, as the route contains no trees that are protected according to District Plan provisions.

30.8 Natural Hazards - Flooding

The Assessment of Flood Hazard Effects, included in Volume 4, assesses the potential flood hazard effect of the proposed transport corridor during its construction and operational phases on the flood extents and levels in the surrounding area. Effects of stormwater quantity, quality and effects on streams will be considered under future resource consents. This assessment focusses on flood hazard effects which is a district plan matter under the AUPOLP.

30.8.1 Construction Effects

Construction works have the potential to affect overland flow paths, the Waihoehoe Stream and its tributaries and the Waipokapū (Hays) Stream and its tributaries. At the proposed arterial location, the Waihoehoe Stream and its tributaries make up a wide flood plain (around 690 m wide).

Works include eight new culvert crossings, two new bridges, open channels and four new stormwater wetlands and associated outlets. Of these works, the majority can be constructed off-line from existing flow paths or use diversions to isolate working areas.

There are limited risks associated with flooding during construction as the bridges proposed are of wide spans and there are few nearby buildings that could be affected. The likely higher risks are expected to be:

- Temporary works at Waipokapū Stream creating a constriction to flood flows – potentially affecting industrial land
- Earthworks potentially obstructing overland flows at around chainage 1900
- Construction of the culvert obstructing overland flows at chainage 1500 and 2200
- The embankment earthworks and construction of culverts obstructing overland flows at chainage 3550 and 3680 close to upstream properties

- Materials stored within the flood plain being washed downstream

The new bridge over the Waipokapū Stream has a central span of 30m which is long enough to bridge over the stream bed and avoid effects from siting piers on the stream bed and channel. This avoids the need for diverting flow in the deepest and fastest flowing section of stream, which consequently reduces the risk of erosion and blockage of the main stream flow path, which could lead to flooding during construction. Similarly, at Waihoehoe Stream, the piers for the central span of 35m have been placed and aligned to be sited either side of the stream banks which will also reduce the risk of erosion and blockage of the main flow path of this stream.

The bridges over Waipokapū Stream, and Waihoehoe Stream will require temporary staging platforms for piling rigs and cranes to be constructed near the banks of the main stream channel. These platforms could cause a constriction to flood flows (once flow overtops the stream banks and starts to occupy the flood plain) and cause a backwater effect raising upstream flood levels. Several properties upstream of the proposed Waipokapū Stream and Waihoehoe Stream crossings are sited within or adjacent to the flood plain. Therefore, the combination of a temporary constriction at the bridges and an extreme flood means there is conceptually a slightly elevated risk of flooding to those properties for the duration of the temporary works being in place. The likelihood of this occurring is however low (a 100 year event) and is only slightly greater than the existing situation (it is a very small additional constriction relative to the size of the flood plain).

Various new culverts need to be installed. Flow paths need to be maintained during construction of these culverts to minimise the risk of creating obstructions and flooding. Flood risks will be minimised during construction as the new culverts will generally be constructed offline and flow maintained through the existing flow paths during construction to minimise flood risk.

Five construction yards are located along the transport corridor but are outside flood plains and major overland flow paths except for one, which is proposed on the downstream side of the Waihoehoe Stream bridge crossing. Site compound 4 and sediment retention pond 4 are both located within the flood plain near the Waihoehoe Stream bridge and therefore might present an increased flood hazard risk. However, they have a functional requirement to be located here to enable the efficient construction of the bridge.

30.8.2 Operational Effects

Operational effects have been assessed through flood modelling at key crossings, bridge structures (Waipokapū Stream Bridge and Waihoehoe Stream Bridge), and at significant areas where the new road embankment encroaches existing flood plains. A summary of the operational effects is below.

The majority of land upstream of the corridor is zoned future urban and therefore, depending upon the timing of the construction of the corridor and potential upstream development, there could be operational effects on either the existing dwellings (at Walker Road and Harry Dodd Road) or the potential upstream development.

In terms of existing properties, there are potential increases in flood levels identified for properties at 105 Walker Road and five properties on Harry Dodd Road. The potential flooding at 105 Walker Road can be mitigated by an overland flow path to be constructed within the proposed designation. Within 125m upstream of the proposed Waihoehoe Stream Bridge, the flood difference maps show that there is less than 50mm of change, with existing properties at Harry Dodd Road identified as experiencing up to a 30mm increase in flood levels. The increase of less than 50mm shows that the proposed

bridge and approaches over the Waihoehoe Stream can be constructed within an acceptable level of effects. However, it is anticipated that up to five existing dwellings may have freeboard less than 500mm and, if this is confirmed, further optimisation of the bridge arrangement or some local offsite mitigation may be required. It is recommended that the magnitude of the effect is confirmed at the detailed design phase and, for any existing authorised habitable floors experiencing more than a 10% reduction in freeboard, mitigation is provided.

In terms of potential upstream development within the future urban zone, the corridor construction introduces two potential operational flooding effects: changes in upstream flood levels - thereby affecting the level at which future habitable floor levels are set; and the creation of flood prone land.

Changes in upstream flood levels could require future urban buildings to be set higher to achieve freeboard. If development of the Future Urban zoned land within the floodplain is to be realised, it is expected that habitable buildings would not be allowed within the current flood plain extents, earthworks within/adjacent to the flood plain would be undertaken to form development sites and building floor levels would be constructed above the existing floodplain with appropriate freeboard. Given the large amount of expected future earthworks in the catchment and the modelled minor changes in flood levels due to the Project, it is expected that the predicted changes in flood levels identified can be easily accommodated.

Creation of flood prone land could limit where future buildings could be constructed: If the capacity of cross drainage is blocked or overwhelmed, water could pond up against the upstream corridor embankment (at chainages 1400, 2500 to 2700 and 3000 to 3700). This can be avoided by setting habitable floor levels above the level of the completed road or mitigated by upsizing culverts and providing inlet protection/secondary inlets/overland flow paths (for which there is space within the proposed designation).

For both of these operational phase flooding effects, it is recommended that coordination occur with Auckland Council and adjacent property owners/developers to address these issues through detailed design of the Project and upstream development design processes.

Most of the land identified for future stormwater management wetlands within the proposed designation is outside of flood plains. Wetlands 3 and 4 are constrained and have had to be placed downstream of the bridge in the edge of floodplains in low water velocity areas. This is considered low risk with further assessment of the risk of scour and overtopping and mitigation recommended for the detailed design and resource consent phase.

30.8.3 Mitigation Measures

30.8.3.1 Construction

For all areas, flood hazards should be addressed in the CEMP. Key issues to consider are:

- siting construction yards and stockpiles outside the flood plain, or in the case of the Waihoehoe Stream near the edges of the flood plain away from higher flow areas
- minimising physical obstructions to flood flows at bridges due to temporary works
- diversion of overland flows away from any longer term working areas within the flood plain
- staging and programming works when there is less risk of high flow events, and

- methods to reduce the conveyance of sediment, or materials and plant that is considered necessary to be stored or sited within the flood plain (e.g. actions to take in response to the warning of heavy rainfall events).

30.8.3.2 Operation

The proposed bridges over the Waipokapū and Waihoehoe Streams have been sized to minimise flooding effects and the current arrangement has only minor effects. As the design progresses, further flood modelling will be required to confirm effects on adjoining properties. Mitigation of effects could include refinements to the bridge geometry or if required, local off-site mitigation measures such as raising existing floor levels.

A condition outlining acceptable changes to flood levels is proposed on the designation so that the key potential flooding effects can be managed to be no more than minor.

The creation of flood prone land risk can be mitigated by the provision of overland flow paths and/or secondary inlets to culverts. There is space within the proposed designation to provide this type of mitigation.

Potential changes to upstream flood levels that could restrict future upstream development are expected to be relatively close to the transport corridor or are considered minor and can be accommodated by upstream development. It is recommended that there is 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. Additionally, coordination of future flood levels requirements and mitigation measures such as overland flow paths with future upstream development plans is recommended.

Design and implementation of mitigation measures will be addressed by a condition on the designation requiring specific flood risk outcomes to be addressed at detailed design.

Overall Recommendations for NoR D4

The following measures and outcomes to manage flood risk are proposed for detailed design and these are proposed as conditions on the designation:

Detailed design should demonstrate:

- The Waipokapū Stream (Hays Stream) is crossed by a bridge
- The Waihoehoe Stream is crossed by a bridge.

It is recommended that during detailed design, the flood modelling of the pre project and post project 100 year ARI levels (both for MPD land use and including climate change) is carried out and measures 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 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)
- that there is no more than a 10% average increase of flood hazard (defined as flow depth times velocity) for main access to authorised habitable dwellings.

Where the above outcomes can be achieved through alternative measures outside of the designation measures such as flood stop banks, flood walls, raising existing habitable floor level and overland flow paths, this may be agreed with the affected property owner and Auckland Council.

30.8.4 Summary of Flooding Effects

The construction of new culverts, new bridges and wetlands have the potential to affect flooding within the Waihoehoe and Waipokapū Stream catchments. Effects on the two main streams can be managed by constructing the bridges from outside the main channels. Flow management, staging and consideration of flood hazards in the CEMP will be important.

The proposed bridges over the Waipokapū and Waihoehoe Streams have been sized to minimise flooding effects and the current arrangement has only minor effects. As the design progresses, further flood modelling will be required to confirm effects on adjoining properties. Mitigation of effects could include refinements to the bridge geometry or if required, local off-site mitigation measures such as flood stop banks, flood walls, raising existing floor levels and overland flow paths.

The risk of culvert blockage and the potential effects will need to be considered further at detailed design stage. However, mitigation measures can be implemented within the proposed designation boundary.

Flood hazard effects can be managed through the conditions included on the proposed designation.

30.9 Noise and Vibration

The Assessment of Construction Noise and Vibration Effects, attached in Volume 4, contains predictions for construction noise carried out using the method recommended in NZS 6803 in accordance with the AUPOIP. The methodology included modelling inputs in regard to a reasonable worst case scenario. Vibration emission radii were also calculated to provide a reasonable worst case estimate at receivers.

The Assessment of Traffic Noise and Vibration Effects, also attached in Volume 4, contains predictions of road traffic noise carried out using the method recommended in NZS 6806 in accordance with rule E25.6.33 of the AUPOIP.

Four scenarios are assessed in accordance with NZS 6806:

- The “Existing scenario” which is the current road network with current traffic volumes, i.e. the existing environment as it is experienced at the time of assessment
- A “Do Nothing” scenario (the likely future environment without the project), which represents the current road network with future traffic volumes, assuming a full build out of the area. This is a theoretical scenario that would not occur in reality. This is because; the current road network could not cope with the future traffic volumes, and future development in the area would not occur without the prior establishment of the new or upgraded roads. Therefore, while the predictions

suggest a significant increase in noise level in the Do Nothing scenario compared with the Existing scenario, this would not be a feasible option

- A “Do Minimum” scenario, (likely future environment with the project) which represents the proposed future road network, incorporating NoRs D1 to D5 and other transport projects in the area (refer to the discussion on Assessment Assumptions in the Assessment of Traffic Noise and Vibration Effects in Volume 4). This scenario assumes a full build out of the area, and the transport infrastructure to enable the development. This is a realistic scenario at a point in time when all proposed Projects within the Drury Package are operational. .
- “Mitigation” scenarios, which represent the traffic noise levels at the PPFs at the design year with various specific noise mitigation options implemented with the aim of achieving the noise criteria categories.

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

The summary below should be read in conjunction with both reports.

30.9.1 Construction Noise and Vibration

30.9.1.1 Potential Construction Noise Levels

Model predictions, assuming the works along the proposed designation boundary, indicate there are 11 buildings where the relevant noise criteria would be exceeded without mitigation. Distances of receivers from the proposed designation area boundary vary greatly along the road alignment with the closest receptor approximately 10 m from drainage and pavement construction works. With 3 buildings (2 residential and 1 commercial) located within the 73m radii of the minimum set back distance required for day-time compliance of 70 dB L_{Aeq} for piling works.

Model predictions indicate the closest receivers could experience noise levels of up to 85dB L_{Aeq} during earthworks, based on the noisiest item of plant operating in the closest position to the receiver, without mitigation. Operation of construction equipment will be intermittent in nature and works in the worst-case location typically latest around 3 days. Whilst plate compactors have been identified as the noisiest equipment, they are only used as part of drainage and pavement construction works. Similarly, piling is only carried out during bridge construction and for limited durations. Other equipment with lower sound powers will generate lower noise levels under the worst-case location and overall average noise levels will be lower for most of construction duration.

These results should be treated as the highest possible noise levels likely to be emitted from the respective equipment. These noise levels would occur infrequently, if at all, as equipment and activities move along the alignment and are not continuously operational. The noise levels provide an indicative prediction of the scale of potential effects based on one possible construction methodology.

30.9.1.2 Construction Noise Effects

The construction noise criteria are predicted to be exceeded at a number of receivers due to their close proximity to the potential areas of work. Closest receivers are 10 m from the proposed designation boundary for drainage and pavement construction works and predicted noise levels are around 80 - 85 dB L_{Aeq} with the noisiest equipment being the loader and plate compactor.

However, the use of this equipment will likely be intermittent in nature during the relevant construction activities. Although the worst-case situations are not expected to be frequent, due to the setback

distances of the majority of the proposed works, these noise levels could result in loss of concentration, annoyance, and a reduction in speech intelligibility.

Night time works at these noise levels are generally not acceptable at residential properties and the use of noisy equipment should be avoided to prevent sleep disturbance. If night-time works are required, mitigation measures will be essential which may include an offer of temporary relocation for the most affected receivers to manage and mitigate adverse effects.

With effective mitigation and management measures in place, such as construction noise barriers along active construction areas within the vicinity of receivers and enclosures around noisy machinery, noise levels can be reduced by up to 10dB at receivers on ground floor. Resulting worst case noise levels could be reduced to 70– 75 dB with mitigation implemented and the number of receivers exceeding the criteria reduced to 8.

In addition, the road construction is linear, and each receiver would only be affected for part of the overall construction duration. A CNVMP with site specific mitigation (described in section 30.9.3) will be required, which sets out how to control noise levels and reduce adverse effects on receivers.

30.9.1.3 Potential Construction Vibration Levels

Four dwellings may experience vibration levels above 5mm/s PPV exceeding the building damage criteria for residential buildings and three commercial buildings may experience vibration levels above 10mm/s PPV exceeding the DIN criteria for commercial properties. Predictions indicate a total of 24 buildings may receive vibration levels above the amenity criterion of 2 mm/s PPV.

It should be noted that the vibration generating equipment will not be operating all of the time and may not operate right at the boundaries of the area of works.

It is not expected high level vibratory works such as the use of roller compactors will be carried out during night-time. If night-time works are required extensive consultation and management plans will be essential.

30.9.1.4 Construction Vibration Effects

Initial predictions indicate that the Project building damage criteria may be exceeded at four residential receiver and three commercial receivers, in particular during the earthworks phase when the vibratory roller compactor is proposed for use. At buildings in close proximity to proposed designation boundary areas, there is the potential for cosmetic damage to buildings (such as cracking) and annoyance from the perception of vibration. A building condition survey should therefore be carried out before (during detailed design) and after construction works at buildings where predictions indicate the relevant building damage criteria may be approached, to determine if any damage has been caused by construction of the Project. Measures to mitigate these potential effects are described in section 30.9.3.

30.9.2 Traffic Noise and Vibration

The proposed Ōpāheke North-South FTN Arterial will tie into existing roads. At the southern extent it will tie into Waihoehoe Road / Fitzgerald Road, which is within NoR D2, further north at Ponga Road / Ōpāheke Road, which is also within NoR D5, and at the northern extent at Hunua/Boundary Roads.

The intersection with Hunua and Boundary Roads is zoned light industrial under the AUPOIP and does not contain PPFs.

Where new roads intersect the existing roads, all PPFs within 100m of the existing road were assessed under the Altered road criteria. The following figures show where the Altered road criteria have been applied along the intersections of Ponga Road and Waihoehoe Road.

The green areas show the 100m boundary from an existing road and red line indicates the 200m boundary for NZS 6806 assessment. All PPFs within the green shaded areas will be assessed under the Altered road criteria.



Figure 30-1 NoR D4 PPFs within 100m of an Existing road – Ponga Road



Figure 30-2 NoR D4 PPFs within 100m of an Existing road – Waihoehoe Road

30.9.2.1 New Roads

Road Traffic Noise Model Results Analysis

Existing scenario predictions show the noise level within the Project Area is between 39 – 55 dB $L_{Aeq}(24hr)$ with all PPFs in Category A.

The likely future scenario without the Project shows a higher predicted range of 51 – 65 dB $L_{Aeq}(24hr)$ with six PPFs showing category change from Category A to Category B and one PPF into Category C. These seven PPFs are predicted to receive noise levels that exceed 57 dB $L_{Aeq}(24hr)$, with a 3dB or more increase. In accordance with NZS 6806, mitigation options were considered to reduce all PPFs for New Roads to Category A. 1.8m high barriers will be implemented at localised areas (for 68 Ponga Road, 36 Ponga Road and 201 Sutton Road and 6 Ponga Road). Recommended mitigation is also discussed in section 30.9.3.

Assessment of Traffic Noise Effects

12 of the 14 PPFs are predicted to experience an increased noise level of 5 dB or more due to the development of the new road. The highest predicted noise increase of 19 dB is at 201 Sutton Road, with mitigation in place. 10 PPFs in total are predicted to experience a noise level increase of

between 9 dB (which will be perceived as a doubling of loudness) to 20 dB (which would be perceived as a quadrupling in loudness).

The new road will introduce a noise source that is not currently present for these PPF, and the existing environment represents a low sound rural environment. Even with mitigation measures in place, this noise increase will be a material change for the residents, if they still reside in the area at the time of road opening. However, the resultant noise levels at these PPFs of 59 – 61 dB $L_{Aeq(24h)}$ are appropriate for residential use and not unexpected in an urban environment

It should be noted, the area will change significantly over time, and the new road would be constructed at a time when development requires the transport corridors. That means that the ambient noise environment will be higher due to more intensive activity and the noise level change will likely be less.

30.9.2.2 Altered Roads

Road Traffic Noise Model Results

Existing scenario predictions show the noise level within the Altered road project area is between 54-66 dB $L_{Aeq(24hr)}$ with three PPFs in Category B and the remaining PPFs in Category A.

Under the likely future scenario without the Project, predictions show a higher traffic noise levels range between 58 – 72 dB $L_{Aeq(24hr)}$ with four PPFs in Category C and three PPFs in Category B due to an increase in traffic volumes (assuming all traffic from all developments is accommodated on the existing roading network).

The likely future scenario with the Project shows a predicted range of 58 – 71 dB $L_{Aeq(24hr)}$ similar to the Do Nothing scenario (likely future scenario without the Project), with the two PPFs remaining in Category B and four PPFs in Category C. As noise at these PPFs is controlled by the existing road rather than the new road and as such no mitigation is required in accordance with NZS 6806. Additionally, predictions indicate this section of existing roads does not qualify as an Altered Road in accordance with NZS 6806 and no mitigation is required.

Additional BPO mitigation measures have not been considered for the five Category C PPFs. Three of the four Category C PPFs (115 Waihoehoe Road, 1 Fitzgerald Road and 6 Fitzgerald Road) have been identified as buildings to be removed for the Waihoehoe Road West FTN Upgrade (NoR D2) and this is likely to be implemented before the Ōpāheke N-S FTN Arterial. Therefore, it is unlikely that these PPFs will be present at the time of Project operation. The predicted noise level at the other Category C PPF (101 Waihoehoe Road) is more relevant to NoR D2 and is addressed in relation to that assessment.

Assessment of Traffic Noise Effects

All PPFs are predicted to have negligible to no changes in noise level compared to the likely future scenario without the project as traffic on the existing road is the dominant noise source. This change will not be noticeable. Any reduction is partially due to redistribution of traffic across the new network.

30.9.3 Mitigation Measures

30.9.3.1 Construction noise and vibration

Specific mitigation measures will be identified within a Construction Noise and Vibration Management Plan (CNVMP) which will be completed for the Project prior to construction. The CNVMP will provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction. The Assessment of Construction Noise and Vibration Effects outlines the inclusions required in the CNVMP, in line with the minimum level of information that must be provided in a CNVMP outlined in Chapter E25.6.29(5) of the AUP OIP. This includes:

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

In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.

In managing noise and vibration effects within the above mechanisms, a hierarchy of mitigation measures will be considered and a best practicable option for mitigation will be implemented, whilst avoiding undue disruption to the community.

As construction will occur several years in the future, receivers may have changed by then, with new and additional receivers in the vicinity due to increased development. Construction noise and vibration effects will be reassessed at the time of construction and managed at the receivers that are present at the time of construction.

30.9.3.2 Traffic noise and vibration

To mitigate the potential traffic noise and vibration effects of the Project, the following mitigation measures are recommended:

- Low noise road surface asphalted concrete (AC-14) will be applied all road surfaces.
- 1.8m high barriers will be implemented at localised areas (for 68 Ponga Road, 36 Ponga Road and 201 Sutton Road and 6 Ponga Road)

Before construction commences, reassessment of the road traffic noise at PPFs identified in the Traffic Noise and Vibration Assessment in Volume 4 will be carried out to determine if mitigation recommended is still BPO to meet the categories as set out in the Traffic Noise and Vibration Assessment. For the Altered road sections, 10 PPFs are Category A and three in Category B. For the New road sections, 11 are Category A and four in Category B. The PPFs and categories to be achieved are included as conditions on the proposed designation.

30.9.4 Summary of Noise and Vibration Effects

At PPFs assessed under the Altered roads criteria there are negligible to no noise level changes predicted and the anticipated changes will not be noticeable. Therefore, adverse noise and vibration effects are not anticipated at these PPFs.

With the proposed mitigation in place for the New road, noise levels will increase at all PPFs as a result of the Project. All but four PPFs remain in Category A with noise levels below 57 dB $L_{Aeq}(24hr)$. The four PPFs will remain in Category B due being either a 2 storey building or on an elevated terrain. It is considered the resultant noise levels of 48-61 dB $L_{Aeq}(24h)$ are appropriate for residential use and not unexpected in an urban environment. The Project area will change significantly over time, and the new road would be constructed at a time when development requires the transport corridors. That means that the ambient noise environment will be higher due to more intensive activity and the noise level change will likely be less. The predicted effects may not be experienced by current residents as PPFs are removed for redevelopment (urban growth).

Adverse construction noise and vibration effects can be appropriately managed through the proposed mitigation measures.

30.10 Network Utilities

30.10.1 Construction Effects

A number of utilities, including major utilities, are located within and around the proposed designation. Relocation, diversion or protection of these may be required. Table 30-3 summarises the known existing and proposed utilities within and around the proposed designation, and the implication the Project is likely to have on these.

Table 30-3 NoR D4 Anticipated Effects on existing utilities of other providers

Utility Provider	Asset	Designation	Potential Effect
First Gas	Gas Transmission Line	9104	Pipe re-alignment, strengthening works, and/ or protection works may be required where the pipe crosses the proposed alignment. Alteration/ relocation and potential realignment of the existing First Gas Designation (9104) may be required.
Watercare	Waikato 1 Watermain	N/A	Waikato 1 Watermain can be protected if required at Hunua/Boundary Road intersection.
	Proposed Booster Station at 72 Hunua Road	N/A	The internal road layout for the booster station has been designed to accommodate the potentially shifted kerb space as a result of the proposed designation.
	Other Assets	N/A	Other assets such as water supply, wastewater pipeline, access chambers, hydrants and others will require protection or relocation to the new road alignment
Vector	Gas Medium Pressure distribution lines	N/A	Distribution lines will need to be realigned onto the new carriageway service corridor.
Counties Power	Overhead high voltage lines and pylons	N/A	High voltage lines and pylons connecting to the substation on Ponga Road, conflict with the proposed alignment. These will likely require relocation with new pylons and / or lines. Short term disruptions may occur
	Overhead power distribution lines	N/A	Overhead power distribution lines will either be relocated underground or new overhead poles installed in the new alignment within the carriageway service corridor. Short term disruptions may occur
Chorus	Communication lines	N/A	Communication lines will need to be relocated to the new verge

30.10.2 Mitigation Measures

Engagement with Network Utility Operators has been ongoing throughout the Project as detailed in section 5.2.2.6 Network Utilities, and will continue throughout the detailed design and construction of the Project.

As a proposed condition of the designation, a Network Utilities Management Plan (NUMP) will be prepared prior to construction of the Project. The NUMP will set out a framework for protecting, relocating and working in proximity to existing network utilities. The NUMP will be prepared in consultation with the relevant network utility operators and will include methods to:

- Provide access for maintenance at all reasonable times, or emergency works at all times during construction activities;
- Manage the effects of dust and any other material potentially resulting from construction activities and able to cause material damage, beyond normal wear and tear to overhead transmission lines in the Project area;
- Demonstrate compliance with relevant standards and Codes of Practice including, where relevant, the NZECP 34:2001 New Zealand Electrical Code of Practice for Electrical Safe Distances 2001; and AS/NZS 4853:2012 Electrical hazards on Metallic Pipelines.

Prior to construction, Network Utility Operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for the following activities:

- operation, maintenance and urgent repair works
- minor renewal works to existing network utilities necessary for the on-going provision or security of supply of network utility operations
- minor works such as new service connections
- the upgrade and replacement of existing network utilities in the same location with the same or similar effects as the existing utility.

30.10.3 Summary of Effects on Network Utilities

Through the implementation of the NUMP and in consultation with network utility operators, any potential adverse effects on network utilities can be managed appropriately.

30.11 Community Effects

30.11.1 Positive Effects

The Ōpāheke N-S FTN Arterial will provide the necessary transport infrastructure required to support the planned urban zoning of land in Drury East and Ōpāheke (and the wider Drury-Ōpāheke growth area) which is accelerating as a result of numerous private plan changes being lodged with Auckland Council. The proposed designation will ensure that the upgrade is planned and integrated (and identified in the AUPOIP) to meet the feasible development capacity targets over the next 30 years to support the growing communities in Drury-Ōpāheke.

The new road will provide for frequent and reliable public transport, active transport modes and a more direct and resilient connection between the Papakura and Drury communities. This will enhance connectivity of both the future community and the existing community in terms of accessing schools, employment, recreational areas, town centres and generally moving around the future community.

The provision of this infrastructure will enable improvements to the way of life and health and wellbeing due to more efficient connections and active modes of transport.

30.11.2 Construction

Construction effects will be dependent on the community present in and surrounding the Project area during construction. Presently this is primarily rural and is a new road so will not impact on traffic. Existing properties at the time of construction may be subject to noise and dust impacts if within close proximity. These effects will be assessed at the time of construction to be adapted to the existing environment.

The acquisition of land will sever some properties and may prompt changes to some rural operations. Prior to construction of the road, the existing rural community within the greenfield area surrounding the Project may reduce as landowners in the community sell to AT or developers and leave the area to make way for development leaving those properties empty. However, the FUZ is planned to urbanise and the Ōpāheke N-S FTN Arterial will be implemented at the time the area starts to urbanise. Therefore, it is anticipated to be a temporary effect as the community transitions into an urban area once the area is live zoned.

The industrial area in the north of the Project area may experience disruption to business operations due to construction traffic and traffic delays and access restrictions.

30.11.3 Operational Effects

As identified within the positive effects discussed above, the Ōpāheke N-S FTN Arterial will provide the necessary transport infrastructure required to support planned urban growth in the Drury-Ōpāheke growth area. In summary, the provision of the new arterial will enable improvements to the way of life and health and wellbeing due to more efficient connections and active modes of transport.

The new road is anticipated to move through a dense residential area in the future, and it may reduce permeability within the residential community and reduce amenity due to noise and visual prominence of the road. However, it is likely the residential development will occur concurrently with the development of the new road and these potential adverse effects will become part of, and be managed within the baseline environment. Additionally, it is considered these potential adverse effects are outweighed by the benefits the new road will provide in supporting the future communities. Overall, the Project is anticipated to have significant positive effects on the future community in which it will operate.

30.11.4 Mitigation Measures

30.11.4.1 Construction Effects

It is anticipated that all community effects arising from construction will be temporary and can be minimised. A Stakeholder and Communication Management Plan (SCMP) will be prepared prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the construction works.

Access and trip disruption will be managed by the CTMP and SCMP proposed as conditions of the designation. This will allow the contractors to identify movement and access requirements of residents and businesses along the corridor and enable alternate access or access at peak times and minimise trip disruption where practicable.

Construction effects on amenity values can be managed by engagement with corridor residents and stakeholders (identified through the SCMP), noise management (CNVMP), and the overall CEMP to manage potential effects.

30.11.4.2 Operational Effects

Significant positive effects are anticipated from the operation of the Project therefore no mitigation is required. However, through the implementation of the ULDMP a range of measures will be implemented to ensure the Project is appropriately integrated into the surrounding landscape and urban context.

30.11.5 Summary of Effects on the Community

The Project will provide significant positive effects to the community in which it will operate. It is considered that overall, the community (existing and future) will benefit from the new transport corridor. The work supports planned urban growth and will have significant transport benefits providing a new safe and resilient north-south connection.

Any potential construction effects can be managed with the development and implementation of the appropriate management plans outlined above and communication with the community and affected land owners / occupiers.

30.12 Property, Land Use and Business Effects

The Ōpāheke N-S FTN Arterial has sought to reduce potential adverse effects on existing private properties and businesses through alignment and project design, where practicable, while acknowledging the planned urban growth and change in the area balancing these drivers. This has included specific consideration of the potential property and business impacts in the assessment of alternatives as discussed in sections 4.2 and 29 and detailed in Appendix A and through design refinement and defining the proposed designation boundary.

Where impacts on property, land use and businesses cannot be avoided, the potential effects discussed in this section relate to directly affected properties and landowners. Potential effects on properties and businesses affected by proximity to the Project have been discussed in section 30.11.

The proposed designation requires land to provide a sufficient footprint to enable the construction and operation of the Ōpāheke N-S FTN Arterial. 30 private properties will be directly affected. These properties are primarily rural and rural-residential, with some open space/reserve land and commercial and recreational land use.

A description of existing land use is provided in section 28.2. In summary, land directly affected by the Ōpāheke N-S FTN Arterial includes the following:

- Rural residential land uses. The majority of land within the proposed designation boundary is currently private farmland. The land is primarily used for grazing with low density rural residential dwellings.
- A number of rural and industrial businesses, including S.A.F.E Engineering (116 Waihoehoe Road) and Wet Fit pool fitness (136 Waihoehoe Road) at the southern extent and a number of industrial businesses at the northern extent including an industrial/construction yard (37A Hunua Road) and

Trenchmate (149 Boundary Road) and the frontage of sites including Boundary Road Brewery (33-35 Hunua Road) and a future Watercare booster pump station (72 Hunua Road).

- The Waipokapū Stream esplanade reserve.
- A private plan change (PC 50 (Private): Waihoehoe Precinct) has been submitted to Auckland Council for land subject, and adjacent to, the proposed Ōpāheke N-S FTN Arterial showing that the area is in the progression of being urbanised. The timing of this urbanisation relative to implementation of the Project is not confirmed.

The potential pre-construction, construction and post construction effects on directly affected properties is discussed in the following sub-sections.

30.12.1 Pre-Construction

The proposed designation has a lapse duration of 20 years to provide a sufficient timeframe which enables construction of the Ōpāheke N-S FTN Arterial in response to the progressive urbanisation of Drury-Ōpāheke. While the length of the lapse date reflects the need to provide long term certainty regarding the alignment of the Project, this has the potential to result in 'planning blight' from the restrictions to development resulting from the proposed designation, if not appropriately managed.

The proposed designation will not preclude the continued (unchanged) use of any directly affected properties prior to construction. However, in accordance with section 176(1)(b) of the RMA, anyone other than a requiring authority with an earlier designation is restricted from carrying out work on the designated land that would prevent or hinder the designated work without first obtaining the requiring authority's consent. The purpose of the Ōpāheke N-S FTN Arterial is to support urban growth in the Drury-Ōpāheke area. The proposed Ōpāheke N-S FTN Arterial is largely located within a rural greenfield area zoned for future urban development and planned to transition from rural to urban land use. As the proposed corridor will not be implemented until planned development occurs the Project is unlikely to affect the current land use of surrounding the Project until such a time that the area starts to develop.

It is likely urban development will start occurring adjacent to the proposed designation before the future arterial is required. This is already evident with private plan changes to live zone land for urban development submitted to Auckland Council in Drury. It is at this point the proposed designation may have adverse effects on the development of private property. Any potential land development issues would be addressed through the construction and operation of the Project (further discussed in sections 30.12.2 and 30.12.3).

As discussed, development is not precluded within the proposed designation area, and AT has actively engaged, or sought to engage, with landowners through the Project development and adapt where practicable. AT will work with land owners and developers under the process in section 176(1)(b) to provide written consent for earthworks, interim road upgrades (or new roads), integrated stormwater solutions and development within the proposed designations – provided those works will not prevent or hinder the work authorised by the proposed designation.

As there may be some time between the proposed designation being confirmed and before construction starts, a Project website (or equivalent virtual information source) will be set up with information on the Project. This will include the anticipated construction timeframes and contact details for enquiries. The website will continue to be updated during construction works.

30.12.2 Construction

The proposed designation includes land required for temporary and permanent works. During construction, the Project will temporarily require land to enable construction activities (detailed in section 27.4). If only temporary occupation of the land is required, it will be leased. Potential effects from the temporary lease/use of land within the proposed designation include disruption to farm or business activities, temporary loss of grazing pasture, stock-proof fencing, disruption to access, changes to driveway gradient, loss of vegetation and temporarily affected amenity.

The measures to mitigate these effects will be developed with the directly affected landowners or occupiers. On completion of the works, the proposed designation boundary will be reviewed and may be removed from any land not required for the on-going operation, maintenance or mitigation of effects of the Project.

Potential adverse effects from construction activities are addressed throughout section 30 with appropriate mitigation identified to avoid or minimise effects on properties in proximity to the works. Particular mitigation measures for residential properties and business disruption during construction include:

- Implementation of a SCMP prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the construction works. Including:
 - Determine adequate notice periods for the commencement of construction activities and works that affect access to properties;
 - Inform parties of the expected timing, duration and staging of works and regular updating of progress; and
 - Provide feedback, inquires and complaints during the construction process.
- Implementation of a CTMP to manage construction traffic and disruption to the local transport network (section 30.2.4), including methods to:
 - Maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be; and
 - Communicate traffic management measures to affected parties.
- Implementation of a CNVMP to provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction and to manage any adverse construction noise and vibration effects on sensitive receivers (section 30.9.3), including methods to:
 - Communicate and engage with nearby residents and stakeholders; and
 - Minimise construction disruption for affected properties during construction.
- In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.
- Implementation of an overall CEMP to manage potential construction effects.

These measures will appropriately minimise disruption to affected properties and allow the continued use of properties where possible. Potential effects will be temporary and therefore it is considered that they will be less than minor.

There is also a condition on the proposed designation to show how flood risk measures will be implemented at detailed design (or that they are no longer required) at specific properties:

- 105 Walker Road
- 103 Harry Dodd Road
- 89 Harry Dodd Road
- 59 Harry Dodd Road
- 106 Harry Dodd Road
- 84 Harry Dodd Road
- 201 Sutton Road.

If these mitigation measures are required, they will be discussed with the land owner and implemented during construction works.

30.12.3 Post Construction

The proposed designation includes land required for temporary and permanent works. The land required for the Project is shown in the designation plans included with the NoR (see Volume 1). Land required for the permanent work will be purchased and following the review of the designation boundary on completion of the works any land not required for the permanent work or for the on-going operation, maintenance or mitigation of effects of the Project will be reinstated in coordination with directly affected landowners or occupiers. This will include:

- Reinstatement of construction areas and reintegrating with the surrounding landform
- Reinstatement of driveways, accessways, fences and gardens.
- Integration of batters and cut/fill slopes with the landscape,

In addition, to mitigate traffic noise effects during operation of the Project, noise mitigation measures were identified to be required at 68 Ponga Road, 36 Ponga Road, 201 Sutton Road and 6 Ponga Road. The achievement of the noise categories set out in the Traffic Noise and Vibration Assessment (and included in the proposed conditions on the designation) will be reassessed at detailed design and BPO mitigation confirmed in consultation with affected landowners. at localised areas for

Therefore the post-construction effects on the use of land will be no more than minor on these landowners.

30.13 Urban Design Evaluation

An Urban Design Evaluation (provided within Volume 4) has been undertaken for the Ōpāheke N-S FTN Arterial, based on the Design Framework (included in the Urban Design Evaluation in Volume 4) established for the Project. The Urban Design Evaluation provides urban design focused commentary on the indicative design of the proposed corridors and recommends urban design outcomes that should be considered in future design stages through the implementation of the ULDMP proposed as a condition on the designation. The design principles that make up the Design Framework seek that transport corridors contribute positively to existing and new communities, the environment and the social and economic vitality of Auckland.

The specific outcomes intended for the Project are shown in blue in Figure 30-3 and Figure 30-4 below. The measures to achieve these outcomes will be confirmed at detailed design and form part of the ULDMP as a condition on the proposed designation. The outcomes include:

- 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.
- Legibility, modal priority for active modes and connectivity demands are addressed at intersections.
- An urban interface approach within the corridor that recognises the transition of densities from THAB to mixed housing urban to mixed housing suburban. The urban interface approach should respond to the changing built form interface, respond to the spatial character of adjacent development and demonstrate permeable pedestrian access between the corridor and adjacent development.
- In future design stages, Manawhenua shall be invited to provide input into relevant cultural landscape and design matters including how desired outcomes reflect their identity and values.
- The identification of urban and landscape design drivers related to the Waipokapū and Waihoehoe Streams, the adjacent notable ecological area as well as the proposed local centre and open space at the intersection of Ponga Road. The future corridor design should demonstrate an appropriate response and integration with these character drivers.
- A landscape plan that considers recommendations from the landscape and visual, arboricultural and ecological assessments including street tree and stormwater wetland planting, construction compound and private property reinstatement and treatment of batter slopes. The landscape plan should also demonstrate integration with the Waipokapū and Waihoehoe Streams where the corridor intersects with the proposed Blue-Green Network. The landscape outcomes should reinforce the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider active transport network.
- Integration of the Ōpāheke stormwater wetlands to ensure an appropriate interface with adjacent land uses, specifically where wetlands are proposed in areas zoned medium 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.

Further urban design opportunities in the Project area have also been identified in Figure 30-3 and Figure 30-4 and shown in orange. These opportunities could be considered by AT or other parties at future stages of design and development.

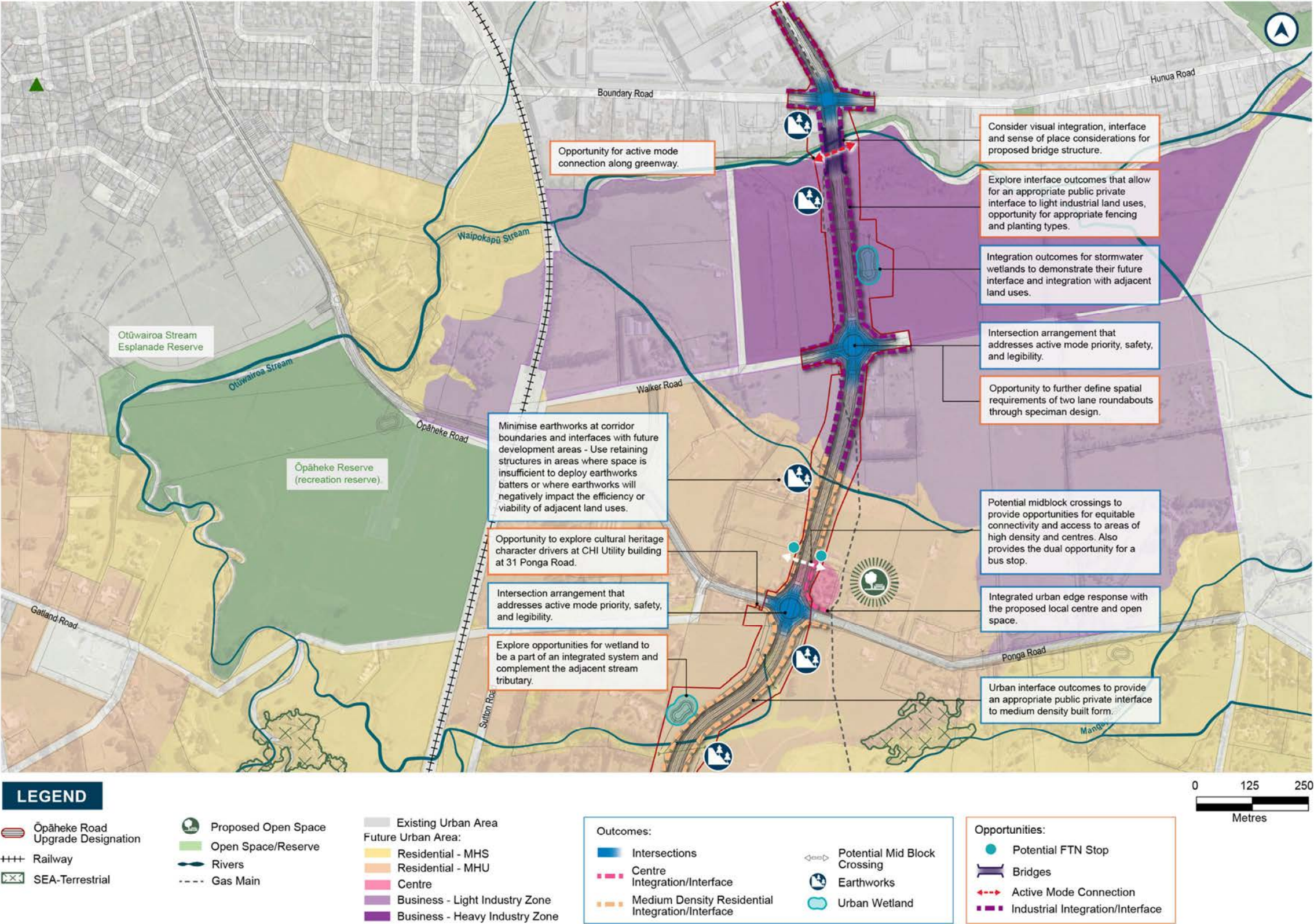


Figure 30-3: Ōpāheke N-S FTN corridor urban design outcomes and opportunities – Sheet 1

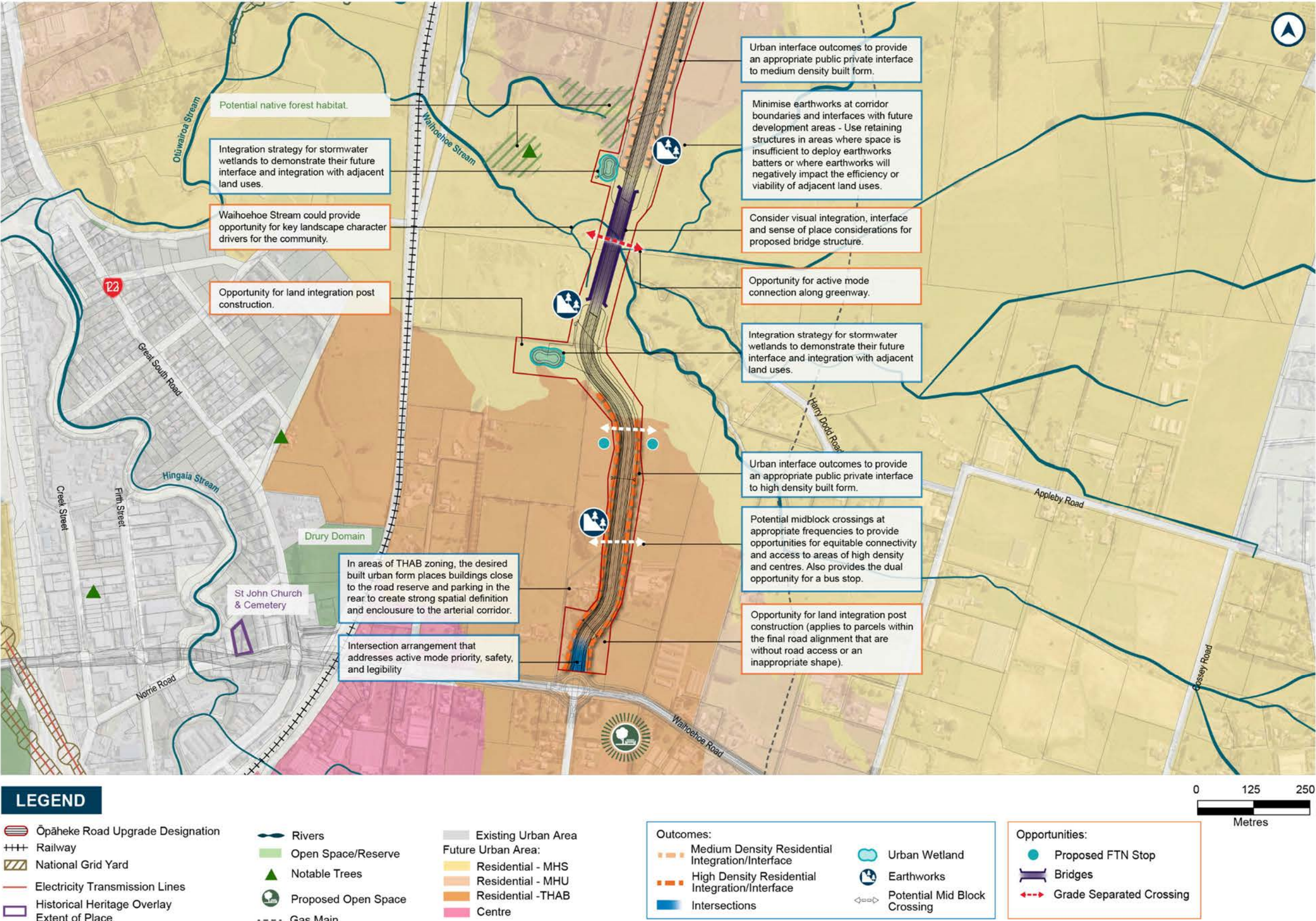


Figure 30-4 Ōpāheke N-S FTN corridor urban design outcomes and opportunities– Sheet 2

31 Ōpāheke N-S FTN Arterial: Summary of Measures to Manage Adverse Effects

The positive effects of the Project are set out in section 30.1 of this AEE.

In the first instance, adverse effects have been avoided and mitigated via alignment decisions and design choices. In addition, a range of measures are proposed for the Project to avoid, remedy or mitigate the potential adverse effects identified in this AEE. These measures are summarised in Table 31-1 below.

These measures will be implemented during the development of the detailed design, prior to and during construction, and once the permanent works are completed. These proposed measures are reflected in the proposed designation conditions included with the NoR.

