WAKA KOTAHI
NZ TRANSPORT AGENCY

PAPAKURA TO BOMBAY STAGE 2

ASSESSMENT OF ALTERNATIVES REPORT

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More information

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Design Construction Report

Abbreviations

Abbreviation	Term
AEE	Assessment of Effects on the Environment
AUP	Auckland Unitary Plan (Operative in Part 2016)
DBC	Detailed Business Case
GPS	Government Policy Statement 2018
MCA	Multi-criteria assessment
NoR	Notice of Requirement
NoR 1	Alteration to the SH1 Designation 6706
NoR 2	Alteration to the SH1 Designation 6700
NoR 3	Alteration to the SH1 Designation 6701
NoR 4	Shared User Path between Quarry Road and Bombay Interchange
NoR 5	Drury South Interchange Connections
NUO	Network Utility Operator
NZTA	NZ Transport Agency Waka Kotahi
P2B	SH1 Upgrades Project between Papakura to Bombay
RMA	Resource Management Act 1991
SGA	Te Tupu Nga Tahi Supporting Growth Alliance
SH1	State Highway 1 Motorway, the Southern Motorway
Southern IIG	NZTA Southern Iwi Integration Group
SUP	Shared Use Path

Glossary of Acronyms / Terms

Acronym/Term	Description
Auckland Council	Means the unitary authority that replaced eight councils in the Auckland Region as of 1 November 2010.
the Project	Stages 2 of the P2B Project between Papakura to Bombay
Project Area	Area of land that is within the proposed designation boundary.

Executive Summary

This Assessment of Alternatives Report (Report) explains the process undertaken by NZ Transport Agency Waka Kotahi (NZTA) to consider alternative sites, design options, and methods for Stage 2 of the Papakura to Bombay (P2B) Project ('the Project'). NZTA must consider alternatives as it does not have sufficient interest in all of the land required to implement the Project. The alternatives process was guided by identified outcomes of the Papakura to Bombay Detailed Business Case (DBC), Part 2 of the RMA, and the P2B Project Objectives.

The purpose of the Report is to document the process undertaken and to demonstrate how adequate consideration has been given to alternative routes, design options and methods, following a transparent and replicable process. The technical consideration of various design options is documented in the technical memos covering each Multi-Criteria Assessment (MCA) process attached to this Report. The Report is to be read alongside the Assessment of Effects on the Environment (Appendix A) and Design and Construction Report (Appendix D).

The Report discusses the Project requirements derived from the DBC, and how these requirements were refined from the DBC phase of the Project. Further detailed investigation was undertaken where NZTA does not have sufficient interest in the land required to implement the Project and where there was the potential for a significant adverse effect on the environment. At these locations an MCA was utilised in collaboration with NZTA specialists, project stakeholders, and mana whenua to determine a preferred design option.

The emerging preferred options that were determined through the assessment of alternatives methodology advanced to concept design level for the purpose of the Notices of Requirement (NOR).

1 Introduction

1.1 Purpose of this Report

NZ Transport Agency Waka Kotahi (NZTA) has identified the preferred design options for elements of Stage 2 (the Project) of the Papakura to Bombay – Papakura ki Pukekura (P2B) Project. This Assessment of Alternatives Report (Report) provides an overview of the assessment of alternative design options undertaken as part of the Project.

The Report has been prepared to support the Notices of Requirement (NoRs) for the Project lodged by NZTA as the Requiring Authority under the Resource Management Act 1991 (RMA). The Project requires five (5) NoRs (outlined in Table 1-1 below) which seek to protect land to authorise the construction, operation and maintenance of upgrades to State Highway 1 (SH1) and associated infrastructure (including a new link road and Shared User Path (SUP)). The Project extent is illustrated in Figure 1-1 below.

Table 1-1 Overview of the Project NoRs

Notice	Project	Purpose
NoR 1	Alteration to SH1 Designation 6706	Motorway
NoR 2	Alteration to SH1 Designation 6700	Motorway
NoR 3	Alteration to SH1 Designation 6701	Motorway
NoR 4	Shared User Path	Designation for the construction, operation and maintenance of a shared path and associated infrastructure.
NoR 5	Drury South Interchange Connections	Designation for the construction, operation and maintenance of a new road and associated infrastructure.

This Report is to be read in conjunction with the Assessment of Effects on the Environment (AEE) attached at Appendix A, and the Design and Construction Report (DCR) attached at Appendix D of the application AEE.

Section 171(1)(b) of the RMA requires a territorial authority making a recommendation on a NoR to have regard to whether the requiring authority has given adequate consideration to alternative sites, routes or methods of undertaking the work in circumstances where it does not have an interest in the land sufficient for undertaking the work, or it is likely that the work will have significant adverse effects on the environment.

There are several principles and key considerations for a requiring authority to apply and adhere to when undertaking an assessment of alternatives and identifying a preferred option. Of note are the following:

a) The process should be adequately transparent and robust, and clearly recorded so that it can be understood by others;

b) An appropriate range of alternatives should be considered; and

c) The extent of options considered, and the assessment of these options, should be proportional to the potential effects of the options being considered.

The future upgrades to SH1 will mostly take place within the existing state highway corridor, which NZTA has a sufficient interest in land required to authorise the future upgrades. Works within this area have not been assessed in detail for alternative design options. However, for land areas required outside of the existing state highway corridor, NZTA does not have sufficient interest in all the land required for the Project and as such, at these locations, is required to give adequate consideration to alternative design options. Some plan

provisions in planning documents (discussed in Section 11 of the application AEE) also require a consideration of alternative locations and design options.

In summary the purpose of this Report is to:

a) document the development of alternative design options for parts of the Project and the process used to assess and compare the options; and

b) identify preferred design options for progression through the NoR concept design.