Table 31-1: Summary of measures to avoid, remedy or mitigate potential adverse effects

AEE Section	Topic	Measures	Mechanism to Implement Measures
30.2	Construction Traffic	- Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. - Methods to manage the effects of temporary traffic management. - Measures to ensure the safety of all transport users. - Methods to manage traffic congestion and manage vehicular and pedestrian traffic near schools. - Identification of site access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors. - Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads. - Methods to manage vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be. - The approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads. - Methods to communication of traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services).	CTMP

AEE Section	Topic	Measures	Mechanism to Implement Measures
30.3	Cultural Values	• Involvement of Manawhenua in Project design and construction. • Identifying cultural matters and principles that should be considered in the development of other management plans (e.g. ULDMP and HAMP see below). • Ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle. • Establishment of protocols for cultural monitoring during construction works.	• Cultural Advisory Report • Cultural Monitoring Plan
30.4	Historic Heritage	• Confirm the methods for the identification and assessment of historic heritage within the designation to inform detailed design. • Confirm the known and potential historic heritage sites within the designation. • Built heritage assessment of the utility structure CHI building on Ōpāheke Road. • Set out the HNZPTA authority requirements for any pre-1900 sites.	• HAMP
30.5 30.13	Landscape, Visual, Urban Design and Amenity	• Demonstrate how the Project is designed to integrate with adjacent urban (or proposed urban) and landscape context. • Provide appropriate walking and cycling connectivity to, and interfaces with, existing or proposed adjacent land uses, and walking and cycling connections. • Promote inclusive access (where appropriate). • Promote a sense of personal safety. • A concept plan and explanation of the rationale for the landscape and urban design proposals • Developed design concepts, including principles for walking and cycling facilities and public transport. • Urban design and landscape details covering: • road design; • roadside elements; • architectural and landscape treatment of major structures and noise barriers • landscape treatment of permanent stormwater wetlands and swales; • integration of passenger transport; • pedestrian and cycle facilities; • heritage items; and • re-instatement of construction and site compound areas, driveways, accessways and fences. • Planting design details including:	• ULDMP

AEE Section	Topic	Measures	Mechanism to Implement Measures
		• street trees, shrubs and ground cover suitable for berms; • where practicable, mature trees and native vegetation should be retained; • treatment of fill slopes to integrate with adjacent land use, streams, riparian margins and open space zones; • planting of stormwater wetlands; • integration of any planting requirements required by conditions of any resource consents for the Project; and • reinstatement planting of construction and site compound areas as appropriate. • Detailed specification relating to weed control and clearance, pest animal management, mulching, plant sourcing and planting, including hydroseeding and grassing. – A planting programme and maintenance plan.	
30.8	Natural Hazards – Flooding	• Methods to mitigate flood hazard effects such as siting stockpiles out of floodplains, minimising obstruction to flood flows and actions to respond to warnings of heavy rain. • Design outcomes relating to bridging identified streams. • A design that achieves flood risk outcomes relating to flood levels and freeboard for existing habitable floors, flood levels on land zoned for urban or future urban development where there is no existing dwelling, flood prone areas and access.	• CEMP • Flood risk outcomes to be achieved at detailed design (demonstrated through the Outline Plan(s))
30.9	Construction Noise and Vibration	• Confirming construction works and anticipated equipment/processes; hours of operation, noise and vibration standards. • Identification of receivers where noise and vibration standards apply. • Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved. • Methods and frequency for monitoring and reporting on construction noise and vibration. • Procedures for maintaining contact with stakeholders, contact details of site supervisor and liaison person. • Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction	• CNVMP • CNVMS

AEE Section	Topic	Measures	Mechanism to Implement Measures
		Noise and/or Vibration Management Schedule will be required. Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys.	
30.9	Operational Noise and Vibration	Confirmation of achieving noise categories at PPFs and confirmation of BPO.	Noise Mitigation Plan
30.10	Network Utilities	- In consultation with network utility operators, protect, relocate and work in proximity to existing network utilities. - Network utility operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for some activities.	NUMP
30.11	Community	- Methods to regularly communicate with the community, stakeholders and land owners/occupiers during construction including timeframes. - Identification of a Project liaison person. - Method to formalise a complaints and response process (and monitoring thereof). - Links to other communication methods in other management plans. - S176(1)(b) approval process for land owners and developers to enable development (whilst not preventing or hindering the work authorised for the Project).	- SCMP - CNVMP - CNVMS - CTMP - CEMP - S176(1)(b) RMA approval process
30.12	Property, Land use and Business		

32 Ōpāheke N-S FTN Arterial: Statutory Assessment

An assessment of the statutory matters that are relevant to the Project under section 171(1) of the RMA has been undertaken and is presented in Part I, Statutory Assessment.

With reference to those matters, and based on the assessment of effects summarised above, the proposed designation is generally consistent with the relevant provisions of National Policy Statements, the Regional Policy Statement and the relevant objectives and policies of the AUPOIP. Adequate consideration has been given to alternative sites, routes and methods of undertaking the Project, and the Project will avoid, remedy or mitigate any adverse effects on the environment. The proposed work and the proposed designation are also reasonably necessary for achieving the objectives of AT for the Project.

33 Ōpāheke N-S FTN Arterial: Conclusion

The wider Drury-Ōpāheke area in the south of Auckland has been signalled to undergo significant urban growth in the next 30 years. The Drury-Ōpāheke area will experience significant change over the coming years as the existing rural environment develops into a new urban area. This is accelerating as private plan changes are lodged with Auckland Council. The Project will provide critical transport infrastructure to support and integrate with the planned future growth in Drury-Ōpāheke and the wider south Auckland growth areas.

While some adverse effects will be generated during construction and operation of the Project, these can be mitigated by the management plans and other measures which are proposed as conditions of the proposed designation. The Project will have significant positive effects, and provide for the social, economic and cultural wellbeing of communities.

The Project is consistent with the relevant planning documents and statutory tests, thereby satisfying the requirements necessary for Auckland Council to recommend confirmation of the NoR on the basis of the conditions proposed by AT.



PART H: NOR D5

Ponga Road and Ōpāheke Road Upgrade

34 Ponga and Ōpāheke Road Upgrade: Description of Project and Proposed Works

34.1 Project Description

As the Drury-Ōpāheke area is urbanised it is proposed to upgrade a 4.15km section of Ponga Road and Ōpāheke Road, from Great South Road in the north, to Jack Paterson Road and the future Mill Road corridor (which forms a separate NZUP project) in the southeast, to a two-lane arterial with separated active transport facilities. The functional intent of the Project is a multimodal corridor that provides access to the proposed Mill Road corridor, FUZ in Papakura and employment areas to the north. The location of the Project is shown in Figure 34-1.

The upgrade of Ponga Road and Ōpāheke Road to a two-lane arterial with separated active transport facilities will support the future urbanisation of the Ōpāheke area, resulting in improved connectivity and urban form outcomes. The upgrade will provide safe and multi-modal access to the Papakura centre, future employment areas and the strategic road and public transport networks. It will improve transport choice, and access to economic and social opportunities for those living and/or working in the Ōpāheke area.

The Project has been separated into three sections as shown in Figure 34-1, including:

- Ponga Road Upgrade: from Ōpāheke Road to Jack Paterson Road
- Ōpāheke Road Rural Upgrade: from the northern extent of the FUZ to Ponga Road
- Ōpāheke Road Urban Upgrade: north of the FUZ
- While the overall plan for the urban area of Ōpāheke Road is to upgrade the active transport facilities from Ōpāheke Road Rural Upgrade in the south to Great South Road, Papakura in the north, generally, the upgrade can fit within the existing road reserve, therefore only the areas affecting land outside the existing road reserve are proposed to be designated.

For the Ponga Road and the Ōpāheke Road Rural upgrade sections it is proposed to widen the existing roads to 24m two-lane urban arterials with separated active transport facilities. As the Ōpāheke Road urban section is an existing and constrained urban environment, it is proposed to upgrade the existing road to a 20m two-lane urban arterial with separated active transport facilities. The urban arterials will have a likely reduced or maintained speed limit of 50kph. Indicative cross-sections of the two corridors (20m and 24m) are provided in Figure 34-2 and Figure 34-3, and indicative design drawings are provided in Volume 3 of this AEE.

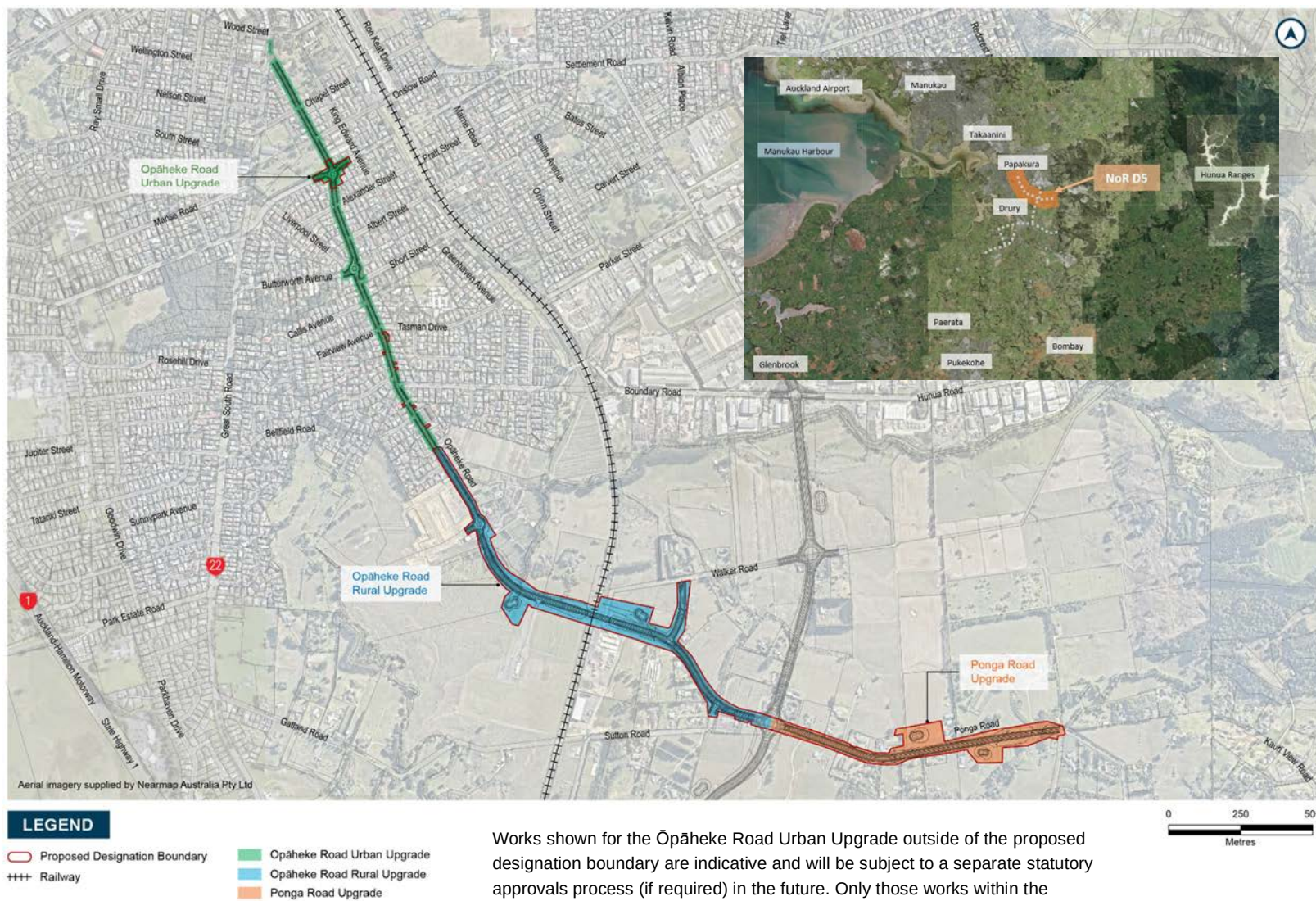


Figure 34-1: NoR D5 Project Sections and Context

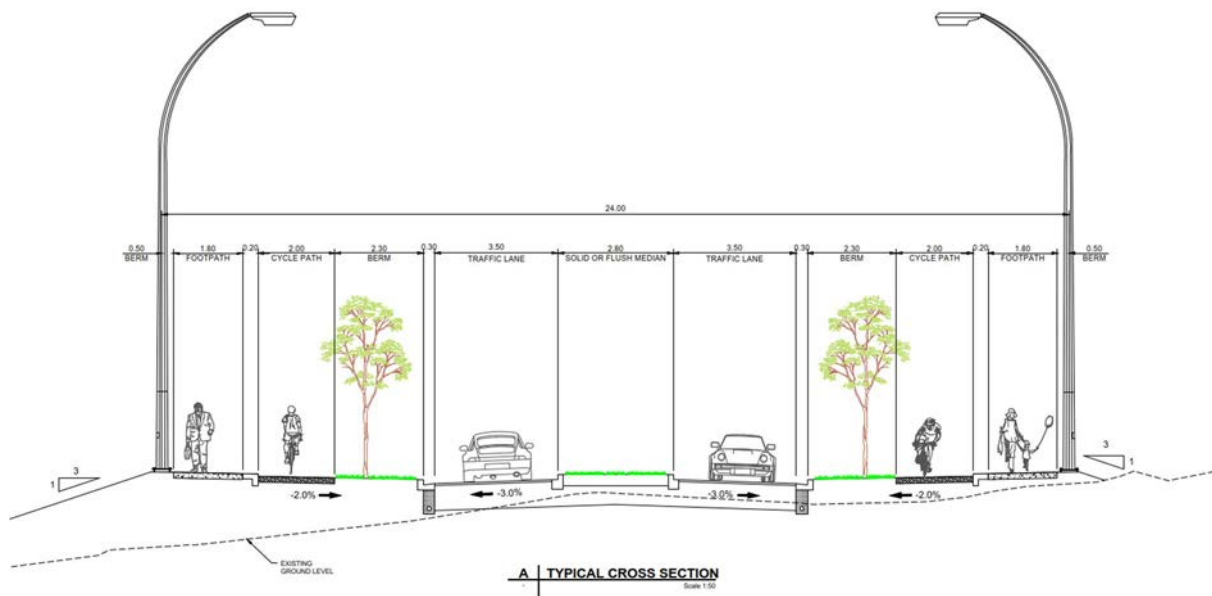


Figure 34-2: Typical Cross Section – 24 m corridor

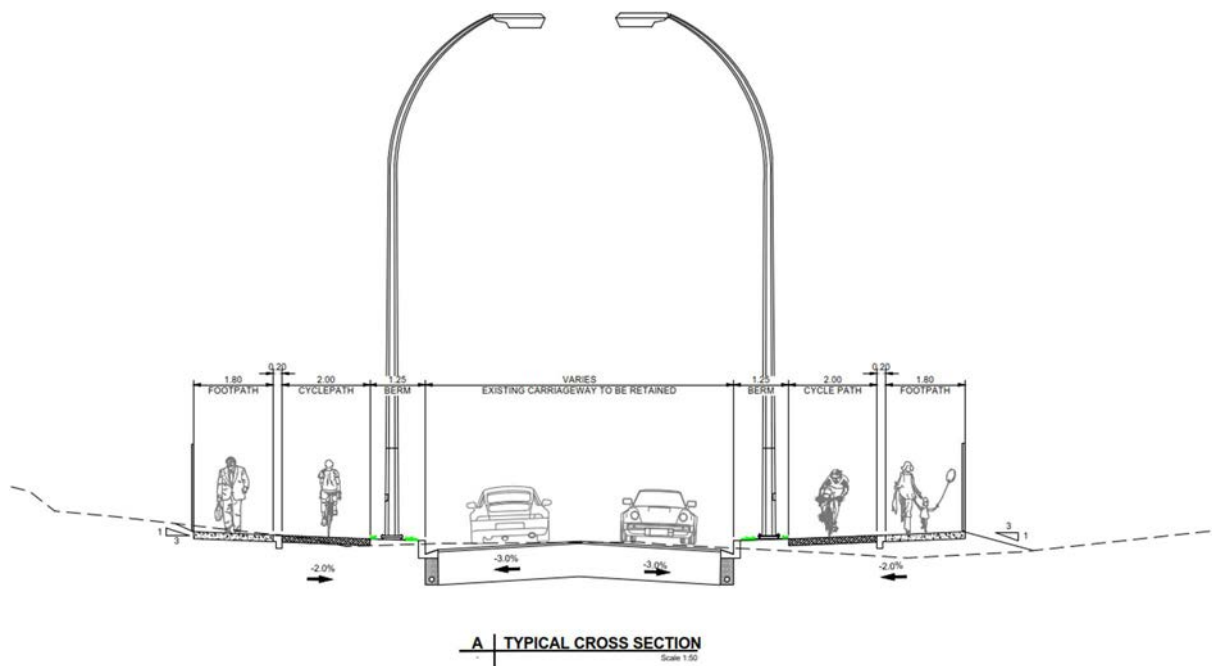


Figure 34-3: Typical Cross Section – 20 m corridor

A new AT designation is proposed to allow sufficient land for the road widening plus land for tie ins with existing roads, stormwater infrastructure, batter slopes and retaining and for other construction related activities including construction compounds and laydown areas, construction traffic manoeuvring and the re-grade of driveways. Because the Ōpāheke Road Urban Upgrade section can generally be undertaken within the existing road reserve, only discrete areas are proposed to be designated. It is proposed to designate:

- Land as identified above for the Ponga Road Upgrade section
- Land as identified above for the Ōpāheke Road Rural Upgrade section
- Nine properties for driveway regrading within the Ōpāheke Road Urban Upgrade section
- A pinch point along the Ōpāheke Road Urban Upgrade section: the Ōpāheke Road and Settlement Road intersection.

This AEE only addresses those areas of the Project within the proposed designation as described above and identified within the design drawings. The following Project descriptions relate solely to these areas.

Key features of the proposed upgrades common to each of the Project sections include:

- A typically 24m or 20m wide road with two lanes and separated active transport facilities
- Localised widening around the existing intersections to accommodate for vehicle queuing and tie-ins and active transport facilities/crossings
- Batter slopes and retaining to enable widening of the corridor and/or wetland construction, and associated cut and fill activities (noting the indicative design of these are based on the existing land form and urban development adjoining these areas may change the work requirements).
- Vegetation removal along the existing road corridor
- Areas for construction related activities including site compounds, construction laydown, bridge works area, the re-grade of driveways and construction traffic manoeuvring.

The works described for the Projects could be carried out in stages as urban development occurs surrounding the Project area.

Indicative design drawings are provided in Volume 3 of this AEE and the Project design standards and details further described in Section 4.2.7.

Further details of each Project section are provided below.

34.1.1 Ponga Road Upgrade Section

The Ponga Road Upgrade section is a 1km long upgrade extending from the proposed intersection with Ōpāheke North-South FTN Arterial in the west, to Jack Paterson Road in the east. In the future Ponga Road will tie into the proposed Mill Road corridor which forms a separate NZUP project. A bridge over Mangapū Stream is proposed raising the existing vertical alignment of the existing road. Two stormwater wetlands are proposed. An overview of the proposed alignment is provided in Figure 34-4.

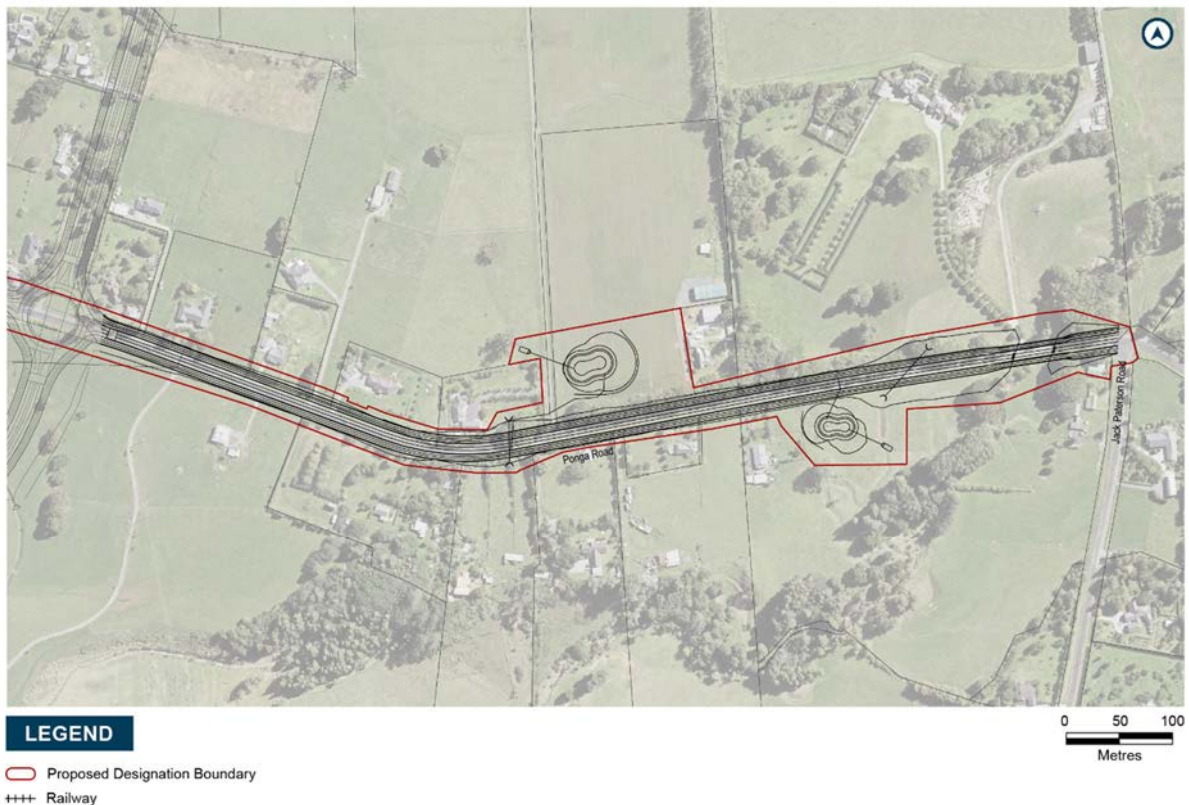


Figure 34-4: Proposed Ponga Road Upgrade

In accordance to the design standards and details identified in Section 4.2.7, and in addition to those features listed in Section 34.1, the key features of the Ponga Road Upgrade include: Roundabout tying into the proposed Ōpāheke N-S FTN Arterial (NoR D4) and Ōpāheke Road Rural Upgrade section

- A bridge over Mangapū Stream
- Extension of existing pipe culverts
- Two stormwater wetlands.

34.1.2 Ōpāheke Road Rural Upgrade Section

It is proposed to widen, and realign a portion of, the existing road within the Ōpāheke Road Rural Upgrade section to a 24m urban arterial. The Ōpāheke Road Rural Upgrade section extends 1.6km from the extent of the FUZ in the north to Ponga Road in the south.

At its northern extent, the Project ties-in with the existing Ōpāheke Road. Further south, a roundabout will provide access to Bellfield Estate. Over Ōtūwairoa Stream two active mode bridges are proposed either side of the existing road bridge. To the east of the bridge the alignment veers offline to the north of the existing road corridor to avoid the Waikato 1 watermain and Ōpāheke Sports Fields. An overbridge is proposed over the NIMT rail line to enable a grade separated rail crossing.

To the east of the NIMT a new connection is provide to Walker Road to allow access to properties on the southern side of Ōpāheke Road. The main alignment then veers south realigning with the existing road. A tie in is provided at Sutton Road and the eastern extent of the Project ties-in at a roundabout

with Ponga Road and the proposed Ōpāheke N-S FTN Arterial. Two stormwater wetlands are proposed. An overview of the proposed alignment is provided in Figure 34-5.



Figure 34-5: Proposed Ōpāheke Road Rural Upgrade

In accordance to the design standards and details identified in Section 4.2.7, and in addition to those features listed in Section 34.1, the key features of the Ōpāheke Road Rural Upgrade include:

- Roundabouts at Bellfield Estate and Ōpāheke N-S FTN Arterial / Ponga Road
- Realignment of a section of Ōpāheke Road and grade separation of the NIMT to avoid the Waikato 1 watermain and Ōpāheke Sports Fields and to allow the bridge to be constructed offline
- New road connection to Walker Road (and closure of a section of the existing Ōpāheke Road – replaced by the new NIMT bridge)
- Two active transport bridges adjoining each side of the existing Ōtūwairoa Stream road bridge
- Two stormwater wetlands. One is an extension of an existing wetland located within Ōpāheke Reserve.

34.1.3 Ōpāheke Road Urban Upgrade Section

While the overall plan for the urban area of Ōpāheke Road is to upgrade the active transport facilities from Ōpāheke Road Rural Upgrade in the south to Great South Road, Papakura in the north, only the areas affecting land outside the existing road reserve are proposed to be designated and assessed as part of this assessment. The Ōpāheke Road Urban Upgrade section of NoR D5 includes the regrading of nine driveways along Ōpāheke Road and the upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout. An overview of the proposed alignment and designation is provided in Figure 34-6. It is noted this assessment of effects is limited to the works within the proposed designation.



Figure 34-6: Proposed Ōpāheke Road Urban Upgrade

In accordance to the design standards and details identified in Section 4.2.7, the key features of the Ōpāheke Road Urban Upgrade include:

- Upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout to provide for separated active transport facilities, including crossing facilities
- Re-grade of nine driveways.

34.2 Project Objectives

The Project Objectives reflect the transport outcomes that were identified for the Southern Growth Area (in the IBC) and specifically the Drury Arterial Network (in the DBC). The Project Objectives for the Ponga and Ōpāheke Road Upgrade are:

1. Provide a transport corridor that improves connectivity to and through Ōpāheke to support and integrate with the urban growth in Ōpāheke
2. Provide a transport corridor that is safe for all users
3. Contribute to mode shift by providing a choice of transport options including active transport.

34.3 Lapse

A lapse period of 20 years is proposed for NoR D5.

34.4 Indicative Construction Methodology

The general construction methodology for the Project is outlined in Section 4.4 and further detail is outlined in the sections below. The indicative construction methodology, including the working room areas specified in Table 4-2, have informed the proposed designation boundary.

Although the Project has been separated into different sections for assessment purposes, where construction methods are consistent across the three sections this summary has been combined to avoid unnecessary repetition.

34.4.1 Construction Overview

Construction of the Project will include earthworks, construction of bridges, pavement, drainage and stormwater wetlands, and service relocation. For each Project section the works are to be constructed in a single construction zone as the works along each corridor are similar in nature.

34.4.2 Indicative Construction Programme and Sequencing

The Ponga Road Upgrade is estimated to take 2 to 2.5 years to construct, the Ōpāheke Road Rural Upgrade is estimated to take 2 to 2.5 years and the Ōpāheke Road Urban Upgrade is estimated to take 1 to 1.5 years. Apart from the bridge over the NIMT rail line which can be constructed offline, most of the works for the Project are to be constructed online, in the existing Ponga Road and Ōpāheke Road alignments. The implementation timeframe for the Project has yet to be confirmed and will respond to timing of urban development as well as funding availability. However, it is currently anticipated that it will be implemented by approximately 2038. In addition, urban development that may occur ahead of the proposed upgrade has the potential to change the detail of construction requirements than what would be required in the existing environment. The proposed designation provides for construction in the existing environment acknowledging this may change in the future.

Each of the Project sections follow similar construction methodology sequencing. A summary of the construction sequence and method for the Ponga Road Upgrade and Ōpāheke Road Rural Upgrade is outlined in Figure 34-7. The construction sequence and methodology for the Ōpāheke Road Urban Upgrade is outlined in Figure 34-8.

Enabling Works

- Site establishment, including: property demolition or modification including fence realignment and driveway relocations, trees and vegetation removal and site compound establishment
- Carry out all necessary services relocation or protection works. Note First Gas permit requirements for working within their service corridor.
- Implement environmental controls including silt fencing and temporary sediment retention ponds
- Install temporary traffic management controls to realign traffic and establish work areas
- Establish site offices, laydown areas and car parking for construction personnel

Stage 1– Westbound Carriageway

- Construct new culverts and extend existing
- Earthworks (during summer months) including topsoil strip, construct stormwater wetlands embankment foundations and construction of embankment to subgrade formation
- Construct bridge works (for Ponga Road bridge over Mangapū Stream, for Ōpāheke Road walking and cycling paths over Ōtūwairoa Stream and bridge over the NIMT rail line)
- Foundations
- Bridge deck construction
- Finishing works
- Remove temporary works and complete embankments works
- Install new stormwater drainage
- Construct new pavement works
- Construct new cycleways and footpaths
- Complete tie-in works, footpath, cycle paths, lighting and landscaping
- Divert traffic onto newly constructed pavement and bridge

Stage 2 – Eastbound Carriageway

- Same process as Stage 1

Stage 3 – Finishing Works

- Complete outstanding pavement works. Remove temporary works
- Install median kerbing, line marking and street lighting
- Complete road finishing works including streetlighting, landscaping, footpaths and cycleways and line marking

Figure 34-7: Ponga Road and Ōpāheke Road Rural Upgrade Indicative Construction Sequencing Summary

Enabling Works

- Site establishment, including: property demolition or modification including fence realignment and driveway relocations, trees and vegetation removal and site compound establishment
- Carry out all necessary services relocation or protection works.
- Implement environmental controls including silt fencing
- Install temporary traffic management controls to realign traffic and establish work area

Stage 1– Roundabout Construction

- Construct pavement for new roundabout within the available working area, lay asphalt and temporary traffic arrangements and driveway regrading

Stage 2 – Roundabout Construction

- Divert traffic onto new construction section to enable reconstruction of the existing pavement
- Construct pavement for new roundabout intersection and driveway regrading

Stage 3 – Finishing Works

- Complete outstanding pavement works. Remove temporary works (potentially during night shifts under full road closure)
- Install median kerbing, line marking and street lighting
- Complete any outstanding re-surfacing works and tie ins (potentially during night shifts under full road closure)
- Complete road finishing works including street lighting, landscaping, footpaths and cycleways and line marking

Figure 34-8: Ōpāheke Road Urban Upgrade Indicative Construction Sequencing Summary

34.4.3 Indicative Construction Methodology

34.4.3.1 Site Establishment

Site Facilities

Construction site compounds and laydowns will be required at a number of indicative locations for the construction of each Project section as shown in Figure 34-9 for the Ponga Road Upgrade, Figure 34-10 for Ōpāheke Road Rural Upgrade and Figure 34-11 for the Ōpāheke Road urban Upgrade. The compounds and laydowns are strategically located at the midpoint of the proposed upgrades and are of relative open space which will maximise the useable area, and minimise any additional work required to establish the site compound.

Where additional laydown is needed along the alignments it will be accommodated within the proposed designation footprint. The use of these compounds will only be required during the construction period and the site will be reinstated upon completion of the works.

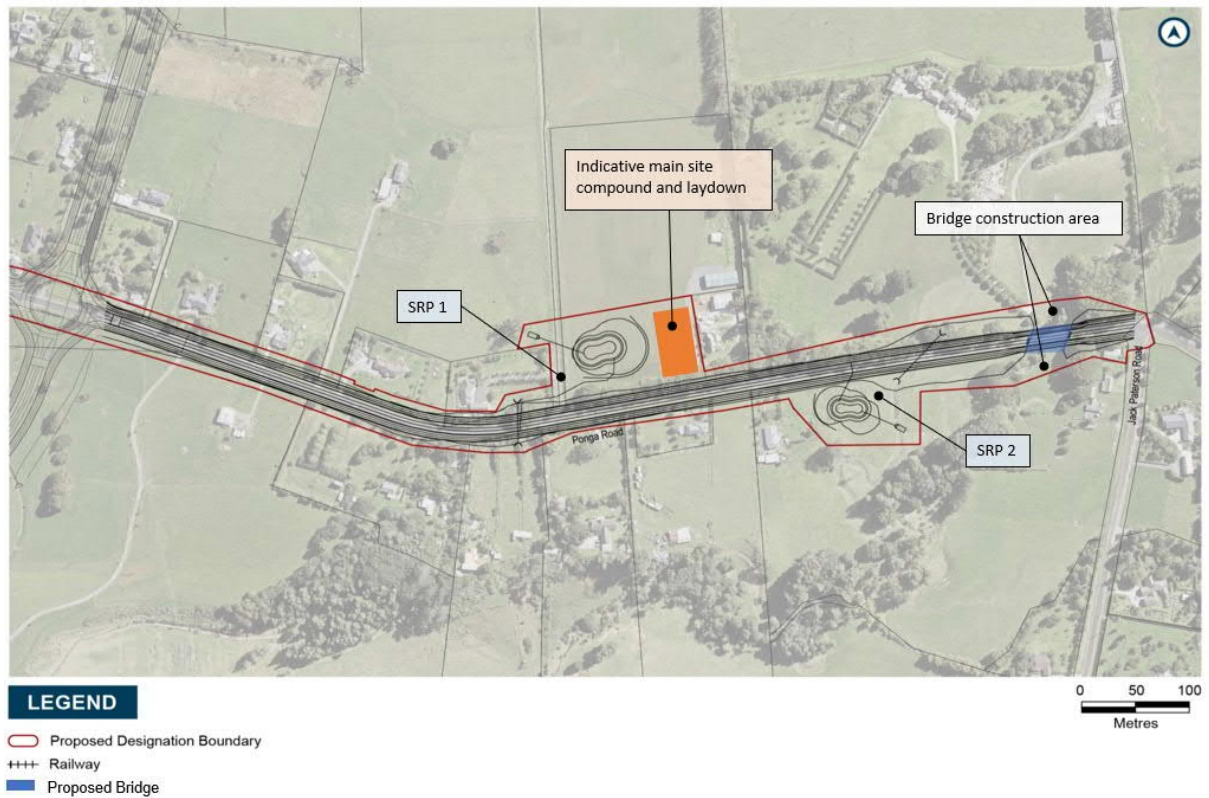


Figure 34-9: Indicative Construction Compounds, Laydown Areas and SRP locations for Ponga Road Upgrade

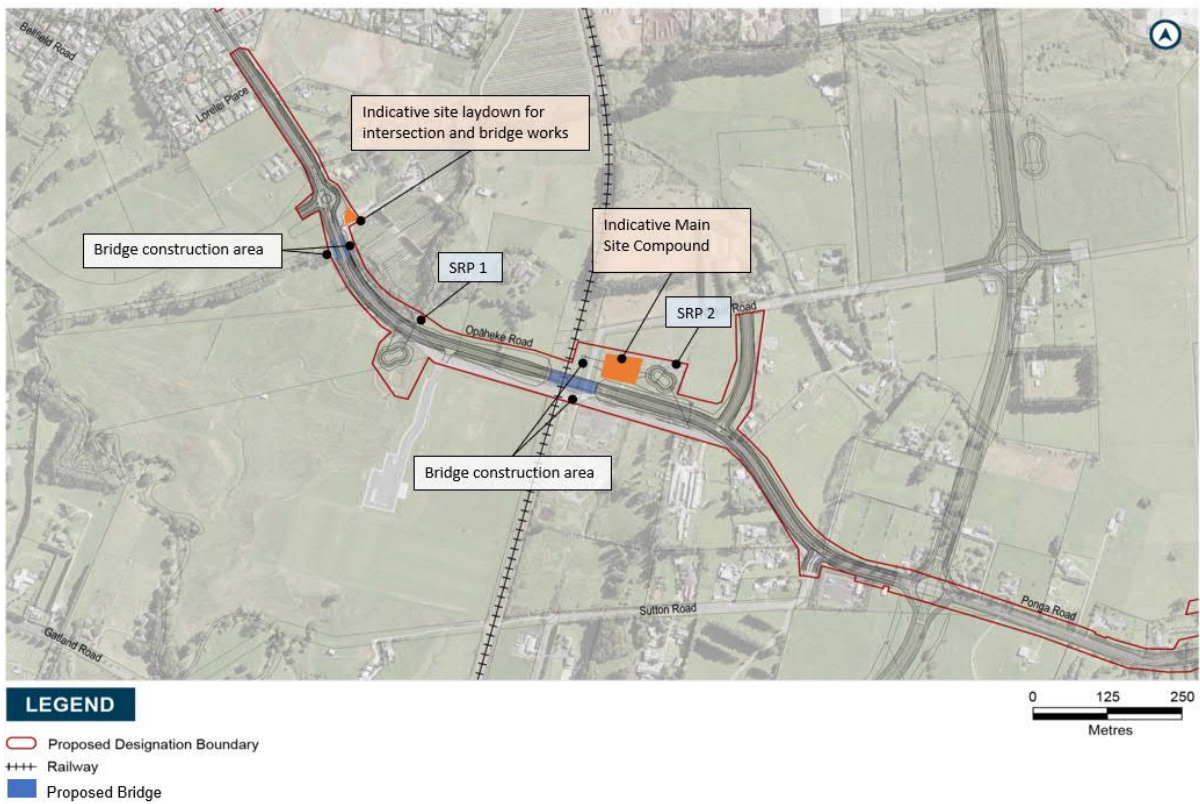


Figure 34-10: Indicative Construction Compounds and Laydown Areas for Ōpāheke Road Rural

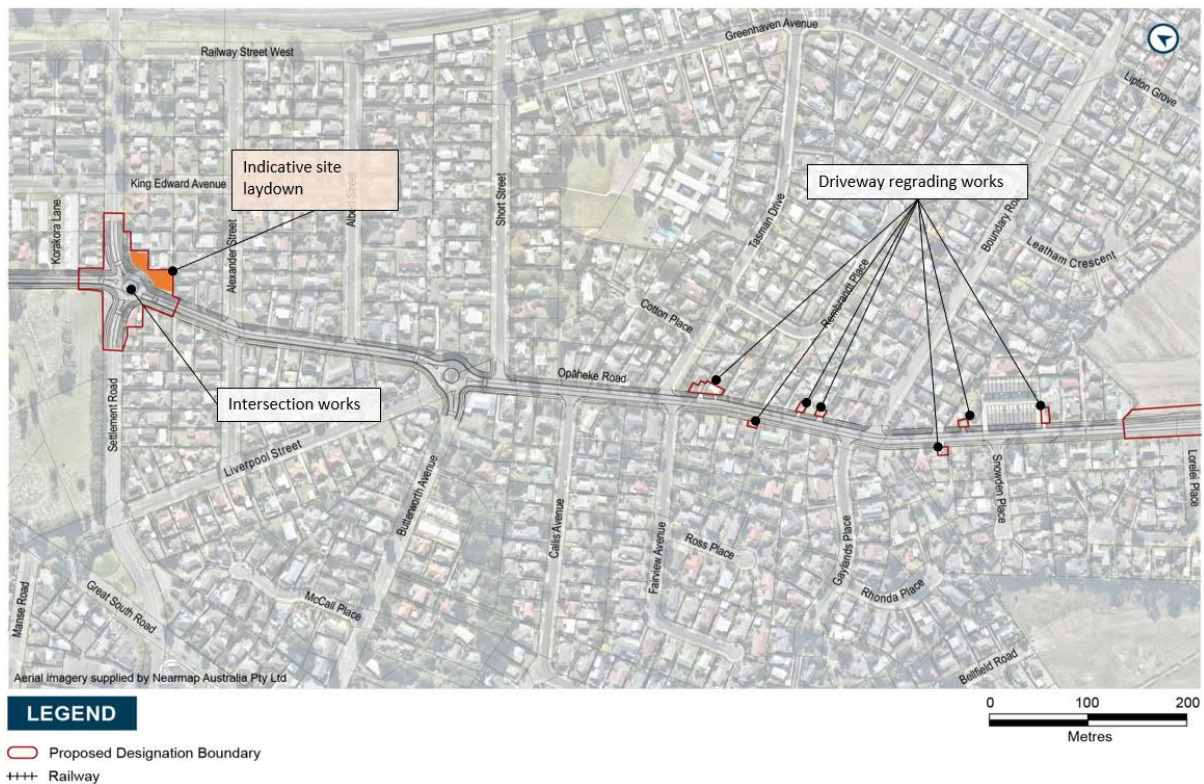


Figure 34-11: Indicative Construction Compounds and Laydown Areas for Ōpāheke Road Urban

Sediment Controls

Surface water from the construction work areas will need to be treated prior to discharge, subject to future resource consents.

For the Ponga Road Upgrade temporary sediment retention ponds will likely be required to manage the erosion and sediment water runoff as shown at indicative locations within Figure 34-9 and Figure 34-12. In the west of Project section area, localised erosion and sediment control, such as silt fencing or cut and cover method will be required as the work does not involve large quantities of earthworks. The presence of the First Gas pipeline and the Counties Power high voltage line within this area also promotes the use of silt fencing rather than a sediment retention pond.

Within the Ōpāheke Road Rural Upgrade, the bulk fill for the embankment on the approaches to the bridge over the NIMT rail line will likely require a temporary sediment retention pond to manage the erosion and sediment water runoff. Figure 34-10 and Figure 34-13 identify the indicative sediment retention pond locations.

As the general nature of the work for the Ōpāheke Road Urban Upgrade only involves minor earthworks, localised erosion and sediment control will be suitable to be implemented onsite. These controls include minimising open earthworks areas by using cut and cover method, installing silt fencing, filter cloth around drains, sandbags, or hay bales near discharge points to filter out the sediments.



Figure 34-12: Ponga Road Upgrade areas identified for Erosion and Sediment Control treatment indicative SRP locations

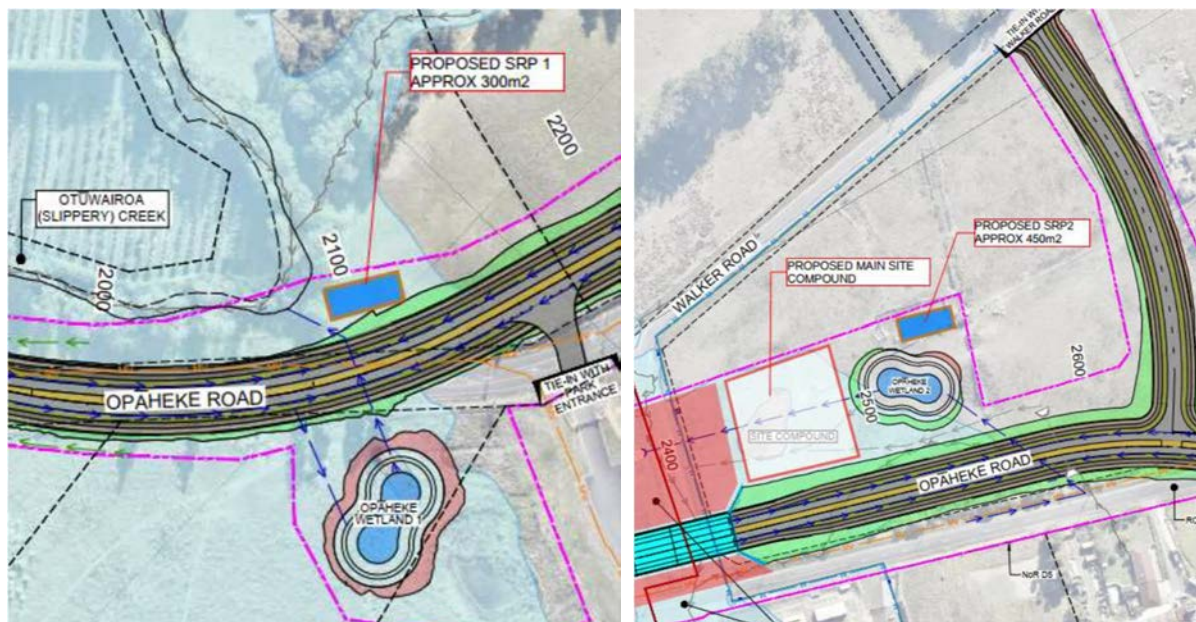


Figure 34-13: Ōpāheke Road Rural Upgrade areas identified for Erosion and Sediment Control treatment indicative SRP locations

Traffic Management and Access

Construction of the Project is anticipated to cause disruptions to the existing road network and property access. Access along Ponga Road and Ōpāheke Road will largely be maintained, however some road closures will be needed for critical activities such as road surfacing, bridge beam installation, drainage crossing installation, or pavement rehabilitation at night or on weekends.

34.4.3.2 Network Utilities

The Project requires the relocation or realignment of a number of network utilities including gas transmission and distribution, overhead electricity transmission, and telecommunications. Works to network utilities will be confirmed at detailed design and may include the following:

For all Project sections:

- **Chorus:** the existing cables running underground along Ponga Road and Ōpāheke Road will be relocated to their final design location. Temporary cabling is likely required to be put in place outside the earthworks area until the final cabling can be installed.

Ponga Road Upgrade:

- **Counties Power Overhead High Voltage Line:** the lines start at the substation and run to the east before heading south at chainage 100 and away from the construction area. These lines may require relocation outside the road corridor where they run parallel to the existing road. A new pylon will be constructed next to the existing one, and a cut over undertaken to switch the power to the new alignment. The disruption to the network is likely to be minimal as the cut over will be programmed to occur over a low demand period. The new location of the pylons is likely to be within the batter location of the new road network, so any earthworks in this area will need to be done in advance of the new pylons.
- **Overhead and underground power distribution lines:** several overhead and underground electrical distribution lines connecting to the substation and run under and parallel to Ponga Road. These will likely require relocation. New cables will be installed by direct bury or directional drill methods and the power switched to the new lines. The overhead power distribution lines will be relocated to their final design location. This is assumed to be underground cabling as is the case already for these cables between chainage 1000 to chainage 1200. The existing lines will need to stay in place until the earthworks and culvert crossings are complete and the new cabling is installed. Alternatively, the overhead lines can be temporary relocated to outside the works area until the final cable works are complete.
- **First Gas Transmission Line:** the exact scope will be finalised in the detailed design phase and in consultation with First Gas to assess the impact to the pipeline. The pipeline under the proposed widening may not be designed to cope with the additional loading hence a pipe relocation, strengthening or protection works may be required.

Ōpāheke Road Rural Upgrade:

- **Watercare:** A 1200mm diameter main water supply pipe running north to south along Walker Road will likely intersect with the proposed bridge over the NIMT rail line. This pipeline will likely require protective capping over any temporary works/ pavement areas. The exact scope will need to be agreed with Watercare based on the design and capacity of the existing pipeline.

Ōpāheke Road Rural Upgrade and Ōpāheke Road Urban Upgrade:

- **Counties Power Overhead and underground distribution lines:** will likely require relocation to the proposed new service corridor along Ōpāheke Road. The existing line may be relocated underground, or new poles installed along the new widened alignment.

34.4.3.3 Culverts and related Stream Works

The Ponga Road Upgrade requires the extension of existing culverts to accommodate road widening. Resource consents will be sought for culverts and associated stream works at detailed design. The existing culvert at CH1440 is unlikely to require any over pumping. Works on the existing culvert at CH1800 may require over pumping. Flows could be pumped to the nearby Mangapū Stream. On site verification will be required during detailed design to confirm the scope of the diversion requirement.

The Ōpāheke Road Rural Upgrade requires the extension of an existing culvert to accommodate road widening. The method for installation will be typical drain laying methods with the likely requirement of additional undercutting and earthworks to ensure there are no settlement issues with the new pipework. Works on the existing culvert will unlikely require any over pumping. Works are likely to be planned for the summer months to better manage water flow volumes.

No culverts or associated stream works are proposed within the Ōpāheke Road Urban Upgrade.

34.4.3.4 Earthworks

Final earthwork volumes will be confirmed during detailed design. The fill material required for both Project sections will need to be of suitable standard to meet the specified design. Access to low cost material close to the site will be a significant factor in limiting haulage requirements and associated impacts and cost.

The Ponga Road Upgrade is expected to generate approximately 3,700m³ of excavated (cut) material and 9,300m³ of fill, with a total volume of material moved at 13,000m³. The Ōpāheke Road Upgrade sections of the Project is expected to generate approximately 7,600m³ of excavated (cut) material assumed suitable to be used as direct structural fill material and 50,000m³ of fill, with a total volume of material moved at 57,600m³.

The bulk of the fill for the Ōpāheke Road Upgrade sections is on the embankment approach to the bridge over the NIMT rail line within the Ōpāheke Road Rural Upgrade. Subgrade improvement techniques may be required such as undercutting any localised soft spots, or cement and lime stabilising. Preloading would typically be required on the significant fill locations, such as the bridge embankments. This will be confirmed in the detailed design phase.

34.4.3.5 Drainage and Stormwater

New stormwater drains will be required on both sides of the road to direct the stormwater to the proposed wetlands or existing stormwater network prior to being discharged. New discharge lines are required from the proposed wetlands. Discharge points for each of the wetlands have been identified and designated accordingly.

Stormwater will discharge to, and works will be required within existing water ways. Resource consents for diversion and discharge of stormwater and stream works will be sought as part of future resource consent processes. These works and activities will be undertaken in accordance with applicable management and mitigation measures and resource consent conditions.

34.4.3.6 Bridges and Structures

The proposed works for each Project section relating to bridges and structures include:

- For Ponga Road:
 - Single span bridge over Mangapū Stream.
- For Ōpāheke Road Rural:
 - Two active mode bridges over Ōtūwairoa Stream
 - Bridge over NIMT rail line.

Traffic management will be required to isolate the traffic and establish the work area for the bridges. A temporary crane pad and retaining solution, such as sheetpiles, will likely be required to allow for the substructure construction.

The construction method will typically follow conventional bottom up bridge construction techniques. The construction sequence will generally be as follows:

- Mobilisation
- Access construction site and start embankment construction
- Piling, pilecaps, and abutment construction
- Bridge beam installation
- Deck construction and barrier installation
- End terminal and approach construction backfill behind abutments.

Ponga Road Bridge

A single span bridge is proposed to traverse over Mangapū Stream, which will replace an existing culvert structure. The road elevation will be higher than the existing alignment due to flood requirements, hence the existing structure will likely need to be demolished.

The bridge will be constructed generally following the stages below:

- Enabling Works – Establish traffic management, reduce traffic to one lane under contraflow arrangements. Protect stream from potential contamination/ damage.
- Stage 1 – Demolish northern half of existing culvert. Construct new eastbound lane, once complete, move existing traffic over to new bridge.
- Stage 2 – Deconstruct remaining half of culvert structure. Construct new westbound lane, once complete, move traffic to permanent configuration.

A temporary retaining solution will likely be required to facilitate stage 1 construction due to the elevation increase of the proposed bridge compared to the existing one.

Ōpāheke Road Bridges

The two active mode bridges over Ōtūwairoa Stream are 25m long and 5m wide and are not connected to the existing bridge over the creek. The bridges will likely be constructed concurrently to maximise efficiency and productivity. Night works will likely be required for critical activities such as bridge beam installation.

The proposed bridge over the NIMT rail line is 80m long with three spans (29m, 22m, and 29m) and MSE wall abutments. This will span over the rail lines (allowing for four tracks) and Walker Road. In

cross section the bridge is 20.8m wide, with two lanes of traffic, separated cycle paths and foot paths on both sides of the bridge and a throw screen attached to the bridge barriers.

The bridge will be constructed generally following the stages below:

- Enabling Works – Establish traffic management, construct temporary traffic diversion or temporary retaining wall as required. Establish temporary crossing over rail.
- Stage 1 – Construct bridge, once complete, move existing traffic over to new bridge.
- Stage 2 – Construct remaining works not completed in Stage 1. Remove temporary works and complete landscaping and tie in works.

To allow the construction of the bridge over the NIMT rail line, it is proposed a temporary pavement be constructed outside the extent of the permanent works (allowed for within the proposed designation boundary). Construction of the temporary pavement will enable the safest and quickest construction of the bridge embankments and bridge structure with minimal interface with the existing traffic. The temporary pavement can be constructed on either the northern or southern side of the existing Ōpāheke Road.

The temporary pavement is typically 7m wide to allow for two lanes of traffic and traffic management devices. A construction corridor beyond the extent of the temporary pavement will also be required to allow for environmental controls, service relocations, temporary earthworks batters, and services protection.

The temporary pavement crossing over the NIMT rail line will need approval from KiwiRail and will need to follow their permit and procedure requirements. A temporary level crossing for the temporary pavement will require modification of the existing rail services. The exact scope will be agreed with KiwiRail during detailed design.

35 Ponga and Ōpāheke Road Upgrade: Existing and Likely Future Environment

This section provides a description of the human, physical and natural features of the existing environment, and the likely future environment within which the Project will be constructed, operated and maintained. It draws on information from a number of sources including the technical assessments included in Volume 4. The potential effects of the Project on this environment and measures proposed to manage these effects are detailed in Section 37 of this report.

35.1 Planning Context

Table 35-1: NoR D5 Planning Context

Existing AUPOIP Zoning and Potential Future Zoning (Drury-Ōpāheke Structure Plan) 10	Existing Zoning: • Future Urban Zone • Strategic Transport Corridor Zone • Open Space – Sport and Active Recreation Zone • Open Space – Conservation Zone • Open Space – Informal Recreation Zone • Business – Neighbourhood Centre Zone • Residential – Mixed Housing Urban Zone • Residential – Mixed Housing Suburban Zone • Residential – Terraced Housing and Apartment Building Zone • Special Purpose – Papakura Cemetery	Potential Future Zoning: • Strategic Transport Corridor Zone • Open Space – Sport and Active Recreation Zone • Open Space – Conservation Zone • Open Space – Informal Recreation Zone • Business – Neighbourhood Centre Zone • Business – Light Industry Zone • Business – Centre Zone • Residential – Mixed Housing Urban Zone • Residential – Mixed Housing Suburban Zone • Residential – Terraced Housing and Apartment Building Zone • Special Purpose – Papakura Cemetery
Precincts	Ōpāheke 1 Precinct	
Overlays and Controls	Overlays • High-Use Stream Management Areas Overlay [rp] Controls • Macroinvertebrate Community Index • Vehicle Access Restricted Control – Adjacent to Level Crossing • Arterial Road	
Designation(s) and other notations	• Designations - 6302, North Island Main Trunk Railway Line, Designations, KiwiRail • Airspace Restriction Designations - ID 200, Ardmore Airport - Height Restrictions, Ardmore Airport Ltd	

Other Non-Statutory Features	• Designations - 9104, Pukekohe to East Tamaki Gas Pipeline, Designations, First Gas Limited
	• Flood Plains • Flood Prone Areas • Overland Flow Paths

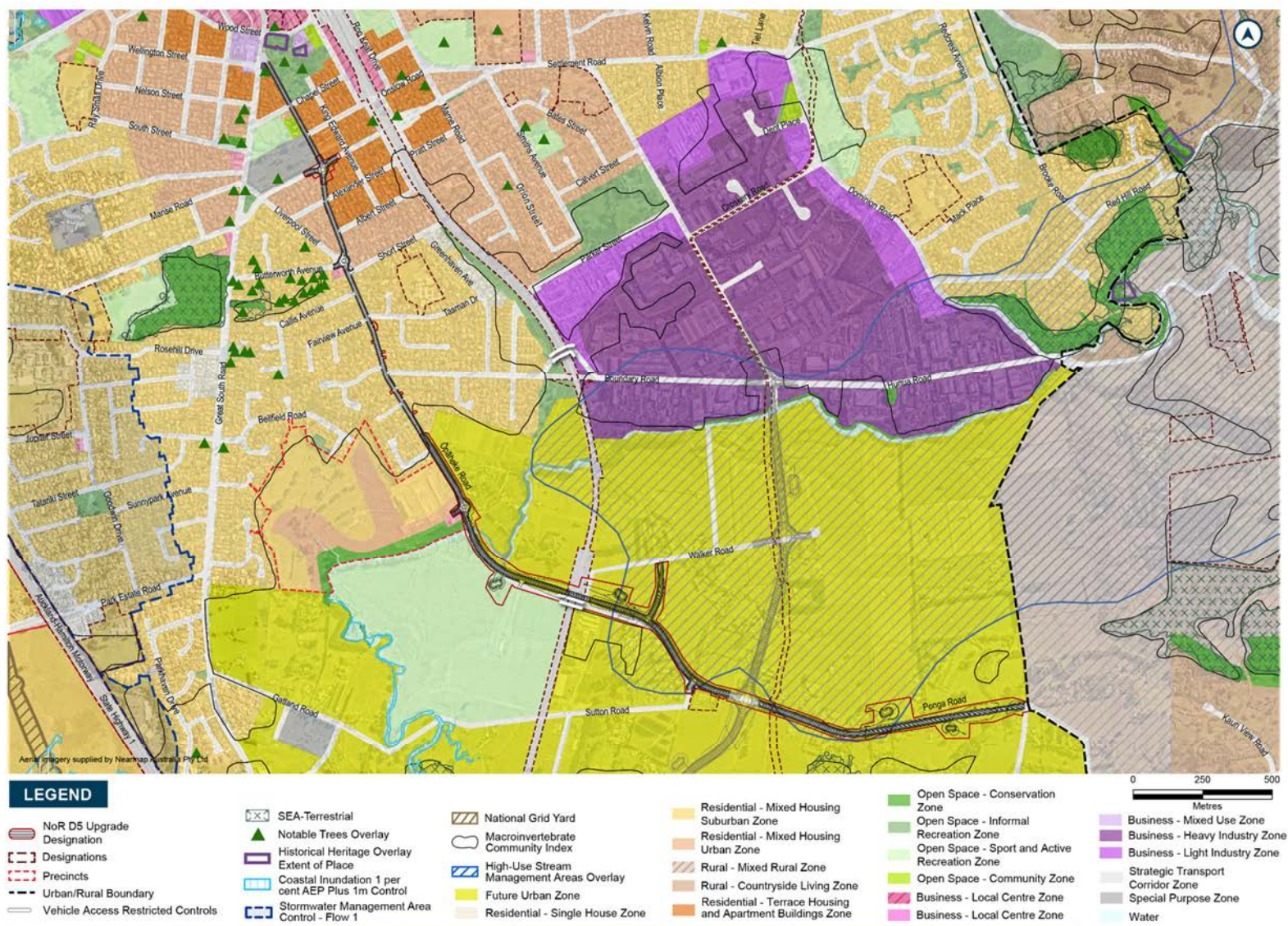


Figure 35-1: NoR D5 Planning Context (AUPOIP)

35.2 Human Environment

Table 35-2: NoR D5 Summary of Existing and Likely Future Human Environment

Land Use and Urban Form	Existing Environment The existing land use environment is illustrated in Figure 35-2. In the north of the Project area land use is largely established low to medium density residential. Papakura Cemetery is located at the intersection of Ōpāheke Road and Settlement Road. On the north side of Ōtūwairoa Stream construction of a medium to high density residential development (Bellfield Estate) within the Ōpāheke 1 Precinct has begun. Bellfield Estate is 22 hectares in size and has been master planned to integrate with Ōpāheke Reserve. Bellfield Estate is currently being prepared for 500 new homes, both terraced housing and standalone housing. In the south, the existing land use is semi-rural with low density housing/lifestyle blocks, home businesses (i.e. bed and breakfasts) and rural businesses including a storage facility and farming. Passive and active recreational land use is prominent in the south including the Ōpāheke Reserve which has recently undergone upgrades. Likely Future Environment The land surrounding the proposed alignment in Ōpāheke is mostly zoned FUZ and forms part of the southern growth area and Drury-Ōpāheke Structure Plan area. The area is planned to undergo significant growth and change in the future. At the north of the alignment in Ōpāheke / Papakura, the environment is an existing residential urban area with a low likelihood of significant change in urban form. The likely future land use environment in which the Project will operate is assumed to be an urban or developing urban environment. Existing urban areas and recreational uses are anticipated to remain however it is expected intensification and redevelopment will occur to support the expanding urbanised area. Based on the Drury-Ōpāheke Structure Plan, the land use pattern surrounding the Project is planned to be largely medium density residential, with a neighbourhood centre north west of Ōtūwairoa Stream, a small centre on Ponga Road, and a light industrial area to the north west (see Figure 35-3). A new park is also proposed within the structure plan on Ponga Road. The final urban form of the existing FUZ areas has yet to be confirmed but the land use outcomes in these areas, as anticipated by the AUPOIP zoning proposed throughout the Drury-Ōpāheke Structure Plan is summarised below. Table 35-3: NoR D5 Anticipated Urban Form <table> <tr> <th>Zone</th><th>Anticipated Outcomes</th></tr> <tr> <td>Residential – Mixed Housing Urban</td><td>Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.</td></tr> <tr> <td>Residential – Mixed Housing Suburban</td><td>Development is typically two storey detached and attached housing in a variety of types and sizes.</td></tr> <tr> <td>Business –Centre</td><td>Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a focus for commercial activities and growth. Depending on the final centre zone</td></tr> <tr> <td>Business – Light Industry</td><td>Anticipates industrial activities that do not generate objectionable odour, dust or noise. This includes manufacturing, production, logistics, storage, transport and distribution activities.</td></tr> </table>	Zone	Anticipated Outcomes	Residential – Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.	Residential – Mixed Housing Suburban	Development is typically two storey detached and attached housing in a variety of types and sizes.	Business –Centre	Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a focus for commercial activities and growth. Depending on the final centre zone	Business – Light Industry	Anticipates industrial activities that do not generate objectionable odour, dust or noise. This includes manufacturing, production, logistics, storage, transport and distribution activities.
Zone	Anticipated Outcomes										
Residential – Mixed Housing Urban	Development typically up to three storeys in a variety of sizes and forms, including detached dwellings, terrace housing and low-rise apartments.										
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Business –Centre	Provides for a wide range of activities including commercial, leisure, residential, tourist, cultural, community and civic services, providing a focus for commercial activities and growth. Depending on the final centre zone										
Business – Light Industry	Anticipates industrial activities that do not generate objectionable odour, dust or noise. This includes manufacturing, production, logistics, storage, transport and distribution activities.										

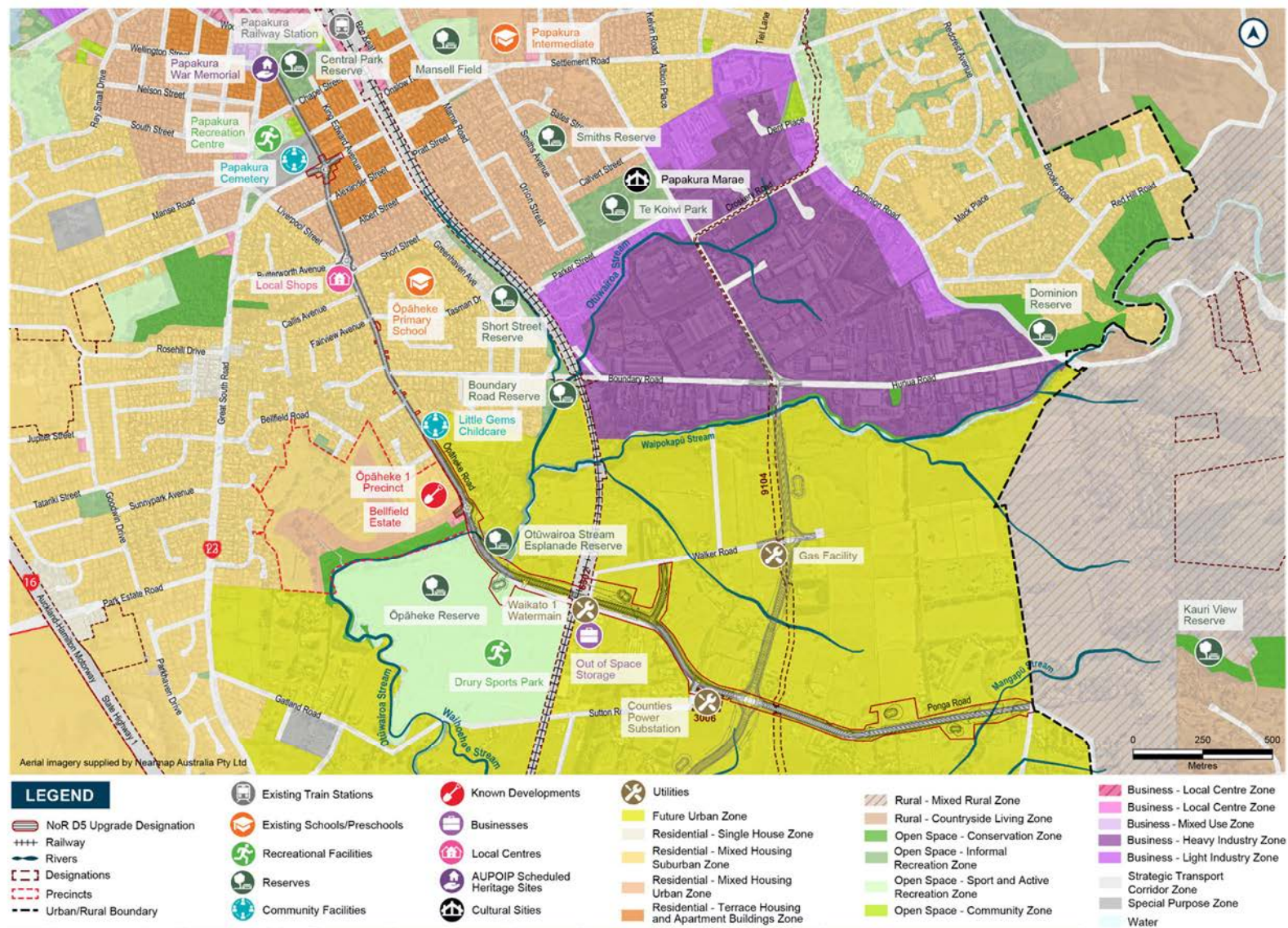


Figure 35-2: NoR D5 Existing Environment – Land Use and Urban Form

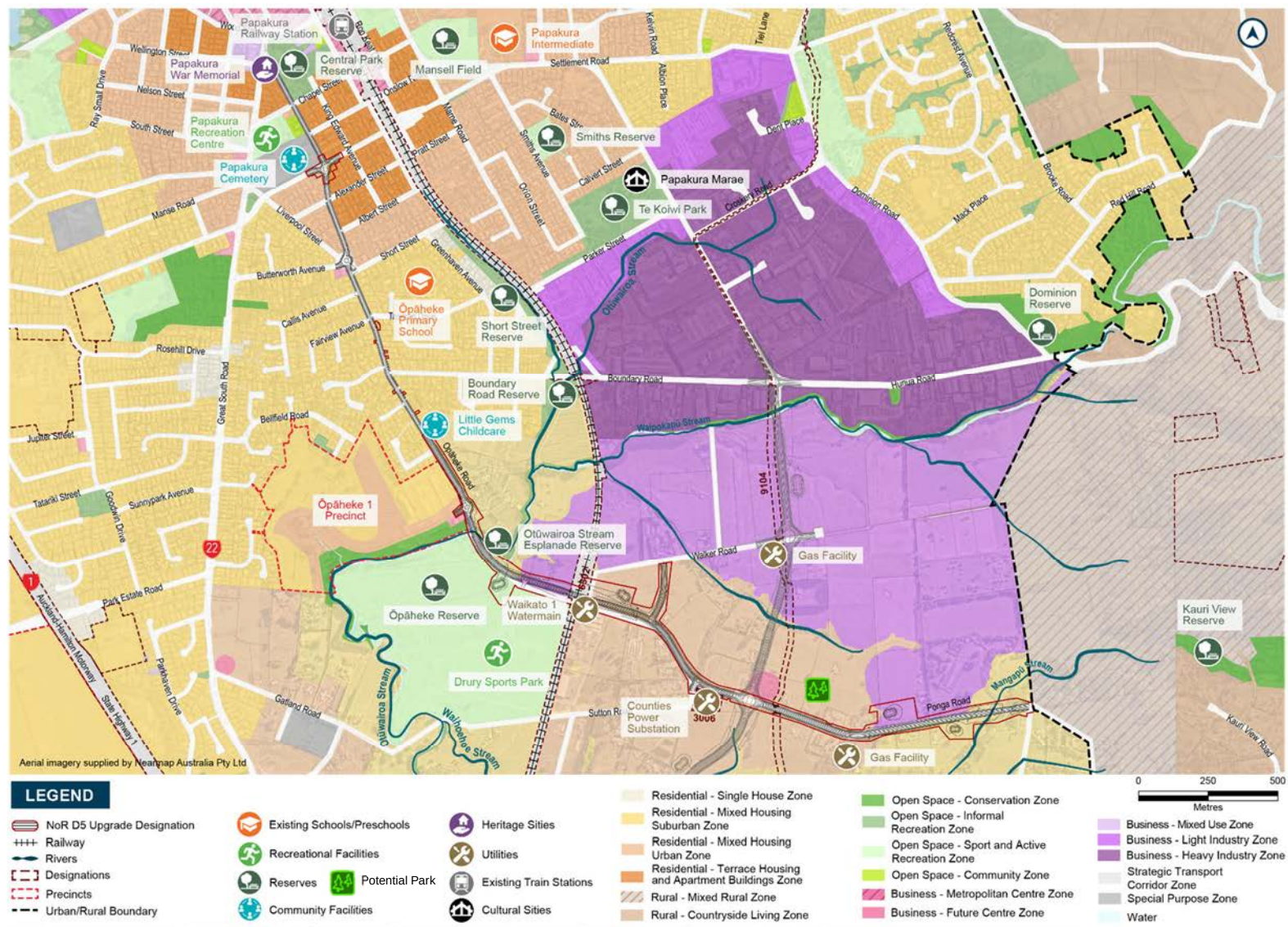


Figure 35-3: NoR D5 Likely Future Environment – Land Use and Urban Form

Transport

The following text provides a summary of the existing and likely future transport environment relating to the Project. A more detailed description of the transport environment is provided within the Assessment of Transport Effects within Volume 4 of this Document set.

Existing Environment

The existing road network can be summarised as follows:

- Ponga Road and Ōpāheke Road (within the FUZ) are two-lane primary collectors, with a posted speed limit of 80kph. They have no active transport facilities. The corridor has no public transport services or facilities.
- Ōpāheke Road (in the existing urban area) in the north, is a two-lane primary collector with a posted speed of 50kph and walking facilities. There are no cycling facilities.
- All the intersections within the Project area, apart from the intersection at Settlement Road and Ōpāheke Road, are priority controlled with no safe active transport crossing facilities.
- Local access roads to neighbouring areas consist of Jack Paterson Road, Sutton Road, Walker Road and Settlement Road with a number of direct property accesses along the corridor.
- Ōpāheke Road currently has a level crossing of the NIMT rail line.
- Over the past 10 years there was a total of 10 crashes on Ponga Road and 21 crashes on Ōpāheke Road with including a total of four serious injury crashes recorded.
- The existing traffic volumes on Ponga Road, Ōpāheke Road and adjacent roads are relatively uncongested (1600 ADT for Ponga Road and Ōpāheke Road).
- There are no public transport services or facilities on Ponga Road and the adjacent local roads. Route 374 uses the northern extent of Ōpāheke Road, up to the intersection with Boundary Road.
- The existing properties adjacent to Ōpāheke Road and Ponga Road currently have access directly onto the road.
- Ponga Road and Ōpāheke Road are not classified to have a high freight function based on the existing strategic freight network and the current Waka Kotahi over-dimension vehicle route and overweight route map.

Likely Future Environment

The planned growth in the Project area, and the transition from a rural to an urban land use environment, will put significant strain on the existing transport infrastructure. A number of planned future transport projects are identified in the Drury-Ōpāheke Structure Plan (subject to planning and funding approvals) and NZUP and will form part of the future transport network that will enable the planned growth to be realised. These are:

- New rail stations at Drury Central and Drury West *
- New Mill Road Corridor *
- SH 1 Papakura-to-Bombay Upgrade **
- Additional rail capacity between Pukekohe and Papakura **
- The other components of the Drury Package Arterial Network (proposed within this report) noting that there may be interim transport infrastructure provided by developers within the Drury Arterial Network (for example a local road built by developers which is later upgraded to an arterial)***
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas are urbanised.

Note: funding approved*, funding partially approved** and subject to planning and funding approvals***.(as at the date of this report).

Historic Heritage and Archaeological Values

The following text provides a summary of the existing and likely future environment as it relates to historic heritage and archaeological values. A more detailed description of the environment identified through research and site surveys is provided within the Assessment of Historic Heritage Effects within Volume 4 of this Document set.

Existing Environment

There are two historic sites within the proposed designation boundary. These are the Ōpāheke railway station (R12/1138, CHI 17176) and the Papakura Cemetery – Presbyterian Section (R12/1166, CHI 16001) both assessed as having moderate heritage values.

The following historic sites are located outside the proposed designation boundary however there is reasonable cause to suspect subsurface deposits may extend into the project footprint:

- US Military Camp, Ōpāheke East Camp, CHI site 17017
- US Military Camp, Ōpāheke East Camp, CHI site 17016
- Ōpāheke Sale Yards, CHI item 16004
- Historic Villa (22282), R12/1144
- Historic villa, CHI 22284, R12/1145
- Utility Building, CHI item 22281 (this building is within the proposed designation boundary of NoR D4)

There is reasonable cause to suspect previously unrecorded historic heritage sites may be present within the proposed designation. This is primarily based on streams and waterways present either side of the road which are areas of higher risk for historic heritage deposits. Additionally, the presence of historic villas in near the footprint suggests other historic structures may be found, such as bridges crossing Mangapū Stream. All unrecorded sites which predate the 1900s are protected under provisions of the HNZPT Act.

Likely Future Environment

The existing environment as it relates to historic heritage and archaeological values may change in the future. As the sites identified near the project area are not protected through the AUPOIP or other legislation it is possible that overtime, as the existing rural area develops, the sites could be adversely impacted or destroyed prior to construction of the transport corridor. In addition, there is a possibility that unknown sites could be uncovered during development of the area prior to construction of the transport corridor which would add to the historical understanding of the area.

Cultural Values

There are no identified Sites of Significance to Manawhenua identified under the AUPOIP within or in close proximity to the Project area.

The cultural values identified by Manawhenua within the Project area highlights the importance of maintenance and enhancement of water quality and ecological values, particularly areas of high indigenous values. The proximity of the Project to Ōtūwairoa and Mangapū Streams and their tributaries means the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage with the potential to uncover undiscovered archaeological sites. The Ōtūwairoa Stream and its tributaries (which includes Waipokapū Stream, Mangapū Stream and Waihoehoe Stream) are Ngāti Tamaoho statutory acknowledgement areas (Ngāti Tamaoho Deed of Settlement 30 April 2017).

Community and Recreational Facilities	Existing Environment Papakura Cemetery which holds social and cultural values is located at the northern extent of the Project area at the intersection of Ōpāheke Road and Settlement Road. The Veterans Affairs section of the cemetery is located adjacent to the existing road corridor. Recreation facilities along the corridor include Ōpāheke Reserve. The northern portion of the reserve is within the floodplain is generally passive recreation. The Bellfield Development, as part of agreements for the Ōpāheke 1 Precinct, is proposing to upgrade this northern part of the reserve. This is to assist in catering for flood flows and additional recreational facilities will be included also such as walking and bike tracks). The southern part of the reserve is a developing active recreation facility (sports complex) which has recently undergone carpark and utility upgrades to provide a future club room. The park is likely to provide for cricket and rugby. Schools near the proposal include Little Gems Childcare and Ōpāheke School to the north. To the north, Papakura is the closest centre that provides some community amenities including local shops, recreational facilities and library. Likely Future Environment In the future environment it is anticipated that Ōpāheke Reserve will be further developed and other the recreational and community activities will remain unchanged with facilities provided in Papakura. It is possible additional community facilities will be provided as development occurs and the population in the surrounding area grows. Schools in the area are expected to remain however could grow as the population in the area increases. It is anticipated Papakura Cemetery will remain. The Drury-Ōpāheke Structure Plan identifies a potential local centre and new suburb park at the western extent of Ponga Road on the northern side of the road.
Ambient Noise	The ambient noise environment is reflective of a rural environment where low noise levels are experienced with limited road traffic noise. Noise monitoring was carried out at 235 Jesmond Road and 116 Waihoehoe Road (as these sites were considered to be representative of the existing noise environment of the Project Areas) over seven days with noise levels recorded ranging between 46 - 49 dB LAeq(24hr). This ambient noise level is likely to change as the surrounding environment urbanises. Although no measurements were taken from an urban location (to reflect the noise environment at the northern extent of the Project area), computer noise modelling of existing noise levels has been shown to be generally accurate (within +/- 2 dB) and effective, particularly in the vicinity of existing roads.
Utilities	Existing Environment Major utilities in the Project area include: • The First Gas transmission pipeline (designation 9104) • The Counties Power substation is located at 9 Ponga Road • Counties Power overhead HV and MV lines • The Watercare Waikato 1 1200mm diameter watermain crosses the Project area from the north at Walker Road. The main runs east along the Project area for approximately 75 metres and then is directed south.

Property Details	Likely Future Environment As the areas surrounding the Project urbanises in the future it can be expected that existing utilities including the Counties Power substation and Waikato 1 watermain will remain, and it is likely additional utilities may be added. Existing overhead powerlines may be undergrounded as part of new development.
	67 properties directly affected, including: - Council owned land: 5 properties totalling approximately 8,733m² - Privately owned land: 60 properties totalling approximately 104,345m² - Railway: one property totalling approximately 4,120m² - Hydro: one property totalling approximately 227m²

35.3 Natural and Physical Environment

Table 35-4: NoR D5 Summary of Existing and likely Future Natural and Physical Environment

Geology	Existing Environment The area surrounding the Project is mapped as being underlain by Puketoka Formation alluvium over its full length. The alignment crosses the Waiau Fault. Within the alignment, the Waiau Fault is described as having downthrown >130m on the north. The result of these movements is that alluvial deposits to the northern end of the alignment, within the Seagrove Graben, are likely to be much thicker than at the southern end, within the Waiau Horst. At its eastern end the Project is approximately 300m west of the Drury Fault. The site sits within the associated Waiau Horst, with rock anticipated at a moderate elevation. Likely Future Environment The geological conditions are not anticipated to significantly vary in the future.
	Existing Environment Key watercourses within the Project area are Ōtūwairoa Stream and Mangapū Stream. Several overland flow paths also cross the existing roads through major culverts. As shown in Figure 35-4 flood prone areas exist along the road. A wide floodplain exists at Ōtūwairoa Stream which overtops the existing bridge on Ōpāheke Road. There is also flooding of properties upstream and downstream of the existing bridge crossing. The floodplain at Mangapū Stream also overtops Ponga Road. Likely Future Environment Although urban development is likely in the future the hydrological environment and natural hazard conditions are not anticipated to significantly vary in the future.

Terrestrial Ecology

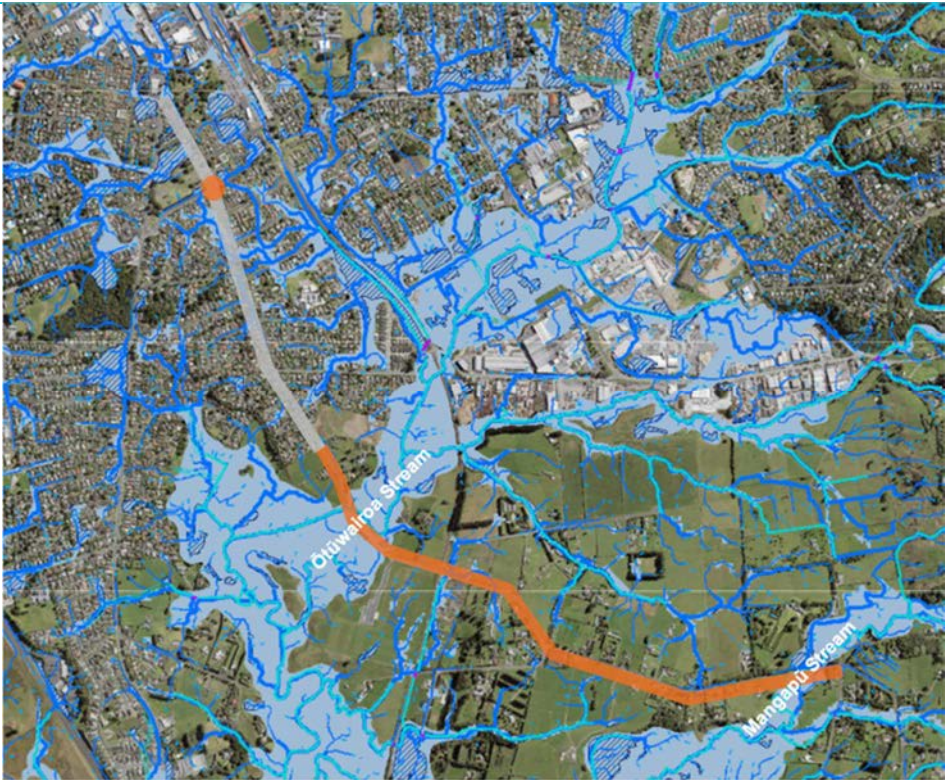


Figure 35-4 Hydrology and Natural Hazards surrounding the Project
(Source: Auckland Council GeoMaps, 2020)

The following text provides a summary of the existing and likely future environment as it relates to ecological features and values. A more detailed description of the environment is provided within the Assessment of Ecological Effects within Volume 4 of this Document set.

Existing Environment

The existing environment surrounding the Project area includes a number of habitats (including terrestrial, freshwater and wetland) and species.

Habitats

The existing terrestrial habitats are highly modified and are dominated by agricultural land, exotic grassland and amenity planting (gardens and parks) with small areas of exotic forest, exotic scrub, exotic wetlands, treeland and remnant forest fragments including critically endangered pūriri forest. Where natural habitat remains, SEAs are identified through the AUPOIP. There are no SEAs within or near to the proposed designation boundary.

The freshwater habitat within the Project area includes four stream branches. All streams are representative of degraded systems primarily due to historical indigenous vegetation clearance which has then been compounded by agricultural practices. This degradation of riparian vegetation and increased nutrient inputs has also led to loss of bank stability, reduced shading and the proliferation of exotic macrophytes within the streams.

	Additionally, many streams have been physically altered, through dredging, reclamation and/or drainage of associated wetlands and/or channelization. Three wetland habitats are identified within the Project area. The wetlands present are classified as highly modified, low value, exotic wetlands dominated by exotic species such as soft rush, Mercer grass, greater bird's-foot-trefoil, buttercup and Dallas grass. The wetlands have been highly degraded through factors such as vegetation removal, drainage and grazing and pugging from livestock. Species Automatic bat monitor (ABM) surveys were undertaken within the wider Drury Package area including within the Project area. The ABM survey results suggested that bats are not frequent visitors to the area during their mating and breeding seasons. However, despite bats not being detected within the area to date, the Project area does provide potential habitat features which would be suitable for use by foraging and commuting indigenous long-tailed bats. No At-Risk or Threatened bird species were found in the site investigations. One species of threatened forest bird, the North Island kākā, was identified in the desktop study as possibly being present. Suitable habitat for the species was identified within the Project area. Habitat availability for the Not Threatened copper skink was confirmed during site investigations, however no other suitable habitat for native lizards was found or considered likely within the Project area. No indigenous lizards were identified as incidental observations. However, the introduced plague skink was identified. During the site investigations, no indigenous frogs were identified as incidental observations and it is highly unlikely that native frog species would occur within the Project area due to lack of suitable habitat. No dedicated fish surveys were undertaken as this will be subject to a future resource consent phase. Likely Future Environment It is assumed that in a future urbanised scenario, permanent streams and areas of indigenous vegetation will generally be avoided and retained. Greater emphasis on the protection and enhancement of existing watercourses and areas of significant natural value, such as that surrounding Ōtūwairoa and Mangapū Streams, is given in the AUPOIP, requiring these areas to be accommodated within the future urban environment. It is also assumed that stormwater design will be integrated into the proposed 'Blue Green Network' and sediment and pollutants will be controlled at source. For example, if riparian habitat restoration is implemented appropriately, it is considered that in a future scenario many of the features of ecological value could be similar or in some cases enhanced.
Vegetation (Trees)	The following text provides a summary of the existing and likely future environment as it relates to trees. A more detailed description of the environment is provided within the Assessment of Arboricultural Effects within Volume 4 of this Document set. Existing Environment In the Ponga Road Upgrade Project area there are no trees that are protected by District Plan provisions. In the Ōpāheke Road Rural Upgrade Project area there are 18 trees in the Project area are protected by District Plan provisions (as identified in within the Assessment of Arboricultural Effects).

	In the Ōpāheke Road Urban Upgrade Project area there are no trees affected by the proposed works that are protected by the AUPOIP. Likely Future Environment The trees within the proposed designation currently provide a range of cultural, amenity, landscape and ecological values. These values will generally increase over the timeframes that may apply to the NoR for road corridor designation. However, the future environment for trees in the Ponga Road Upgrade and Ōpāheke Road Rural Upgrade Project area is likely to be very different as the land use pattern and zoning changes from rural and FUZ to urban. This change is likely to result in removal of trees that are not protected by the current plan framework. Removal of trees can therefore be expected to occur as the land use changes from a rural environment to an urban environment in the future. The planting of new trees would also occur as part of an urban landscape.
Topography and Landscape Context	The following text provides a summary of the existing and likely future environment as it relates to landscape features and values. A more detailed description of the environment is provided within the Assessment of Landscape and Visual Effects within Volume 4 of this Document set. Existing Environment There are no regionally or nationally significant landscapes (ONLs, ONFs, HNC or ONCs) within or proximate to the Project area. The Project is situated within a broader landscape that has been assessed by the AUPOIP as being suitable for urbanisation. The Ponga Road Upgrade Project area is situated within the existing Ponga Road corridor and extends into adjacent land that is characterised by flat and low undulating landform to the south and lowland floodplains of the Mangapū Stream and gently rolling landform accommodating to the north, both of rural character. Vegetation cover comprises areas of remnant indigenous forest outside of the Project area, mature English Oak trees on the southern side of the existing road corridor. Several SEAs are located outside of the Project area and enrich the landscape character values of the contextual setting of the wider area including extensive areas of indigenous forest within the elevated Hunua Ranges foothills directly east of the Project area, forming the backdrop to the local landscape. The Ōpāheke Road Rural Upgrade Project area is situated within the existing Ponga Road and Ōpāheke Road corridor and extends into adjacent land that is characterised by flat to low undulating rural lifestyle blocks, becoming increasingly urban towards the northern extent of the corridor adjacent to Bellfield Estate. Landscape amenity of the Project area is heightened by Ōpāheke Reserve and the constructed wetland with native planting within the reserve, the recently upgraded sporting facilities and the mature native and exotic trees within the Ōtūwairoa Stream riparian corridor. Ōpāheke Reserve and its proximity to Ōtūwairoa Stream contribute to the localised landscape and natural character values of the Project area. The Ōpāheke Road Urban Upgrade Project area is situated within the existing road corridor, within an established residential area. Existing topography though this section is generally flat and open and landscape features include typical residential elements such as boundary fencing, garden plantings and roadside vegetation (within the road reserve and private property boundaries) as well as the existing streetscape elements of the road corridor. Papakura Cemetery is a prominent feature within the visual composition of the existing intersection. Likely Future Environment

The rural land adjacent to the Ponga Road Upgrade and Ōpāheke Road Rural Upgrade Project area will witness a significant change from rural to urban land use and character over the next 30 years. The quality and natural character values of open space, riparian and wetland environments such as the Ōtūwairoa Stream and the existing mature native and exotic trees along the margins will endure future development and perhaps even underpin much of the localised urban framework. These environments are generally anticipated to be retained and, in some instances, enhanced as urban development progresses, in accordance with the policy direction of the AUPOIP which generally seeks to protect and enhance these landscape features.

It is expected that the less defining vegetative features of the Project area and local landscape will make way for new urban development, which will likely include street tree plantings, public open space design and planting within private yards.

The proposed Mill Road project, which has funding under the NZUP programme and will intersect with the Ponga Road Upgrade in the east, represents a substantial infrastructure project that is likely to further delineate the landscape character of the rural land in the area.

Land surrounding the Ōpāheke Road Urban Upgrade has been up zoned through the AUPOIP to more intensive residential zone. As such, a more compact form of urban development is anticipated to evolve in the future within the local context of the Project section area.

36 Ponga and Ōpāheke Road Upgrade: Consideration of Alternatives

A detailed assessment of alternatives was undertaken for the Project to identify the proposed route (process is described in Section 4.2 and further outlined in the Alternatives Assessment Report attached at Appendix A). The following sections provide an overview of the alternatives assessment process through the corridor assessment (IBC Phase) to the route refinement assessment (DBC and NoR Phase). This summary should be read in conjunction with the full assessment, including the process undertaken and outcomes reached, provided in the Alternatives Assessment Report attached at Appendix A.

36.1 Ponga Road Upgrade Section

36.1.1 Corridor Alternatives Assessment

TFUG recommended a new connection through the FUZ rather than upgrading the existing Ponga Road.

During the corridor alternatives assessment, the upgrade of Hunua and Boundary Roads were investigated as well as the upgrade of Ōpāheke and Ponga Roads at the short list stage.

Although the upgrade of Ponga Road was identified to potentially affect a large number of properties (it was envisioned as a 30m wide cross section), particularly through earthworks, and works would be required in a floodplain and require stream crossings, it was recommended as a preferred corridor because, in combination with Ōpāheke Road, it was assessed to have greater network benefit function connecting FUZ areas to Papakura, employment areas to the north and the proposed Mill Road corridor over the upgrade of Hunua Road and Boundary Road. The Ponga Road connection was generally supported in public consultation.

The figures below show the long list and short list options considered in the IBC.

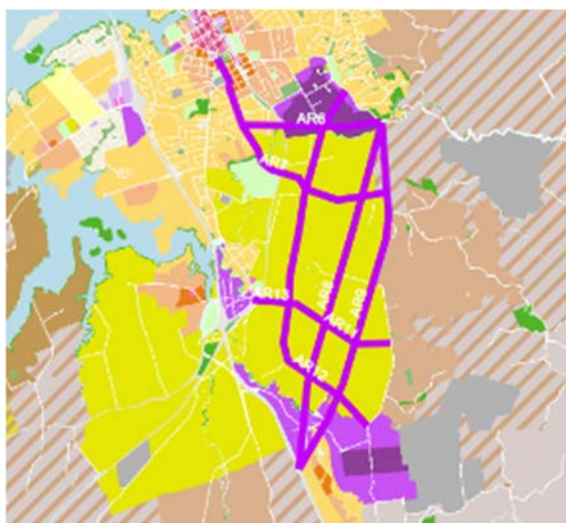


Figure 36-1: IBC Drury East Long List Options

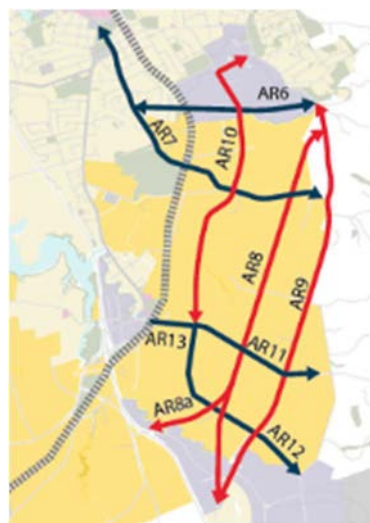


Figure 36-2: IBC Drury East Short List Options

36.1.2 Route Refinement Alternatives Assessment

36.1.2.1 Option Development

Route refinement for the Ponga Road Upgrade included specialist assessment of three options from Ōpāheke Road to Jack Paterson Road:

- Option A – widening to the north of the existing road
- Option B – widening to the south of the existing road
- Option C – widening to both sides of the existing road

The three options for the Ponga Road Upgrade are shown in Figure 36-3.

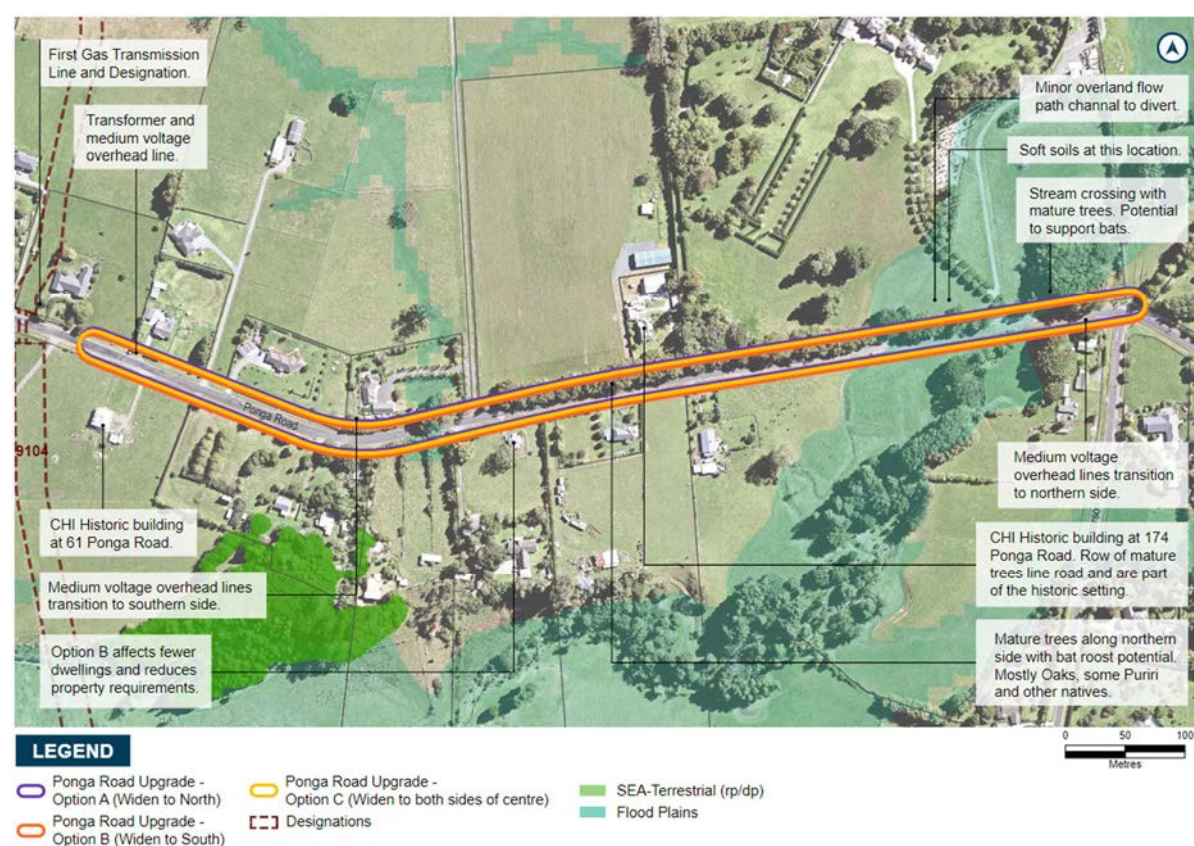


Figure 36-3: Ponga Road Upgrade Options for route refinement showing constraints and considerations

36.1.2.2 Assessment

The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 36-3. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners and landowners.

36.1.2.3 Preferred Option

The preferred option (Option B) is to widen generally to the south of the existing road corridor. The preferred option was chosen because:

- This option has less immediate effects on dwellings resulting in less property acquisition.

- This option reduces impacts on mature trees on the northern side of the road corridor which contribute to ecological (trees may support roosting 'Threatened: Nationally Critical' long tailed bats), heritage and amenity values.

Although a number of heritage sites were identified, none of the options impact these. All route refinement options provided the same level of achievement against the transport outcomes.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the Project has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

36.1.2.4 Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 36-1: Discounted Options - SH22 Upgrade

Option	Reasons for discounting
Option A	• This option would impact on mature trees which contribute to heritage, ecological (trees may support roosting 'Threatened: Nationally Critical' long tailed bats) and amenity values. • This option will result in greater property impacts
Option C	• This option would impact on mature trees which contribute to heritage, ecological (trees may support roosting 'Threatened: Nationally Critical' long tailed bats) and amenity values. • This option will result in greater property impacts • Temporary traffic management during construction more complex

36.1.2.5 Intersection Form

Along this corridor, there is one intersection to be upgraded at Ōpāheke N-S FTN Arterial and Ōpāheke Road. This intersection is included in the Ōpāheke N-S FTN Arterial corridor and is assessed in Section 29.2.2.3.

36.1.2.6 Summary

The preferred option for the Ponga Road Upgrade was Option B, widening to the south of the existing road corridor to reduce impacts where possible. Through the intersection form assessment it was recommended that a roundabout be implemented at the Ponga Road intersection with Ōpāheke N-S FTN Arterial and Ōpāheke Road.

36.2 Ōpāheke Road Upgrade

36.2.1 Corridor Alternatives Assessment

TFUG recommended upgrading Ōpāheke Road. During the corridor alternatives assessment, a number of new and upgraded arterials were investigated in Ōpāheke and Drury East. This included the upgrade of Hunua and Boundary Roads as well as the upgrade of Ōpāheke Road and Ponga Road at the short list stage. Upgrade of Ōpāheke Road included removal of a level crossing, which was identified to address safety concerns and assist in making the road run more efficiently (particularly for public transport). It provides access to the proposed Ōpāheke N-S FTN Arterial and continuing onto Ponga Road to access the proposed Mill Road corridor and supports high demand for bus trips on Ōpāheke Road. The upgrade of Ōpāheke and Ponga Roads (AR 7 as shown in Figure 36-5) were assessed to have greater network benefit function connecting FUZ areas to Papakura, employment areas to the north and the proposed Mill Road corridor.

The IBC did indicate that upgrade of Ōpāheke Road could potentially affect a large number of properties (envisioned as a 30m wide cross section), particularly through earthworks, and that the works would be required in a floodplain and stream crossings would be required. The Ōpāheke Road connection was generally supported in public consultation. The figures below show the long list and short list options considered during the corridor assessment.

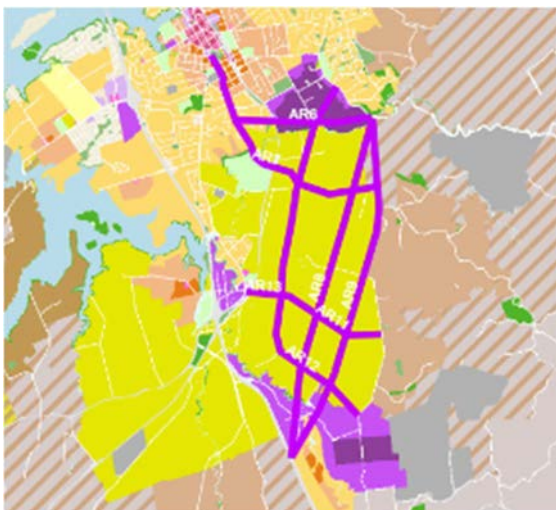


Figure 36-4: IBC Drury East Long List Options

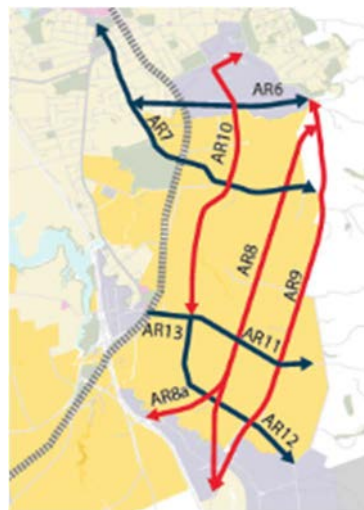


Figure 36-5: IBC Drury East Short List Options

36.2.2 Route Refinement Alternatives Assessment

The route refinement of Ōpāheke Road was separated into the Ōpāheke Road Rural Upgrade and Ōpāheke Road Urban Upgrade for assessment.

36.2.2.1 Ōpāheke Road Rural Upgrade

Option Development

Route refinement for the Ōpāheke Road Rural Upgrade included specialist assessment of three options from Ponga Road to just north of Lorelei Place (northern extent of the FUZ):

- Option A – widening to the northeast of the existing road
- Option B – widening to the southwest of the existing road
- Option C – widening to both sides of the existing road.

The three options for the Ōpāheke Road Rural Upgrade are shown in Figure 36-6.

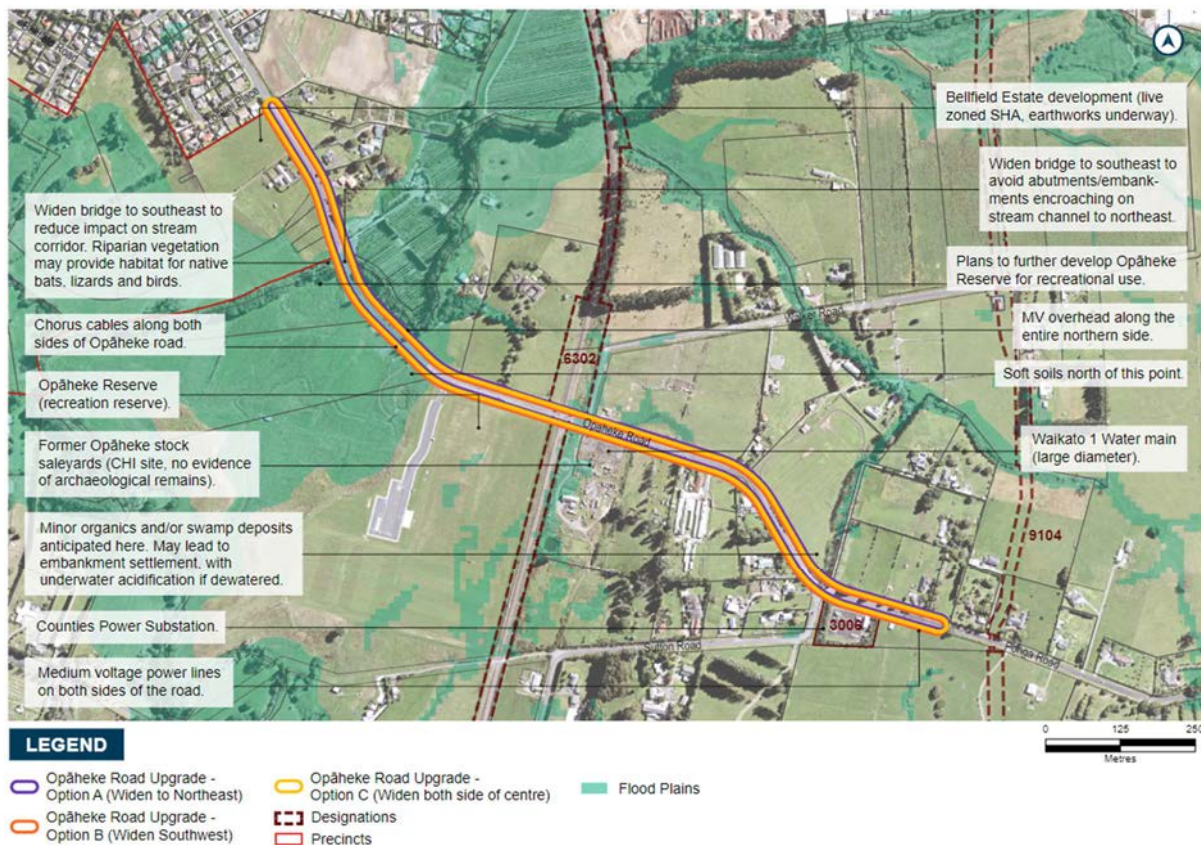


Figure 36-6: Ōpāheke Road Rural Upgrade Options for route refinement showing constraints and considerations

Assessment

The three options were qualitatively assessed against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 36-6. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners and landowners.

Preferred Option

The preferred option (Option A) is to widen generally to the north-east of the existing road corridor. The preferred option was chosen because this option:

- Reduces property impacts including on live-zoned property and special housing area to the southwest that is currently under development.
- Has less impact on Auckland Council Parks land (recreational uses) and conservation zoned land
- Reduces impact on cultural heritage sites
- Reduces impacts on utilities, specifically the Counties Power Substation.

All route refinement options provided the same level of achievement against the transport outcomes.

Following identification of the preferred option, discussions were undertaken with Watercare on the Waikato 1 watermain within the alignment, east of the NIMT rail line. Design refinement was undertaken to shift the alignment at this location further to the north (preferred side for widening) to avoid impacts on the watermain. This also provided other benefits including reducing impact on the Ōpāheke Reserve sports fields and meant the Ōpāheke NIMT bridge could be constructed offline which has construction traffic and programme benefits. This design change was discussed with all technical specialists at a team workshop and confirmed.

As a result of realigning Ōpāheke Road further to the north, access for the properties on the southern side of Ōpāheke Road would need to be re-routed. Two options were considered:

1. Utilise the existing Ōpāheke Road alignment providing a connection to the new alignment in the east
2. Provide a new connection to Walker Road in the north with access provided via Walker Road under the NIMT rail bridge.

Utilising the existing Ōpāheke Road alignment was discounted due to geometric and safety concerns of the angle of the connection to the new alignment and location of the connection on a corner. Therefore, providing a new link to Walker Road was recommended as it provided the access required and enabled a safe tie in with the proposed alignment.

Subsequent to the preferred option being identified, a revised national freshwater policy statement and new freshwater regulations came into effect (the National Policy Statement for Freshwater Management 2020 and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020), which gives greater protection to natural inland wetlands and streams. Given this new policy direction, the Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for the Project has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. As a result, no further design refinement is required at this stage.

Discounted Options

The following table summarises the reasons for discounting the remaining two options.

Table 36-2: Discounted Options - Ōpāheke Road Rural Upgrade

Option	Reasons for discounting
Option B	• Greatest impact on heritage features. • Greatest impact on property including on live zoned special housing area currently under development. • This option will result in greater property impacts • Relocation of the Counties Power Substation would be required.
Option C	• Impacts on heritage features. • Greater impact on property including on live zoned special housing area currently under development. • Relocation of the Counties Power Substation would be required. • Temporary traffic management during construction more complex

Intersection Form

Along this corridor, there are two intersections to be upgraded. A summary of the assessment of alternative intersection forms is provided below with further detail provided within the Assessment of Alternatives report (Appendix A). The preferred intersection form was used to inform the proposed designation boundary while allowing flexibility in intersection design in the future:

- **Ōpāheke Road / Bellfield Estate Development:** Roundabout preferred because:
- Roundabout works better for single lane approaches as an overall design
- **Ōpāheke N-S FTN Arterial / Ōpāheke Road:** Intersection included within the Ōpāheke N-S FTN Arterial Corridor (Section 29.2.2.3).

36.2.2.2 Ōpāheke Road Urban Upgrade Section

Option Development

The Ōpāheke Road Urban Upgrade will upgrade Ōpāheke Road to a 20m cross section improving the active transport facilities along the corridor. Generally the proposed works can be accommodated within the existing road corridor except for the Ōpāheke Road / Settlement Road intersection. Therefore, options were developed for the Ōpāheke Road / Settlement Road intersection to investigate the most appropriate intersection treatment within the existing urban environment. This included specialist assessment of four options:

- Option A – signalised intersection with active modes
- Option B – roundabout in centre of existing intersection
- Option C – roundabout on eastern side (Settlement Road)
- Option D – roundabout on southern side (Ōpāheke Road)

The four options for the Ōpāheke Road / Settlement Road intersection are shown in Figure 36-7 to Figure 36-10.



Figure 36-7: Option A – Signalised intersection with active modes

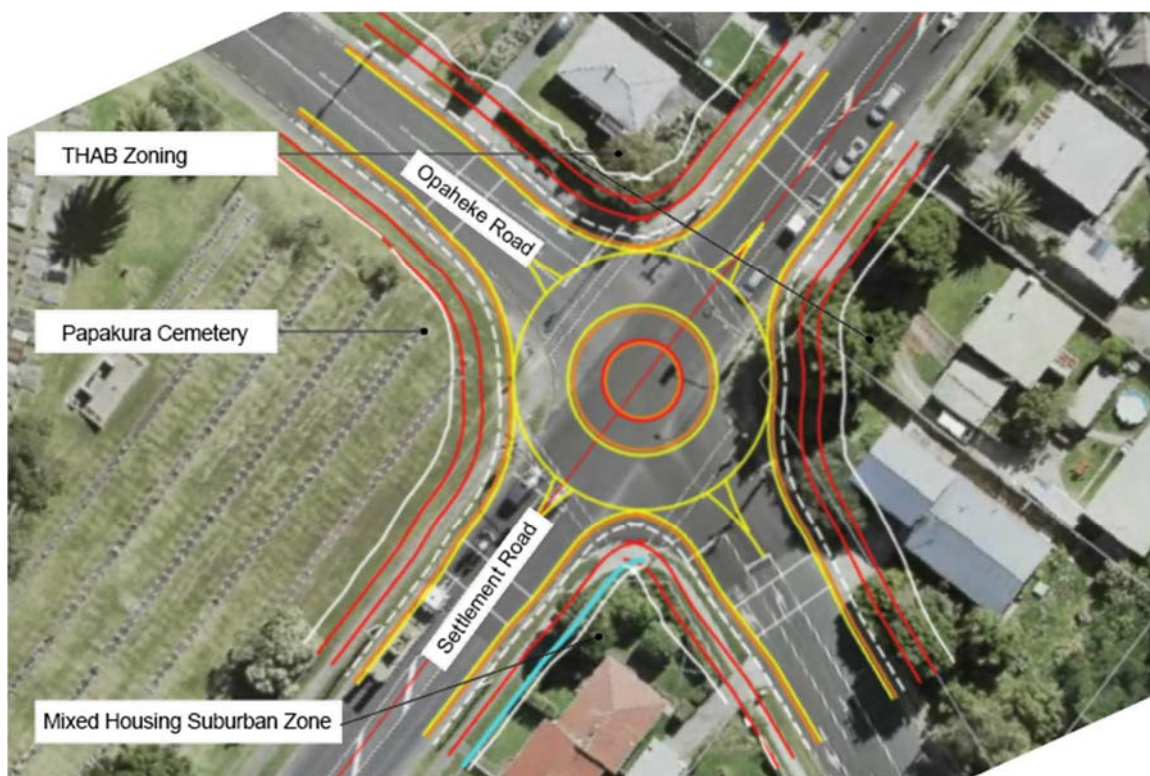


Figure 36-8: Option B – Roundabout in centre of existing intersection



Figure 36-9: Option C – Roundabout on eastern side (Settlement Road)



Figure 36-10: Option D – Roundabout on southern side (Ōpāheke Road)

Assessment

The four options were qualitatively assessed against the MCA framework by subject matter experts. In determining the preferred option, the Project Team took into consideration the MCA assessment and the engagement undertaken with project partners.

Preferred Option

Following further investigation and engagement with project partners, a preferred option for the Ōpāheke Road / Settlement Road intersection was identified. Although being more expensive and having more property impacts than Option A, the preferred option (Option D) is to upgrade the active mode facilities with a southern roundabout at the Ōpāheke Road/ Settlement Road intersection. The preferred option was chosen because:

- It meets transport outcomes (improves connectivity, mode shift, high quality active modes)
- Provides additional safety outcomes with a roundabout (reduces the number of potential conflicts).
- Has minimal impact on the Papakura Cemetery
- It does not compromise on, and allows enough room for a high quality, active mode upgrade for an area zoned for residential growth (THAB).

An opportunity recognised with this option was that it provides for more flexibility for any future upgrades on Settlement Road and connections to Papakura Station.

Discounted Options

The following table summarises the reasons for discounting the remaining three options.

Table 36-3: Discounted Options - Ōpāheke Road / Settlement Road Intersection

Option	Reasons for discounting
Option A	• Does not have sufficient space to accommodate the active modes upgrade as well as adequate berm and kerb space required. • Would lock in a sub-standard facility • Lower level of safety for road users (compared to the other options) • Requires works within the Papakura Cemetery • Proximity to burial plots – would require approval from Local Board and Auckland Council. Consultation with Returned Services Association and potentially the family of the adjacent burial plots. • Takes slivers off the properties which may compromise the viability for the owners for future development (in THAB zone).
Option B	This option was discounted because the significant impacts on burial plots in Papakura Cemetery.
Option C	• Residual developable area would be more triangular shaped parcels, reducing the viability for reintegration of land for disposal after the Project • Unlikely to be an appropriate intersection treatment due to the sharp turn radius in the south-western quadrant

36.2.3 Summary

The preferred option for the Ōpāheke Road Rural Upgrade was Option A, widening to the northeast of the existing road corridor to minimise impacts where possible. This includes the grade separation (new bridge) crossing the NIMT.

Through the intersection form assessment for the Ōpāheke Road Rural Upgrade it was recommended that roundabouts be implemented at the Ōpāheke Road intersections with Bellfield Estate and Ōpāheke N-S FTN Arterial and Ponga Road.

The preferred option for the Ōpāheke Road / Settlement Road intersection was Option D, southern roundabout on Ōpāheke Road because it avoids the Papakura Cemetery, has improved safety outcomes and is the most appropriate intersection treatment.

37 Ponga and Ōpāheke Road Upgrade: Assessment of Effects on the Environment

This section summarises the actual and potential effects of the construction, operation and maintenance of the Ponga and Ōpāheke Road Upgrade, including whether these effects are positive or adverse and the scale, duration and location of effects.

Key transport outcomes, land use integration and the avoidance of adverse effects on area or features of high value have been key drivers for the identification and selection of the proposed designation corridor and the subsequent refinement of the corridor. Where avoidance has not been possible, measure to remedy or mitigate significant adverse effects have been proposed. Details of these are included in Section 38 and reflected in proposed designation conditions.

37.1 Positive Effects

The Project will generate a range of positive effects. The nature and degree of these positive effects are discussed in subsequent sections of the AEE, but in summary:

- The Project will provide transport infrastructure necessary to support and integrate with the planned urban growth in Drury-Ōpāheke. The Project will unlock development capacity in the southern growth area where development pressure is accelerating. This is evident from recent private plan changes being lodged with Auckland Council.
- The Project provides a safe, reliable arterial corridor that will support growth, enable sustainable travel choice, address safety concerns and significantly improve access to employment and social amenities. This will improve the way people live in terms of daily commutes and connecting to the community. In particular, it will:
 - Provide significantly improved transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport, which will significantly reduce the risk of DSIs;
 - The grade separation of the NIMT with Ōpāheke Road will reduce crash risk and general traffic delay between road users and any existing and future rail services;
 - The Project will unlock safe and sustainable east-west mode choices and will connect to future strategic North-South corridors (Mill Road and the Ōpāheke North-South FTN Arterial), and to Papakura township;
 - The upgrade will integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors;
 - Improved active mode connectivity to recreational facilities including Ōpāheke Reserve and the Ōpāheke Reserve Sports Park including the ability to tie into the proposed greenways and recreational corridors anticipated by the Drury -Ōpāheke Structure Plan, Blue-Green Network;
- The Project will improve flood resilience and prevent floods overtopping Ponga Road at Mangapū Stream through the replacement of the existing twin 2000 dia. culverts to a bridge and raising the road alignment.
- Slower speed limits adjacent to existing dwellings and commercial activities and an improved streetscape will improve the experiential qualities of the corridor for users and private properties adjacent to the road corridor.

- Net increase in green infrastructure within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences.
- The Project will provide health and wellbeing benefits to the wider community through providing active mode and public transport choices.
- Opportunities to present any new historic information identified during the works to the community through information boards and other displays as the historic heritage of the area is currently not well understood.

37.2 Traffic and Transportation

The potential effects of the Project on traffic and transportation have been assessed in the Assessment of Transport Effects report, provided in Volume 4. The effects assessment has been assessed on the likely future environment, based on the full build out of the southern growth areas in 2048+, and taking into account relevant wider infrastructure upgrades. This methodology is outlined in the Assessment of Transport Effects Report. The potential effects are summarised below and should be read in conjunction with that report.

37.2.1 Positive Effects

The Project will have significant positive traffic and transportation effects. It will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, addresses safety concerns and improves access to employment and social amenities.

The Project will significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, active mode and public transport. The upgrade will also unlock safe and sustainable east-west mode choices and connects to future strategic north-south corridors (Mill Road and the Ōpāheke N-S FTN Arterial, and to the Papakura township).

The provision of additional segregated active transport facilities will significantly improve safety for vulnerable users and significantly reduce the risk for DSIs. The grade separation of the NIMT with Ōpāheke Road will eliminate any crash risk and general traffic delay between road users and any existing and future rail services.

The upgrade will integrate well with surrounding land use and the wider transport network to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors. The positive effects of the Project are discussed in further detail in the assessment of operational effects below.

37.2.2 Operational Effects

The existing Ponga and Ōpāheke Roads are not fit for purpose to support the planned future urban growth. For Ponga Road, the average ADT is expected to increase from 1,600 (2016) to 5,400 in 2048+ and on Ōpāheke Road from 1,600 (2016) to 6,000 in 2048+. It is also anticipated that the number of pedestrians and cyclists will increase significantly when the area is fully urbanised.

There are significant adverse effects expected if future growth progresses and existing transport infrastructure remains the same. These adverse effects include increased safety risk for all users, unsafe environments for active modes and decreased reliability for general traffic and public transport.

The existing high-speed environment coupled with the increase in traffic as a result of the growth and lack of dedicated active transport facilities will create a hostile environment for vulnerable road users.

37.2.2.1 General Transport Effects

The Project proposes that the function of Ponga Road and Ōpāheke Road (Rural and Urban section) change from an existing rural/urban two-lane collector road to an urban two-lane arterial catering for vehicles, public transport and active modes. The proposed design includes dedicated active transport facilities on both sides of the road, and central medians (either flush or raised) for Ponga Road and Ōpāheke Road (Rural section), to separate the two directions of traffic movements and include grade separation of the NIMT with Ōpāheke Road. This will eliminate any crash risk and general traffic delay between road users and any existing and future rail services.

The Ōpāheke Road (Urban section) also includes an upgrade of the Ōpāheke Road / Settlement Road intersection to a roundabout with separated active transport facilities, including crossing facilities and the re-grade of nine driveways. Although the Project does not provide additional corridor capacity for general traffic, upgrading and separating the existing transport facilities will result in significant positive safety effects.

37.2.2.2 Safety Effects

The Project has been designed with consideration of the latest safety guidance, including AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrades that comprise NoR D5 are expected to result in positive effects on safety including:

- Separated and protected walking and cycling facilities on Ponga Road and Ōpāheke Road which will significantly improve the safety for existing and future vulnerable road users
- Reduced speed environment from 80kph to the more appropriate speed of 50kph which will significantly improve safety for all users in rural sections
- Appropriate vehicle lane widths and delineations to enhance the urban-type road environment which will improve safety in rural sections
- A centre median (flush or raised) that separates the two directions of traffic which will prevent head on crashes in rural sections
- Realignment of a section of Ōpāheke Road and grade separation of the NIMT with Ōpāheke Road which will eliminate any crash risk between road users and existing and future rail services.

Overall, the proposed design of Ponga Road and the Ōpāheke Road Upgrade is well aligned with the transport safety principles from AT and it will provide a much safer transport system with positive effects on all road users.

37.2.2.3 Walking and Cycling effects

Walking and cycling are key components to the future environment surrounding Ponga Road and Ōpāheke Road. There are several key attractors which suggest walking and cycling will significantly increase as growth progresses in the Drury and Ōpāheke, including the proposed future land use zoning and the wider connections that this corridor will have to other key corridors (i.e. the Mill Road corridor and the new Ōpāheke N-S FTN Arterial).

The Project proposes to reduce the speed to 50km/h, repurpose Ponga Road and Ōpāheke Road (Rural section) to an urban arterial, and provide segregated walking and cycling facilities on both

sides of the road to support growth, enable sustainable travel choice and combat expected safety concerns.

The Project will have a number of positive effects on walking and cycling, including that it will:

- Enable safe movement for vulnerable road users along and across Ponga Road and Ōpāheke Road and significantly reduce the likelihood and exposure to potential crashes
- Provide good integration with the future walking and cycling network, especially between the future Mill Road and Papakura township
- Reduce reliance on vehicle trips through the higher number of active mode trips, which results in positive environmental and health benefits
- Provide good integration with proposed walking and cycling facilities on the Ōpāheke N-S FTN and serve as a key enabler to achieve mode shift targets
- Improve existing and likely future safety and severance issues
- Support growth of the surrounding area and improve access to employment and social amenities.

The grade separation of the NIMT with Ōpāheke Road will also eliminate any crash risk conflicts with the rail line and general traffic delay between road users and any existing and future rail services.

37.2.2.4 Public Transport Effects

There are two new bus routes that will use the NoR D5 corridor, which will operate alongside the two lanes planned for both alignments. The exact location of bus stops will be defined at later stages, as part of detailed design for the Project. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined.

Overall, the Project will improve integration with the future public transport network connecting Drury and Papakura, resulting in improved east-west connection between Mill Road and Papakura township and train station.

37.2.2.5 Effects on Access

Based on the predicted flow of traffic and mixed elements of walking and cycling, direct property access on to the network is not recommended given the negative safety implications. As the area develops, existing properties accesses will be re-routed on to the collector road network, as indicated in the Drury-Ōpāheke Structure Plan, where appropriate. Some properties will face a minor diversion impact on the main network given that direct property access will be limited.

As the proposed Ōpāheke Road bridge over the NIMT (grade separation of the existing level crossing) and proposed upgrade to Ōpāheke Road is realigned to the north of the existing Ōpāheke Road (see Figure 37-1, some existing property access will have a deviation to access the upgraded Ōpāheke Road. For the properties on the existing Ōpāheke Road this entails a small detour underneath the new NIMT bridge and onto a new link between Walker Road the upgraded Ōpāheke Road. For the properties to the north on Walker Road, the access on to Ōpāheke Road will also be via the new link. While there is a slight detour, mostly for those properties on the existing Ōpāheke Road, this will be a safer access with direct access to the rail line no longer allowed (the road will be stopped). This reduces conflict between vehicles and active transport and the rail corridor.

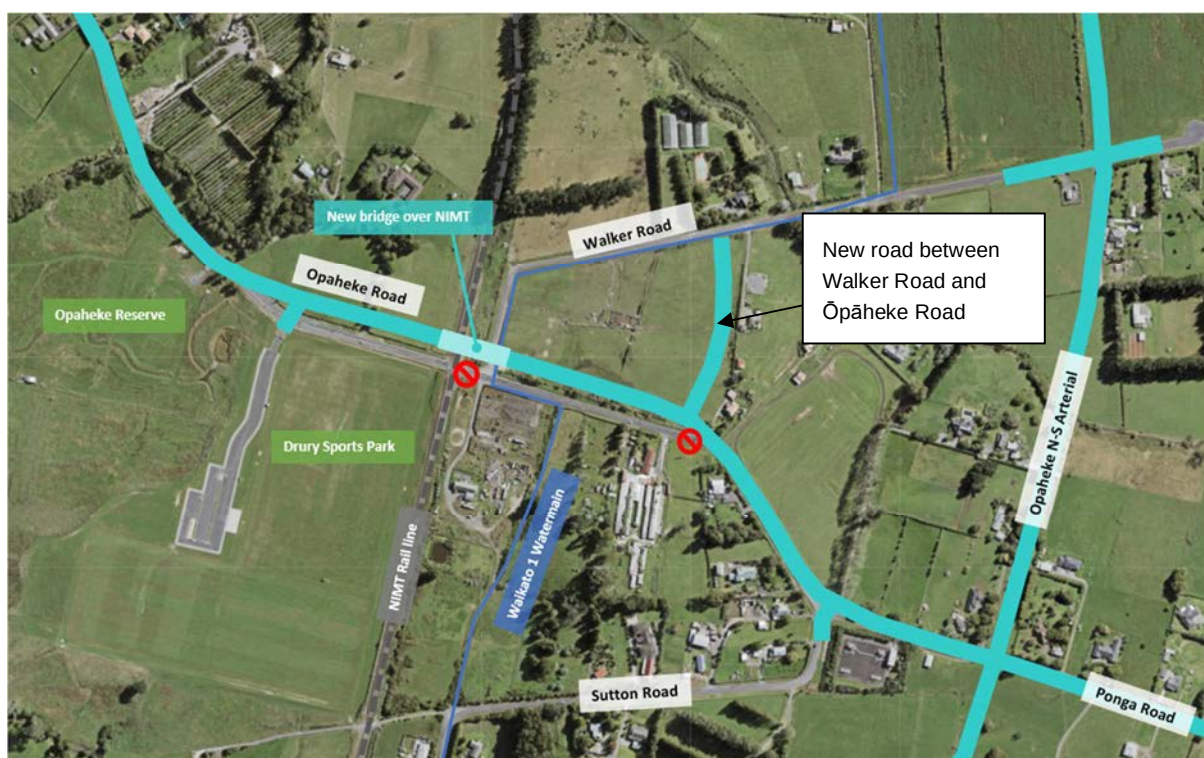


Figure 37-1 New link between Walker Road and Ōpāheke Road (Aerial imagery source: Auckland Council GeoMaps)

37.2.3 Construction Effects

The assessment of construction effects is based on the indicative construction method, construction programme and the nature of works for each construction zone. In terms of construction effects, there are several potential temporary adverse effects mainly linked to traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). Potential adverse effects on transport during the construction of the Project can be summarised as follows:

- **Temporary traffic management** will be required to facilitate the construction activities, however, the construction of a new bridge over the rail line will be carried out without affecting live traffic but may require temporary traffic management to access the construction site. The scale of temporary traffic management to delineate live traffic away from the construction zones, is largely dependent on the various stages and requirements of the construction activities. Short term temporary road closures for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches and gas relocation. Other activities may require stop/go or contraflow traffic management, such as drainage, construction of footpath/cycle path, utility relocation, survey and investigation work.
- **Construction traffic movements** to accommodate the movement of earthworks will likely result in the increase of traffic volume on construction routes used during the construction period of the Project.
- **Construction vehicles** will include truck movements (heavy), light delivery and staff/contractor vehicle movements (light). The total estimated trips associated with construction works are:
 - For Ponga Road: approximately 9,800 heavy truck movements staged over one to one and a half years, and approximately 100 light vehicles per day.

- For Ōpāheke Road (Rural and Urban): approximately 7,700 heavy truck movements staged over two to two and a half years for the Rural section and one to one and a half years for the Urban section, and approximately 150 light vehicles per day.
- **Road safety** impacts from site access points, posted speed and sight lines for construction vehicles.
- **Pedestrian and cyclist safety:** Based on crash data for the Ōpāheke Road Rural section, it is expected that the additional construction traffic is unlikely to have a notable impact to the existing active transport modes. The Ōpāheke Road Urban section, closure of existing footpaths is inevitable and will require traffic management to provide safe alternative options for pedestrians and cyclists. At Ponga Road, it is likely that the demand to use pedestrian and cyclist facilities will increase prior to construction of the Project. In light of this, construction effects on pedestrians and cyclists should be assessed again prior to construction, when a greater level of detail is available about surrounding facilities and land use activities.
- **Existing driveways** that remain during construction will be required to have temporary access provision through temporary traffic management controls.

It is recommended the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

37.2.4 Mitigation Measures

37.2.4.1 Operational effects

Based on the assessment of effects, as summarised above, the Project will have significant positive effects on the operation of the transport system. There are no anticipated adverse effects that require mitigation.

37.2.4.2 Construction effects

To address the potential construction effects identified, a Construction Traffic Management Plan (CTMP) will be prepared prior to the start of construction. Any CTMP prepared will be submitted to Council for information ten working days prior to the start of works. Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. The objective of the CTMP is to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP will include:

- Methods to manage the effects of temporary traffic management activities on traffic;
- Measures to ensure the safety of all transport users;
- The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
- Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
- Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;

- The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads;
- Methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services);

If required, SSTMP should be developed to manage constraints on access to affected properties.

37.2.5 Summary of Transport Effects

The existing Ponga and Ōpāheke Roads are not fit for purpose to support the planned future urban growth. There are significant adverse effects expected if future growth progresses and existing infrastructure remains the same, including increased safety risks, unsafe environments for active modes and decreased reliability for general traffic and public transport.

The Project will have significant positive operational effects. It will provide a safe, reliable arterial network that supports growth, enables sustainable travel choice, combats safety concerns and significantly improves access to employment and social amenities.

The Project will improve all transport facilities for all modes, resulting in improved safety for those that travel by car, active modes and public transport. It will also unlock safe and sustainable east-west mode choices and connect to future strategic north-south corridors. The upgrade will also significantly improve safety for vulnerable users and will significantly reduce the risk of DSIs. The Project is not expected to have any adverse operational effects that require mitigation.

In terms of construction effects, some potential adverse effects are anticipated but these are mainly linked to temporary traffic management. These can be managed appropriately through the implementation of a CTMP.

37.3 Cultural

37.3.1 Discussion

This section presents our understanding of the cultural values and issues of significance to Manawhenua in respect of the Project. This section draws from our engagement with Manawhenua and inputs provided by Manawhenua during Project development. Ngāi Tai ki Tāmaki, Ngāti Maru, Ngāti Tamaoho, Ngāti Te Ata Waiohū, Te Ahiwaru, Ngāti Whanaunga and Te Ākitai Waiohū have been actively involved in the development of the Arterial Network.

The Ōtūwairoa Stream and its tributaries (which includes Waipokapū Stream, Mangapū Stream and Waihoehoe Stream) and their tributaries are Ngāti Tamaoho statutory acknowledgement areas (Ngāti Tamaoho Deed of Settlement 30 April 2017). The Project does not affect any identified Sites of Significance to mana whenua under the AUPOIP, wāhi tapu, other taonga or Māori land. However, in developing the Project, recognition has been given to both the relationship of Tangata Whenua to their lands, culture and traditions in this area and the commitment to partnership between Manawhenua and AT. The partnership approach that has been taken in delivering the Project with Manawhenua is discussed further in respect to engagement in section 5.2.1.1 Ngā Manawhenua of this AEE.

Manawhenua involvement has included participation in all Project phases through options assessment, design refinement and effects assessment of the preferred corridor. Engagement with these iwi groups has included site walkovers to identify and address any culturally significant effects, as well as discussion of the approach to cultural impact assessments which could accompany the NoRs. Ngāti Tamaoho, Ngāi Tai Ki Tamaki, Te Ākitai Waiohū and Ngāti Te Ata Waiohū confirmed their intent to prepare a Cultural Impact Assessment (CIA) for inclusion NoR documentation. However, due to internal resourcing constraints these were unable to be completed to date. A Historic Summary was prepared by Ngāti Tamaoho (included in Volume 4) which has been used as a reference by the Project team.

The partnership with Manawhenua highlighted the following matters of importance:

- **Water quality:** the importance of maintenance and enhancement of water quality, particularly through stormwater treatment.
- **Ecology:** the importance of maintenance and enhancement of ecological values, particularly areas of high indigenous values.
- **Cultural heritage:** the importance of imposing an appropriate accidental discovery protocol for undiscovered archaeological sites, particularly given the proximity of the works to the Mangapū Stream, Ōtūwairoa Stream and Waipokapū Stream. Manawhenua identified the Project area was particularly well suited for previous settlement, interconnected by numerous waterways and wetland areas providing vital resources and travel routes. Thus this was an area of travel, trade, and connection with rich cultural heritage.

The Project has also recognised Manawhenua cultural values, particularly with regards to the mauri of, and the relationships of Manawhenua with natural and physical resources including freshwater, land, air and coastal resources. Significant adverse effects on these values have been avoided, remedied or mitigated as appropriate. In particular, sufficient land has been included within the proposed designation to provide appropriate stormwater discharges treatment (subject to future resource consenting processes). SEAs, wetlands and waterways have been avoided where practicable, including by replacing the existing culvert at Mangapū Stream with a bridge. Manawhenua expressed a strong preference for bridges instead of culverts, or box culverts (that have no structure in the bed of the stream) and reducing infrastructure within floodplains.

37.3.2 Mitigation

A number of workshops were held with Manawhenua to work collaboratively on the draft condition set. The conditions that relate to ongoing Manawhenua involvement in the Project were developed and agreed with Manawhenua. The proposed designation conditions include the following measures to involve Manawhenua in Project design and construction and ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle.

Cultural Advisory Report

Manawhenua will be invited to prepare a Cultural Advisory Report prior to the start of detailed design of the Project. The objective of the Cultural Advisory Report is to assist in understanding and identifying Ngā Taonga Tuku Iho ('treasures handed down by our ancestors') affected by the Project, to inform their management and protection. To achieve the objective, Waka Kotahi will invite Manawhenua to prepare a Cultural Advisory Report that:

- Identifies the cultural sites, landscapes and values that have the potential to be affected by the construction and operation of the Project;
- Sets out the desired outcomes for management of potential effects on cultural sites, landscapes and values;
- Identifies traditional cultural practices within the area that may be impacted by the Project;
- Identifies opportunities for restoration and enhancement of identified cultural sites, landscapes and values within the Project area;
- Taking into account the outcomes of the above, identify cultural matters and principles that should be considered in the development of the Historic and Archaeological Management Plan (see section 37.4), ULDMP (see section 37.5) and the Cultural Monitoring Plan (see below).
- Identifies and (if possible) nominates traditional names along the Project alignment, noting there may be formal statutory processes outside the Project that apply to any decision-making process.

The desired outcomes for management of potential effects on cultural sites, landscapes and values identified in the Cultural Advisory Report will be discussed with Manawhenua and those outcomes reflected in the relevant management plans where practicable.

Development of other Management Plans

Manawhenua will be invited to participate in the development of the ULDMP to provide input into relevant cultural landscape and design matters as outlined above. Additionally, the Historic and Archaeological Management Plan will be prepared in consultation with Manawhenua.

Cultural Monitoring Plan

Prior to the start of construction works or enabling works, a Cultural Monitoring Plan will be prepared. The objective of the Cultural Monitoring Plan is to identify methods for undertaking cultural monitoring. The Cultural Monitoring Plan will include:

- Requirements for formal dedication or cultural interpretation to be undertaken prior to start of construction works in areas identified as having significance to Mana Whenua;
- Requirements and protocols for cultural inductions for contractors and subcontractors;
- Identification of activities, sites and areas where cultural monitoring is required during particular construction works;
- Identification of personnel to undertake cultural monitoring, including any geographic definition of their responsibilities; and
- Details of personnel to assist with management of any cultural effects identified during cultural monitoring, including implementation of any Accidental Discovery Protocol.

37.3.3 Cultural Summary

The Project team have worked closely with Manawhenua throughout the Project lifecycle and have taken their values and concerns into consideration, including on ecological values, water quality and cultural heritage. Overall the indicative design of the Project and future design and construction management measures will respond positively to the matters raised by Manawhenua and is consistent with the values they identified during Project design and engagement processes.

37.4 Historic Heritage

The Assessment of Effects on Historic Heritage, included in Volume 4, assesses the potential effects on historic heritage resulting from the future construction and operation of the Project. The report assesses the potential effects on any identified recorded historic heritage sites and unidentified subsurface archaeological remains that might be exposed during construction. The report should be read in conjunction with the summary set out below.

Figure 37-2 shows the historic heritage sites within and adjacent to the proposed designation boundary.

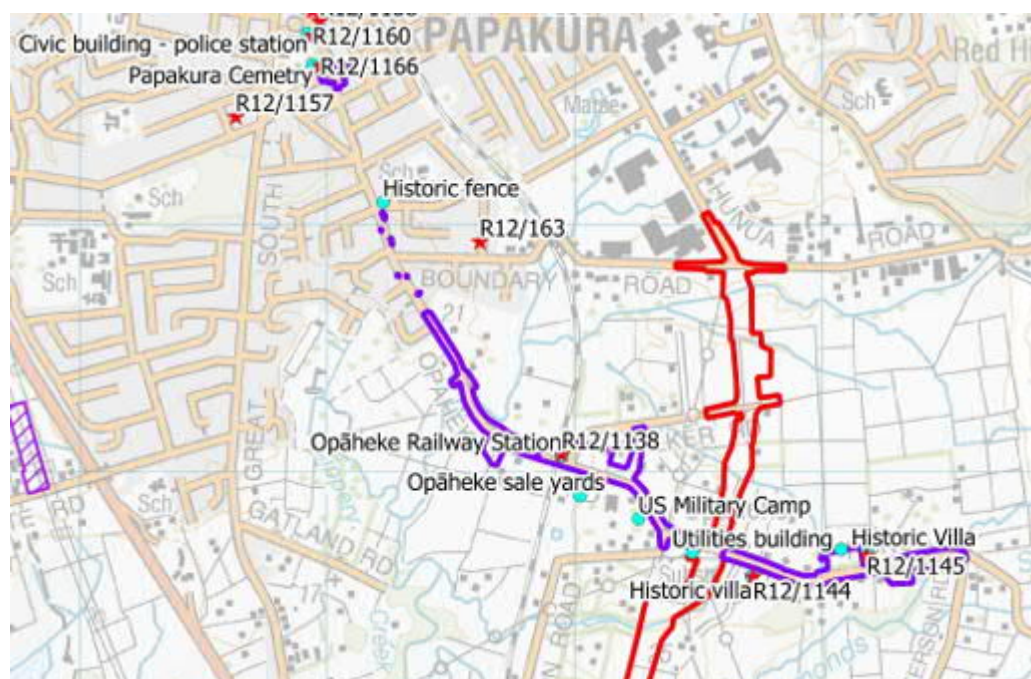


Figure 37-2 NoR D5 Historic Heritage Sites within and Adjacent to the Proposed Designation Boundary

37.4.1 Construction Effects

37.4.1.1 Ponga Road Upgrade Section

The assessment found no recorded historic heritage sites within the Ponga Road Upgrade section.

The assessment identified nearby recorded sites which may have potential subsurface extents extending into the proposed construction footprint; this includes the front yards of pre-1900 villas R12/1144 and R12/1145, and the Ōpāheke East WWII Military Camp. Any such deposits uncovered would likely be adversely affected due to damage/destruction during the construction phase of the Project. While the recorded CHI point of the Ōpāheke East WWII Military Camp is not within the proposed designation, the stone which marks the World War II camp will be adversely impacted as it falls within the road reserve to be utilised for the Project.

There is potential that previously unrecorded historic heritage sites will be found within the proposed designation boundary many of which are likely to be from the 19th century domestic occupation, although the presence of pre-contact Māori period sites cannot be ruled out. Without mitigation, any such sites uncovered would likely be adversely affected due to damage/destruction during the construction phase of the Project.

37.4.1.2 Ōpāheke Road Rural and Urban Upgrade Sections

The Ōpāheke Road Rural and Urban Upgrade sections intersect with, or are adjacent to several recorded historic heritage sites. These sites are shown in Figure 37-2 and include:

- Ōpāheke Railway Station (R12/1138, CHI 17176)
- Papakura Cemetery (R12/1166, CHI item 16001)
- Coutland Brother's tramway (site location unknown)
- Ōpāheke Sale Yards (potential subsurface extents extending into the proposed construction footprint)
- Ōpāheke West US WWII Military Camp (potential subsurface extents extending into the proposed construction footprint)

The specific potential adverse effects of the construction works to known sites are set out in Table 37-1. There is also potential that previously unrecorded historic heritage deposits will be found within the Project footprint, including at waterways, many of which are likely to be from the 19th century township occupation, although it cannot be ruled out if precontact Māori period sites are also present. The presence of the Ōtūwairoa Stream can also indicate potential presence of both precontact Māori sites, as well as the potential for remnants of pre-1900s European bridges. Without mitigation, any such sites uncovered would likely be adversely affected due to damage/destruction during the removal of the sites during the construction phase of the Project.

Table 37-1: NoR D5 Summary of potential effects on historic heritage sites

Site	Potential Effects
Ōpāheke Railway Station (R12/1138, CHI 17176)	The recorded point of the Ōpāheke Railway Station is within the proposed designation. The proposed works may have adverse effects to the subsurface deposits of the Ōpāheke Railway Station, including impacts caused by bridge works as a result of the removal of deposits from the site. The above ground structures of the site have been removed, so any intact deposits will be subsurface, if present. The overall values of the site are moderate.
Papakura Cemetery – Presbyterian Section, (R12/1166, CHI item 16001)	The proposed works will extend into the legal boundary of the Presbyterian Section of the Papakura Cemetery (but on land that is currently used a public footpath), site R12/1166, although there is no physical evidence that archaeological deposits could be exposed as a result of this work. Any potential subsurface features associated with R12/1166 could be identified using non-invasive methods such as Ground Penetrating Radar, which will better determine if deposits are at risk of damage.
Coutland Brother's tramway (site location unknown)	The location of this site is unknown, meaning the impact to the site as a result of the Project cannot be assessed. Further research and survey should be undertaken under the HAMP before construction commences. The overall values of the site are unknown as little is known about the site. The above ground structures of the site have been removed, so any intact deposits will be subsurface if present.
Other potential sites	Nearby recorded sites may have potential subsurface extents extending into the proposed construction footprint. This includes the Ōpāheke Sale Yards and the Ōpāheke West US WWII Military Camp. Potential subsurface extents of these sites could be unearthed if they extend into the construction footprint during ground disturbance.

37.4.2 Operational Effects

It is possible the operation of the Project could have an adverse effect to the knowledge, historic, and context values of some sites by modifying the wider landscape they belong to (recognising the known sites are adjacent to existing roads, therefore the widening of the road has not fundamentally changed the site's context). This has a risk of diminishing the understanding of the heritage of what is already a poorly recorded and understood area. However, the Drury Ōpāheke area will undergo substantial change over the coming years as the area urbanises, and the Project is just one aspect of the wider changing landscape.

37.4.3 Mitigation Measures

As a proposed condition of the designation, a HAMP will be prepared prior to the start of construction. The HAMP will:

- Set out the methods for the identification and assessment of historic heritage within the designation to inform detailed design.
- Identify the known and potential historic heritage sites within the designation
- Set out the HNZPTA authority requirements for any pre-1900 sites

Specific recommendations for detailed design and construction works include:

- Wherever possible, known sites should be avoided.
- Where sites are suspected of extending into the works area, under the HAMP further research including non-invasive techniques and possible Section 56 authority investigations under the HNZPT Act should be undertaken to clarify site extents and effects of construction.
- Any temporary construction works areas, such as lay downs, silt fencing, water bunds and spoil heaps, should avoid known site extents if there are alternative locations available.
- Known site extents adjacent to construction areas should be protected through fencing.
- The stone marking the World War II Ōpāheke East Camp should be removed off site by a suitable professional, stored under agreed conditions established in the HAMP, and relocated to a suitable location once works are complete. Further details regarding this work can be established as part of the HAMP.

Since archaeological survey cannot always detect sites of traditional significance to Māori, or wāhi tapu, the appropriate mana whenua authorities will be consulted regarding the possible existence of such sites, and the recommendations in this report.

Any adverse effects on previously unrecorded archaeological deposits that are exposed during the works can be mitigated by obtaining a precautionary HNZPTA authority. This authority will be sought prior to construction of the Project.

Any operational effects of the transport corridor will be mitigated by providing information on any recorded sites, for example an information board along a walking or cycle route. Any information shared, if at all, will be at the discretion of mana whenua.

37.4.4 Summary of Effects on Historic Heritage

The Project will impact on known and potential sites during the construction and operational phases of the works. A HNZPTA authority will be applied for to manage the damage to pre-1900 sites. Post-1900 sites which still hold some heritage value will be managed with research and opportunities for

interpretation to the public (i.e. through information boards). Further desktop and field research will help determine the appropriate forms of mitigation, undertaken as a requirement of the HAMP, which will be prepared to inform detailed design before construction commences. The HAMP will:

- set out the methods for the identification and assessment of historic heritage within the designation to inform detailed design, such as further research and surveys needed;
- Identify the known and potential historic heritage sites within the designation;
- Identify which areas should be considered to work under an HNZPTA authority, after a full assessment of effects of the proposed ground disturbance.

Additionally, site specific mitigation measures are proposed as outlined in the sections above. With the mitigation measures described above put in place, the potential adverse effects of the Project on historic heritage values will be managed appropriately.

37.5 Landscape and Visual

The Assessment of Landscape and Visual Effects, included in Volume 4, assesses the potential effects on landscape character, natural character and visual effects associated with the construction and operation of the Project and recommends ways of mitigating these effects. The effects were assessed in the following two categories:

Temporary Effects (Construction Effects): Describes the anticipated impacts on the bio-physical elements and features of the landscape resource (landform, vegetation and hydrology) resulting from the construction of the Project. It also includes visual amenity effects for both public and private viewing audiences from construction works.

The construction activities required to implement the Project are categorised under the following broad headings:

- **Site enabling works** - site establishment, demolition and vegetation clearance;
- **Project formation works** - bulk earthworks and formation of new road surface and batter slopes, culvert upgrades, stormwater wetlands, private driveway regrades and bridge construction;
- **Finishing works** - lighting, signage, footpath/cycleway details and line markings, streetscape elements and landscaping (including street trees, mitigation planting and riparian/wetland planting (to be determined by detailed design through the ULDMP and by regional resource consents)).

Permanent Effects (Operational Effects): Describes the effects on the landscape of completed works (including integrated landscape mitigation measures), the significance of physical landscape change and ultimately the resulting effects of the Projects on landscape character, natural character and visual amenity for both public and private viewing audiences. This section summarises the potential effects and mitigation measures proposed. The summary below should be read in conjunction with the report.

37.5.1 Positive Effects

A number of positive landscape and visual effects are anticipated as a result of the operation of the Project (including proposed mitigation as detailed in 37.5.4). Positive effects are likely to include:

- A streetscape to match the emerging urban form within adjacent land;

- Improved and/or new opportunities for active modes of transport and the ability to provide improved connectivity to the proposed Greenways and recreational corridors anticipated by the Drury - Ōpāheke Structure Plan (within the Blue-Green Network proposed in that Structure Plan);
- Net increase in green infrastructure within the Project areas associated with street trees, berm and stormwater plantings and planted stormwater wetlands. This will improve visual amenity for road users and adjacent audiences;
- Slower speed limits adjacent to existing dwellings and commercial activities, improving on the experiential qualities of the corridor for users and private properties situated adjacent to the road.
- Improved connectivity with Ōpāheke Reserve.
- 'Breathing space' along the southern boundary of Papakura Cemetery adjacent to the proposed roundabout upgrade.

37.5.2 Construction

37.5.2.1 Physical Landscape Effects

During construction, potential adverse effects on the physical landscape include construction laydown areas, extent of vegetation clearance, the scale and location of proposed cut and fill slopes (noting the scale anticipated may reduce as a result of urban development prior to the construction of the Project), construction of the proposed stormwater wetlands and bridge construction.

Indicative site compound and construction areas will temporarily occupy land as follows:

- Within the Ponga Road Upgrade section: pastoral land that is already somewhat modified by existing rural land use and within the heavily modified stream and floodplain environment (for bridge construction area).
- Within the Ōpāheke Road Rural Upgrade Section: pastoral land that is already somewhat modified by existing rural land use with the exception of the Ōtūwairoa Stream bridge construction area within the terrestrial margins of the stream environment
- Within the Ōpāheke Road Urban section: modified urban landform.

Physical landscape effects of the site compounds and construction areas are likely to be negligible considering the modified environments, degradation that is present within the existing stream environments and the sporadic nature of existing vegetation which includes exotic shrubs and trees interspersed with very few native species. Additionally, hydrological improvements are sought by upgrading the existing culvert at Mangapū Stream to a bridge. However, some vegetation, including mature trees will need to be removed and construction activities. Overall, the physical landscape effects resulting from establishment and use of the construction work areas within the Project area will be low to moderate-low.

Broad areas of street-side vegetation and localised areas of terrestrial vegetation are proposed to be removed during construction. This includes mature trees and shrubs located within the road reserve and within the road-side boundaries of private properties located adjacent to the road. Within the Ponga Road Upgrade section Project works are also likely to be undertaken beneath the driplines of mature trees and critically endangered Pūriri Forest. However, impacts on these trees have been reduced through the alternatives assessment and design process. As the detailed design progresses and resource consents are sought, the extent and type of indigenous vegetation effected will be determined. Overall, the physical landscape effects likely to arise from the vegetation clearance within the Project area during construction will be temporary and will be very low to moderate taking into account the trees likely to be removed and their maturity.

The Project will include a range of structures (including bridges and retaining walls) and earthworks associated with construction of the structures and the final road form. Proposed bridge works and retaining walls include:

- A new bridge over the heavily modified Mangapū Stream and associated retaining walls; A new road bridge over the NIMT rail line which will separate the road corridor above existing surface level by approximately 8m at the highest point
- Two new active mode bridges either side of the existing Ōtūwairoa Stream bridge crossing. The bridge will include spill through abutments with driven piles either side of the stream banks.
- Low retaining walls within the Ōpāheke Road Urban section are proposed at separated intervals along the road corridor to reduce impacts on adjacent properties.

Given that the stream environments are already heavily modified and degraded with sporadic existing vegetation, the construction of bridges and retaining walls are expected to have negligible impacts on the existing stream and floodplain environment.

The Walker Road connection is proposed at CH 2650 and will extend into greenfield land to connect with Walker Road in the north. The connection is proposed within pastoral land and the physical landscape effects are likely to be negligible.

The Project involves a range of cut and fill slopes, including at proposed bridge locations, varying in scale from very small (1m wide) to large (30m wide), and will alter the existing modified landform of the road corridor and some adjacent property boundaries. Papakura Cemetery will only marginally be impacted by proposed earthworks, with the exception of the low retaining wall proposed along the eastern boundary of the grounds. All proposed cut and fill slopes will be shaped to integrate into the adjacent landform and will be absorbed into the existing modified road corridor and pastoral landscape.

On majority of Ponga Road, the proposed earthworks will result in a new carriageway approximately 0.2m – 1m above existing ground level. Larger fill slopes between CH 1750 – 2050 are required to integrate the elevated section of Ponga Road, which is expected to be raised over Mangapū Stream. Apart from the new bridge over the NIMT rail line 8m above the existing road corridor, the Ōpāheke Road Upgrade (rural and urban) will generally maintain existing ground levels. Overall, impacts on the physical landscape to implement the proposed earthworks and structures will range from very low to moderate-low.

To construct the proposed stormwater wetlands, earthworks to re-shape the land and achieve optimal depths and edge profiles will be finalised at detailed design. Three of these wetlands are proposed within open pastoral areas, outside of existing waterways, within land that is already modified by rural land use. One of these wetlands will be integrated into the existing constructed, heavily modified wetland at the Ōpāheke Reserve, extending the size and profile of the wetland environment and providing an opportunity to increase the capacity of the existing wetland and enhance the planting typologies currently implemented within the reserve. Impacts on the physical landscape to implement the proposed stormwater wetlands will be low.

Potential effects on private properties adjacent to the existing road corridors during the construction period will be low to moderate and include:

- Surface level changes between private property boundaries and the upgraded road corridor, requiring existing driveways and private accessways to be regraded;

- Encroachment into private yard areas and the removal of private garden plantings and trees, ancillary buildings and boundary fences; and
- Demolition of existing dwellings.

Site finishing works to be determined at detailed design will occur within the already modified areas of the Project. Resulting physical landscape effects are expected to be negligible.

37.5.2.2 Temporary Visual Effects

The construction of the Project sections are anticipated to be completed in the following timeframes:

- Ponga Road: 1 to 1.5 years
- Ōpāheke Road Rural Upgrade: 2 to 2.5 years
- Ōpāheke Road Urban Upgrade: 1 to 1.5 years.

Within the Ōpāheke Road Urban Upgrade section, the Project work areas each have a limited receiving audience, with proposed works assumed to take place within the context of the adjoining sections of the road upgrade. As such, visual effects for private landowners is anticipated to be low.

For the remaining two Project sections, visual effects are anticipated to occur progressively through the Project area during the construction period. Some vantage points within the Project area are likely to witness heightened adverse visual effects through the construction phase due to the magnitude of vegetation removal and/or earthworks proposed. Adverse visual effects for the transient public viewing audience are likely to be low to moderate-low through the construction phase. Similar effects are likely to be heightened for the private viewing audience directly adjacent to the Project area on the basis of more direct and prolonged engagement with the construction activities, and in particular those properties where mature trees are proposed to be removed. Therefore, visual effects are likely to range between moderate-low to moderate during the construction phase for private viewing audiences.

The nature and significance of the potential adverse visual effects is considered to be moderated through the Project area by the following aspects:

- Road works and construction activities can generally be expected to occur within existing roads; and
- The existing road carriageways and NIMT rail line are already dominant elements within the visual composition of Project area.

Therefore, visual effects for transient viewing audiences will be low to moderate-low and visual effects for private viewing audiences are likely to range between moderate-low to moderate during construction.

37.5.3 Operational Effects

37.5.3.1 Natural Character Effects

Potential effects on the natural character of the stream margins arise from landform modification and vegetation clearance associated with the bridge construction areas, retaining walls and fill slopes (subject to resource consent approvals).

As the detailed design progresses and resource consents are sought, the full extent and type of indigenous vegetation affected will be determined. It is anticipated that reinstatement and mitigation planting at the completion of works will assist with mitigating any landscape and natural character effects arising from the proposed bridges across Mangapū and Ōtūwairoa Streams. Mitigation measures are outlined in section 37.5.4.

On the basis of the above (allowing for future landscape mitigation of riparian areas), adverse natural character effects are likely to be low.

37.5.3.2 Visual Amenity Effects

The NIMT bridge crossing, although of considerable height in relation to the existing road surface levels, is expected to be visually absorbed into the emerging urban neighbourhood that will develop adjacent to it. Given the proposed Drury-Ōpāheke Structure plan zoning, future urban form is likely to include 2-3 story town housing and apartment buildings. Overall, there are likely to be a range of visual amenity effects on public and private viewing audiences relative to proximity to the corridor with mitigation proposed in section 37.4.3. These include:

- For existing properties set back from the Project area, the visual amenity effects will be a small incremental increase in existing effects from the road corridor.
- As a direct result of the Project, residents may experience some level of material change to the visual composition and residential amenity of the road corridor as perceived from private property.
- Impacted properties may experience heightened visual amenity and residential character effects as a direct result of driveway regrading, potential loss of yard space and by the greater proximity of the carriageway and footpaths/cycleways to private dwellings however, it is considered appropriate when viewed in the context of a medium-high density urban environment in the long term.
- Public viewing audiences will continue to engage with a similar transport environment, within the backdrop of an increasingly urban neighbourhood character. Over time visual amenity and appeal for users will improve, due to an improved streetscape design, maturing street trees and berm plantings and greater accessibility to active modes of transport.

Based on the above, visual effects within the Project area are likely to be very low and moving to beneficial for transient viewers through the operational phase of the Project. For the private viewing audience, the visual effects are likely to be moderate-low to low, reducing over an extended period of time.

37.5.3.3 Landscape Character Effects

The principal elements of the Project (including the road form, driveway regrading, batter slopes, stormwater wetlands and structures) will permanently alter the character of the existing Ponga Road Upgrade corridor and adjacent landscape. The existing Ponga Road corridor is distinctively rural in character owing to the limited urban streetscape features, unstructured hedgerow and shelter belt planting and the rural lifestyle properties adjacent on both sides of the corridor. Within the Ōpāheke Road Rural Upgrade section, although much of the local landscape can be described as rural, the Projects' proximity to the established neighbourhood of Ōpāheke, mix of land uses (including large sporting complex) and development at Bellfield Estate results in a character more akin to a peri urban landscape. Within the Ōpāheke Road Urban Upgrade section, residential character will remain the same.

Within the proposed designation, broad areas of street-side vegetation are proposed to be removed. The existing vegetation (in particular mature trees), contributes to the visual amenity of the road corridor and provides a degree of screening and privacy for properties adjacent to the road. If not mitigated, removal of this vegetation will have adverse effects on the landscape character of the existing road corridor. Mitigation measures are outlined in section 37.5.4.

Within the Ponga Road Upgrade section, the extent of vegetation removal, although notable (in relation to mature specimen trees) is not considered to impact adversely on the cohesive landscape pattern identified through the local landscape and Project area. This landscape pattern is locally prominent and is expected to remain largely intact through future urban development.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional active modes of transport, reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features are expected to improve landscape and urban amenity within the future corridor. The Project is anticipated to operate within the context of increased urbanisation as adjacent FUZ land is progressively live-zoned and urbanised. On that basis, the magnitude and nature of landscape change proposed by the Project is considered to accord with that which will occur throughout the localised landscape over time.

Based on the above considerations, adverse landscape character effects are assessed as low, with general mitigation measures included in the Project works.

37.5.4 Mitigation Measures

To address the modification to the landscape arising from the Project, prior to construction, an ULDMP will be prepared, and will address the principal elements of the Project that are likely to give rise to temporary and permanent adverse effects on landscape character, natural character and visual amenity:

1. **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.
2. **Mangapū Stream Bridge:** to be designed in a manner that contributes to the local identity and urban amenity of the landscape and aligned with Mana Whenua preferred design principles, noting the opportunity to design the bridge as a feature in the landscape and create a threshold experience for users as they transition between urban and rural areas.
3. **The NIMT bridge** will be elevated approximately 8m above existing road surface level and will influence the character and visual amenity of the road corridor and that of the adjacent future urban neighbourhoods as well as views from Ōpāheke Reserve. On that basis, the new bridge should be designed to visually integrate into the landscape context and contribute to the sense of place, and aligned with Mana Whenua preferred design principles. This will involve relating the structure to the character and scale of surrounding future urban form and proposed landscape treatments.
4. **The Ōtūwairoa Stream bridge** is situated within a key landscape and ecological corridor, i.e. directly adjacent to the Ōtūwairoa Stream Open Space – Conservation Zone and within the proposed Blue-Green Network. Given its key location, the footpath and cycleway connections should be designed in a manner that contributes to the local identity and urban amenity of the landscape, and aligned with Manawhenua preferred design principles.

5. **Active transport connectivity:** investigate opportunities within the proposed designation to integrate active transport facilities with existing open space areas and those identified through the Blue-Green Network and with future urban developments that may be development prior to the construction of the Project. These areas will include the Auckland Council Greenways crossing that is intended to link the Boundary Road reserve area in the north through to the Ngakoroa Stream environment in the south, via the Project area and adjacent Ōpāheke Reserve.
6. **Planting design details:** landscape design and planting design details will be prepared for the Project that demonstrate the following:
 - a. Street trees along the full length of the Project area in conjunction with shrubs and ground cover species appropriate for the use within stormwater treatment areas and berms. Species and tree stature should be selected to correspond with adjacent land use and blue-green areas, in accordance with the 9 key principles outlined in the Auckland's Urban Ngahere (Forest) Strategy,
 - b. Identification of existing trees and vegetation that will be retained. Where practicable, mature trees and indigenous vegetation should be retained
 - c. Identification of areas where top soil may be re-used within the project area
 - d. Reinstatement planting within private property boundaries in consultation with property owners
 - e. Shape and treatment of fill slopes and residual land, to integrate with adjacent land use and areas where the Project intersects with the proposed Blue-Green Network.
 - f. Stormwater wetland design and planting
 - g. Integration of Mana Whenua preferred design principles in relation to planting, structures and hard landscape elements.
 - h. Site preparation, implementation and maintenance requirements for all planting typologies.

The general location of recommended mitigation measures is illustrated in Appendix 1. Landscape Plans and Images: Maps 42-46 within the Assessment of Landscape and Visual Effects (Volume 4). The proposed mitigation measures will, where practicable, be integrated with any revegetation requirements of future resource consent processes. Opportunities for integration of landscape mitigation works with the proposed Blue-Green Network, indicated by the Drury – Ōpāheke Structure Plan will also be considered.

37.5.5 Summary of Landscape and Visual Effects

Overall landscape and visual effects range from very low to moderate for the construction phase and very low to moderate-low for the operational phase. Future development of FUZ areas on adjacent land will substantially change the scale and character of the adjacent landscape as experienced from within the road, and will absorb the landscape and visual changes proposed within the Project area.

With the proposed mitigation measures in place to address effects on landscape, natural character and visual amenity (implemented through an ULDMP), the proposed features and scale of the Project are able to be integrated into the existing and future landscape adequately to remedy the potential adverse effects arising from the Project.

At the completion of the Project, the upgraded corridor will resemble that of an urban arterial on account of the additional vehicle lanes, active modes of transport (improving connectivity), reduced speed limit, structured street tree plantings, integrated stormwater management and engineered roading elements that are inherently urban in aesthetic. These features and the resulting streetscape are expected to improve landscape and urban amenity within the future corridor.

37.6 Ecology

The Assessment of Ecological Effects, included in Volume 4, assesses the potential ecological effects of the Project on the environment, where these relate to ecological values that are subject to district plan controls in the AUP. Those ecological matters that trigger Regional plan and/or Freshwater NES resource consent applications will be assessed and consents sought at a later date for the Project, with any required mitigation assessed fully at that time. However, potential ecological effects of the activities likely requiring resource consents and/or wildlife permits at a later stage of the Project were considered in the report to inform alignment and design options and to inform the proposed designation boundary for the Project. The ecological assessment of effects follows the Environment Institute of Australia and New Zealand (EIANZ) Guidelines. These were used to assess the ecological value of identified ecological features and evaluate the magnitude and level of potential effects that the Project could have on these features. The report should be read in conjunction with the summary set out below.

37.6.1 Positive Effects

Positive ecological effects are currently anticipated as a result of the Project. The new bridge structure over Mangapū Stream will provide a connection between extensive native forest habitat in the Hunua foothills, with known elegant gecko records in SEA_T_7032, 0.5 km to the east. A new bridge structure will allow for stream bank restoration under the road and allow for lizards to disperse along where vegetated dry passage is incorporated in bridge design. As the existing culvert causes fragmentation for native lizards, an upgrade to a bridge structure would be considered to be of ecological benefit, and connectivity would be improved.

Another positive ecological effect currently anticipated as a result of the Project is a net increase in green infrastructure and associated habitats within the Project area associated with street trees, berm and stormwater plantings and planted stormwater wetlands.

37.6.2 Assessment of Construction Effects

37.6.2.1 Summary of Potential Construction Effects, Prior to Mitigation

The proposed construction activities have the potential to cause adverse effects on ecological features within or adjacent to the Project area, without mitigation. Potential construction effects that relate to the activities authorised by the proposed designation are:

- Vegetation removal leading to the permanent loss of terrestrial habitats;
- Construction activities causing light, noise and vibration leading to the disturbance and displacement of indigenous fauna (e.g. bats, lizards and birds).

37.6.2.2 Magnitude of Construction Effects

The magnitude of the construction effects listed above on affected ecological features are discussed in the following sections.

Terrestrial Habitat

A number of trees and groups of trees were identified within the Project area that are subject to district plan controls and will be removed or affected due to the Project. These are outlined in the Assessment of Ecological Effects and Assessment of Arboricultural Effects, both provided in Volume

4. With the exception of the large black poplar trees in Ōpāheke Reserve, the majority of district plan trees/vegetation are young and exotic, albeit they do provide important vegetated habitat in a predominantly urban landscape for fauna and the support of ecosystem services.

Bat presence has not been confirmed from Project surveys, however, bats have been recorded in desktop records within 4 km of the Project in the Hunua Ranges. Although the habitats within the Project area are considered to be of low value for bats, the potential presence of roosting bats during removal should not be discounted in the black pine trees to be removed from Ōpāheke Reserve. The trees at this location have been identified to have low bat roost potential, however this may need to be reassessed in the future, to ensure compliance with the Wildlife Act (1953).

Any nesting native birds or native copper skink that could be injured during tree or vegetation removal will also require management under the Wildlife Act (1953).

The district plan trees/vegetation are exotic and therefore of low ecological value botanically but could provide potential habitat for common native birds, lizards and bats. These habitats are common and easily replaced in the short term and as such the magnitude of effect is considered to be low.

Species

Bats

Bats have not been detected within or adjacent to the Project area therefore, it is unlikely that construction activities (including light spill, noise and vibration) would result in the disturbance or displacement of individuals or their roosts because they are likely infrequent visitors to the area. As such, the magnitude of effect on bats is considered to be low.

Birds

Noise, vibration and lighting disturbance caused by construction activities could displace indigenous birds from suitable nesting and foraging habitat within and adjacent to the Project area. The Project area has low value habitat for forest birds. The majority of birds which occur in the Project area are common in the local area (modified agricultural land). They are adapted to human modified environments, and suitable foraging habitat of equal or better quality will remain adjacent to the Project area during construction. The stand of native forest potentially suitable for At Risk – Recovering kākā is not considered to be breeding habitat and is likely to be largely avoided by the Project. Overall, the magnitude of effects from the Project construction activities on the local bird population is considered to be low.

Herpetofauna

Indigenous copper skink (Not Threatened) are likely to be present throughout the Project area within any suitable surrogate habitat, such as rank grassland, treeland habitat along stream corridors and planted vegetation. There is also the potential for ornate skink to be present within similar habitat, although, ornate skink is only likely to be found along the key stream corridors (Mangapū Stream and Waipokapū Stream) and where these habitat features are connected to adjacent stands of native forest pūriri forest and kahikatea forest. As the key stream corridors with suitable lizard habitat (Mangapū Stream and Waipokapū Stream) will be bridged, the habitat present within the Project area will be retained. Although some vegetation clearance may be required to accommodate bridge construction, it is assumed that some riparian habitat will be retained. To manage construction effects

some exclusion or salvage may be required prior to construction to ensure compliance with the Wildlife Act 1953.

Noise, vibration and lighting disturbance caused by construction activities could displace indigenous lizards locally during construction, however suitable habitat is present adjacent to the Project area from suitable habitat adjacent into the Project area. However, lizards are considered to be sheltered within existing adjacent habitat and therefore the magnitude of effects from the Project on the local lizard population is considered to be low.

37.6.2.3 Level of Construction Effects

Table 37-2 below summarises the overall level of construction ecological effects for each key ecological feature and fauna group. The assessment identified that the level of ecological effects from the construction of the Project on all of the ecological features were very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project construction effects.

Table 37-2: NoR D5 Summary of potential ecological effects during construction based on ecological value and magnitude of the effect

Ecological Feature	Ecological Value	Magnitude of Construction Effects	Level of Ecological Effect
Terrestrial habitat – district matters	Low	Moderate	Low
Bats	Low	Low	Very low
Birds – forest habitat	Moderate and Low	Low	Very Low/Low
Herpetofauna	Moderate	Low	Low

37.6.3 Assessment of Operational Effects

37.6.3.1 Summary of Potential Operational Effects, Prior to Mitigation

The Project involves widening of the existing two lane 20 m wide crossing section to a 24 m wide cross-section to accommodate footpaths and cycleways. Although some adverse effects may occur from the current baseline, many operational effects such as fragmentation and noise and lighting are likely to be pre-existing effects from operation of the existing road. In summary, potential operational effects from the Project on indigenous fauna that relate to the activities authorised by the proposed designation are:

- Loss in connectivity to indigenous fauna (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road, leading to fragmentation of habitat; and
- Disturbance and displacement of indigenous fauna and their nests/roosts (e.g. bats, birds, herpetofauna) due to light, noise and vibration effects from the operation of the road.

37.6.3.2 Magnitude of Operational Effects

Bats

As bats have not been recorded within or adjacent to the Project area, it is considered unlikely that the operation of the Project (including noise and vibration from traffic and light from the road) would result in the disturbance or displacement of individuals or their roosts. As such, the magnitude of effect on bats is considered to be low.

Birds

The potential operational effects from the Project on forest birds include displacement as a result of light spill and noise during operation and habitat fragmentation where the Project crosses known habitat corridors. However, as the Project is to widen an existing road, adverse effects such as fragmentation and disturbance already exist. Loss of connectivity through permanent habitat loss and disturbance such as operational noise/vibration and light can lead to an overall reduction in size and quality of bird foraging habitat. However, the species present are those species which have adapted to use habitats modified by humans and as such, the magnitude of effects from the operation of the Project are considered to be low. Additionally, as the area surrounding the Project becomes increasingly urbanised over time any birds would become habituated to new light levels or avoid the proposed road corridor.

Herpetofauna

Indigenous lizard species have been identified in the local area and there is the potential that:

- Copper skink (Not Threatened) could be present; and
- Ornate skink, (all At Risk – Declining) could be present within the Project area e.g. Pūriri Forest and vegetated stream corridors, where surrogate habitat areas connected to native forest habitats such as planted and exotic vegetation with dense ground cover and/or log piles.

Native lizards require vegetated corridors (such as riparian stream corridors) to facilitate natural dispersal. The Project is upgrading existing roads and bridges and therefore is not considered to create any additional barriers to movement or dispersal of lizards. During detailed design connectivity will be retained for lizards including appropriately vegetated corridors under bridges or include ledges within culverts or under bridges e.g. Waipokapū Stream.

Key areas of focus for improving habitat connectivity should include the crossing of the Mangapū Stream where remnant forest fragments occur that could be used as connecting habitat for native lizards. The existing culvert over the Mangapū Stream creates a barrier for native lizards. The new bridge structure over Mangapū Stream will provide connection between extensive native forest habitat in the Hunua foothills, with known elegant gecko records in SEA_T_7032, 0.5 km to the east. A new bridge structure would allow for stream bank restoration under the road and allow for lizards to disperse along where vegetated dry passage is incorporated in bridge design. As the existing culvert causes fragmentation for native lizards, an upgrade to a bridge structure would be considered to be of ecological benefit, and connectivity would be improved resulting in positive effects. As the area will become increasingly urbanised any lizards may become habituated to existing light levels or may avoid the proposed road corridor.

Overall it is considered that the magnitude of operational effects on indigenous lizards will be low.

37.6.3.3 Level of Operational Effects

Table 37-3 below summarises the overall level of operational ecological effects for each key ecological feature and fauna group. The assessment identified that the level of ecological effects from the operation of the Project on all of the ecological features were very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required for the Project operational effects.

Table 37-3: NoR D5 Summary of potential ecological effects during operation based on ecological value and magnitude of the effects

Ecological Feature	Ecological Value	Magnitude of Operational Effects	Level of Ecological Effect
Bats	Low	Low	Very low
Birds – forest habitat	Moderate and Low	Low	Low and Very low
Herpetofauna	Moderate	Low	Low

37.6.4 Mitigation Measures

The assessment identified that the level of ecological effects from the construction and operation of the Project on all of the ecological features were very low or low. In accordance with the EIANZ Guidelines mitigation measures would only be proposed where effects are moderate and above and as such mitigation measures are not required.

37.6.5 Summary of Effects on Ecology

The level of effects from the construction and operation of Project was assessed to be very low or low for all of the relevant habitat and fauna species (bats, birds and lizards) therefore no mitigation is required.

37.7 Arboriculture

The Assessment of Arboricultural Effects, included in Volume 4, assesses the potential effects of the Project on existing trees protected by the AUPOIP district plan provisions and recommends ways of mitigating these effects. Any trees that trigger regional plan consenting requirements were considered to inform design and alignment choices, however effects on these trees will be further assessed and managed through a future resource consent process. Due to the changing nature of the environment and plan rules applicable to tree protection in rural vs urban land zoning, a detailed re-assessment of protected trees and their status under the AUPOIP will be undertaken closer to the time of construction. Potential effects on arboriculture during construction and operation of the Project and proposed mitigation measures are described in the following sections.

37.7.1 Positive Effects

Construction of the new road with road-side berms provides an opportunity for street trees to be established within the new environment. The establishment of street trees within the road corridor will

provide opportunities for trees to exist over large portions of the road corridor where currently few exist.

Widening to the south side of Ponga Road reduces impacts on the large existing tree resource on the northern side of Ponga Road. Where the trees on the north side of Ponga Road are able to be retained, this allows for retention of the significant benefits that the trees contribute to the environment.

37.7.2 Construction Effects

37.7.2.1 Ponga Road Upgrade Section

This Project section does not affect any trees protected under the district plan provisions. Therefore, there are no adverse effects on protected trees. However, several trees have been planted in the road reserve adjacent to Ponga Road and removal of these Council-owned trees, as proposed, will result in adverse effects.

37.7.2.2 Ōpāheke Road Rural Upgrade Section

Protected trees in the road reserve adjacent to Ōpāheke Reserve Sports Park may be affected by construction works associated with the proposed stormwater infrastructure and road formation. The two groups of trees include one Japanese cedar (*Cryptomeria japonica*) and six swamp cypress (*Taxodium distichum*) that are well-established specimen with good form and health. The trees provide stormwater reduction, soil stability and amenity function outside the public reserve at 165 Ōpāheke Road.

A group of poplar trees growing on the bank of the Otuwairoa Stream / Slippery Creek includes one large tree that has been assessed to be in a hazardous condition. This is due to a large seam of decay on the trunk and the lean of the trees towards the bridge. This group of trees will require removal prior to any works relating to the bridge construction.

A mixed group of trees growing in the road reserve of Ōpāheke Road, outside 2 Lorelei Place will require removal for the road widening and path construction. The group of public trees provides some amenity to the location, however none of the trees are individually significant specimens.

A single ash tree outside 97 Ōpāheke Road will also require removal for the road widening and path construction. This tree is one of many of this species in the road reserve of Ōpāheke Road, which provide amenity to the street.

Potential construction effects can cause decline, death and/or instability in trees that are not adequately protected during works within their root zones. This will result in adverse construction effects on these protected trees, and measures to mitigate potential construction effects are outlined in section 37.7.4.

37.7.2.3 Ōpāheke Road Urban Upgrade section

The proposed designation within the Ōpāheke Road Urban Upgrade section does not affect any trees protected under the district plan provisions. Therefore, there are no adverse effects.

37.7.3 Operational Effects

Once the road has been constructed, no further effects on trees is anticipated. Ongoing maintenance of street trees and trees retained adjacent to the road corridor is a standard operational requirement that does not generate adverse environmental effects. Street tree planting (as discussed in section 37.7.4) will result in more trees in the public realm and an enhanced road environment in the long term resulting in positive effects.

37.7.4 Mitigation Measures

As a proposed condition of the designation, a Tree Management Plan will be developed prior to construction to identify existing trees protected under the District Plan, confirm the construction methods and impacts on each tree and detail methods for all work within the rootzone of trees that are to be retained. The Tree Management Plan will include:

- Confirmation that protected trees identified in the Assessment of Arboricultural Effects still exist;
- Advice on how the design and location of works can avoid, remedy or mitigate effects on the existing trees;
- Recommended planting to replace protected trees that require removal;
- Establishing tree protection zones and specifying tree protection measures such as protective fencing, ground protection and physical protection of roots, trunks and branches;
- Detailing methods for all work within the rootzone of trees that are to be retained in line with appropriate arboricultural standards.

The effects of tree loss can be mitigated by comprehensive planting within berms in the new road layout. Replacement planting will be decided through a planting plan for the Project under the ULDMP. The ULDMP will also include methodologies to establish new trees within the road reserve, including creation of quality below ground environments, correct planting methods and appropriate maintenance. Replanting of the stream embankment and road reserve will mitigate potential effects on amenity, ecology, stormwater and land stability.

The Tree Management Plan will be limited to the identification of those trees identified in the Arboricultural Assessment as currently protected under the District Plan, as trees protected under Regional Plan provisions will be addressed as part of a future resource consent process.

Any trees protected by Regional Plan provisions that are to be retained will be addressed as part of the future resource consent process. A Tree Management Plan addressing potential effects on these trees will be developed as part of that process and is proposed as a condition of this designation. This should identify any protected trees, confirm the construction methods, and impacts on each tree and detail methods for all work within the root zone of trees that are to be retained.

37.7.5 Summary of Arboriculture Effects

Some potential construction effects on protected trees in Ōpāheke Road Rural section have been identified, but there are no effects on protected trees within the other Project sections. To address any potential construction effects, a Tree Management Plan will be implemented. The Plan will address construction methodologies and mitigation measures for works affecting all protected trees that exist at the time of construction to avoid and mitigate adverse arboricultural effects. The effects of tree loss can be mitigated by comprehensive planting within the Project area including within the berm and

open space such that long-term effects, once replanting matures, overall effects are considered to be minor.

37.8 Natural Hazards - Flooding

The Assessment of Flood Hazard Effects, included in Volume 4, assesses the potential flood hazard effect of the proposed transport corridor during its construction and operational phases on the flood extents and levels in the surrounding area. Effects of stormwater quantity, quality and effects on streams will be considered under future resource consents. This assessment focusses on flood hazard effects which is a district plan matter under the AUP. In presenting information on and assessing flood hazard effects, it is therefore acknowledged that there will be a subsequent process for seeking resource consents.

37.8.1 Positive Effects

The Ponga Road Upgrade requires a new crossing of Mangapū Stream. It is proposed to change the twin existing 2000 dia. culverts to a bridge to accommodate new design levels required to tie into the proposed Mill Road and prevent floods overtopping the road.

37.8.2 Construction Effects

37.8.2.1 Ponga Road Upgrade

The main construction phase risks are associated with the new bridge over the Mangapū Stream with road levels reducing the amount of road overtopping and new abutments directing that flow toward the existing culverts / potential bridge. The existing twin 2000 dia. culverts may provide a ready-made diversion for the bridge construction works.

37.8.2.2 Ōpāheke Road Rural Upgrade

The new active transport bridges can likely be constructed from the existing road and bridge. The retaining wall construction for the north east abutment will be close to the existing stream channel and may require sheet piling to separate construction from the main flow channel. Where sheet piling is required to separate works from the channel, flood flows will be constricted and the potential for flooding effects will be greater than the existing bridge for the period of the works.

37.8.2.3 Ōpāheke Road Urban Upgrade

Works include reconfiguring drainage to accommodate the new intersection and treating and attenuating runoff within a rain garden near the south eastern corner of the intersection.

There could be adverse effects associated with diversion of flows during construction of the works if this is not appropriately sequenced.

37.8.3 Operational Effects

Operational effects have been assessed through flood modelling to consider the flooding extents at existing culvert crossings, bridges and other significant areas where the new road embankment encroaches existing flood plains.

37.8.3.1 Ponga Road Upgrade

Ponga Road currently crosses Mangapū Stream over two 2000 dia. culverts - with flood flows overtopping the road. The height of the road above the culverts is small with limited upstream ponding before the overtopping would occur. Ponga Road is proposed to be raised in this location to allow it to tie into the Mill Road vertical alignment immediately to the east. A bridge is needed to allow additional flow under Ponga Road and prevent floods overtopping the road and therefore minimise increases to upstream flood levels. There are no existing houses within the flood plain upstream of Ponga Road. The access to two houses at 198 Ponga Road is through the existing flood plain immediately north of the existing twin 2000 dia. culverts and changes in water levels and flow patterns could affect the flood hazard.

The main span of the proposed bridge will need to be set to minimise increases in flood levels, velocity and flood hazards in the area.

37.8.3.2 Ōpāheke Road Rural Upgrade

The proposed active transport bridges at Ōpāheke Road over the Ōtūwairoa Stream could increase flood levels upstream, including at a house at 156 Ōpāheke Road. It is recommended that the magnitude of the effect is confirmed at the detailed design phase and, for existing authorised consented habitable floors with more than a 10% reduction in freeboard, mitigation is provided so that there is no more than a 10% reduction in freeboard. Mitigation could consist of increasing the span of the existing bridge to achieve freeboard. Other measures off site could also be considered. Any other new or redeveloped habitable floors upstream should be designed to account for the post development scenario. A management response is recommended to be developed to manage use of the Ōtūwairoa Stream bridges during overtopping flooding events.

The proposed rail overbridge is sited to the north of the existing Ōpāheke Road and will obstruct an existing overland flow path to the north of the eastern rail bridge abutment. Provided the existing drain within the existing road reserve is maintained and a new overland flow path past Wetland 2 is provided to divert flow around the north side of the approach embankment, the flooding effects will be minor.

37.8.3.3 Ōpāheke Road Urban Upgrade

Modelling has not been carried out at this location due to the small change in impervious area and terrain. The works could disturb the existing overland flow path that crosses Settlement Road from north to south and that then runs overland through residential properties to the south-east. The increase in impervious area increase could increase the overland flow peak rate and exacerbate existing flooding effects downstream.

37.8.4 Mitigation Measures

37.8.4.1 Construction

Flood hazards for the construction phase will be addressed in a CEMP. Key considerations will include:

- siting construction yards and stockpiles outside the flood plain
- minimising the physical obstruction to flood flows at the existing 2000 dia. culverts from temporary works

- staging and programming to carry out work when there is less risk of high flow events, and
- methods to reduce the conveyance of materials and plant that is considered necessary to be stored or sited within the flood plain (e.g. actions to take in response to the warning of heavy rainfall events).

37.8.4.2 Operation

Ponga Road

The proposed bridge at Mangapū Stream will need to have sufficient span to accommodate flows that previously overtopped the road, the abutments set back from the main channel to avoid overly constricting flows and its deck should have appropriate freeboard to the 100 year ARI flood level. Changes to the flood hazard for access for the two houses at 198 Ponga Road should be considered further at detailed design and a condition is recommended to address this. If required, mitigation would consist of decreasing the depth of flooding by increasing the span and flow capacity of the proposed bridge.

Ōpāheke Road Rural Upgrade

The proposed two cycle / pedestrian bridges have an effect on flood levels and in particular causes an increase in the depth of flooding at 156 Ōpāheke Road. The existing bridge span may need to be increased to reduce the increase in flood level on the upstream dwelling at 156 Ōpāheke Road or the reduction in freeboard otherwise mitigated. This will require further assessment during detailed design and a condition on the proposed designation is proposed to address this.

Ōpāheke Road Urban Upgrade

The following mitigation is recommended:

- Surface runoff from the intersection is captured and attenuated so that the 10 and 100 year peak flow rates do not increase
- Improve inletting capacity at existing low spots to capture flow in the pipe system rather than let it run overland.

There is the opportunity for surface runoff from the intersection from chainage 520 to be treated and attenuated in the south east corner of the proposed designation for the new intersection. The discharge could then be connected to the existing 450 mm dia. pipe along King Edward Avenue.

Overall Recommendation for NoR D5

The following measures and outcomes to manage flood risk are proposed for detailed design and these are proposed as conditions on the proposed designation.

Detailed design should demonstrate that the Mangapū Stream (Symonds Stream) located at NZTM 1775480, 5893662 is crossed by a bridge. It is recommended that during detailed design, the flood modelling of the pre project and post project 100 year ARI levels (both for MPD land use and including climate change) is carried out and measures 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 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)
- that there is no more than a 10% average increase of flood hazard (defined as flow depth times velocity) for main access to authorised habitable dwellings.

Where the above outcomes can be achieved through alternative measures outside of the designation measures such as flood stop banks, flood walls, raising existing habitable floor level and overland flow paths, this may be agreed with the affected property owner and Auckland Council.

37.8.5 Summary of Flooding Effects

Overall it is considered that the potential flooding effects arising from the proposed transport corridor for NoR D5 can be adequately mitigated and that there is land available within the proposed designation to provide for the required works.

37.9 Noise and Vibration

The Assessment of Construction Noise and Vibration Effects, attached in Volume 4, contains predictions for construction noise were carried out using the method recommended in NZS 6803 in accordance with the AUPOIP. The methodology included modelling inputs in regard to a reasonable worst case scenario. Vibration emission radii were also calculated to provide a reasonable worst case estimate at receivers.

The Assessment of Traffic Noise and Vibration Effects, also attached in Volume 4, contains predictions of road traffic noise were carried out using the method recommended in NZS 6806 in accordance with rule E25.6.33 of the AUPOIP.

Four scenarios are assessed in accordance with NZS 6806:

- The “Existing scenario” which is the current road network with current traffic volumes, i.e. the existing environment as it is experienced at the time of assessment
- A “Do Nothing” scenario (the likely future environment without the project), which represents the current road network with future traffic volumes, assuming a full build out of the area. This is a theoretical scenario that would not occur in reality. This is because; the current road network could not cope with the future traffic volumes, and future development in the area would not occur without the prior establishment of the new or upgraded roads. Therefore, while the predictions suggest a significant increase in noise level in the Do Nothing scenario compared with the Existing scenario, this would not be a feasible option
- A “Do Minimum” scenario, (likely future environment with the project) which represents the proposed future road network, incorporating NoRs D1 to D5 and other transport projects in the area (refer to the discussion on Assessment Assumptions in the Assessment of Traffic Noise and Vibration Effects in Volume 4). This scenario assumes a full build out of the area, and the transport

infrastructure to enable the development. This is a realistic scenario at a point in time when all proposed Projects within the Drury Package are operational. .

- “Mitigation” scenarios, which represent the traffic noise levels at the PPFs at the design year with various specific noise mitigation options implemented with the aim of achieving the noise criteria categories.

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

The summary below should be read in conjunction with both reports.

37.9.1 Construction Noise and Vibration

37.9.1.1 Potential Construction Noise Levels

Model predictions assuming the works along the proposed designation boundary indicate there are 72 buildings (45 residential in rural areas, 25 residential in urban areas and 2 commercial properties) where the relevant noise criteria would be exceeded without mitigation. Distances of receivers from the proposed designation area boundary vary greatly along the road alignment with the closest receptor approximately 6 m from drainage and pavement construction works. There are no buildings location within the 73m radii of the minimum set back distance required for day-time compliance of 70 dB L_{Aeq} for piling works.

Model predictions indicate the closest receivers could experience noise levels of up to 90 dB L_{Aeq} during drainage and pavement construction works, based on the noisiest item of plant operating in the closest position to the receiver, without mitigation. Operation of construction equipment will be intermittent in nature and works in the worst-case location typically latest around three days. Whilst plate compactors have been identified as the noisiest equipment, they are only used as part of drainage and pavement construction works. Other equipment with lower sound powers will generate lower noise levels under the worst-case location and overall average noise levels will be lower for most of construction duration.

These results should be treated as the highest possible noise levels likely to be emitted from the respective equipment. These noise levels would occur infrequently, if at all, as equipment and activities move along the alignment and are not continuously operational. The noise levels provide an indicative prediction of the scale of potential effects based on one possible construction methodology.

37.9.1.2 Construction Noise Effects

The construction noise criteria are predicted to be exceeded at a number of receivers due to the close proximity to the potential areas of work up to the proposed designation boundary line. Closest receivers are 6 m from the proposed designation boundary for earthworks and predicted noise levels are around 85- 90 dB L_{Aeq} with the noisiest equipment being loader and plate compactor.

However, the use of these items of equipment will likely be intermittent in nature during the relevant construction activities. Although the worst-case situations are not expected to be frequent, due to the setback distances to the majority of the proposed works, these noise levels could result in loss of concentration, annoyance, and a reduction in speech intelligibility.

Night time works at these noise levels are generally not acceptable at residential properties and the use of noisy equipment should be avoided to prevent sleep disturbance. If night-time works are

required mitigation measures will be essential which may include an offer of temporary relocation for the most affected receivers to manage and mitigate adverse effects.

With effective mitigation and management measures in place, such as construction noise barriers along active construction areas within the vicinity of receivers and enclosures around noisy machinery, noise levels can be reduced by up to 10dB at receivers on ground floor. Resulting worst case noise levels could be reduced to 75-80 dB with mitigation implemented and number of receivers exceeding the criteria reduced to 57.

In addition, the road construction is linear, and each receiver would only be affected for part of the overall construction duration. A CNVMP with site specific mitigation as required (described in section 37.9.3), sets out how to control noise levels and reduce adverse impacts on receivers.

37.9.1.3 Potential Construction Vibration Levels

42 dwellings may experience vibration levels above 5mm/s PPV exceeding the building damage criteria for residential buildings and three commercial buildings exceeding vibration levels of 10mm/s PPV. Predictions indicate a total of 129 buildings may receive vibration levels above the amenity criterion of 2 mm/s PPV. This does not include vibration from potential construction on driveways along the proposed Ōpāheke Road Urban Upgrade alignment.

It should be noted that the vibration generating equipment will not be operating all of the time and may not operate right at the boundaries of the area of works. Works around urban Ōpāheke Road involves roundabout construction and resurfacing works and equipment used are typically expected to generate vibration levels lower than indicated above.

It is not expected that high level vibratory works such as the use of roller compactors will be carried out during night-time. If night-time works are required extensive consultation and management plans will be essential. Mitigation measures are described in section 37.9.3.

37.9.1.4 Construction Vibration Effects

Initial predictions indicate that the Project building damage criteria may be exceeded at 42 residential buildings and three commercial buildings, in particular during the earthworks phase when the vibratory roller compactor is proposed for use. Of the 42 residential buildings, 21 are in the Bellfield estate and 15 are within the Ōpāheke Road Urban upgrade area. At buildings in close proximity to proposed designation boundary areas, there is the potential for cosmetic damage (such as cracking) and annoyance from perception of vibration. A building condition survey should therefore be carried out before (during detailed design) and after construction works at properties where predictions indicate the relevant building damage criteria may be approached, to determine if any damage has been caused by construction of the Project.

37.9.2 Traffic Noise and Vibration

This Project consists of Altered roads across the three Project sections: Ponga Road Upgrade (Rural), Ōpāheke Road Rural Upgrade (Rural) and Ōpāheke Road Urban Upgrade (Urban). The rural upgrades have been assessed separately to the urban upgrade due to the different assessment extent (200m from the road edge for rural areas vs 100m from the road edge for urban areas).

For this Project, changes to the road lanes are minimal and only occur at intersections with an additional Walker Road link. For NoR D5, the increase in traffic volume would occur irrespective of the

proposed works, that provide for active transport facilities rather than additional traffic lanes and therefore the effects discussed are not strictly due to the Project.

Of further note, although Walker Road link is a New Road, the three PPFs along this link are situated within 100m of an existing road. Therefore, these PPFs have also been considered under the Altered road criteria.

Ponga Road Upgrade and Ōpāheke Road Rural Upgrade sections

Road Traffic Noise Model Results Analysis

Existing scenario predictions show the existing traffic noise level within the Project area is between 40 – 66 dB $L_{Aeq(24hr)}$ with 11 PPFs in Category B and the remainder in Category A.

Under the likely future scenario without the Project, predictions shows traffic noise levels range between 43 – 70 dB $L_{Aeq(24hr)}$ with 18 PPFs in Category C and 15 PPFs in Category B due to an increase in traffic volumes, assuming a full development build of the surrounding area and resultant traffic on the existing road network.

The likely future scenario with the Project showed a slightly lower predicted range of 40- 65 dB $L_{Aeq(24hr)}$ with all but three PPFs in Category A due to reduced traffic volumes. The three PPFs in Category B are located at the new Bellfield development with noise levels predicted to marginally exceed the most stringent Category A criteria by less than 1dB. These PPFs are predicted to experience a 5 dB reduction in noise level when compared to the likely future scenario without the project which is a significant positive effect. In accordance with NZS 6806, as all PPFs that are predicted to receive noise levels greater than 64 dB $L_{Aeq(24hr)}$ will experience an increase in noise levels of less than 3dB when compared to the existing scenario, these sections of the Project do not fall into the thresholds of an Altered road, and mitigation measures have not been considered.

Assessment of Traffic Noise Effects

One PPF at 216 Ōpāheke Road is predicted to experience a noise level increase of 7 dB due to the close proximity to the new Walker Road link. This will be perceived as a clearly noticeable increase in noise level. This noise increase will be significant to the residents, if they still reside in the area at the time of road opening. However, the resultant noise level of 59 dB $L_{Aeq(24h)}$ is appropriate for residential use and not unexpected in an urban environment.

Importantly, the area will change significantly over time, and the new road would be constructed at a time when development requires the transport corridors. That means that the ambient noise environment will be higher due to more intensive activity and the noise level change will likely be less. The predicted effects may not be experienced by current residents.

The majority of PPFs are predicted to experience minor positive effects due to noise level decreases which will just be noticeable. This decrease is generally due to traffic being redistributed across the new roading network.

Ōpāheke Road Urban Upgrade section

Road Traffic Noise Model Results Analysis

This section of the Project includes the upgrade of the existing intersection (from signals to a roundabout) and includes active transport facilities. The Project does not provide additional traffic lanes, and therefore, the increase in traffic volume would occur independently from the Project being progressed. For completeness, the assessment has been undertaken despite the traffic noise effects being independent of the Project.

Existing scenario predictions show the existing traffic noise level within this project area is between 52 – 72 dB $L_{Aeq(24hr)}$ with 66 PPFs in Category A, 16 PPFs in Category B and 21 in Category C.

Under the Do Nothing scenario, predictions shows slightly lower traffic noise levels, due to lower traffic volumes, range between 49 – 71 dB $L_{Aeq(24hr)}$ with 15 PPFs remaining in Category C and eight PPFs into Category B.

The likely future scenario with the Project shows a slightly elevated range of 52 – 72 $L_{Aeq(24hr)}$ with 63 PPFs in Category A, 13 in Category B and 27 in Category C. Ten PPFs changed from a Category A to Category B, five PPFs changed from Category A to Category C and five Category B PPFs changed to Category C due to the new intersection and increased traffic flow. As such in accordance with NZS 6806 mitigation options should be considered to reduce all PPFs to Category A.

Mitigation options of low noise road surface and localised barriers have been considered to reduce predicted noise levels at PPFs to Category A.

Low noise road surface consisting of asphaltic concrete AC-14 road surface along the intersection was selected as the BPO. Noise levels from this mitigation range between 46 – 67 dB $L_{Aeq(24h)}$ which reduces noise levels by 5dB. Ten of the 27 Category C PPFs are moved to Category B with the remaining Category C PPFs moved to Category A. All of the ten Category B PPFs are in Category C under the existing scenario but a 4-6 dB decrease in noise level is predicted with this mitigation option. No PPF would remain in Category C.

Assessment of Traffic Noise Effects

All but one PPF are predicted to experience no change or a negligible to moderate noise level reduction, with low noise road surface applied. The majority of PPFs are predicted to experience a 2 – 4 dB decrease due to the Project and the completion of the surrounding road network, which is a slight reduction and will be a positive change for the existing residents.

One PPF at 21 Settlement Road is predicted to experience a 4 dB noise level increase due to the Project's roundabout reduced proximity to the property, increased traffic flow and removal of a property nearest to the intersection due to the Project which previously provided shielding at this PPF. This change will be noticeable but the resultant noise level of 58 dB $L_{Aeq(24h)}$ is appropriate for residential use and not unexpected in an urban environment.

37.9.3 Mitigation Measures

37.9.3.1 Construction Noise and Vibration

Specific mitigation measures will be identified within a Construction Noise and Vibration Management Plan (CNVMP) which will be completed for the Project prior to construction. The CNVMP will provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction. The Assessment of Construction Noise and Vibration Effects outlines the inclusions required in the CNVMP, in line with the minimum level of information that must be provided in a CNVMP. This includes:

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

In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.

In managing noise and vibration effects within the above mechanisms, a hierarchy of mitigation measures will be considered and a best practicable option for mitigation will be implemented, whilst avoiding undue disruption to the community.

As construction will occur several years in the future, receivers may have changed by then, with new and additional receivers in the vicinity due to increased development. Construction noise and vibration effects will be reassessed at the time of construction and managed at the receivers that are present at the time of construction.

37.9.3.2 Traffic Noise and Vibration

The following mitigation measures are proposed for the Project:

- **For the Ōpāheke Road Urban Upgrade section – Ōpāheke Road/Settlement Road intersection:** asphalted concrete (AC-14) is recommended to be applied all road surface at the intersection. The recommended mitigation for the Ōpāheke Road Urban Upgrade section will result in a positive and noticeable changes to noise levels for the PPFs predicted to receive the highest noise levels, and will ensure that noise levels will be reasonable for residential use. The noise level at all but nine PPFs can be reduced to Category A, with noise levels at the nine PPFs reduced from a Category C to B.
- **Reassessment at Detailed Design:** At detailed design for the Ponga Road and Ōpāheke Rural sections, reassessment of the road traffic noise at PPFs will be carried out to determine if the categories are still achieved without mitigation and to determine BPO mitigation if required. For Ōpāheke Road Urban section, reassessment of the road traffic noise at PPFs will be carried out to determine if mitigation recommended are still BPO to meet the categories. The PPFs and categories to be achieved are included in the Noise and Vibration Assessment and are included as conditions on the proposed designation.

37.9.4 Summary of Noise and Vibration Effects

The Project does not provide for additional traffic lanes, and therefore, the change in traffic volume would occur independently from the Project being progressed. However, for the Ponga Road and Ōpāheke Road Rural Upgrade sections, traffic noise levels will generally decrease at most PPFs. All PPFs, with the exception of three, can remain in Category A with predicted noise levels below 64 dB _{L_{Aeq}(24hr)} with no mitigation required. The three Category B PPFs are existing two-storey Category B PPFs with marginal exceedance of the most stringent Category A criteria.

With proposed mitigation in place at the Ōpāheke/Settlement Road intersection, the predicted traffic noise levels within the Ōpāheke Road Urban section will be reduced, resulting in a positive effect on the future noise environment.

Adverse construction noise and vibration effects can be appropriately managed through the proposed mitigation measures.

37.10 Network Utilities

37.10.1 Construction Effects

A number of utilities, including major utilities, are located within and around the proposed designation. Relocation, diversion or protection of these may be required. Table 37-4 summarises the known existing and proposed utilities within and around the proposed designation, and the implication the Project is likely to have on these.

Table 37-4 NoR D5 Anticipated effects on existing utilities of other providers

Utility Provider	Asset	Designation	Potential Effect
First Gas	Gas Transmission Line	9104	Pipe re-alignment, strengthening works, and/ or protection works may be required where the pipe crosses the proposed alignment. Alteration/ relocation and potential realignment of the existing First Gas Designation (9104) may be required.
Watercare	Waikato 1 Watermain	N/A	Waikato 1 Watermain is located at Ōpāheke Road near the NIMT rail line. The main will not be impacted by the works.
	Other Assets	N/A	Other assets such as water supply, wastewater pipeline, access chambers, hydrants and other assets will require protection or relocation to the new road alignment.
Vector	Gas Medium Pressure distribution lines	N/A	Distribution lines will need to be realigned onto the new carriageway service corridor.
Counties Power	Overhead High Voltage Line and pylons	N/A	High voltage lines and pylons connecting to the substation on Ponga Road will likely require relocation with new pylons and / or lines. Short term disruptions may occur.
	Substation at 9 Ponga Road	3006	Regrading of the entrance to the substation at 9 Ponga Road, which has a network of 22kV cables beneath will be required. The existing designation will be overlapped and approval will be required from Counties Power for works within their designation.
	Overhead and underground power distribution lines	N/A	Overhead and underground lines will either be relocated underground or new overhead poles installed in the new alignment within the carriageway service corridor. Short term disruptions may occur.
Chorus	Communication lines	N/A	Communication lines will need to be relocated to the new verge

Utility Provider	Asset	Designation	Potential Effect
KiwiRail	NIMT Rail line	6302	Positive effect on safety of rail network through grade separation. Some disruption likely during construction works. Permission to work within the rail corridor will be sought from KiwiRail for the bridge construction activities and the bridge demolition or deconstruction will be carried out during a weekend rail shutdown if required.

37.10.2 Mitigation Measures

Engagement with Network Utility Operators has been ongoing throughout the Project as detailed in section 5.2.2.6 Network Utilities. Engagement will be ongoing throughout the detailed design and construction of the Project.

As a proposed condition of the designation, a Network Utilities Management Plan (NUMP) will be prepared prior to construction of the Project. The NUMP will set out a framework for protecting, relocating and working in proximity to existing network utilities. The NUMP will be prepared in consultation with the relevant network utility operators and will include methods to:

- Provide access for maintenance at all reasonable times, or emergency works at all times during construction activities;
- Manage the effects of dust and any other material potentially resulting from construction activities and able to cause material damage, beyond normal wear and tear to overhead transmission lines in the Project area;
- Demonstrate compliance with relevant standards and Codes of Practice including, where relevant, the NZECP 34:2001 New Zealand Electrical Code of Practice for Electrical Safe Distances 2001; and AS/NZS 4853:2012 Electrical hazards on Metallic Pipelines.

Prior to construction, Network Utility Operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for the following activities:

- operation, maintenance and urgent repair works
- minor renewal works to existing network utilities necessary for the on-going provision or security of supply of network utility operations
- minor works such as new service connections
- the upgrade and replacement of existing network utilities in the same location with the same or similar effects as the existing utility.

37.10.3 Summary of Effects on Network Utilities

Through the implementation of the NUMP and in consultation with network utility operators, any potential adverse effects on network utilities can be managed appropriately.

37.11 Community Effects

37.11.1 Positive Effects

The Ponga and Ōpāheke Road Upgrade will provide the necessary transport infrastructure required to support the planned urban zoning of land in Ōpāheke (and the wider Drury-Ōpāheke growth area). The proposed designation will ensure that the upgrade is planned and integrated (and identified in the AUPOIP) to meet the feasible development capacity targets over the next 30 years to support the growing communities in Drury-Ōpāheke.

The provision of active transport facilities will provide alternative opportunities to connect the community (existing and future) and provide a choice of transport options to commute to education and work. In particular, it will provide the community active transport options to access Ōpāheke Reserve for community sports and recreation opportunities. This will positively impact both the health and wellbeing and way of life (way people work, play and live) of the community and the environment (amenities).

37.11.2 Construction Effects

Potential social impacts during construction include disruption to connectivity and way of life due to delays in commutes (work and education) and increased disruptions to moving around the area due to road works and access restrictions. Access to community and recreational facilities may also be disrupted, including at Ōpāheke Reserve and Papakura Cemetery. There are potential impacts to health and wellbeing due to noise and dust from construction within close proximity of residential houses, recreation and community facilities including some construction works that will be required within Ōpāheke Reserve and Papakura Cemetery.

37.11.3 Operational Effects

As identified within the positive effects discussed above, the Project will provide the necessary transport infrastructure required to support planned urban growth in the Drury-Ōpāheke growth area supporting growing communities. In summary, the Project will positively impact the health and wellbeing and way of life (way people work, play and live) of the community and the environment (amenities). The Project avoids direct impact to the Ōpāheke Reserve Sports Park and will not have any adverse effects on the use of Papakura Cemetery or the Ōpāheke Reserve (by utilising an existing stormwater wetland).

37.11.4 Mitigation Measures

37.11.4.1 Construction Effects

It is anticipated that all community effects during the construction of the Project will be temporary and can be minimised. A Stakeholder and Communication Management Plan (SCMP) will be prepared prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the Construction Works.

Access and trip disruption will be managed by the CTMP and SCMP proposed as conditions of the designation. This will allow the contractors to identify movement and access requirements of residents and businesses along the corridor and enable alternate access or access at peak times and minimise

trip disruption where practicable. Access will be maintained to recreation facilities and community facilities including Papakura Cemetery and Ōpāheke Reserve and land requirements for construction will be minimised to avoid disruption of passive recreation uses.

Construction effects on amenity values of property, community and recreation areas can be managed by engagement with residents along the corridor and stakeholders (identified through the SCMP), noise management (CNVMP), and the overall CEMP to manage potential effects.

37.11.4.2 Operational Effects

Significant positive effects are anticipated from the operation of the Project therefore no mitigation is required. However, through the implementation of the ULDMP a range of measures will be implemented to ensure the Project is appropriately integrated into the surrounding landscape and urban context.

37.11.5 Summary of Effects on the Community

The Project will provide significant positive effects to the community in which it will operate. It is considered that overall, the community (existing and future) will benefit from the changes made to the corridor. The work supports planned urban growth and will have significant safety and transport benefits, providing safe active transport facilities and improving access to existing and future community resources, connectivity and health and wellbeing.

Any potential construction effects can be managed with the development and implementation of the appropriate management plans outlined above and communication with the community and affected land owners / occupiers.

37.12 Property, Land Use and Business Effects

The Ponga and Ōpāheke Road Upgrade has sought to reduce potential adverse effects on existing private properties and businesses through alignment and project design, where practicable, while acknowledging the planned urban growth and change in the area balancing these drivers. This has included specific consideration of the potential property and business impacts in the assessment of alternatives, as discussed in sections 4.2 and 36 and detailed in Appendix A, and through design refinement and defining the proposed designation boundary.

Where impacts on property, land use and businesses cannot be avoided, the potential effects discussed in this section relate to directly affected properties/landowners. Potential effects on properties and businesses affected by proximity to the Project have been discussed in 37.11.

The proposed designation requires land to provide a sufficient footprint to enable the construction and operation of the Ponga and Ōpāheke Road Upgrade, 60 private properties will be directly affected. These properties are primarily rural, rural-residential and urban-residential, with some open space/reserve land and commercial land use.

A description of existing land use is provided in section 35.2. In summary land directly affected by the Ponga Road and Ōpāheke Road Upgrade includes the following:

- The large portion of land in the south of the corridor within the proposed designation boundary (i.e. beyond the existing Ponga Road and Ōpāheke Road (rural) road reserve) is currently private farmland. The land is primarily used for grazing with low density rural residential dwellings.

- Urban residential sites within the Ōpāheke Road Urban Upgrade section. The land for nine of these properties is limited to the property frontage for driveway regrading.
- The Ōpāheke Reserve passive recreation area, including for integration with an existing stormwater wetland and esplanade reserve.
- Two rural based businesses including Golden Harvest Poultry (211 Ōpāheke Road) and Out of Space Storage (201 Ōpāheke Road). Land proposed to be designated for these businesses is generally the frontage adjacent to Ōpāheke Road.
- Counties Power Substation (9 Ponga Road) as discussed in section 37.10.

The potential pre-construction, construction and post construction effects on directly affected properties is discussed in the following sub-sections.

37.12.1 Pre-Construction Effects

The proposed designation has a lapse duration of 20 years to provide a sufficient timeframe which enables construction of the Ponga Road and Ōpāheke Road Upgrade in response to the progressive urbanisation of Drury-Ōpāheke. While the length of the lapse date reflects the need to provide long term certainty regarding the alignment of the Project, this has the potential to result in 'planning blight' from the restrictions to development resulting from the proposed designation, if not appropriately managed.

The proposed designation will not preclude the continued (unchanged) use of any directly affected properties prior to construction. However, in accordance with section 176(1)(b) of the RMA, anyone other than a requiring authority with an earlier designation is restricted from carrying out work on the designated land that would prevent or hinder the designated work without first obtaining the requiring authority's consent.

The purpose of the Ponga and Ōpāheke Road Upgrade is to support urban growth in the Drury-Ōpāheke growth area. The Project is located within the existing Ponga Road and Ōpāheke Road corridors largely (excluding those properties within the Ōpāheke Road Urban Upgrade section) within a rural greenfield area zoned for future urban development and planned to transition from rural to urban land use. As the proposed corridor will not be implemented until planned development occurs the Project is unlikely to affect the current land use surrounding the Ponga Road and Ōpāheke Road Rural section until such a time that the area starts to develop.

It is likely urban development will start occurring adjacent to the proposed designation before the future arterial is required. This is already beginning to be evident with recent development at Bellfield Estate. It is at this point the proposed designation may have adverse effects on the development of private property. Any potential land development issues would be addressed through the construction and operation of the Project (further discussed in sections 37.12.2 and 37.12.3). The existing open space and urban zoned areas are expected to have a lesser scale of development change as they are zoned in line with their existing uses. However some of the properties in the Ōpāheke Road Urban Upgrade section are zoned THAB or Mixed Housing Urban and could have potential for intensification.

As discussed, development is not precluded within the proposed designation area and AT has actively engaged, or sought to engage, with landowners through the Project development and adapt where practicable. AT will work with land owners and developers under the process in section 176(1)(b) to provide written consent for earthworks, interim road upgrades (or new roads), integrated

stormwater solutions and development within the proposed designations – provided those works will not prevent or hinder the work authorised by the proposed designation.

As there may be some time between the proposed designation being confirmed and before construction starts, a Project website (or equivalent virtual information source) will be set up with information on the Project. This will include the anticipated construction timeframes and contact details for enquiries. The website will continue to be updated during construction works.

37.12.2 Construction

The proposed designation includes land required for temporary and permanent works. During construction, the Project will temporarily require land to enable construction activities (detailed in section 34.4). If only temporary occupation of the land is required, it will be leased. Potential effects from the temporary lease/use of land within the proposed designation include disruption to farm activities or business, temporary loss of grazing pasture, stock-proof fencing, disruption to access, changes to driveway gradient, loss of vegetation and temporarily affected amenity.

The measures to mitigate these effects will be developed with the directly affected landowners or occupiers. On completion of the works, the designation boundary will be reviewed and may be removed from any land not required for the on-going operation, maintenance or mitigation of effects of the Project.

Potential adverse effects from construction activities are addressed throughout section 37 with appropriate mitigation identified to avoid or minimise effects on properties in proximity to the works. Particular mitigation measures for residential property and business disruption during construction include:

- Implementation of a SCMP prior to the start of construction to identify how the public and stakeholders (including directly affected and adjacent owners and occupiers of land) will be communicated with throughout the construction works. Including:
 - Determine adequate notice periods for the commencement of construction activities and works that affect access to properties;
 - Inform parties of the expected timing, duration and staging of works and regular updating of progress; and
 - Provide feedback, inquire and complaints during the construction process.
- Implementation of a CTMP to manage construction traffic and disruption to the local transport network (section 37.2.4), including methods to:
 - Maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be; and
 - Communicate traffic management measures to affected parties.
- Implementation of a CNVMP to provide a framework for the development and implementation of best practicable options to avoid, remedy or mitigate the adverse effects on receivers of noise and vibration resulting from construction and to manage any adverse construction noise and vibration effects on sensitive receivers (section 37.9.3), including methods to:
 - Communicate and engage with nearby residents and stakeholders; and
 - Minimise construction disruption for affected properties during construction.
- In addition to a CNVMP, it may be necessary to produce Site Specific or Activity Specific Construction Noise and Vibration Management Schedules where noise and/or vibration limits are predicted to be exceeded for a more sustained period or by a large margin.

- Implementation of an overall CEMP to manage potential construction effects.

These measures will appropriately minimise disruption to affected properties and allow the continued use of properties where possible. Potential effects will be generally temporary and therefore it is considered that they will be less than minor.

There is also a condition on the designation to show how flood risk measures will be implemented at detailed design (or that they are no longer required) at specific properties at 156 Ōpāheke Road and 198 Ponga Road. If these mitigation measures are required, they will be discussed with the land owner and implemented during construction works.

37.12.3 Post Construction

The proposed designation includes land required for temporary and permanent works. The land required for the Project is shown in the designation plans included with the NoR (see Volume 1). Land required for the permanent work will be purchased and following the review of the designation boundary on completion of the works any land not required for the permanent work or for the on-going operation, maintenance or mitigation of effects of the Project will be reinstated in coordination with directly affected landowners or occupiers. This will include:

- Reinstatement of construction areas and reintegrating with the surrounding landform
- Reinstatement of driveways, accessways, fences and gardens.
- Integration of batters and cut/fill slopes with the landscape.

Therefore the post-construction effects on the use of land will be no more than minor on these landowners.

37.13 Urban Design Evaluation

An Urban Design Evaluation (provided within Volume 4) has been undertaken for the Ponga Road and Ōpāheke Road Upgrade, based on the Design Framework (included in the Urban Design Evaluation in Volume 4) established for the Project, the Urban Design Evaluation provides urban design focused commentary on the indicative design of the proposed corridors and recommends urban design outcomes that should be considered in future design stages through the implementation of the ULDM proposed as a condition on the designation. The design principles that make up the Design Framework seek that transport corridors contribute positively to existing and new communities, the environment and the social and economic vitality of Auckland.

The specific outcomes intended for the Project are shown in blue in Figure 37-3 to Figure 37-5 below. The measures to achieve these outcomes will be confirmed at detailed design and form part of the ULDM as a condition on the proposed designation. The outcomes include:

- 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.
- Legibility, modal priority for active modes and connectivity demands are addressed at intersections.
- An urban interface approach within the corridor that recognises the transition of densities and land uses from residential, industrial and local centre. The urban interface approach should respond to

the changing built form interface, respond to the spatial character of adjacent development and demonstrate permeable pedestrian access between the corridor and adjacent development.

- In future design stages, Manawhenua will be invited to provide input into relevant cultural landscape and design matters including how desired outcomes reflect their identity and values
- The identification of urban and landscape design drivers related to the Mangapū and Ōtūwairoa Streams, the Ōpāheke Reserve, as well as the proposed local centre and open space at the intersection of Ōpāheke and Ponga Road. The future corridor design should demonstrate an appropriate response and integration with these character drivers.
- A landscape plan that:
 - Considers recommendations from the landscape and visual, arboricultural and ecological assessments including street tree and stormwater wetland planting, construction compound and private property reinstatement and treatment of batter slopes.
 - Integrate with the Mangapū and Ōtūwairoa Streams where the corridor intersects with the proposed Blue-Green Network.
 - Reinforces the wider vegetation patterns of the local landscape and create connections to proposed greenways and the wider active transport network.
 - provides an appropriate interface to the Papakura Cemetery through the planting type, scale and arrangement.
- Integration of the Ponga and Ōpāheke stormwater wetlands to ensure an appropriate interface with adjacent land uses, specifically where wetlands are proposed in areas zoned medium 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. Further urban design opportunities in the Project area have also been identified in Figure 37-3 to Figure 37-5 and shown in orange. These opportunities could be considered by AT or other parties at future stages of design and development.

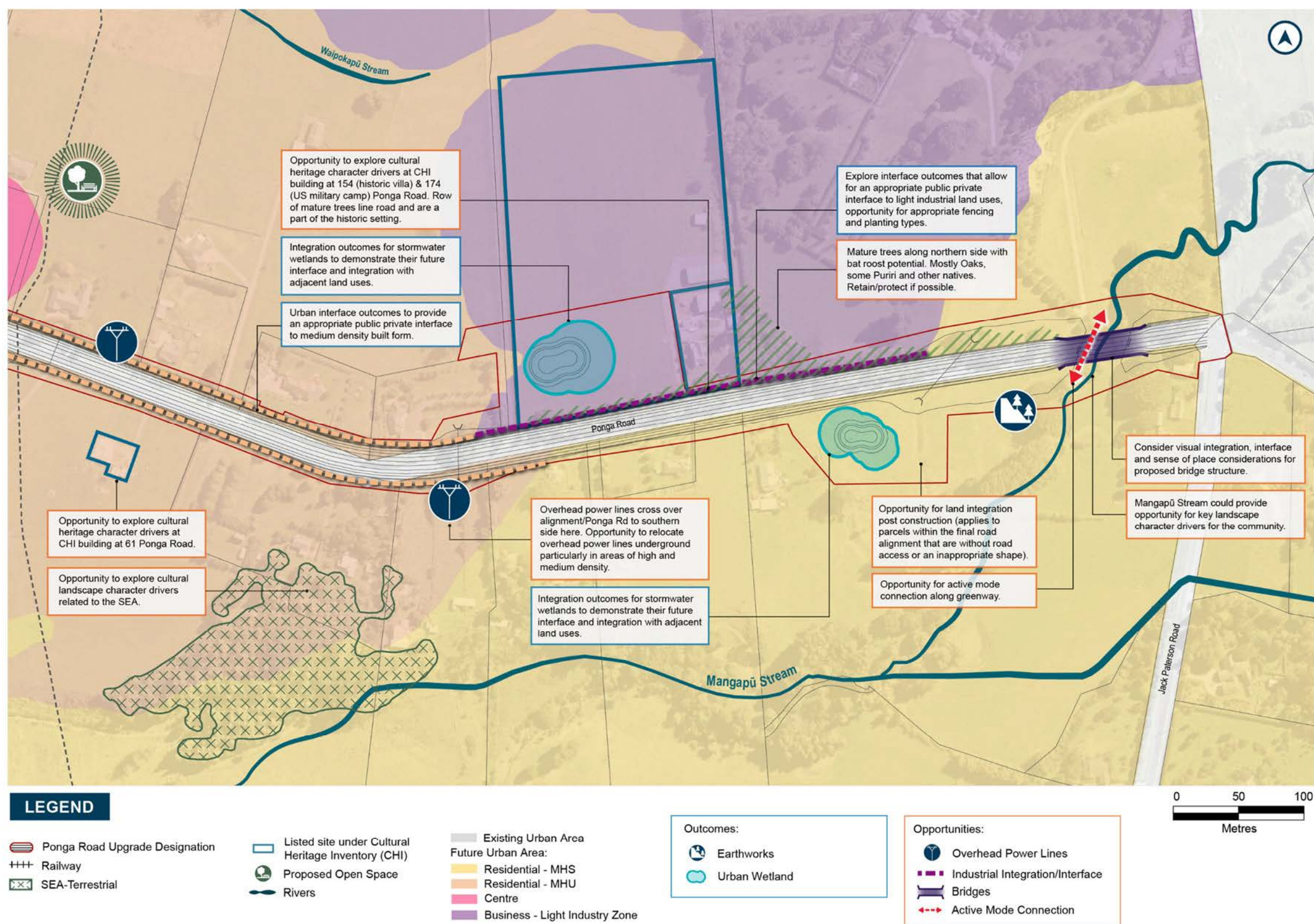


Figure 37-3: Ponga Road Upgrade urban design outcomes and opportunities

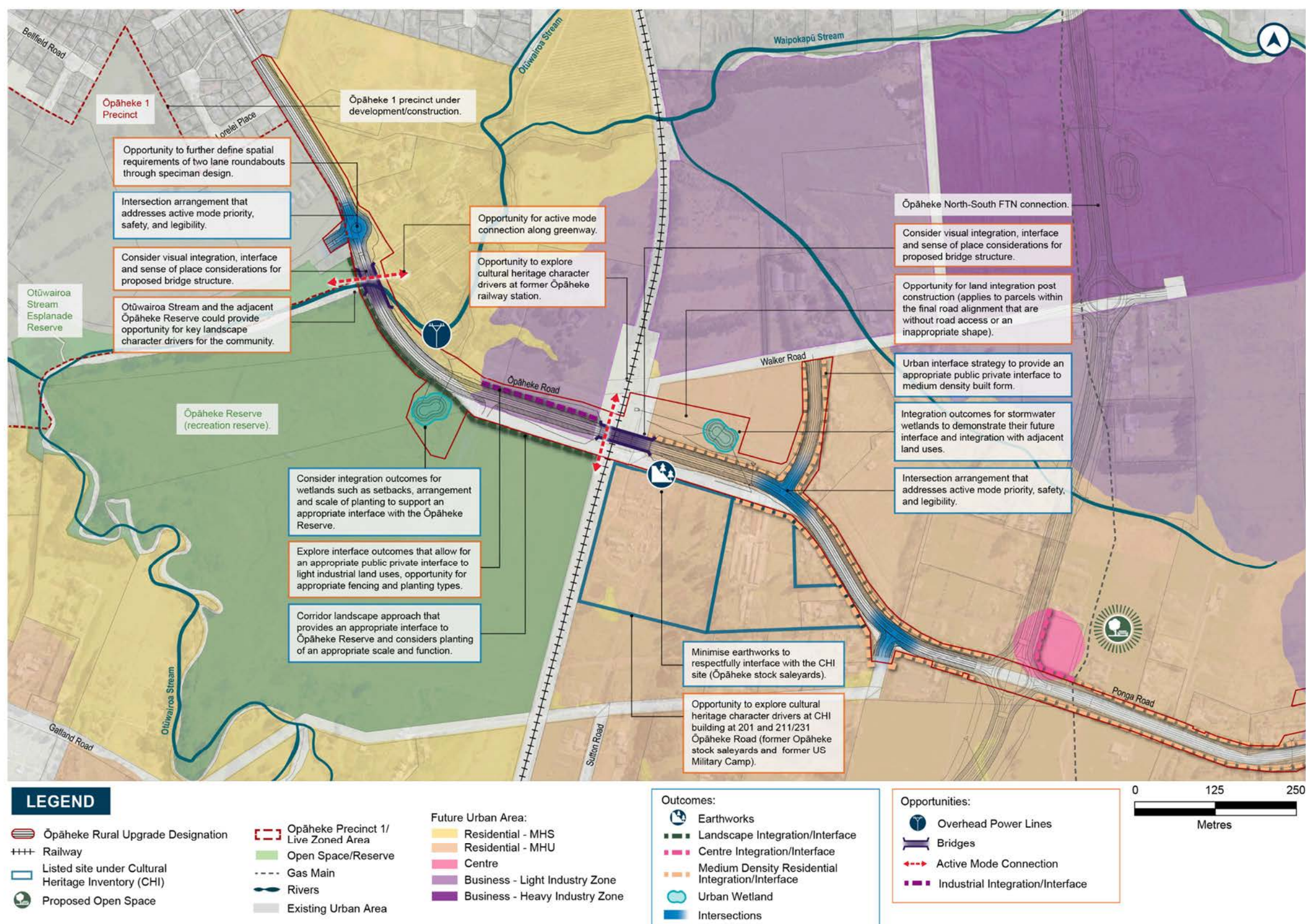


Figure 37-4: Opāheke Road (Rural) Upgrade additional urban design outcomes and opportunities

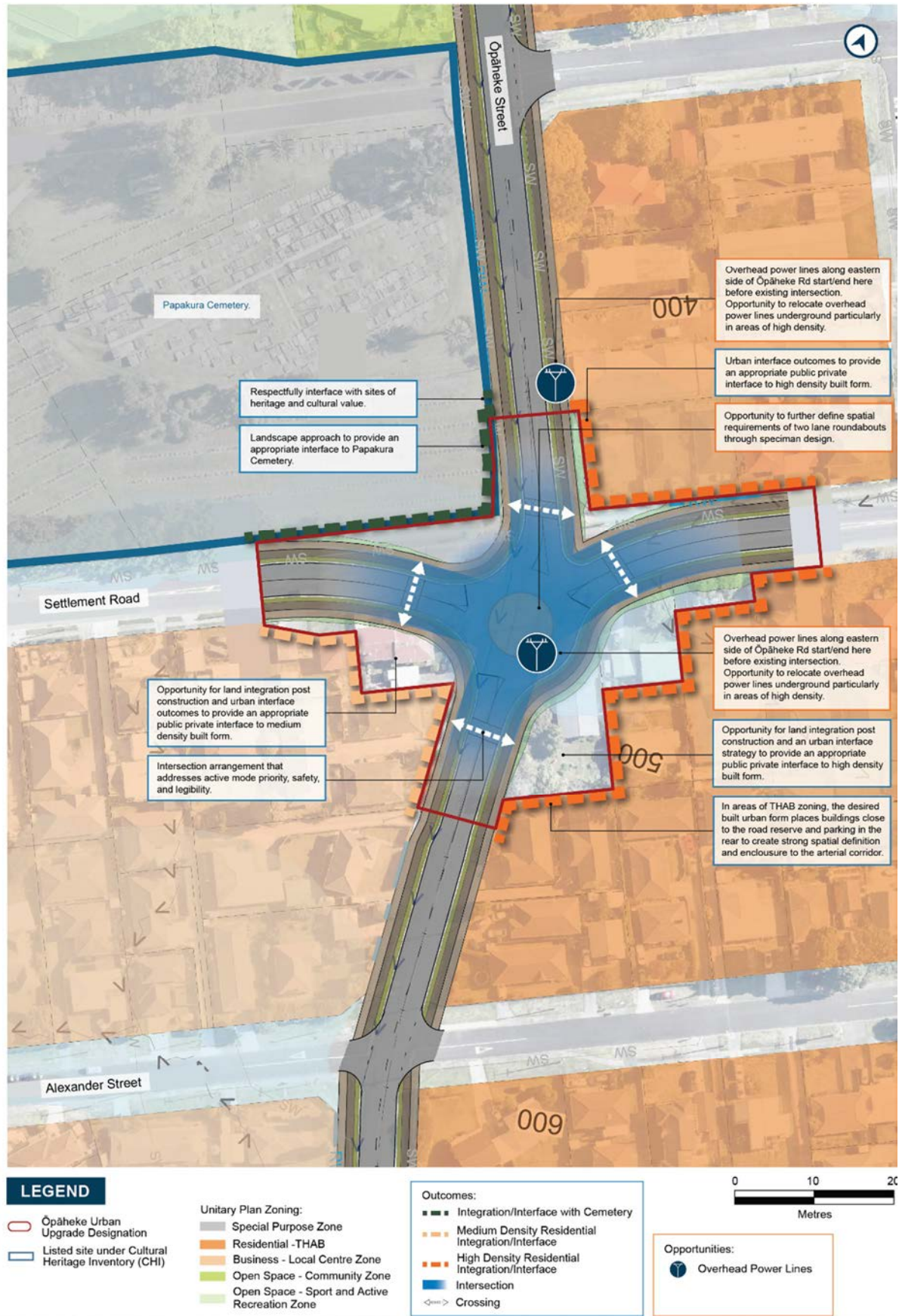


Figure 37-5 Ōpāheke Road (Urban) Upgrade urban design outcomes and opportunities

38 Ponga and Ōpāheke Road Upgrade: Summary of Measures to Manage Adverse Effects

The positive effects of the Project are set out in section 37.1 of this AEE.

In the first instance, adverse effects have been avoided and mitigated via alignment decisions and design choices. In addition, a range of measures are proposed for the Project to avoid, remedy or mitigate the potential adverse effects identified in this AEE. These measures are summarised in Table 38-1 below.

The measures will be implemented during the development of the detailed design, prior to and during construction, and once the permanent works are completed. These proposed measures are reflected in the proposed designation conditions included with the NoR.

Table 38-1: NoR D5 Summary of measures to avoid, remedy or mitigate potential adverse effects

AEE Section	Topic	Measures	Mechanism to Implement Measures
37.2	Construction Traffic	- Any potential construction traffic effects will be reassessed prior to construction taking into account the specific construction methodology and traffic environment at the time of construction. - Methods to manage the effects of temporary traffic management. - Measures to ensure the safety of all transport users. - Methods to manage traffic congestion and manage vehicular and pedestrian traffic near schools. - Identification of site access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors. - Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads. - Methods to manage vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be. - The approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads. - Methods to communication of traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services).	CTMP

AEE Section	Topic	Measures	Mechanism to Implement Measures
37.3	Cultural Values	• Involvement of Manawhenua in Project design and construction. • Identifying cultural matters and principles that should be considered in the development of other management plans (e.g. ULDMP and HAMP see below). • Ensure the continued recognition of Manawhenua cultural values throughout the Project lifecycle. • Establishment of protocols for cultural monitoring during construction works.	• Cultural Advisory Report • Cultural Monitoring Plan
37.4	Historic Heritage	• Confirm the methods for the identification and assessment of historic heritage within the designation to inform detailed design. • Confirm the known and potential historic heritage sites within the designation. • Methods to store and relocate the stone marking the World War II Ōpāheke East Camp on Ponga Road. • Set out the HNZPTA authority requirements for any pre-1900 sites.	• HAMP
37.5 37.13	Landscape, Visual, Urban Design and Amenity	• Demonstrate how the Project is designed to integrate with adjacent urban (or proposed urban) and landscape context. • Provide appropriate walking and cycling connectivity to, and interfaces with, existing or proposed adjacent land uses, and walking and cycling connections. • Promote inclusive access (where appropriate). • Promote a sense of personal safety. • A concept plan and explanation of the rationale for the landscape and urban design proposals • Developed design concepts, including principles for walking and cycling facilities and public transport. • Urban design and landscape details covering: • road design; • roadside elements; • architectural and landscape treatment of major structures and noise barriers • landscape treatment of permanent stormwater wetlands and swales; • integration of passenger transport; • pedestrian and cycle facilities; • heritage items; and • re-instatement of construction and site compound areas, driveways, accessways and fences. • Planting design details including:	• ULDMP

AEE Section	Topic	Measures	Mechanism to Implement Measures
		• identification of existing trees and vegetation that will be retained. Where practicable, mature trees and native vegetation should be retained; • street trees, shrubs and ground cover suitable for berms; • treatment of fill slopes to integrate with adjacent land use, streams, riparian margins and open space zones; • planting of stormwater wetlands; • integration of any planting requirements required by conditions of any resource consents for the Project; and • reinstatement planting of construction and site compound areas as appropriate. • Detailed specification relating to weed control and clearance, pest animal management, mulching, plant sourcing and planting, including hydroseeding and grassing. – A planting programme and maintenance plan.	
37.7	Arboriculture	• Confirmation that protected trees under the district plan provisions identified in the Assessment of Arboricultural Effects still exist. • How the design and location of works can avoid, remedy or mitigate effects on the existing trees. • Recommended planting to replace trees that require removal. • Establishing tree protection zones and specifying tree protection measures such as protective fencing, ground protection and physical protection of roots, trunks and branches. • Detailing methods for all work within the rootzone of trees that are to be retained in line with appropriate arboricultural standards.	• Tree Management Plan
37.8	Natural Hazards – Flooding	• Methods to mitigate flood hazard effects such as siting stockpiles out of floodplains, minimising obstruction to flood flows and actions to respond to warnings of heavy rain. • Design outcomes relating to bridging specific streams. • A design that achieves flood risk outcomes relating to flood levels and freeboard for existing habitable floors, flood levels on land zoned for urban or future urban development where there is no existing dwelling, flood prone areas and access.	• CEMP • Flood risk outcomes to be achieved at detailed design (demonstrated through the Outline Plan(s))

AEE Section	Topic	Measures	Mechanism to Implement Measures
37.9	Construction Noise and Vibration	- Confirming construction works and anticipated equipment/processes; hours of operation, noise and vibration standards. - Identification of receivers where noise and vibration standards apply. - Management and mitigation options, including alternative strategies adopting the BPO where full compliance with the relevant noise and/or vibration standards cannot be achieved. - Methods and frequency for monitoring and reporting on construction noise and vibration. - Procedures for maintaining contact with stakeholders, contact details of site supervisor and liaison person. - Identification of areas where compliance with the noise and/or vibration standards will not be practicable and where a Site Specific Construction Noise and/or Vibration Management Schedule will be required. - Procedures for how remedial works will be undertaken, should they be required as a result of the building condition surveys.	- CNVMP - CNVMS
37.9	Operational Noise and Vibration	Confirmation of achieving noise categories at PPFs and confirmation of BPO.	Noise Mitigation Plan
37.10	Network Utilities	- In consultation with network utility operators, the methods to protect, relocate and work in proximity to existing network utilities. - Network utility operators with existing infrastructure located within the proposed designation will not require written consent under section 176 of the RMA for some activities.	NUMP
37.11	Community	- Methods to regularly communication with the community, stakeholders and land owners/occupiers during construction, including timeframes. - Identification of a Project liaison person. - Method to formalise a complaints and response process (and monitoring thereof). - Links to other communication methods in other management plans. - S176(1)(b) RMA approval process for land owners and developers to enable development (whilst not preventing or hindering the work authorised for the Project).	- SCMP - CNVMP - CNVMS - CTMP - CEMP - S176(1)(b) RMA approval process
37.12	Property, Land use and Business		

39 Ponga and Ōpāheke Road Upgrade: Statutory Assessment

An assessment of the statutory matters that are relevant to the Project under section 171(1) of the RMA has been undertaken and is presented in Part I, Statutory Assessment.

With reference to those matters, and based on the assessment of effects summarised above, the proposed designation is generally consistent with the relevant provisions of National Policy Statements, the Regional Policy Statement and the relevant objectives and policies of the AUPOIP. Adequate consideration has been given to alternative sites, routes and methods of undertaking the Project, and the Project will avoid, remedy or mitigate any adverse effects on the environment. The proposed work and the proposed designation are also reasonably necessary for achieving the objectives of AT for the Project.

40 Ponga and Ōpāheke Road Upgrade: Conclusion

The wider Drury-Ōpāheke area in the south of Auckland has been signalled to undergo significant urban growth in the next 30 years. The Drury-Ōpāheke area will experience significant change over the coming years as the existing rural environment develops into a new urban area. This is accelerating as private plan changes are lodged with Auckland Council. The Project will provide critical transport infrastructure to support and integrate with the planned future growth in Drury-Ōpāheke and the wider south Auckland growth areas.

While some adverse effects will be generated during construction and operation of the Project, these can be mitigated by the management plans and other measures which are proposed as conditions of the proposed designation. The Project will have significant positive effects, and provide for the social, economic and cultural wellbeing of communities.

The Project is consistent with the relevant planning documents and statutory tests, thereby satisfying the requirements necessary for Auckland Council to recommend confirmation of the NoR on the basis of the conditions proposed by AT.



PART I

Statutory Assessment

41 Statutory Assessment

Section 171(1) sets out the matters that must be considered by a territorial authority in making a recommendation on a NoR for a new designation. Under Section 181(2), those same matters are to be considered 'with all necessary modifications', in relation to a notice of requirement for an alteration as if it were a notice of requirement for a new designation. In the context of the Drury Package, NoR D1 is for an alteration to an existing designation (6707), and NoRs D2 – D5 are for new designations.

This section provides an assessment of the statutory matters that are relevant to each of the Projects within the Drury Package under Section 171(1) (for NoRs D2 – D5) and Section 181(2) (for NoR D1) of the RMA. This section is set out following the order of requirements under Section 171(1) of the RMA, concluding with an assessment of the Projects against Part 2 of the RMA.

This following assessment is made with reference to the preceding sections of this report including:

- Parts D, E, F, G and H - Section 8, 15, 22, 29 and 36: Consideration of Alternatives
- Parts D, E, F, G and H - Section 9, 16, 23, 30 and 37: Assessment of Effects on the Environment
- Parts D, E, F, G and H - Section 10, 17, 24, 31 and 38: Summary of Measures to Manage Adverse Effects
- Part C - Section 5: Engagement

41.1 Relevant provisions of RMA planning documents (section 171(1)(a) and section 181(2))

When considering the effects of allowing a requirement, section 171(1)(a) of the RMA requires that particular regard be had to any relevant provisions of:

(i) a national policy statement:

(ii) a New Zealand coastal policy statement:

(iii) a regional policy statement or proposed regional policy statement:

(v) a plan or proposed plan

Under Section 181(2), those same matters are to be considered 'with all necessary modifications', in relation to a notice of requirement for an alteration as if it were a notice of requirement for a new designation.

The applicable RMA planning documents, and the provisions of those planning documents that are considered relevant to the consideration of the NoRs within the Drury Package are provided in Appendix B and summarised in Figure 41-1.

The assessment of the relevant provisions of RMA planning documents was undertaken by reviewing National Policy Statements and the AUPOIP and identifying the key objectives and policies within those documents that are relevant to the Project. Where similar themes were identified across the documents, the provisions were grouped and assessed collectively. Similarly, where assessment against the relevant provisions of RMA planning document is consistent between the NoRs within the Drury Package, a combined assessment is provided. Bespoke assessment, where required, for each NoR is also provided. Table 41-1 provides this assessment.

In addition to those required by the above, the relationship of the Drury Package to a number of other related plans and strategies is also assessed in the subsequent sections. These are considered relevant matters under Section 171(1)(d) and Section 181(2) of the RMA.



Figure 41-1 Statutory Framework Applicable to the Drury Package

Table 41-1: Statutory Assessment

Applicable Notice	Key Objectives and Policies	Analysis
Urban growth and development capacity - Development capacity is planned and sequenced with infrastructure to meet the future needs of communities. - Urban growth and its associated infrastructure is provided for (and integrated) in appropriate locations, whilst recognising the values of highly productive rural land.		
All	NPS-UD Objective 1 & 6. Policy 1(c)(e)(f), Policy 6. AUPOIP [RPS]: B2.2.1(1), B2.2.1(3), B2.2.1(5), B2.4.1(6), B2.4.2(6), B3.2.1(5), B3.3.1(1)(b), B3.3.1(1)(c), B3.3.2(4)(a-b), B3.3.2(5)(a), B9.2.1(2) AUPOIP [DP]: E27.2(1), E27.2(2), E27.2(5), E27.2(6). NoR D2 only: Drury 1 Precinct 6.25 Objectives 8, 9, 10, Policies 15, 16	Summary of Objectives and Policies - The National Policy Statement on Urban Development (NPS-UD) seeks to ensure urban environments are well-functioning and enable all people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety. Within the NPS-UD Auckland is recognised as a Tier 1 urban environment and therefore is subject to a greater policy direction in terms of intensification and density of urban form. The NPS-UD directs that urban development is integrated with infrastructure planning and funding decisions and is strategic over the medium to long term. - The objectives and policies of the AUPOIP seek to provide sufficient feasible development capacity for housing with set dwelling targets over the next 30 years. In order to reach these targets adequate infrastructure must be existing or provided prior to or with development. - Provisions in Chapter E27 – Transport seek to ensure that land use and all modes of transport are integrated in a manner that realises the benefits of an integrated network and managing the adverse effects of traffic generation. Assessment - The objectives and policies emphasise the importance of providing short, medium and long term residential and business capacity. This includes medium and long-term strategic planning for urban development. The Drury Package is consistent with these objectives and policies by providing for the necessary transport infrastructure to support the zoning of land in the Drury-Ōpāheke growth area and the establishment of the necessary development capacity which is accelerating as a result of numerous private plan changes being lodged with Auckland Council. - Route protection will ensure that the necessary transport infrastructure is planned and integrated (and identified in the AUPOIP) to meet the feasible development capacity targets over the next 30 years. - The proposed Drury Package designations will protect the land for the construction of the future arterial transport corridors which generally traverse rural land zoned for future urban development. Drury-Ōpāheke is a planned growth area and some of the urban development is likely to start occurring adjacent to the proposed designations before the future arterial transport corridors are required.

Applicable Notice	Key Objectives and Policies	Analysis
		- Where necessary, AT and Waka Kotahi will work with land owners and developers under the process in section 176(1)(b) to provide written consent to enable development for earthworks, interim road upgrades (or new roads) and development within the proposed designations and alteration to existing designation – provided those works will not prevent or hinder the work authorised by AT's and Waka Kotahi designations and alteration to designation for the Drury Package. It is anticipated that collector roads within the arterial corridors maybe delivered in partnership with developers. - The NPS-UD and AUPOIP recognise the benefits of urban development where they contribute to peoples social, economic, cultural and environmental wellbeing. Of particular relevance to the Drury Package: where good accessibility is provided for all people between housing, jobs, community services, natural spaces, and open spaces, including by way of public or active transport. The Project will ensure land is protected to contribute to the accessible, high quality, effective, efficient and safe transport routes (including public and active transport modes) that support the movement of people, goods and services for the future planned development in Drury-Ōpāheke Conclusion - Each of the Projects within the Drury Package give effect to these objectives and policies by protecting corridors to deliver a flexible integrated transport system to positively contribute to, and support, quality, connected urban and natural environments.
Enabling Infrastructure - Infrastructure is enabled and where appropriate protected. - Benefits of infrastructure are recognised while adverse effects are avoided, remedied or mitigated.		
All	AUPOIP [RPS]: B2.2.1(1)(c-d), B3.2.1(1), B3.2.1(2), B3.2.1(3), B3.2.1(4), B3.2.1(5), B3.2.1(8), B3.2.2(1), B3.2.2(7), B3.2.2(8), B3.3.1(1), B3.3.2(1), B3.3.2(3), B3.3.2(4)(b).	Summary of Objectives and Policies - Objectives and policies in RPS Chapter B3 of the AUPOIP recognise the importance infrastructure plays in realising Auckland's economic potential. This includes integrating the provision of infrastructure with urban growth, avoiding incompatible land uses and increasing resilience. The policy direction recognises the importance of the transport network in the movement of people, goods and services, urban form, enabling growth, and providing choices. - Objectives and policies in Chapter E26 of the AUPOIP identify that infrastructure is critical to the social, economic, and cultural well-being of people and communities and the quality of the environment. The development, operation, use, repair, maintenance, upgrading and removal of infrastructure is anticipated and enabled, and the benefits infrastructure can have, as well as a range of adverse effects, are acknowledged within the objectives and policies.

Applicable Notice	Key Objectives and Policies	Analysis
	AUPOIP [DP]: E26.2.1(1), E26.2.1(2), E26.2.1(4), E26.2.1(9), E26.2.2(4), E26.2.2(14), E26.2.2(15). AUPOIP [DP]: E27.2(1), E27.2(2), E27.2(5). NoR D2 & D5 only: E27.2(6). NoR D2 only: AUPOIP [DP]: Drury 1 Precinct 6.25 Objectives 2,10. Policies 3, AUP:OIP E17.2(1), E17.2(3), E17.3(1).	Assessment <u>Drury Arterial Network Benefits and Land Use Integration</u> • The Drury Package strongly meets these objectives and policies by providing for a wide range of transport benefits for the community both individually and part of the wider integrated regional network planned for the area. • The Drury Arterial Network will significantly improve transport facilities for all modes, providing for a range of mode choices to support the projected growth in transport demand from urban development. The Drury Arterial Network will integrate well with proposed surrounding land uses and the wider transport network responding to the timing, scale and form of urban development triggers and staging of future infrastructure corridors, helping to facilitate and unlock urban development and enable the general social and economic growth of Drury-Ōpāheke and the wider area. • The Drury Arterial Network will result in improved safety for those that travel by car, active modes and public transport, as well as the movement of goods and services. The risk of death and serious injuries will be significantly reduced. Safety and amenity for vulnerable users will be significantly improved with the provision of segregated active transport facilities including crossing facilities at all intersections. • The Drury Arterial Network will improve corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand. • As well as the future communities in the Southern FUZ areas the Drury Arterial Network is planned to serve, the positive impacts of the proposed infrastructure upgrades will also benefit the existing communities by providing a safer, more efficient and reliable transport network and an increase in mode choice enabling the movement of people, goods and services. • The RPS and district plan provide objectives and policies that seek to ensure infrastructure is provided in an integrated manner, with both land use and existing infrastructure. Waka Kotahi and AT have been working closely with Auckland Council, Watercare, First Gas, Counties Power, Transpower and other providers to ensure the future transport network is delivered in an integrated way with existing and future infrastructure. <u>Adverse effects are avoided, remedied or mitigated.</u> • Infrastructure has operational and functional needs that need to be recognised to ensure that the relevant infrastructure is effective. The Project has sought to avoid adverse effects as far as practicable and where possible, demonstrated through the upgrade existing roads and through the alternatives assessment process. • Any potential adverse effects, as identified in Section, 9, 16, 23, 30 and 37, that cannot be avoided through design have been mitigated or remedied where appropriate through the proposed conditions of the proposed designations, the proposed alteration to the existing SH22 designation and by the design and management framework which has been adopted.

Applicable Notice	Key Objectives and Policies	Analysis
		- The proposed designations and the proposed alteration to the existing SH22 designation provide sufficient width to allow flexibility in design enabling them to respond to the surrounding land use and potential effects as required in future design and outline plan processes. This will be supported by the management framework which identifies key environmental outcomes and design principles that direct further design and assessment to provide for adaptability to the specific requirements of the future urban context. Conclusion - The Drury Package achieves these objectives and policies by enabling upgrades of, and proposed new strategic transport infrastructure providing a wide range of transport benefits for the community whilst ensuring that adverse effects are avoided, remedied or mitigated.
National Grid - Significance of the National Grid is recognised. - Allow development where it does not compromise the National Grid's effective development, operation, maintenance and upgrading are enabled.		
D2	NPS-ET: Objective, Policies 1, 10, AUPOIP B3.2.1(7), B3.2.2(7) AUPOIP D26.2(1), D26.3(1) AUPOIP E26.2.1(7)	Summary of Objectives and Policies - The relevant objectives and policies of the NPS for Electricity Transmission (NPS-ET) and the AUPOIP RPS seek to enable and provide for the National Grid, recognising the national significance of the electricity transmission network and to manage the adverse effects of other activities on the network to ensure its operation is not compromised. - The objectives and policies of Chapter B3 of the AUPOIP RPS also encourage co-location of infrastructure where safe to do so and operational and technical requirements are satisfied. - Specific AUPOIP objectives and policies aim to ensure the efficient development, operation, maintenance, upgrading and removal of the National Grid is not compromised by subdivision, use and development by ensuring operational and technical requirements and standards are satisfied. Assessment - For the Jesmond to Waihoehoe Road West FTN Arterial (NoR D2), 220kV lines pass over Bremner Road at the Ngakoroa Stream bridge and 110kV lines pass over Bremner Road on near the SH1 bridge at Victoria Street. Works will be managed to reduce the potential adverse effects from working beneath and around the National Grid.

Applicable Notice	Key Objectives and Policies	Analysis
		- Engagement with Transpower has been ongoing throughout the development of the Project and their feedback has been considered as part of refinement of the Project. At the Ngakoroa Stream bridge, vertical clearance is constrained by the transmission lines. As outlined in section 5.2.2.6, the design has been informed from engagement with Transpower and by the Waka Kotahi Papakura to Drury South project which has been developed to provide adequate clearance to the lines. It is also understood that the 110kV towers may be relocated in conjunction with the Papakura to Drury South project or decommissioned. - At detailed design, and through the implementation of the NUMP proposed as a condition of the designation, ongoing engagement will be undertaken with Transpower to confirm working room clearance around the 220kV lines (and if the 110kV are present) during construction. Any potential adverse effects on the National Grid can be managed appropriately. Conclusion - It is considered that the Project contributes to the achievement of these objectives and policies by recognising the national significance of electricity transmission and by appropriately managing any potential adverse effects to ensure its operation is not compromised.
Indigenous Biodiversity and Ecological Values - The protection and enhancement of indigenous biodiversity and ecological values (including in degraded areas) is promoted. - Protect scheduled values but provide for infrastructure in sensitive areas considering: - the benefits and value of providing that infrastructure; - the functional or operational need to locate or traverse that location; - whether any practicable alternatives would avoid or reduce effects on the scheduled values - how the infrastructure contributes to the planned growth and intensification of Auckland.		
All	AUPOIP [RPS]: B7.2.1(2), B7.5.1(2), B7.5.2(1)(f). AUPOIP [DP]: E12.2(1), E12.3(1), E12.3(2)(c).	Summary of Objectives and Policies - The AUPOIP objectives and policies seek to protect and enhance ecological values across terrestrial, freshwater and coastal environments (see the Coastal Theme of this table for more on coastal values). - The primary method the AUPOIP uses to protect biodiversity, which gives effect to the NZCPS, is the identification of SEAs. These areas receive the highest level of protection. Biodiversity values outside SEAs also need to be considered and effects on them addressed.

Applicable Notice	Key Objectives and Policies	Analysis
	AUPOIP E15.2(1), E15.2(2), E15.3(1), E15.3(2), E15.3(3) E15.3(4)(b), E15.3(7) E26.2.1(9), E26.2.2(4), E26.2.2(8) NoR D1 and D2 only: AUPOIP [RPS]: B3.2.1(3), B3.2.2(3), B3.2.2(6), B7.2.1(1), B7.2.1(2), B6.2.2(5). AUPOIP [RP & DP]: D9.2(1), D9.2(2), D9.2(3), D9.3(1), D9.3 (2), D9.3(3), D9.3(8), D9.3(10) AUPOIP [DP]: E26.2.2(6) D2 only: NZCPS O1, P6, P11.	- Adverse effects on biodiversity are to be avoided as far as practicable, and where avoidance is not practicable to be minimised. Other adverse effects on biodiversity and ecosystems should be avoided, remedied or mitigated. The provisions recognise that avoidance of areas with biodiversity values is not always practicable for infrastructure. Where biodiversity is affected, measures to protect and restore biodiversity through legal protection and active management should be considered. - Of particular reference to NoR D1 and NoR D2, where SEAs are identified within the proposed designation and the proposed alteration to the existing SH22 designation footprint, the policies of Chapter B3 and E26 seek to enable the development and operation of infrastructure. This includes sensitive areas that are scheduled in the AUPOIP in relation to the coastal environment and indigenous biodiversity, such as SEAs, provided adverse effects are avoided or reduced where practicable and the infrastructure has an operational and functional need to locate in sensitive areas. - While the objectives and policies of the AUPOIP generally seek to recognise the benefits, functional and operational needs and value of investment in infrastructure and to enable the safe, efficient and secure provision of infrastructure where appropriate, the objectives and policies also anticipate that there may be some adverse effects as a result of the provision of such infrastructure. The objectives and policies recognise that in some instances such adverse effects may be appropriate given the necessity of, and essential services provided by, infrastructure. Assessment of all Projects in the Drury Package - Although resource consents are not being sought for the Drury Package at this time, ecological effects arising in respect of activities that require consents have been considered to inform alternatives assessment, Project design and the proposed designation and alteration footprints. - In light of this, generally, the Projects within the Drury Arterial Network have sought to avoid or minimise impacts on a range of high value ecological areas including wetlands, streams and SEAs. This is demonstrated through the comprehensive alternatives assessment process undertaken and design refinement. The proposed transport infrastructure is critical to enable existing and future communities to provide for their social, economic, and cultural well-being.
D1	As above.	NoR D1 Assessment The Assessment of Ecological Effects found most habitats and species likely to occur within the Project Area are generally modified and exotic and are of Low ecological value and likely to support Not Threatened native species of birds and lizards which

Applicable Notice	Key Objectives and Policies	Analysis
		have adapted to an already modified landscape. However the Ngakoroa Stream corridor is highlighted for its High value wetland habitat and potential to support At Risk Declining wetland bird species. - Through the alternatives assessment, the SH22 Upgrade alignment has been widened to the south at the Ngakoroa Stream Bridge to minimise impacts on the high value wetland habitat within SEA_T_530b. However, in order to construct the new bridge, there is a functional need to provide construction and bridge staging areas on both sides of the proposed bridge temporarily during construction. Therefore the proposed alteration to the existing designation is not able to completely avoid temporary construction-related effects on the SEAs while enabling the efficient construction of the Project. While there are likely to be temporary construction activities above and adjacent to the SEA, these can be mitigated through detailed design and future consent processes. Where avoidance of effects is not practicable, such as that described above, measures are proposed to mitigate effects. Additionally, the proposed alteration to the existing designation provides opportunities to further minimise impacts during the detailed design. - In considering the potential future effects arising from activities that may require resource consent in the future, the Assessment of Ecological Effects identified that any potential effects of the Project on ecological features within or adjacent to the Project area, can be adequately managed in any future consent processes. This includes managing potential effects to SEA_T_530b. NoR D1 Conclusion - The Project is consistent with these objectives and policies as the proposed alignment has minimised effects on streams, high value wetlands, terrestrial habitats and species of value where practicable. In particular, although the Project has a functional need to locate within the SEA environment due to the location of existing infrastructure and requirements for construction, Additionally, the proposed infrastructure is critical for existing and future communities to provide for their needs and well-being the SH22 Upgrade has reduced impacts the high value wetland habitat within SEA_T_530b by widening to the opposite side of the SEA which is of lesser ecological value. Any potential adverse effects on the SEAs will be able to be managed through future consent processes. There is flexibility in the proposed alteration to the existing designation to further minimise impacts at detailed design. Adverse effects of the Project on ecological features within the Project area can be managed and mitigated.
D2	As above. Drury 1 Precinct 6.25 Objective 3. Policy 9	NoR D2 Assessment The Assessment of Ecological Effects found most habitats and species likely to occur within the Project Area are generally modified and exotic and are of Low ecological value and likely to support Not Threatened native species of birds and lizards which have adapted to an already modified landscape. However, the Ngakoroa Stream corridor was highlighted for its high value wetland habitat and potential to support At-Risk and Threatened wetland bird species.

Applicable Notice	Key Objectives and Policies	Analysis
		- Through the alternatives assessment, the Bremner Road FTN Upgrade alignment has been widened to the south at the existing Ngakoroa Stream Bridge to avoid direct impacts on the coastal marine area, a high value marine wetland habitat within SEA_M1_29b and an HHEP to the north of the existing bridge. However, in widening to the south to avoid impacts to the high value marine SEA, a terrestrial SEA (SEA_T_530b) will be impacted to the south. The nature of widening an existing bridge and avoiding the high value CMA and Marine SEA creates the need for the proposed infrastructure to impact upon the terrestrial SEA to the south. Where avoidance of effects is not practicable, measures to minimise effects will be proposed. Additionally, the proposed designation provides opportunities to further avoid or minimise potential impacts during the detailed design. - Bridge staging area is also required on the southern side of the bridge temporarily during construction. Therefore the proposed designation is not able to completely avoid temporary construction-related effects on the SEA while enabling the efficient construction of the Project. Conditions proposed on the designation seek to avoid disturbance effects during construction on any potential At-Risk and Threatened Wetland Birds firstly by aiming to avoid the breeding season where practicable, and then by locating and protecting (i.e. by a buffer area) any nests identified prior to construction works. Where avoidance of effects is not practicable through these measures, with guidance from an ecologist, measures to minimise disturbance effects will be proposed. - The Project has also sought to protect and enhance ecological values through bridging new stream crossings including of the unnamed stream at CH700 within the Jesmond to Bremner Link and across the Hingaia Stream. - In considering the potential future effects arising from activities that may require resource consent in the future, the Assessment of Ecological Effects identified that any potential effects of the Project on ecological features within or adjacent to the Project area, can be adequately managed in any future consent processes. This includes managing potential effects to SEA_T_530b. NoR D2 Conclusion - The Project is consistent with these objectives and policies as the proposed alignment has minimised effects on streams, high value wetlands, terrestrial habitats and species of value where practicable. The Project builds upon existing infrastructure and is located within the SEA terrestrial environment to avoid high value marine SEA, CMA and HHEP. Any potential adverse effects on the SEAs will be able to be managed through future consent processes. There is flexibility in the proposed designation to avoid or minimise impacts at detailed design. - Conditions proposed on the designation seek to avoid disturbance effects on At-Risk and Threatened wetland birds during construction and minimise any effect where avoidance is not practicable. - Adverse effects of the Project on ecological features within the Project area can be appropriately avoided, managed and/or mitigated. Additionally, the proposed infrastructure is critical for existing and future communities to provide for their needs and well-being.

Applicable Notice	Key Objectives and Policies	Analysis
D3, D4 and D5	As above.	NoR D3, D4 and D5 Assessment - The Assessment of Ecological Effects found most habitats and species likely to occur within the NoR D3, D4 and D5 Project areas are generally modified and exotic and are of Low ecological value and likely to support Not Threatened native species of birds and lizards which have adapted to an already modified landscape. Potential adverse effects on these habitats and species are also generally low. - The Ōpāheke N-S FTN Arterial and the Ponga Road and Ōpāheke Road Upgrade Projects have also sought to protect and enhance ecological values and indigenous biodiversity through bridging new stream crossings including of Ōtūwairoa and Waipokapū Streams as well as replacing the existing culverts at Mangapū Stream with a bridge. - Through alternatives assessment, minimising effects on streams was considered in particular for Ōpāheke N-S FTN Arterial. - In considering the potential future effects arising from activities that may require resource consent in the future, the Assessment of Ecological Effects identified that any potential effects of the Project on ecological features within or adjacent to the Project area, can be adequately managed in any future consent processes. NoR D3, D4 and D5 Conclusion - In addition to the assessment completed above for all NoRs, the Waihoehoe Road East Upgrade, Ōpāheke N-S FTN Arterial and Ponga Road and Ōpāheke Road Upgrade are considered to be consistent with the objectives and policies because adverse effects on indigenous biodiversity are avoided or minimised and values protected.
Freshwater - The health and well-being of water bodies and freshwater ecosystems is prioritised - The permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams), and wetlands are to be avoided unless, amongst other matters, it is necessary to provide for infrastructure and no practicable alternative exists		
All	NPS Freshwater Management Objective 1, Policies 6, 7, 8, 9. AUPOIP [RPS]: B7.3.1(3), B7.3.2(1),	Summary of Objectives and Policies The NPS Freshwater objective and policies seek to ensure that natural and physical resources are managed in a way that prioritises first, the health and well-being of water bodies and freshwater ecosystems followed by the health needs of people and then the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future. In particular, the NPS Freshwater seeks to protect natural wetlands, rivers, outstanding waterbodies and habitats of indigenous freshwater species.

Applicable Notice	Key Objectives and Policies	Analysis
	B7.3.2(4), B7.3.2(5), B7.3.2(6), B7.4.1(4), B7.4.1(5), B7.4.2(1)(a), B7.4.2(1)(d), B7.4.2(7)(b), B7.4.2(8), B7.4.2(9), AUPOIP [DP]: E12.2(1), E12.3(2)(c).	- The relevant AUPOIP objectives and policies seek to protect and enhance ecological values in freshwater environments. The permanent loss and significant modification or diversion of lakes, rivers, streams (excluding ephemeral streams), and wetlands are to be avoided unless, amongst other matters, it is necessary to provide for infrastructure and no practicable alternative exists. The objectives and policies seek to manage subdivision, use, development, including discharges and activities in the beds of lakes, rivers, streams, and in wetlands, to limit the establishment of structures within the beds of lakes, rivers and streams and in wetlands to those that have a functional need or operational requirement to be located there. Assessment - Although resource consents (regional and NES Freshwater) are not being sought for the Drury Package at this time, ecological effects arising in respect of activities that require consents have been considered to inform alternatives assessment, Project design and the proposed designation and proposed alteration to the existing SH22 designation footprints. - In light of this, generally, the Projects within the Drury Arterial Network have sought to avoid or minimise impacts on streams and high value wetlands. This is demonstrated through the comprehensive alternatives assessment process undertaken and design refinement. In most cases, the Projects are upgrading existing transport infrastructure that have existing stream crossings High value wetland environment has been avoided and / or reduced where practicable (NoR D1 and NoR D2). Although the form of stream crossings will be confirmed at detailed design, bridges are proposed over high value streams (Ngakoroa, Waihoehoe, Hingaia, Ōtūwairoa, Waipokapū Streams) and the replacement of culverts with a bridge is proposed at Mangapū Stream. - When the revised national freshwater policy statement and new freshwater regulations came into effect The Project Team reconsidered the potential effects of the preferred options on identified natural inland wetlands and streams. Generally, the alignment and design refinement process for each proposed designation and the proposed alteration to the existing SH22 designation has sought to avoid or minimise impacts on high value natural wetlands and streams, unless there is a functional requirement for any such impacts or other high value environmental constraints. There will be further opportunities to minimise any impacts within the Project alignment during the detailed design of the Projects. - As discussed under the indigenous biodiversity assessment above, some freshwater environments have been impacted where there is a functional and operational need to do so. In considering the potential future effects arising from activities that may require resource consent in the future, the Assessment of Ecological Effects identified that any potential effects of the Drury Arterial Network on ecological features within or adjacent to the Project areas, can be adequately managed in any future consent processes. Additionally, there is flexibility in the proposed designation and the proposed alteration to the existing SH22 designation to further minimise impacts at detailed design.

Applicable Notice	Key Objectives and Policies	Analysis
		- The proposed transport infrastructure is critical to enable existing and future communities to provide for their social, economic, and cultural well-being. Conclusion - The Drury Arterial Network is consistent with these objectives and policies as the proposed alignments have sought to avoid or minimise impacts on streams and wetlands unless there is a functional requirement for any such impacts. In most cases (except NoR D4 which is a proposed new transport corridor), the Projects are upgrading existing infrastructure and have existing stream crossings. In considering the potential future effects arising from activities that may require resource consent in the future, the Assessment of Ecological Effects identified that any potential effects of the Drury Arterial Network on ecological features within or adjacent to the Project areas, can be adequately managed in any future consent processes.
Ngā Manawhenua - Mana Whenua values are recognised and protected. - Mana Whenua are to be included in resource management processes, particularly in decision making in their role as kaitiaki		
All	AUPOIP [RPS] B4.2.1(2), B6.2.1(1), B6.2.1(2), B6.3.1(1), B6.3.1(2), B6.3.1(3), B6.3.2(1), B6.3.2(2)(d), B6.3.2(3), B6.3.2(6), B6.5.1(1), B6.5.1(3), B6.5.1(5), B6.5.2(1), B6.5.2(4), B6.5.2(5), B6.5.2(6), B6.5.2(9), B7.4.1(6).	<u>Kaitiakitanga</u> Summary of Objectives and Policies - The RPS requires recognition of and provision for the principles of Te Tiriti o Waitangi, in particular through Manawhenua participation in resource management processes. Assessment - Recognition of Te Tiriti o Waitangi partnerships is a key objective for the Drury Package and Manawhenua have been involved in the Drury Arterial Network from the start of the Supporting Growth Programme. - Manawhenua have since been actively involved throughout development of the early concepts, through alternatives assessment and identification of the preferred options. This partnership approach has allowed understanding and the incorporation of Manawhenua values and expression of kaitiakitanga throughout the Drury Package. This has included participation in identifying any opportunities for mitigation, and any opportunities for representing cultural features in the landscape. - Further incorporation of Manawhenua values and the expression of kaitiakitanga was enabled through monthly southern Manawhenua at hui and a site visit where discussion with Manawhenua was had, including information sharing, the approach and

Applicable Notice	Key Objectives and Policies	Analysis
	AUPOIP [DP] E12.3(1), E12.3(2)(c), E12.3(4). NoR D1 only: AUPOIP E21.2(5), E21.3(10) NoR D1 & D2 only: AUPOIP [RP/DP] D9.2(3), D9.3(7)	methodology for assessment of environmental effects, updates from project environmental specialists and discussion and approach to cultural impact assessments. Initially, Ngāti Tamaoho, Ngāi Tai Ki Tamaki, Te Ākitai Waiohū and Ngāti Te Ata Waiohū confirmed they each intended to prepare a Cultural Impact Assessment (CIA) of the Drury Package for inclusion in NoR documentation. However, due to internal resourcing constraints these were unable to be completed to date, with the exception of a history summary from Ngāti Tamaoho, which has been considered by the Project. - Waka Kotahi and AT are committed to ongoing engagement with Mana Whenua which aligns closely with the RPS' long term view. Manawhenua will continue to be involved in the Drury Package to help maintain consistency with these objectives and policies. The proposed designation and the proposed alteration to the existing SH22 designation conditions set out ongoing engagement and participation of Manawhenua in the future design and implementation of the Project. These conditions have been developed in consultation with Manawhenua. <u>Māori values</u> Summary of Objectives and Policies - The principles of the Te Tiriti o Waitangi are also recognised and provided for in the sustainable management of natural and physical resources, wāhi tapu and other taonga. Sites and places of significance to Mana Whenua are recognised and provided for in the objectives and policies of the AUPOIP. Assessment - The partnership approach that the Drury Package has taken with Manawhenua, means that Manawhenua values are embedded in the Drury Package which gives effect to the provisions of the AUPOIP. Having involved Manawhenua in design development and decision-making on Project alignments and design, has enabled the incorporation of the holistic and long-term inter-generational Māori world view. - The Drury Package has also recognised Manawhenua cultural values, particularly with regards to the mauri of, and the relationships of Manawhenua with natural and physical resources including freshwater, land, air and coastal resources. Significant adverse effects on these values are required to be avoided, with lesser adverse effects avoided, remedied or mitigated as appropriate. - There is one site of significance to Manawhenua (Plan Change 22) identified at 27 Bremner Road approximately 340 metres north of the proposed NoR D2 designation. The Project does not impact the site and existing access to the site off Bremner Road will be maintained. There are no other sites of significance to Manawhenua or any identified wāhi tapu, other taonga or Maori land. Therefore any such sites are not adversely affected by the location of new infrastructure. Within NoR D1, it is proposed to

Applicable Notice	Key Objectives and Policies	Analysis
		designate part of a property that is Treaty Settlement Land (67 Mercer Street) mainly for temporary construction areas. The Project Team has discussed this with LINZ (who administers the land) who advised the land is currently vacant and advised on the process to occupy this land. - Designation conditions for each of the proposed designations and the proposed alteration to the existing SH22 designation are proposed to provide for ongoing consultation with Manawhenua as well as accidental discovery protocols which require Manawhenua involvement. Appropriate actions will be taken ensuring tikanga Maori is adhered to particularly where any kōiwi are accidentally discovered. Conclusion - The Drury Package has actively involved Manawhenua throughout the project life including through assessment of alternatives and recognition of cultural values.
Natural hazards, including climate change - Avoid increasing risk of adverse effects in areas subject to natural hazards (including climate change). - Where infrastructure and development is required in these areas, natural hazard risks must be managed		
All	NPS-UD Objective 8, Policy 1(e)(f), Policy 6(e). AUPOIP [RPS] B2.3.1(1)(f), B3.2.1(1), B3.2.2(9)(a-b), B10.2.1(2), B10.2.1(3), B10.2.1(4), B10.2.1(5), B10.2.1(6), B10.2.2(7), B10.2.2(8),	Summary of Objectives and Policies - The NPS-UD directs that urban environments support reductions in greenhouse gas emissions and are resilient to the current and future effects of climate change. - The objectives and policies of Chapter B10 of the AUPOIP enable and recognise the importance of infrastructure to support urban growth which includes integrating the provision of resilient transport networks and infrastructure in these areas and avoiding effects in areas subject to natural hazards and risk and adapting to the effects of climate change. - Specific AUPOIP objectives and policies reinforce the unique requirements of infrastructure and that it can have an operational or functional need to locate within a natural hazard area. Where infrastructure is required to locate within a hazard area significant adverse effects on people and property are sought to be first avoided, and otherwise mitigated to the extent practicable. Assessment - The Drury Package supports the direction set out in the objectives and policies.

Applicable Notice	Key Objectives and Policies	Analysis
	B10.2.2(12), B10.2.2(13). AUPOIP [DP] E12.2(1), E12.3(5), E12.3(6). AUPOIP [DP] E36.2(1), E36.2(2), E36.2 (3), E36.2 (4), E36.2(5), E36.3(3), E36.3(4), E36.3(21-30), E36.3(35)	- The Drury Package will deliver better accessibility and mode choice by providing FTN and active transport - therefore reducing the reliance on low occupancy vehicles. This provides an important component to realising the regional emissions benefits of an integrated network. This shows alignment with the objectives and policies, and a positive contribution towards a reduction in greenhouse gas emissions. - A number of design measures to provide resilience to flooding, inundation and climate change have been adopted across the Drury Arterial Network. Flood modelling undertaken for the Drury Package assessed the existing terrain and proposed network terrain – both using maximum probable development with 10 and 100 year average recurrence interval plus climate change rainfall considerations. In doing so, the modelling took into consideration flood hazard and risk associated with both rainfall events, climate change and the coastal inundation 1 per cent AEP Plus 1m control. The flood risk assessment has recommended outcomes to ensure at detailed design that existing flooded properties are not exacerbated, no flood prone areas are created and any increase in flood risk for existing or future habitable floor levels or access to properties are less than minor. For some Projects as discussed in more detail below, flood risk and resilience will be improved by the Projects. - The proposed designations and the proposed alteration to the existing SH22 designation provide for street tree planting that, when delivered, will contribute to reducing urban heat island effects in the future, more intensively, urbanised areas where 'islands' of higher temperatures can be caused by high concentrations of structures such as buildings roads and infrastructure in one area. The future planting will contribute to the amenity of the area by providing shade and microclimatic cooling qualities. Conclusion - Each Drury Package Project is consistent with these objectives and policies by supporting a reduction in greenhouse gas emissions through modal choice, contribute to reducing urban heat island effects and providing resilient transport infrastructure that will support urban growth. The Projects will generally provide positive flood resilience effects and will avoid, remedy and mitigate potential adverse effects on people and property in areas subject to natural hazards and risk, adapting to the effects of climate change.
D1	As above	Specific NoR D1 Flood Risk Assessment - The SH22 Upgrade will result in a positive effect at the Ngakoroa Stream allowing greater conveyance capacity by the proposed Ngakoroa Stream Bridge. This results in much improved freeboard to the bridge with benefits to the safe passage of flow and safety of those using the bridge. - The Project has been designed so that any potential adverse flooding effects can be appropriately managed and will be less than minor with the implementation of the proposed alteration to designation conditions. Potential construction and operational effects of

Applicable Notice	Key Objectives and Policies	Analysis
		the Project were identified and mitigation measures proposed through conditions of the alteration to the existing designation. This includes the management of flood hazards during the construction phase through the CEMP, and further flood risk assessment at the detailed design so that existing flooded properties are not exacerbated, no flood prone areas are created, and any increase in flood risk for existing or future habitable floor levels and access to properties are less than minor. Overall, flood hazards effects can be appropriately managed. NoR D1 Conclusion The Project SH22 Upgrade is consistent with these objectives and policies, specifically the objectives and policies in the RPS Chapter B10.2 (natural hazards and climate change) and Chapter E36 (natural hazards) by providing resilient transport infrastructure that will support urban growth while avoiding, remedying and mitigating effects on people and property in areas subject to natural hazards and risk.
D2	As above	Specific NoR D2 Flood Risk Assessment - At detailed design of road levels, upsizing of culverts and providing inlet protection, flood levels can be appropriately managed. Construction of a diversion drain at 119, 125 and 131 Jesmond Road will direct overland flow away from the buildings on site, lower flood levels and could improve the existing situation. This is to be addressed at detailed design. - Within the Bremner Road FTN Upgrade section, a bridge is proposed over an unnamed stream to maintain conveyance of flows. The proposed bridge over the Ngakoroa Stream will have improved flood resilience with less frequent overtopping and the decreases the flooding upstream by 0.16m due to its wider span. - With the removal of the Norrie Road Bridge flood levels are reduced by 0.34 m upstream and 0.07 m downstream in the 100 year rainfall event, thereby reducing the flood risk to a number of buildings and roads. - The replacement of the Norrie Road bridge (with the Hingaia Stream Bridge) will give a reduction in upstream flooding during the 100 year ARI rainfall event of 320 mm at Norrie Road. The existing Norrie Road/Hingaia Stream Bridge is set below the 100 year flood levels and increases upstream flood levels. The proposed new bridge is higher with longer spans, which will provide greater flood freeboard to the corridor and improve resilience. - Flooding effects from the Waihoehoe Road West section of the corridor are considered no more than minor as the road is located on a gentle ridge and does not encroach on to any flood plains or overland flow paths. - The overall effect of NoR D2 on flooding is positive or can be adequately mitigated within the proposed designation with proposed mitigation measures in place.

Applicable Notice	Key Objectives and Policies	Analysis
		NoR D2 Conclusion The Jesmond to Waihoehoe Road West FTN Upgrade is consistent with these objectives and policies, specifically the objectives and policies in the RPS Chapter B10.2 (natural hazards and climate change) and Chapter E36 (natural hazards) by providing resilient transport infrastructure that will support urban growth while avoiding, remedying and mitigating effects on people and property in areas subject to natural hazards and risk.
D3	As above	Specific NoR D3 Flood Risk Assessment - The Project has been designed so that any potential adverse flooding effects can be appropriately managed and will be less than minor with the implementation of the proposed designation conditions. Potential construction and operational effects of the Project were identified and mitigation measures proposed through conditions of the designation. This includes the management of flood hazards during the construction phase through the CEMP, and further flood risk assessment at the detailed design phase ensuring the design does not exacerbate flood risks. Overall, flood hazards effects can be appropriately managed and flood risk will not be exacerbated by the Project. NoR D3 Conclusion - The Waihoehoe Road East Upgrade is consistent with these objectives and policies, specifically the objectives and policies in the RPS Chapter B10.2 (natural hazards and climate change) and Chapter E36 (natural hazards), by providing resilient transport infrastructure that will support urban growth while avoiding, remedying and mitigating effects on people and property in areas subject to natural hazards and risk.
D4	As above	Specific NoR D4 Flood Risk Assessment - There may be some temporary construction phase flooding risk associated with temporary construction works required for new bridges and the construction of culverts on line. However, flood hazards during the construction phase can be managed through the CEMP. - The majority of land upstream of the corridor is zoned future urban and therefore, depending upon the timing of the construction of the corridor and potential upstream development, there could be operational effects on either the existing dwellings (at Walker Road and Harry Dodd Road) or the potential upstream development. It is recommended that the magnitude of the effect is confirmed at the detailed design phase and, for any existing habitable floors experiencing more than a 10% reduction in freeboard, mitigation is provided. This is proposed as a condition on the designation. It is also proposed that further flood risk assessment is

Applicable Notice	Key Objectives and Policies	Analysis
		undertaken at the detailed design to show that existing flooded properties are not exacerbated, no flood prone areas are created, and any increase in flood risk for existing or future habitable floor levels and access to properties are less than minor. - Overall it is considered that the potential flooding effects arising from the proposed transport corridor for NoR D4 can be adequately mitigated and that there is land available within the proposed designation to provide for the required works. NoR D4 Conclusion - The Ōpāheke N-S FTN Arterial is consistent with these objectives and specifically the objectives and policies in the RPS Chapter B10.2 (natural hazards and climate change) and Chapter E36 (natural hazards), by providing resilient transport infrastructure that will support urban growth while avoiding, remedying and mitigating effects on people and property in areas subject to natural hazards and risk.
D5	As above	Specific NoR D5 Flood Risk Assessment - The Project will improve flood resilience and prevent floods overtopping Ponga Road at Mangapū Stream through the replacement of the existing twin 2000 dia. culverts to a bridge and raising the road alignment. - The Project has been designed so that any potential adverse flooding effects can be appropriately managed and will be less than minor with the implementation of the proposed designation conditions. Potential construction and operational effects of the Project were identified and mitigation measures proposed through conditions of the designation. This includes the management of flood hazards during the construction phase through the CEMP. - Further flood risk assessment at the detailed design phase in particular for the proposed cycle and pedestrian bridges over Ōtūwairoa Stream to ensure the design does not increase flood levels upstream, or at private properties. - Overall it is considered that the potential flooding effects arising from the proposed transport corridor for NoR D5 can be adequately mitigated by the Project and that there is land available within the proposed designation to provide for the required works. NoR D5 Conclusion - The Ponga Road and Ōpāheke Road Upgrade and specifically the objectives and policies in the RPS Chapter B10.2 (natural hazards and climate change) and Chapter E36 (natural hazards), by providing resilient transport infrastructure that will support urban growth while avoiding, remedying and mitigating effects on people and property in areas subject to natural hazards and risk.

Applicable Notice	Key Objectives and Policies	Analysis
Urban form and quality design - Transport networks support a quality urban form and are designed to achieve high levels of amenity and safety for users. - The place function of transport networks is balanced with the functional movement purpose.		
All	AUPOIP B2.2.1(1)(e), B2.3.1(3), B2.3.2(1)(d-f), B2.3.2(2)(a-b), B2.3.2(4), B3.3.1(1)(d), B3.3.2(4)(a), B3.3.2(7). AUP:OIP E12.2(1), E12.3(2), E12.3(3) AUPOIP E17.2(1), E17.2(2), E17.2(3), E17.3(1), E17.3(4). AUP:OIP E24.2(1), E24.2(2), E24.3(1), E24.3(2). AUPOIP E25.2(1), E25.2(2), E25.3(2), E25.3(5)].	Summary of Objectives and Policies - The objectives and policies seek to create and protect urban environments that are both functional and enjoyable for people, by balancing the place and movement function of transport networks achieving high levels of amenity and safety for users. - To achieve balance between place and movement, the objectives and policies recognise a necessary mode shift, minimising private vehicle travel in favour of public transport, active transport. - The objectives and policies also require that the impacts of construction on amenity is managed (dust, noise and vibration) whilst acknowledging that some disturbance and reduced amenity is inevitable. Assessment - Each Project in the Drury Package gives effect to the objective and policies providing for separated and safe active mode facilities and integrating transport infrastructure with the proposed centres (Drury West and East) and neighbourhoods to support compact urban development. - There is flexibility within the proposed designation and the proposed alteration to the existing SH22 designation footprints to integrate with adjacent development and the environmental features. Due to the likely long delivery timeframe, the final details of amenity considerations for the operation of each Project in the Drury Arterial Network (including landscaping, street trees, street furniture, lighting etc.) will be decided at detailed design through Outline Plan/s and resource consents. - A ULDMP is proposed as a condition of the proposed designations and the proposed alteration to the existing SH22 designation. The ULDMPs will integrate the permanent works of each Project into the surrounding landscape and urban context and ensure that the Drury Arterial Network contributes to a quality urban environment and manages potential adverse landscape and visual effects. The ULDMP(s) for SH22 Upgrade will be consistent with the Bridging the Gap: Waka Kotahi Urban Design Guidelines (2013). - Amenity of the corridors during construction will be managed appropriately through engagement with residents, the community and stakeholders, and through the construction noise and vibration, and construction management plans proposed as conditions of the designations and the proposed alteration to the existing SH22 designation.

Applicable Notice	Key Objectives and Policies	Analysis
		Conclusion Each Project within the Drury Arterial Network will provide separated and safe active mode facilities and will integrate with the planned centres and neighbourhoods to support compact urban development. The Drury Package will manage any adverse effects on amenity during construction and sets outcomes and further opportunities through the ULDMPs to integrate permanent works into the surrounding landscape and urban context. This will ensure that the Drury Arterial Network contributes to a quality urban environment and manages potential adverse landscape and visual effects .
Historic Heritage - Recognises the importance of heritage to the identity of Auckland by avoiding significant adverse effects on scheduled historic heritage, where practicable, and encouraging new development to have due regard to significant historic heritage. - Protect scheduled values but provide for infrastructure in sensitive areas considering: - the benefits and value of providing that infrastructure; - the functional or operational need to locate or traverse that location; - whether any practicable alternatives would avoid or reduce effects on the scheduled values - how the infrastructure contributes to the planned growth and intensification of Auckland.		
All	AUPOIP [RPS]: B3.2.1(1), B3.2.1(2), B3.2.1(3), B3.2.2(1), B3.2.2(3), B3.2.2(6), B3.3.1(1), B3.3.2(1), B3.3.2(2), B3.3.2(3), B3.3.2(7). B5.2.1(1), B5.2.2(6), B5.2.2(7), B5.3.1(2), B5.3.2(4)(c), B5.3.2(4)(d). AUPOIP [DP]	Summary of Objectives and Policies - The RPS recognises the importance of heritage to the identity of Auckland, and the importance of active stewardship to protect it from inappropriate subdivision use and development. The provisions seek to avoid significant adverse effects on scheduled historic heritage, where practicable, and to encourage new development to have due regard to significant historic heritage. - The policies of Chapter B3 and E26 seek to enable the development, operation and maintenance of infrastructure, even in sensitive areas that are scheduled in the AUPOIP in relation to historic heritage, provided adverse effects are avoided or reduced where practicable and an operational and functional need to locate in sensitive areas arises. - While the objectives and policies of the AUPOIP generally seek to recognise the benefits, functional and operational needs and value of investment in infrastructure and enable the safe, efficient and secure provision of infrastructure where appropriate, the objectives and policies also anticipate that there may be some adverse effects as a result of the provision of such infrastructure. However, the objectives and policies recognise that in some instances such adverse effects may be appropriate given the necessity of, and essential services provided by, infrastructure.

Applicable Notice	Key Objectives and Policies	Analysis
	E26.2.1(9), E26.2.2(4)(c)(e), E26.2.2(6).	
D1 and D3	As above	NoR D1 & D3 Assessment - The SH22 Upgrade and Waihoehoe Road East Upgrade will not adversely affect any known historic heritage sites. However, there is a likelihood of exposing previously unrecorded deposits during their construction periods. The Assessment of Effects on Historic Heritage recommends a HAMP be prepared at detailed design before construction commences. As part of the HAMP, further research and survey will be undertaken to support a precautionary HNZPTA authority for the Project footprints. - Any adverse effects to potential previously unrecorded archaeological deposits that are exposed during the works will be mitigated under the provisions of a precautionary HNZPTA authority, and the means of mitigation detailed in an Archaeological Management Plan prepared for the HNZPTA authority application. An HNZPTA authority will be sought prior to construction of the Project. NoR D1 & D3 Conclusion - The SH22 Upgrade and Waihoehoe Road East Upgrade are consistent with the objectives and policies as they do not impact on scheduled historic heritage and they recognise the importance of historic heritage through the implementation of the HAMP and providing a precautionary approach to the potential of identifying previously unrecorded sites during construction.
D2	As above NZCPS Policy 17 AUPOIP [DP]: AUPOIP E12.2(1), E12.3(1) AUPOIP D17.2(1), D17.2(2), D17.2(3) D17.3(24), D17.3(25)	Summary of Objectives and Policies applicable to NoR D2 only - In addition to those objectives and policies described above, applicable to NoR D2, the NZCPS policy on historic heritage aims to protect historic heritage in the coastal environment from inappropriate subdivision, use, and development. NoR D2 Assessment - In light of the high values within HHEPs the Project has sought to avoid adverse effects on these values as far as practicable and to otherwise minimise effects and this is demonstrated through the comprehensive alternatives assessment process undertaken. - Through the alternatives assessment, the alignment has been widened to the south at the Ngakoroa Stream Bridge and at Norrie Road to avoid impacting the scheduled HHEPs of Slippery Creek Wharf/Commissariat Redoubt wharf site (located within the coastal environment). - Through alternatives assessment the Project has also avoided the HHEP of Saint John's Anglican Church and cemetery. Along Jesmond Road, the alignment was widened to the west at this location to reduce impacts on the Aroha Cottage HHEP, however a

Applicable Notice	Key Objectives and Policies	Analysis
		small portion of the site is designated to allow for driveway regrading. The Assessment of Effects on Historic Heritage identified it is not expected that any significant impact to heritage will occur to the Aroha Cottage site because of the nature of works being driveway regrading and the fact that the 1863 cottage is not in its original location. • In avoiding scheduled HHEP sites, the Project will impact upon known items of historic heritage including standing structures and potentially subsurface deposits within the Project extent. Nearby recorded sites may have potential subsurface extents extending into the proposed construction footprint. There is also potential of exposing previously unrecorded deposits during construction, including within the coastal environment. • A HAMP will be prepared at detailed design before construction commences. As part of the HAMP, further research and survey will be undertaken to support a precautionary HNZPTA authority for the Project footprint and will include site specific mitigation measures as outlined in 16.4.4 which will appropriately manage any adverse effects. • Any adverse effects to potential previously unrecorded archaeological deposits that are exposed during the works will be mitigated under the provisions of a precautionary HNZPTA authority, and the means of mitigation detailed in an Archaeological Management Plan prepared for the HNZPTA authority application. An HNZPTA authority will be sought prior to construction of the Project. NoR D2 Conclusion • The Project is consistent with the objectives and policies as the Project recognises the importance of heritage and avoids and protects the values of scheduled historic heritage. The Project protects historic heritage in the coastal environment and it recognises the importance of historic heritage through the implementation of the HAMP, specific mitigation measures, and providing a precautionary approach to the potential of identifying previously unrecorded sites during construction.
D4	As above	NoR D4 Assessment • The Project will not impact on any AUPOIP scheduled historic heritage sites. The Brick Utility Building (CHI site 22281) is within the footprint of the Project and will be impacted and removed for construction purposes. The building is standing; however has little value based on the AUP RPS values assessment. It is not protected by provisions of the HNZPT Act. There is also potential of exposing previously unrecorded deposits during construction. • A HAMP will be prepared at detailed design before construction commences. As part of the HAMP, further research and survey will be undertaken to support a precautionary HNZPTA authority for the Project footprint and will include a built heritage assessment of the Brick Utility Building (CHI site 22281) to determine effects and discuss reuse/relocation of the building.

Applicable Notice	Key Objectives and Policies	Analysis
		- Any adverse effects to potential previously unrecorded archaeological deposits that are exposed during the works will be mitigated under the provisions of a precautionary HNZPTA authority, and the means of mitigation detailed in an Archaeological Management Plan prepared for the HNZPTA authority application. An HNZPTA authority will be sought prior to construction of the Project. NoR D4 Conclusion - The Project is consistent with the objectives and policies as the Project does not impact on scheduled historic heritage and it recognises the importance of historic heritage through the implementation of the HAMP, specific mitigation measures, and providing a precautionary approach to the potential of identifying previously unrecorded sites during construction.
D5	As above	NoR D5 Assessment - The Project will not impact on any AUPOIP scheduled historic heritage sites. The Project may have adverse effects on subsurface deposits of known historic heritage sites within the Project extent and nearby recorded sites may have potential subsurface extents extending into the proposed construction footprint. There is also potential of exposing previously unrecorded deposits during construction. - A HAMP will be prepared at detailed design before construction commences. As part of the HAMP, further research and survey of the Project area, and specific sites, will be undertaken to support a precautionary HNZPTA authority for the Project footprint. - Any adverse effects to potential previously unrecorded archaeological deposits that are exposed during the works will be mitigated under the provisions of a precautionary HNZPTA authority, and the means of mitigation detailed in an Archaeological Management Plan prepared for the HNZPTA authority application. An HNZPTA authority will be sought prior to construction of the Project. NoR D5 Conclusion - The Project is consistent with the objectives and policies as the Project does not impact on scheduled historic heritage and it recognises the importance of historic heritage through the implementation of the HAMP, specific mitigation measures, and providing a precautionary approach to the potential of identifying previously unrecorded sites during construction.

Applicable Notice	Key Objectives and Policies	Analysis
Coastal Preserve and protect the coastal environment from inappropriate use and development while providing for infrastructure that has an operational or functional need to locate in the coastal environment.		
All	NZCPS O1, O2, O3, O4, O5(a), O6, P2, P3(1), P4, P5(1), P6(1)(a), P6(1)(h), P6(1)(i), P11, P13(1), P15, P17, P19(3)(j) P25(d). Hauraki Gulf Marine Park Act 2000: sections (7) and (8) AUPOIP [RPS]: B8.2.1(1), B8.2.1(2), B8.2.2(3), B8.2.2(4), B8.3.1(1), B8.3.1(2), B8.3.1(7), B8.3.2(1), B8.3.2(3), B8.3.2(4), B8.3.2(5), B8.3.2(6), B8.3.2(7), B8.4.1(1), B8.4.1(2), B8.4.2(1), B8.4.2(3)(i), B8.5.1(1), B8.5.1(3), B8.5.2(2), B8.5.2(16). AUPOIP [RCP/DP] E18.2(1), E18.3(1), E18.3(2), E18.3(3).	Summary of Objectives and Policies - It is acknowledged that the coastal environment is not limited to the coastal marine area and is defined in policy 1 of the New Zealand Coastal Policy Statement as including: - The coastal marine area. - Areas where coastal processes, influences or qualities are significant (i.e. lakes, lagoons, estuaries, wetlands and their margins). - Areas at risk of coastal hazards. - Coastal vegetation and habitat of coastal species (i.e. migratory birds). - Elements and features which contribute to character/landscape/visual qualities or amenity. - Items of cultural and historic heritage in coastal marine area or coast (see the Historic Heritage section of this assessment). - Inter-related coastal marine and terrestrial systems, including intertidal zone. - Physical resources and built facilities including infrastructure that have modified the coastal environment. - The objectives and policies seek to preserve and protect natural character, protect the coastal environment from inappropriate use and development, recognise the importance of and provide for public access and open space, and achieve the outcomes of the HGMPA. - The AUPOIP provisions give effect to the NZCPS through SEA overlay provisions and seek to maintain the natural characteristics and qualities that contribute to the coastal environment whilst providing for subdivision and development, and also restoring and rehabilitating the natural character values. In providing for use and development in the coastal environment, the provisions seek that this undertaken in appropriate places and is of an appropriate form and within appropriate limits.

Applicable Notice	Key Objectives and Policies	Analysis
	AUPOIP E19.2(1), E19.3(1), E19.3(2).]	
D1, D3, D4, D5	As above	Assessment NoR D1, D3, D4 and D5 are not within the coastal environment therefore the Projects are not inconsistent with the objectives and policies of the NZCPS.
D2	As above	NoR D2 Assessment • The Project involves the upgrade of an existing road and bridge within the coastal environment. The alternatives assessment has resulted in the existing road being widened to the south to avoid the CMA, marine SEA and HHEP. However, the infrastructure remains within the coastal environment. The proposed two lane extension to the Ngakoroa Stream bridge has the potential to alter the natural character of waterbodies by heightening the impression of further human modification. However, the design of the bridge has the opportunity be designed sympathetically with the coastal environment and recognise the relationship mana whenua has with the area. • As the detailed design progresses and resource consents are sought, the full extent and type of indigenous vegetation affected will be determined. Through resource consent mitigation of works within the coastal environment, there is opportunity to enhance ecological function and natural character values to be improved adjacent to the Ngakoroa Stream and the interface with the CMA. • The Project has also recognised and involved Mana Whenua throughout, providing for kaitiakitanga and recognising the special relationship Mana Whenua have with the coastal environment. Particular consideration has been given to avoiding effects on public use and enjoyment of public space in the coast environment, and coastal hazard areas have been identified and assessed. • Given the above it is considered that the Project is appropriately located, of an appropriate form and within will be developed within appropriate limits, taking into account the range of uses and values of the coastal environment • Prior to construction, a ULDMP will be prepared which will address the principal elements of the Project that are likely to give rise to temporary and permanent adverse effects on landscape character, natural character and visual amenity. Given the existing level of modification within the coastal environment and the success of recent restoration efforts throughout the Ngakoroa catchment, reinstatement and mitigation planting at the completion of works is expected to adequately mitigate the landscape and natural character effects in the coastal environment arising from the Project.

Applicable Notice	Key Objectives and Policies	Analysis
		NoR D2 Conclusion It is considered that the Project contributes to the achievement of these objectives and policies by firstly, seeking to avoid impacts on the CMA, marine SEAs and HHEP within the coastal environment and by proposing to upgrade an appropriate, existing transport corridor which is of an appropriate form and within appropriate limits. Furthermore, reinstatement and mitigation planting at the completion of works is expected to adequately mitigate the landscape and natural character effects in the coastal environment arising from the Project.
Natural Landscapes Natural landscapes and features with outstanding values are to be protected from inappropriate subdivision use, and development by avoiding where practicable, and otherwise remedying or mitigating, adverse effects on those areas or features.		
All	AUP:OIP RPS B4.2.1(1), B4.2.1(3), B4.2.2(3), B4.2.2(6), B4.2.2(7), B4.2.2(8), B4.3.1(1), B4.3.1(2), B4.3.2(3), B4.5.1(1), B4.5.2(4).	Summary of Objectives and Policies - The RPS seeks to recognise and protect natural heritage. In particular, the policies of the RPS seek to identify features with outstanding natural values, evaluate and schedule those outstanding natural features, protect the physical and visual integrity of those features from inappropriate subdivision use, and development, and, where practicable and appropriate, enhance outstanding natural features. - The RPS identifies that the volcanic heritage of Auckland is a particularly notable feature across the region. The RPS also indicates that notable trees are a particularly important natural feature. Therefore, the RPS seeks to protect the values of both volcanic features and notable trees. Assessment - There are no identified outstanding natural landscapes, features or characters identified in AUPOIP within the Drury Arterial Network Project areas. Nor are there any notable trees or volcanic viewshafts affected. The Assessment of Landscape and Visual Effects concluded there are no regionally or nationally significant landscapes within or proximate to the proposed designation and the proposed alteration to the existing SH22 designation boundaries. - Significant adverse landscape and visual effects have been 'avoided through a substantive alternatives assessment process involving specialist inputs and design refinement to minimise effects and integrate the Project works within the landscape. As a result, the Projects seek to limit physical effects on SEAs, high value streams and wetlands and other high value landscape features within the local landscape.

Applicable Notice	Key Objectives and Policies	Analysis
		Throughout the Drury Arterial Network, there is generally significant opportunity for natural character values to be improved and opportunities to integrate with the proposed Auckland Council Blue-Green network. The proposed designation and the proposed alteration to the existing SH22 designation conditions require the implementation of an ULDMP during the detailed design of each of the Projects. With this in place, and through future resource consenting stages, the proposed features and scale of the Projects within the Drury Arterial Network are able to be integrated into the existing and future landscape to remedy any potential adverse effects on landscapes arising from the Projects.
Open Space Zones Enable infrastructure while protecting values of open space zones and avoiding, remedying or mitigating adverse effects on residents, communities and the environment.		
D1, D2, D4, D5	AUPOIP E16.2(1), E16.2(2), E16.3(2), E16.3(3) NoR D1: AUPOIP [DP]: H7.2(2), H7.3(4), H7.4.2(1), H7.4.3(1), H7.6.3(7) NoR D2: AUPOIP [DP]: H7.2(2), H7.3(4), H7.4.2(1), H7.4.3(1), H7.5.2(1), H7.5.2(2), H7.5.3(2), H7.6.3(7) NoR D4: AUPOIP [DP]: H7.2(2), H7.3(4), H7.4.2(1), H7.4.3(1)	Summary of Objectives and Policies - The general objectives and policies of open space zones in the AUPOIP seek to enable infrastructure while avoiding, remedying or mitigating adverse effects on residents, communities and the environment. Objectives and policies in Chapter E16 of the AUPOIP seek to protect the cultural, amenity, landscape and ecological values of trees in open space zones and increase the quality and extent of tree cover in open space zones. Assessment - NoR D1, D2, D4 and D5 traverse existing open space zones. The Projects within the Drury Arterial Network has sought to reduce adverse effects on Open Space Zones and community facilities as far as practicable and this is demonstrated through the alternatives assessment process. - The Projects have sought to reduce impact on open space zones where practicable. In particular: - The SH22 Upgrade generally avoids direct permanent impact on open space and community facilities, with the exception of fill slopes along the edge of Ngakoroa Reserve and temporary construction areas within the southern end of the Drury Sports Complex and on the edges of the Ngakoroa Reserve. - For NoR D2, in order to avoid impacts on the CMA, SEA Marine and HHEP on the northern side of Bremner Road, the Bremner Road FTN Upgrade alignment is proposed to be widened to the south, impacting on the passive recreation area within the Drury Sports Complex. A bridge site laydown is also proposed at this location to enable the construction of the bridges over the Ngakoroa Stream and SH1. Impacts on the Drury Sports Complex fields are avoided.

Applicable Notice	Key Objectives and Policies	Analysis
	NoR D5: AUPOIP[DP]: H7.2(2), H7.3(4), H7.4.2(1), H7.4.3(1), H7.5.2(1), H7.5.2(2), H7.5.3(2), H7.6.3(7)	• Within NoR D5, the Ōpāheke Road Rural alignment was shifted north to reduce impacts on the Ōpāheke Reserve Sports Park, avoiding any impacts to the sports fields. • Potential construction effects on amenity values of Open Space Zones can be managed through engagement with residents, the community and stakeholders (through a SCMP), and through construction noise and vibration management (CNVMP), and construction management plans (CTMP and CEMP) to minimise potential effects. A ULDMP is recommended as a condition of the proposed designations and the proposed alteration to the existing SH22 designation which will require all areas be reinstated at the completion of the construction period and will require any left-over fill to be removed from construction areas and shaping of the ground to integrate with surrounding landform. • The Projects will provide for improved and new opportunities for active modes of transport and the ability to provide improved connectivity to open space areas, reserves and recreation facilities including the Drury Sports Complex and Ōpāheke Reserve and Sports Park. The Project in the Drury Arterial Network also provide an opportunity to tie into the proposed greenways and recreational corridors anticipated by the Drury -Ōpāheke Structure Plan, Blue-Green Network. • The Assessment of Arboricultural Effects undertaken for the Projects identified 20 trees protected under the district plan provisions within NoR D2 in Drury Sports Complex. It is anticipated that these trees will be removed or works may occur in the tree's root zone. One group of protected trees in Drury Sports Complex was identified in NoR D1. It is likely these trees can be retained. No trees protected under the district plan provisions are identified in NoR D4 and D5. • The effects of tree loss can be mitigated by comprehensive planting within berms in the new road layout. Replacement planting will be decided through a planting plan for the Project under the ULDMP proposed as a condition on the proposed designations and the proposed alteration to the existing SH22 designation. • In addition, a Tree Management Plan will be developed prior to construction to identify the existing trees protected under the District Plan, confirm the construction methods and impacts on each tree and detail methods for all work within the rootzone of trees that are to be retained. Conclusion • The Projects are consistent with the objectives and policies by providing for infrastructure while avoiding, remedying or mitigating adverse effects on residents, communities, trees and the environment.

Applicable Notice	Key Objectives and Policies	Analysis
Residential Zones • Use land efficiently to increase housing capacity and improve choice and access to public transport • Non-residential development provides for communities' wellbeing and avoids adverse effects on residential amenity		
D2, D5	AUPOIP H5.2(1), H5.2(4), H5.3(8), H5.3(10) AUPOIP H6.2(1), H6.2(4), H6.3(10), H6.3(9)	Summary of Objectives and Policies • The relevant objectives and policies of the Residential – Mixed Housing Urban and Residential – Terraced Housing and Apartment Building zones seek to ensure land is efficiently used to provide higher density urban living, increase housing capacity and improve choice and access to public transport. • Specific objectives and policies also seek to recognise the functional and operational requirements for development, in particular that non-residential activities provide for communities' social, economic and cultural well-being while avoiding, remedying or mitigating adverse effects on residential amenity. Assessment • NoR D2 and D5 traverse existing residential zones. NoR D2 and D5 are consistent with these objectives and policies by providing for the necessary transport infrastructure to support the intensified residential zoning currently under development within the Project areas and to increase the development capacity. • The Projects will ensure land is protected to contribute to the accessible, high quality, effective, efficient and safe transport routes (including public and active transport modes) that support the movement of people, goods and services for residential zoned areas enabling communities' social, economic and cultural wellbeing to be provided for. • A ULDMP is proposed as a condition of the proposed designations. The ULDMPs will integrate the permanent works of each Project into the surrounding landscape and urban context and ensure potential adverse landscape and visual effects are managed. • Amenity of the corridors during construction will be managed appropriately through engagement with residents, the community and stakeholders, and through the construction noise and vibration, and construction management plans proposed as conditions of the designations.

Applicable Notice	Key Objectives and Policies	Analysis
		Conclusion It is considered that NoR D2 and D5 contribute to the achievement of these objectives and policies by providing the necessary transport infrastructure required to support the growth of these areas while avoiding, remedying or mitigating adverse effects on residential amenity.
Business Zones - Positively contribute towards planned future form and quality, creating a sense of place, amenity and convenience - Recognise requirements of development while avoiding, remedying or mitigating adverse effects		
D2, D4 and D5	NoR D2 only: AUPOIP H11.2(3), H11.2(7), H11.2(8), H11.3(2), H11.3(3), H11.3(12), H11.3 (20) AUPOIP H13.2(3), H13.2(9), H13.3(3), H13.3(12), H13.3(18), H13.3(20), H13.3(21) AUPOIP H17.2(1), H17.2(3), H17.2(4), H17.3(4), H17.3(7) NoR D4 only: AUPOIP H16.2(1), H16.2(4), H16.3(3) NoR D5 only:	Summary of Objectives and Policies - The relevant objectives and policies for all centre zones and the Business – Mixed Use Zone in the AUPOIP seek development to positively contribute towards planned future form and quality, enabling the development of intensive residential activities, creating a sense of place particularly with regard to streets by providing pedestrian amenity, movement, safety and convenience for people of all ages and abilities. - The relevant objectives and policies for the Business – Heavy Industry Zone in the AUPOIP seek to ensure heavy industry operates efficiently and is not unreasonably constrained by other activities. - Objectives and policies of the relevant business zones also seek to recognise the functional and operational requirements of activities and development while avoiding, remedying or mitigating adverse effects on amenity values and the natural environment of adjacent public open spaces and residential areas. Assessment - NoR D2, D4 and D5 traverse existing business zones. The NoR D2, NoR D4 and NoR D5 (as well as the rest of the Drury Arterial Network) will positively contribute towards the planned future form and quality, They will create a sense of place particularly for streets by providing improved pedestrian amenity, movement, safety and convenience for people of all ages and abilities. The Projects in the Drury Package provide a safe and reliable arterial network including active transport and public transport facilities that supports growth, enables sustainable travel choice, addresses safety concerns and improves access to employment and social amenities. - The Projects will improve the reliability of the transport network enabling business zones to operate efficiently, particularly with regard to improved efficiency of freight movements and better transport connections.

Applicable Notice	Key Objectives and Policies	Analysis
	AUPOIP H12.2(3), H12.2(7), H12.3(3), H12.3(12), H12.3(17)	- A ULDM is proposed as a condition of the proposed designations. The ULDMs will integrate the permanent works of each Project into the surrounding landscape and urban context and ensure potential adverse landscape and visual effects are managed. - Amenity of the corridors during construction will be managed appropriately through engagement with residents, the community and stakeholders (through the SCMP), and through the construction noise and vibration, and construction management plans (in particular the CTMP) proposed as conditions of the designations. Conclusion - It is considered that the Projects contribute to the achievement of these objectives and policies by positively contributing towards planned future form and quality of centre and business zones, improving the efficiency of these zones through better transport connections and reliability and mitigating adverse effects on amenity values and the natural environment of adjacent public open spaces and residential areas.
Strategic Transport Corridor Zone Railway and state highway corridors to be used safely, effectively and efficiently		
D1, D2, D5	AUPOIP H22.2(1), H22.3(1), H22.3(2), H22.3(4)	Summary of Objectives and Policies The relevant objectives and policies of Chapter H22 seek for railway and state highway corridors to be used safely, effectively and efficiently for the transportation of people and goods in an integrated manner. The objectives and policies seek to provide for transport related activities, active transport (where feasible) and enable the provision of works and measures to enhance infrastructure and minimise its adverse effects.
D1	As above	NoR D1 Assessment - The SH22 Upgrade is anticipated to have significant positive effects on the transport network once operational. The Project improves safety, reliability and efficiency of the existing state highway and the wider network. - The Project will improve facilities for all modes of transport and significantly reduce the risk of DSIs and improve road safety for those that travel by car, freight, active mode and public transport. It improves corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand.

Applicable Notice	Key Objectives and Policies	Analysis
		- While there are temporary adverse effects during construction of the Project, effects can be appropriately avoided, remedied and mitigated. NoR D1 Conclusion - The SH22 Upgrade gives effect to the objectives and policies by providing an integrated, safe, effective and efficient transport corridor, enhancing infrastructure while managing adverse effects.
D2 and D5	As above	NoR D2 and D5 Assessment - The Strategic Transport Corridor Zone applies to NoR D2 and D5 where they traverse SH1 (NoR D2) and the NIMT rail line (NoR D2 and D5). The NoR D2 and D5 Projects enable the existing railway and state highway corridors to be used safely, effectively and efficiently for the transportation of people and goods in an integrated manner. The Projects have been designed in consultation with KiwiRail and Waka Kotahi to ensure they do not adversely affect the corridors once the proposed Projects are operational. - To ensure any potential adverse effects on the NIMT rail line during construction are managed, permission to work within the rail corridor will be sought from KiwiRail for the bridge construction activities on Waihoehoe Road and Ōpāheke Road, and the bridge demolition or deconstruction on Waihoehoe Road will be carried out during a weekend rail shutdown if required. Additionally, the proposed grade separation of Ōpāheke Road over the rail line will improve rail network safety. To ensure any potential adverse effects on the SH1 corridor during construction are managed, any required traffic management will be implemented in consultation with Waka Kotahi. - The NUMP, proposed as a condition to the designations, will set out a framework for protecting and working in proximity to existing network utilities including the NIMT rail line and SH1. The implementation of the NUMP will ensure the existing corridors can be used safely, effectively and efficiently. NoR D2 and D5 Conclusion - The Projects give effect to these objectives and policies by ensuring the existing NIMT and SH1 corridors can be used safely, effectively and efficiently during the construction and operation of the Projects.

41.2 Adequate Consideration of Alternatives (section 171(1)(b))

Where the requiring authority does not have an interest in the land sufficient for undertaking the work, or the work is likely to have a significant adverse effect on the environment, Section 171(1)(b) requires the territorial authority to have particular regard to whether adequate consideration has been given to alternative, sites, routes and methods for undertaking the work.

The process by which Waka Kotahi (for NoR D1) and AT (for NoR D2 to D5) have considered alternative sites, routes and methods of the Projects is summarised in Section 4.2. A wide range of alternatives have been investigated for the addressing the future transport needs of the Drury-Ōpāheke growth area. The process and conclusion reached for each Project is documented in sections 8, 15, 22, 29 and 36 of the Report. The preferred option for each Project has been based on a comprehensive and robust optioneering process taking into account Manawhenua, stakeholder and landowner feedback and specialist assessment inputs. As such it is concluded that adequate consideration has been given to alternative sites, routes and methods for undertaking the work, satisfying the requirements of s171(1)(b) of the RMA.

41.3 Reasonable Necessity (section 171(1)(c))

Section 171 (1)(c) of the RMA requires particular regard to be had to:

‘whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority for which the designation is sought’.

The works proposed within each NoR are reasonably necessary for achieving their Project Objectives because of the reasons listed in Table 41-2.

The proposed designations and alteration to existing designation are reasonably necessary for achieving the Project Objectives of each of the NoRs because:

- They enable flexibility and ability to construct, operate and maintain the transport corridor in accordance with the proposed designations and proposed alteration to existing designation
- They enable the future works to be undertaken in a comprehensive and integrated manner
- They provide certainty to landowners, the community and stakeholders through identifying in the AUPOIP the location, nature and likely extent of the Projects and the Requiring Authority’s intended use of that land
- It will protect the land from incompatible development by third parties
- It will protect the land so the transport corridor can be implemented when required in line with growth They enable the Requiring Authority to avoid, remedy and mitigate any adverse effects of the Project.

Table 41-2 Reasonable Necessity for Achieving the Project Objectives

Notice	Project Objectives	Reasons the works are reasonably necessary to achieve the Project Objectives
D1	1. Provide a transport corridor that supports and integrates with the urban growth of Drury by improving accessibility and connectivity along SH22 2. Provide a transport corridor that is safe for all users 3. Provide for additional capacity and a choice of transport options including active transport	• The proposed works will improve accessibility and connectivity for all users along SH22 supporting the planned urban growth in Drury and significantly improve access to employment and social amenities • It provides additional capacity and reliability for all modes of transport to support the planned growth in Drury • It provides a transport corridor that is safe for all users by providing sufficient space within the designation for intersection upgrades and active transport facilities • The proposed works will assist in the efficient operation of the surrounding local transport network • The proposed works provide a sustainable choice of transport options through the provision of separated and protected active transport facilities, including signalised pedestrian / cycle crossing facilities
D2	1. Provide an arterial transport corridor that connects key destinations in Drury East and west to support and integrate with urban growth in Drury 2. Provide an arterial transport corridor that is safe for all users 3. Contribute to mode shift by prioritising frequent and reliable public transport and provides a choice of transport options including active transport	• The proposed works will assist in the efficient operation of the local transport network • The proposed works will improve connectivity for all users between key destinations in Drury East and West supporting the planned urban growth in Drury • It provides a transport corridor that is safe for all users by providing sufficient space within the designation for intersection upgrades and active transport facilities • The proposed works contribute to mode shift by providing a choice of transport options through the provision of separated and protected active transport facilities, including signalised pedestrian / cycle crossing facilities and prioritising frequent and reliable public transport through the provision of bus lanes
D3	1. Provide an arterial transport corridor that connects key destinations in Drury East and to support and integrate with urban growth of Drury 2. Provide an arterial transport corridor that is safe for all users	• The proposed works will assist in the efficient operation of the local transport network • The proposed works will improve connectivity for all users between key destinations in Drury East supporting the planned urban growth in Drury • It provides a transport corridor that is safe for all users by providing sufficient space within the designation for intersection upgrades and active transport facilities

Notice	Project Objectives	Reasons the works are reasonably necessary to achieve the Project Objectives
	3. Contribute to mode shift by providing a choice of transport options including active transport	The proposed works provide a choice of transport options through the provision of separated and protected active transport facilities, including signalised pedestrian / cycle crossing facilities
D4	- Provide a new north south arterial transport corridor between Drury and Papakura that improves network resilience to support and integrate with the urban growth of Drury-Ōpāheke - Provide an arterial transport corridor that is safe for all users - Contribute to mode shift by prioritising frequent and reliable public transport and provides a choice of transport options including active transport - Provide for long term identification and protection of the transport corridor to support urban growth in Drury-Ōpāheke	- The proposed works will assist in the efficient operation of the local transport network - The proposed works will provide a new north south transport corridor between Drury and Papakura that improves network resilience supporting the planned urban growth in Drury-Ōpāheke - It provides a transport corridor that is safe for all users by providing sufficient space within the designation for intersection upgrades and active transport facilities - The proposed works contribute to mode shift by providing a choice of transport options through the provision of separated and protected active transport facilities, including signalised pedestrian / cycle crossing facilities and prioritising frequent and reliable public transport through the provision of bus lanes.
D5	- Provide an arterial transport corridor that improves connectivity to and through Ōpāheke to support and integrate with the urban growth of Ōpāheke - Provide an arterial transport corridor that is safe for all users - Contribute to mode shift by providing a choice of transport options including active transport	- The proposed works will assist in the efficient operation of the local transport network - The proposed works will improve connectivity for all users to and through Ōpāheke supporting the planned urban growth in Ōpāheke - It provides a transport corridor that is safe for all users by providing sufficient space within the designation for intersection upgrades and active transport facilities - The proposed works provide a choice of transport options through the provision of separated and protected active transport facilities, including signalised pedestrian / cycle crossing facilities

41.4 Other Matters (section 171(1)(d))

When considering the NoRs, the territorial authority must have particular regard to any other matter the territorial authority considers reasonably necessary in order to make a recommendation on the requirement. Other matters considered relevant to each of the NoRs are consistent across the Drury Package. Therefore one assessment against these matters has been undertaken which applies to all of the NoRs. Other matters considered relevant to the Drury Package are set out and assessed in Table 41-3.

Table 41-3: Assessment against other relevant matters

Central Government
Government Policy Statement on land transport (GPS) for 2021/22 – 2030/31 The Government Policy Statement on Land Transport 2021 continues the strategic direction of GPS 2018, but provides stronger guidance on what Government is seeking from land transport investments. The GPS outlines the Government's strategy to guide land transport investment over the next 10 years, influencing decisions on how money from the National Land Transport Fund will be invested across activity classes, such as state highways and public transport. The overall strategic priorities for GPS 2021, the national objectives for land transport and the themes and the results the Government wishes to achieve through the allocation of the Fund are summarised as follows: • Safety – a safe system, free of death and serious injury. • Access – a system that provides increased access to economic and social opportunities • Climate change – a low carbon transport system that supports emissions reductions, while improving safety and inclusive access • Improving freight connections – improving freight connections for economic development. The Drury Package provides a safe and reliable arterial network that supports growth, enables sustainable travel choice, addresses safety concerns and improves access to employment and social amenities. The Drury Package is anticipated to significantly reduce the risk of DSI's and improve road safety for all users. The Drury Package will significantly improve all transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport. It improves corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand. The GPS 2021 prioritises reduction of greenhouse gas emissions and a shift to active modes, PT and low emission vehicles. This focus is well aligned to the Project which provides an increase in modal choice including active modes and public transport, both which enable a reduction in greenhouse gas emissions compared to trips taken in private vehicles. Overall, the Drury Package positively contributes towards the strategic priorities in the GPS.
National Land Transport Programme 2018-2021 The National Land Transport Programme (NLTP) is a three-year programme of planned activities and a 10-year forecast of revenue and expenditure prepared by Waka Kotahi to give effect to the GPS 2018. As identified above, the Drury Package positively contributes towards the strategic priorities identified in the GPS. Additionally, the NLTP highlights the investment in the Supporting Growth Programme to confirm and protect transport networks that are needed to support the development of new future urban growth areas over the next 30 years.

The Thirty Year New Zealand Infrastructure Plan 2015

The Thirty Year New Zealand Infrastructure Plan looks to advance the debate of long-term provisions, make changes to the current approach to planning and management and to encourage investment in New Zealand's infrastructure while recognising the challenges the country needs to navigate. The Plan envisages that by 2045 New Zealand's infrastructure will be resilient and co-ordinated and contributes to a strong economy and high living standards.

In regards to Auckland, the Plan notes that challenges exist around projected population growth with Auckland forecast to grow by another 716,000 people by 2045 meaning that over the next 25 years, Auckland will need to provide 400,000 more dwellings. The Drury Package provides an integrated approach to land-use and infrastructure planning which is critical to deliver good urban outcomes. The plan envisages \$18.7 billion expected to be spent on infrastructure between 2015 and 2025. The Drury Package forms part of this spending and falls within the scope of this plan by enabling and providing for future urban growth in the Southern Growth Area in Auckland.

Waka Kotahi Amended Statement of intent 2018-2022

This document sets the Waka Kotahi amended statement of intent and what is hoped to be achieved in terms of transport infrastructure over the next few decades based on the strategic direction of the GPS 2018. The Waka Kotahi focus is on creating an efficient and sustainable transport system that is safe, easy and connected providing one integrated land transport system that helps people get the most out of life and supports business. The Drury Package provides a safe and reliable arterial network that supports growth, enables sustainable travel choice, addresses safety concerns and improves access to employment and social amenities, therefore, is consistent with the Waka Kotahi Amended Statement of Intent.

Road to Zero: New Zealand's Road Safety Strategy 2020-2030

Road to Zero outlines a strategy to guide improvements in safety on our roads, streets, footpaths, cycleways, bus lanes and state highways in New Zealand over the next 10 years. The vision of the strategy is a *New Zealand where no one is killed or seriously injured in road crashes*. The Strategy focuses on achieving this vision through system management, road user choices, vehicle safety, work-related road safety and infrastructure improvements and speed management.

The Drury Package plays a key role in providing opportunity to plan and design system improvements that embed the Road to Zero strategy. The Drury Package is anticipated to significantly reduce the risk of DSI's and improve road safety for all users. The Drury Package will significantly improve all transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport.

Waka Kotahi Integrated Planning Strategy

This strategy sets out what Waka Kotahi aim to achieve from an integrated planning approach leading and working with a range of government and private organisations to bring land use and transport planning and investment together. Waka Kotahi's vision is to help create better transport systems and options (safer, cheaper and offering more choice, reliability and efficiency) for all customers (commuters, freight operators, consumers, tourists, students and the wider public), especially at peak travel times.

Congruent with the Integrated Planning Strategy, the Drury Package has been developed through the Supporting Growth Programme which is a collaboration between AT and Waka Kotahi to plan for integrated transport investment in Auckland's future urban zoned areas over the next 10 to 30 years. AT and Waka Kotahi have partnered with Auckland Council, Manawhenua and KiwiRail and have worked closely with stakeholders and the community to develop the Drury Package which will provide a safe and reliable arterial

network that integrates with land use planning, supports growth, enables sustainable travel choice for all transport users, addresses safety concerns and improve access to employment and social amenities.

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011

It is likely that some of the land directly affected by the Project is on the Auckland Council HAIL register. When resource consents to construct the Project are sought, any necessary resource consents under the NES for Assessing and Managing Contaminants in Soil to Protect Human Health will be obtained.

Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009

The construction and operation of the Drury Package will not have any likely adverse effects on the National Grid, or require resource consent pursuant to the NES for Electricity Transmission Activities.

Resource Management (National Environmental Standards for Freshwater) Regulations 2020

The construction and operation of the Project will likely result in works that affect freshwater streams and wetlands. Any necessary resource consents will be obtained as part of the future consent process for the

Central Government and Auckland Council

Auckland Transport Alignment Project (ATAP)

The Auckland Transport Alignment Project ("ATAP") is a joint project involving Auckland Council, the Ministry of Transport, AT, Waka Kotahi, the Treasury and the State Services Commission. The final report (April 2018) sets out a clear direction for the development of Auckland's transport system over the next 10 years. The vision seeks transport investment decisions that deliver broad economic, social, environmental and cultural benefits to Auckland and New Zealand by providing safe, reliable and sustainable access to opportunities. Specifically, this includes easily connecting people, goods and services to where they need to go; providing high quality and affordable travel choices for people of all ages and abilities; seeking to eliminate harm to people and the environment; supporting and shaping Auckland's growth, and; creating a prosperous, vibrant and inclusive city.

The ATAP package highlights the need for significant investment in transport infrastructure to enable urban growth in greenfield FUZ areas, encourage the use of public transport and active modes, and to provide a reasonable level of service to future residents. ATAP specifically notes investment into three main areas including for arterial roads and footpaths (including bus and cycle lanes where required). The Drury Package is consistent ATAP as it will provide a safe and reliable arterial network that integrates with land use planning, supports growth, enables sustainable travel choice for all transport users, addresses safety concerns and improve access to employment and social amenities.

Auckland Regional Land Transport Plan 2018-2028

The Regional Land Transport Plan (RLTP) sets out the funding programme for Auckland's transport services and activities over a 10-year period. Planned transport activities for the next three years are provided in detail while proposed activities for the following seven years are outlined. The RLTP is jointly delivered by AT, NZTA and KiwiRail, and forms part of the National Land Transport Programme. The Supporting Growth Programme is identified as a committed, ongoing programme in the RLTP which it identifies will enable the sequence of land release specified in the FULSS, and improves access to places where people live and work.

Auckland Council

Auckland Plan 2050

The purpose of the Auckland Plan is to contribute to Auckland's social, economic, environmental and cultural well-being through a 30 year vision for Auckland's growth. It sets a strategic direction for Auckland and its communities that integrates social, economic, environmental, and cultural objectives. The Auckland Plan's Development Strategy outlines the direction Auckland will take managing expansion in future urban areas noting the constraint that these areas are predominantly rural at present and have little or no infrastructure in place to cope with urban development. The Auckland Plan outlines the need to provide the required bulk infrastructure (water, wastewater, storm water and transport) to these areas in the right place at the right time.

The Auckland Plan also seeks that Aucklanders will be able to get where they want to go more easily, safely and sustainably. The Drury Package will provide a safe and reliable arterial network that integrates with land use planning, supports growth, enables sustainable travel choice for all transport users, addresses safety concerns and improve access to employment and social amenities. The development Drury Package has been a direct response to the Auckland Plan. The Drury Package will help facilitate the sustainable growth of the Drury-Ōpāheke area enabling the bulk transport infrastructure required to unlock development potential.

Drury-Ōpāheke Structure Plan 2019

The Drury-Ōpāheke Structure Plan outlines Auckland Council's strategic direction for future growth in Drury-Ōpāheke, transforming the FUZ into a highly desirable urban place where people can live, work and play. A *well-connected Drury-Ōpāheke* is one of the key outcomes sought by the structure plan, ensuring the transport network responds to anticipated economic growth by providing efficient, resilient and safe connections to employment areas, centres and other destinations within Drury-Ōpāheke and the wider Auckland region. It seeks frequent, reliable and attractive public transport options and a safe, well connected cycle and pedestrian network. Additionally, the structure seeks to ensure land development and infrastructure delivery is highly coordinated.

The Drury Package aligns with the Drury-Ōpāheke Structure Plan integrating with the proposed land uses and transport network. The Drury Package was developed and assessed with reference to the Council's vision of the area outlined in the Plan. The Drury Package enables the planned development to be realised by providing the critical transport infrastructure to support the urban growth. The Drury Package will provide a multimodal, safe and reliable arterial network that is coordinated with, and supports growth. The Drury Package enables sustainable travel choice for all transport users, addresses safety concerns and improves access to employment and social amenities.

Drury Transport Infrastructure Programme (DTIP)

DTIP is an ongoing joint programme between the Government and Auckland Council to determine the optimal timing, staging, funding and sequencing of the delivery of the preferred transport network for Drury. In particular, the programme seeks to determine the transport infrastructure required to support existing enabled development capacity in Drury West, and enable expedited urbanisation of specific landholdings in Drury East. This seeks to expedite the projects necessary to support an accelerated rate of land release occurring in the Drury-Ōpāheke growth area. DTIP directly aligns with the Drury Package, with all of the Projects included in the scope of DTIP analysis.

Auckland Future Land Supply Strategy (FULSS)

The FULSS was adopted by the Council in July 2017 and is a region wide strategic document detailing the location and timing for the release of new greenfield areas. It recognises the importance of aligning infrastructure planning with growth management. The Drury Package is critical to delivering a safe, efficient, reliable and resilient transport network to enable the greenfield capacity planned for the Drury-Ōpāheke area therefore supports the growth objectives of the FULSS.

Auckland Transport Integrated Transport Programme 2012-2041 (Published 2013).

Auckland's Integrated Transport Programme (ITP) sets out the 30-year investment programme to meet the transport priorities outlined in the Auckland Plan across modes covering the responsibilities of all transport agencies. Developed by AT and Waka Kotahi in collaboration with Auckland Council, the ITP provides a consolidated transport investment programme across the transport system over the next 30 years. In line with the Auckland Plan, the ITP identifies a key challenge for Auckland's transport networks will be servicing the forecast growth in residential and business activity in greenfield areas and that land use and infrastructure planning require careful planning and integration. The ITP identified that transport improvements within and through Auckland will be crucial in facilitating land use changes in Auckland's growth areas. This approach includes investment into strategically important road, public transport and active transport improvements.

The Drury Package directly responds to the ITP providing a safe and reliable arterial network that integrates with land use planning, supports growth, enables sustainable travel choice for all transport users, addresses safety concerns and improves access to employment and social amenities.

Auckland Regional Public Transport Plan 2018-2028

The Auckland Regional Public Transport Plan 2018-2028 (RPTP) describes the public transport network that AT proposes for the region, identifies the services that are integral to that network over the next 10 years, and sets out the policies and procedures that apply to those services. The vision to have a public transport system with seamless end-to-end customer journeys that are safe, accessible and reliable focussing on making walking, cycling and public transport, the preferred choice for many more Aucklanders. Key outcomes of the RPTP include an increasingly safe, secure and sustainable public transport system with services that integrate with surrounding, and planned, land uses and contribute to placemaking.

The Drury Package will significantly improve transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport. The dedicated FTN facilities will significantly improve capacity and resilience, resulting in improved journey time performance and consistency for future public transport users. Consistent with the direction of the RPTP, the Drury Package will provide a safe, reliable multi-modal arterial network that supports growth, enables sustainable travel choice, addresses safety concerns and significantly improve access to employment and social amenities, integrating with existing and future planned urban development in the Drury-Ōpāheke area.

Vision Zero for Tāmaki Makaurau: a transport safety strategy and action plan to 2030

Developed in 2019, Vision Zero extends the existing safe system approach to stop the human sacrifice of mobility, placing safety at the forefront of the future transport system for all modes by designing safe places for people. Vision Zero has a goal to eliminate transport deaths and serious injuries by 2050 (in line with the Auckland Plan 2050). The Drury Package plays a key role in providing opportunity to plan and design system improvements that embed Vision Zero principles, and specifically contribute to the Vision Zero priorities. The Drury Package is anticipated to significantly reduce the risk of DSI's and improve road safety for all users. The Drury Package will significantly improve all transport facilities for all modes, resulting in improved safety for those that travel by car, freight, active mode and public transport.

Auckland Long-term Plan 2018-2028

The Auckland Long Term Plan 2018-2028, which is required under LGACA 2002, sets out the Council's 10-year financial plan, and is guided by the strategic direction set by the Auckland Plan, as described and assessed above.

Auckland Economic Development Strategy 2012

The Auckland Economic Development Strategy sets out Auckland Council's 10-year strategy to make Auckland an internationally prosperous city. The top priority of the Auckland Economic Development Strategy is to — Grow a business-friendly and well-functioning city. This strategy aims to strengthen collaboration, provide and develop supporting infrastructure, and attract, build and retain talent and business capital in Auckland. Part of this purpose is to make Auckland more internationally connected and increase Auckland's exporting capacity.

The Drury Package will play a vital role in unlocking the growth and success of new neighbourhoods and economic centres by improving and creating more reliable and efficient access to economic and social opportunities. The Drury Package will improve the resilience of the transport network and increase corridor capacity allowing improvements in freight movements in and around Drury-Ōpāheke. Overall, the Drury Package is consistent with the Auckland Economic Development Strategy, improving reliability and access to the critical economic and social needs of existing and future communities.

Auckland Parks and Open Spaces Strategic Action Plan (2013)

This Action Plan seeks to protect, and conserve Auckland's environment, heritage and landscape, expand and develop Auckland's park and open space networks, and to connect and utilise these parks and open spaces. The Drury Package will require the acquisition of land from a number of parks/open spaces along the route during construction. This will reduce the amount of park space available to Auckland residents for the construction period. However, once complete, each of the Projects within the Drury Package will reinstate parks and provide new connections between existing parks and open spaces via proposed active transport infrastructure.

Auckland Sport and Recreation Strategic Action Plan 2014-2024 (refreshed 2017)

This plan seeks to increase the availability to, and participation in, physical activities, recreation and sport within Auckland. In particular, the Plan focuses on increasing participation in informal recreation, providing infrastructure to improve access to open spaces and waterbodies, sporting achievement and improving Council's parks and recreation sector. Through the Alternatives Assessment for the Drury Package, sports and recreation facilities including Drury Sports Complex playing fields (NoR D1 and D2) and Ōpāheke Reserve Sports Park (NoR D5) have been actively avoided. The Drury Package will also provide cycleway and walkway connections which will help increase informal physical activity and improve access to open spaces and recreation facilities.

Te Tāruke-ā-Tāwhiri: Auckland's Climate Action Framework and Plan

The purpose of Auckland's Climate Action Framework and Plan is to increase Auckland's resilience to the impact of climate change and reduce emissions that cause climate change, with one of the key moves identified to deliver clean, safe and equitable transport options. The Drury Package has been designed having regard to and taking into account climate change and resilience. The Drury Package will deliver better accessibility and mode choice (thus avoiding the present reliance on low occupancy vehicles (LOV)). This

provides an important component to realising the regional emissions benefits of an integrated network. This shows alignment with, and a positive contribution towards the Climate Action Framework and Plan.

Auckland Growing Greener

Auckland Growing Greener is an ongoing initiative to help realise the vision of the Auckland Plan. It outlines the role of council and council-controlled organisations to deliver on four priority areas – restoring nature, urban transformation, zero waste and healthy waters. Concentrating on urban transformation, the strategy identifies the key role better public and active transport choices play in achieving the Auckland Plan vision. The Drury Package will provide a safe, reliable multi-modal arterial network that supports growth and enables sustainable travel choice throughout the Drury-Ōpāheke area. This provision supports the Auckland Growing Greener strategy and contributes towards achieving the Auckland Plan vision.

Auckland Indigenous Biodiversity Strategy 2012

The Auckland Indigenous Biodiversity Strategy seeks to protect, maintain and restore the indigenous biodiversity within Auckland. This involves conserving as many species as possible with particular attention being given to those species which are threatened, implementing iwi values, educating Auckland's communities and fostering guardianship and the collaboration of governmental organisations. Biodiversity has been a key consideration of the Drury Package in particular in efforts to avoid, remedy or mitigate the potential adverse effects.

Auckland's Urban Ngahere (Forest) Strategy

The Auckland Urban Ngahere (Forest) strategy recognises the ecosystem services as well as economic and cultural benefits delivered by green infrastructure within the urban environment and sets out objectives of the strategy which include the need to grow and protect urban ngahere in existing and future urban areas. Although the Drury Package seeks the removal of some trees within the proposed designation boundary (protected by district plan rules), this will be mitigated by planting within the new road layouts and results in positive effects due to the lack of trees within the Drury area. The long-term outcome of comprehensive street tree planting will be more trees in the public realm and increased amenity value within the road network, consistent with the Auckland Urban Ngahere (Forest) strategy.

Local Board Plans

The Drury Package is situated within two local board areas: Franklin and Papakura. Both the Franklin and Papakura Local Board Plans outline outcomes for the respective local board areas. Both plans identify outcomes relating to an improved and well connected transport system, including active modes, managing growth, economic prosperity and protection and care for the environment.

The Drury Package is consistent with the outcomes of the Local Board Plans. The upgrade will integrate well with proposed surrounding land uses and the wider transport network, to respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors. In doing so the Drury Package manages any adverse effects on the environment. The Drury Package will provide a multimodal, safe and reliable arterial network that supports growth, enables sustainable travel choice for all transport users, address safety concerns and improve access to employment and social amenities. The Drury Package will also support the economic outcomes sought by enabling economic growth and increasing productivity. The Drury Package will help facilitate the sustainable growth of both the Franklin and Papakura Local Board areas.

Iwi Management Plans - None known.

41.5 Part 2 of the RMA

This section considers the Drury Package in terms of the purpose and principles of Part 2 of the RMA, sections 5 through to 8.

41.5.1 Section 5 – Purpose and Principles

Section 5 states the purpose of the Act is to promote the sustainable management of natural and physical resources. Sustainable management is defined in Section 5(2) to mean:

“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 while:

- a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
- b) Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and*
- c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.”*

The Drury Package will enable people and communities to provide for their social, economic and cultural wellbeing and for their health and safety, by:

- Enabling planned urban growth within Drury-Ōpāheke by providing critical transport infrastructure required to unlock growth and capacity of the FUZ land resource in the Drury-Ōpāheke growth area;
- Providing significant community, social and transport benefits through a safe and reliable arterial network that supports and integrates with planned growth, enables sustainable travel choice, addresses safety concerns and improves access to employment and social amenities including:
- An increase in modal choice including active modes and public transport;
- Significant reduction in the risk of DSI's and improve road safety for all users
- Improved connectivity between proposed centres and within the Drury-Ōpāheke area;
- Improved corridor capacity, resulting in improved journey times and reliability for future freight and public transport demand.
- Making the local environments more pleasant – e.g. through better suited and integrated infrastructure for an urban environment, including active transport facilities, opportunities for berm planting and making it easier to get around for all users;
- Cultural well-being is provided for through Manawhenua kaitiaki.

Sustainable management also involves the promotion of the matters in section 5(2) (a) through to (c) of the RMA. In this regard, the following conclusions from the planning assessments set out in this report are made:

- In terms of sustaining the potential of natural and physical resources for future generations, the Project will improve the resilience of the transport network to flood hazard. Specifically,
 - Within NoR D1 resilience of the Ngakoroa Stream crossing to flood hazard and climate change is provided through improved freeboard and slight decreases in flood depth and velocity at the stream;
 - Within NoR D2, better management of overland flow on Jesmond Road, decrease of flooding upstream of the Ngakoroa Bridge, flood levels reduced upstream and downstream of the removed Norrie Road reducing the flood risk to a number of buildings and roads,

significantly reduced upstream flood risk and improved freeboard and resilience of proposed Hingaia Stream Bridge and positive effect on the existing flooding affecting the rail transport corridor; and

- Within NoR D5, the Project will improve flood resilience and prevent floods overtopping Ponga Road at Mangapū Stream through the replacement of the existing twin 2000 dia. culverts to a bridge and raising the road alignment.
- The Projects have sought to utilise the existing road corridor, enabling the efficient use of existing physical resources. Where required, to respond to planned urban development and transport demand, a new corridor is required for NoR D4. In working with developers as urban development progresses, NoR D4 may be progressed as a local (collector) road and then upgraded to an arterial when required in the future. This is also an efficient use of physical resource;
- The Drury Package will meet the future transportation needs of the Drury-Ōpāheke area;
- The Projects do not preclude opportunities for other land transport development, such as incremental improvements to existing transport corridor or improvements to public transport, particularly rail;
- The Projects safeguard the life supporting capacity:
 - Of air – by improving mode choice and reducing congestion, improving air quality at a local level;
 - Of water – by providing sufficient land required to manage water quality and quantity in future consenting processes;
 - Of soils – by the management of future construction works;
 - Of ecosystems – by avoiding (where practicable), remedying and mitigating the adverse effects on high value ecological areas including wetlands, streams and SEAs; and
 - Of people and communities – by managing actual and potential adverse effects both during construction and operation, and by having significant positive effects on the transport network, capacity for urban growth, potential economic growth, and the wider community, while maintaining opportunities for needed urban development; and
- The Projects avoid where practicable, and otherwise remedy and mitigate adverse effects on the environment through the designs developed to date, and through identification of mitigation measures to be captured in subsequent design phases of the Projects in the Drury Package.

The Projects within the Drury Package are consistent with section 5 of the RMA.

41.5.2 Section 6 – Matters of National Importance

In considering if confirmation of the NoRs for the Drury Package would achieve the purpose of the RMA, a number of matters of national importance are to be recognised and provided for. Those section 6 matters considered relevant to the Projects are addressed in Table 41-4.

Table 41-4 Assessment against Part 6 Matters

Part 6 Matter	NoR	Assessment
(a) <i>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</i>	All	- This matter is most relevant to the Project areas surrounding the Ngakoroa Stream, Hingaia Stream and tributaries. These areas are considered to have moderate to heightened localised natural character value. Other stream and wetland environments within the Drury Package area including Waipokapū Stream, Waihoehoe Stream, Ōtūwairoa Stream, Mangapū Stream and associated floodplains have been heavily modified by historic vegetation clearance and rural land use such that they remain in a state of degradation with no management . - Adverse effects on natural character values identified have largely been avoided through the alternatives assessment process. As a result, the Projects avoid significant landscape features and seek to limit physical effects on SEAs, streams and other high value landscape features within the local landscape. The Projects will preserve the natural character of the stream environments through reinstatement and mitigation planting at the completion of works. The Projects provide significant opportunity for natural character values to be improved through reinstatement landscaping and opportunities to integrate the Drury Arterial Network with the proposed Auckland Council Blue-Green network landscape.
(b) <i>The protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development</i>	All	The Projects in the Drury Package avoid outstanding natural features and landscapes.
(c) <i>The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna</i>	All	- The Projects within the Drury Package have sought to avoid or minimise impacts on a range of high value ecological areas including high value wetlands, streams and SEAs. This is demonstrated through the comprehensive alternatives assessment process undertaken and assessment provided in this AEE. - Where avoidance or minimisation of effects is not practicable, measures are proposed to mitigate effects of the works. Additionally, the proposed designations have provided further opportunities to minimise any impacts within the Project alignments during the detailed design of the Projects. Further mitigation related to resource consent requirements will also be incorporated in the future consenting phase of the Projects. - In considering the potential future effects on areas of significant indigenous vegetation and habitats arising from activities that may require resource consent in the future, it was determined that any potential effects of the Drury Package can be adequately managed in any future consent processes.

Part 6 Matter	NoR	Assessment
(d) <i>The maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers</i>	All	The proposed designations will not impact upon any existing public access to streams or the CMA in the Project areas. The Drury Arterial Network has the potential to provide enhanced access to streams and the CMA in the Project areas through the provision of active transport facilities and future integration with AC's proposed Blue-Green Network identified in the Drury-Ōpāheke Structure Plan.
(e) <i>The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga</i>	All	- This matter is recognised and provided for throughout the Drury Package. Manawhenua have been actively involved throughout development of the early concepts, through alternatives assessment and identification of the preferred options. The opportunity to provide CIA's was provided and the history summary provided by Ngāti Tamaoho has been considered by the Project team. - The ongoing partnership with Manawhenua has provided an understanding and the incorporation of Manawhenua values and expression of kaitiakitanga throughout the Projects. - There are no sites of significance to Manawhenua, wāhi tapu, other taonga or Maori land identified within the Project areas. The relationship of the respective iwi with the Project area, their ancestral lands, waahi tapu and taonga will be recognised and provided for through the involvement of Manawhenua in developing and implementing various mitigation measures and management plans at the time of detailed design and construction.
(f) <i>the protection of historic heritage from inappropriate subdivision, use, and development</i>	D1 & D3	The SH22 Upgrade and Waihoehoe Road East Upgrades will not adversely affect any identified historic heritage sites. While the Projects avoids any recorded historic heritage sites, previously unrecorded deposits may potentially be exposed during construction. The potential to disturb unrecorded sites is managed by the requirement for an accidental discovery protocol and implementation of a HAMP requiring further research and survey.
	D2	- Through the alternatives assessment, the alignment has been widened to the south at the Ngakoroa Stream Bridge and at Norrie Road to avoid impacting the scheduled HHEPs of Slippery Creek Wharf/Commissariat Redoubt wharf site and Saint John's Anglican Church. Along Jesmond Road, the alignment was widened to the west at this location to reduce impacts on the Aroha Cottage HHEP, however a small portion of the site is designated to allow for driveway regrading. It is not expected that any significant impact to heritage will occur to the Aroha Cottage site as the house has been relocated to the site. - The Project will impact upon known items of historic heritage including standing structures and potential subsurface deposits within the Project extent. Nearby recorded sites may have potential subsurface extents extending into the proposed construction footprint. There is also potential of exposing previously unrecorded

Part 6 Matter	NoR	Assessment
		deposits during construction. The potential to disturb unrecorded sites is managed by the requirement for an accidental discovery protocol and implementation of a HAMP requiring further research, survey and include site specific mitigation measures.
	D4	The Project will not impact on any AUPOIP scheduled historic heritage sites. The Brick Utility Building (CHI site 22281) is within the footprint of the Project and will be impacted and removed for construction purposes. The building is standing; however, has little value based on the AUP RPS values assessment. It is not protected by provisions of the HNZPT Act. There is also potential of exposing previously unrecorded deposits during construction. The potential to disturb known and unrecorded sites is managed by the requirement for an accidental discovery protocol and implementation of a HAMP requiring further research, survey and will include a built heritage assessment of the Brick Utility Building (CHI site 22281) to determine effects and discuss reuse/relocation of the building.
	D5	The Project will not impact on any AUPOIP scheduled historic heritage sites. The Project may have adverse effects on subsurface deposits of known historic heritage sites within the Project extent and nearby recorded sites may have potential subsurface extents extending into the proposed construction footprint. There is also potential of exposing previously unrecorded deposits during construction. The potential to disturb known and unrecorded sites is managed by the requirement for an accidental discovery protocol and implementation of a HAMP requiring further research and survey.
(g) <i>the protection of protected customary rights:</i>	All	None of the Projects within the Drury package impact upon any protected customary rights.
(h) <i>the management of significant risks from natural hazards.</i>	D1	The Project manages risk from natural hazards during both the construction and operation phases. Measures to mitigate flood risk during construction (measures included in the CEMP proposed as a condition of the designation) and future flood risk modelling will ensure the design does not exacerbate flood risks. Additionally, the Project will improve the resilience of the Ngakoroa Stream crossing to flood hazard and climate change through improved freeboard and slight decreases in flood depth and velocity at Ngakoroa Stream.

Part 6 Matter	NoR	Assessment
	D2	- The Project manages risk from natural hazards during both the construction and operation phases. Measures to mitigate flood risk during construction (measures included in the CEMP proposed as a condition of the designation). It is also proposed that further flood risk assessment is undertaken at the detailed design to show that existing flooded properties are not exacerbated, no flood prone areas are created, and any increase in flood risk for existing or future habitable floor levels and access to properties are less than minor. - Additionally, the Project will have a range of positive effects on flood hazard and resilience including better management of overland flow on Jesmond Road, decrease of flooding upstream of the Ngakoroa Bridge, flood levels reduced upstream and downstream of the removed Norrie Road reducing the flood risk to a number of buildings and roads, significantly reduced upstream flood risk and improved freeboard and resilience of proposed Hingaia Stream Bridge and positive effect on the existing flooding affecting the rail transport corridor.
	D3 & D4	The Waihoehoe Road East and Ōpāheke N-S FTN Arterial Projects manage risk from natural hazards during both the construction and operation phases. Measures to mitigate flood risk during construction (measures included in the CEMP proposed as a condition of the designations). It is also proposed that further flood risk assessment is undertaken at the detailed design to show that existing flooded properties are not exacerbated, no flood prone areas are created, and any increase in flood risk for existing or future habitable floor levels and access to properties are less than minor.
	D5	- The Project manages risk from natural hazards during both the construction and operation phases. Measures to mitigate flood risk during construction (measures included in the CEMP proposed as a condition of the designation) . It is also proposed that further flood risk assessment is undertaken at the detailed design to show that existing flooded properties are not exacerbated, no flood prone areas are created, and any increase in flood risk for existing or future habitable floor levels and access to properties are less than minor. - Additionally, the Project will improve flood resilience and prevent floods overtopping Ponga Road at Mangapū Stream through the replacement of the existing twin 2000 dia. culverts to a bridge and raising the road alignment.

41.5.3 Section 7 – Other Matters

Each Project in the Drury Package has had particular regard and appropriately responded to the matters in section 7 of the RMA. In particular:

- The kaitiakitanga of Manawhenua has been recognised through engagement at all stages of the Drury Arterial Network development and will continue through construction and operation.
- The ethic of stewardship has been recognised in the engagement with and participation of stakeholders and community groups who have a specific interest in and exercise stewardship over particular resources;
- Input throughout the design process from various agencies has enabled the development of an integrated transport solution, and that provides important community and environmental outcomes;
- Through the alternatives assessment process, the Drury Arterial Network was determined to be the most efficient use of natural and physical resources, particularly in utilising existing road corridors;
- The alignment selection and design process has sought to avoid adverse effects on existing and future amenity values. Particular regard has been given to the management of amenity values during construction and those surrounding the Ngakoroa Stream, Hingaia Stream and tributaries, considered to have moderate to heightened, localised natural character values. Active transport facilities will be notably improved throughout the Drury Arterial Network improving the safety and amenity of the urban environment;
- The selection of the alignment and indicative design has sought to avoid adverse effects on ecosystems as far as practicable while allowing flexibility for further refinement during detailed design;
- The Drury Arterial Network has been designed to respond to the effects of climate change, providing resilience to flooding taking into account climate change.
- The Drury Arterial Network responds to the effects of climate change and the reduction of greenhouse gas emissions by providing improved reliability for public transport and active transport facilities.
- The Drury Arterial Network responds to the effects of climate change through the provision for street tree planting that, when delivered, will contribute to reducing urban heat island effects.

41.5.4 Section 8 – Treaty of Waitangi

Section 8 of the RMA requires that the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) are taken into account when managing the use, development, and protection of natural and physical resources.

Waka Kotahi and AT have partnered with Manawhenua throughout the development of the Drury Arterial Network. This has resulted in the selection of transport corridor alignments which avoid and minimises adverse effects on cultural values where practicable. This has included minimising impacts on SEAs, wetlands and streams and ensuring that construction management plans will be in place to protect water quality and any previously unrecorded items of cultural heritage encountered.

Further engagement will be undertaken in the detailed design and construction phases to ensure that the principles of the Treaty of Waitangi are taken into account.

Given these factors, the development of the Drury Arterial Network is considered to be consistent with the principles of the Treaty of Waitangi.

41.5.5 Part 2 Conclusion

While the Projects within the Drury Package will have some adverse effects, when considering the significant regional and local benefits of the Project, alongside the measures proposed to avoid, remedy and mitigate the adverse effects, overall the Drury Package achieves the purpose and principles of the RMA.



PART J

Conclusion

42 Drury Package Conclusion

The wider Drury-Ōpāheke area in the south of Auckland has been signalled to undergo significant urban growth in the next 30 years. The Drury-Ōpāheke area will experience significant change over the coming years as the existing rural environment develops into a new urban area. This is accelerating as private plan changes are lodged with Auckland Council. The Drury Arterial Network will provide critical transport infrastructure to support and integrate with the planned future growth in Drury-Ōpāheke and the wider south Auckland growth areas.

While some adverse effects will be generated during construction and operation of the Projects, these can be mitigated by the management plans and other measures which are proposed as conditions of the proposed designations and alteration to existing designation. The Projects will have significant positive effects, and provide for the social, economic and cultural wellbeing of communities at a local and regional level.

The Drury Package is consistent with the relevant planning documents and statutory tests, thereby satisfying the requirements necessary for Auckland Council to recommend confirmation of the NoR on the basis of the conditions proposed by Waka Kotahi and AT.

Appendix A

Assessment of Alternatives

Appendix B

Relevant Statutory and Strategic Planning Documents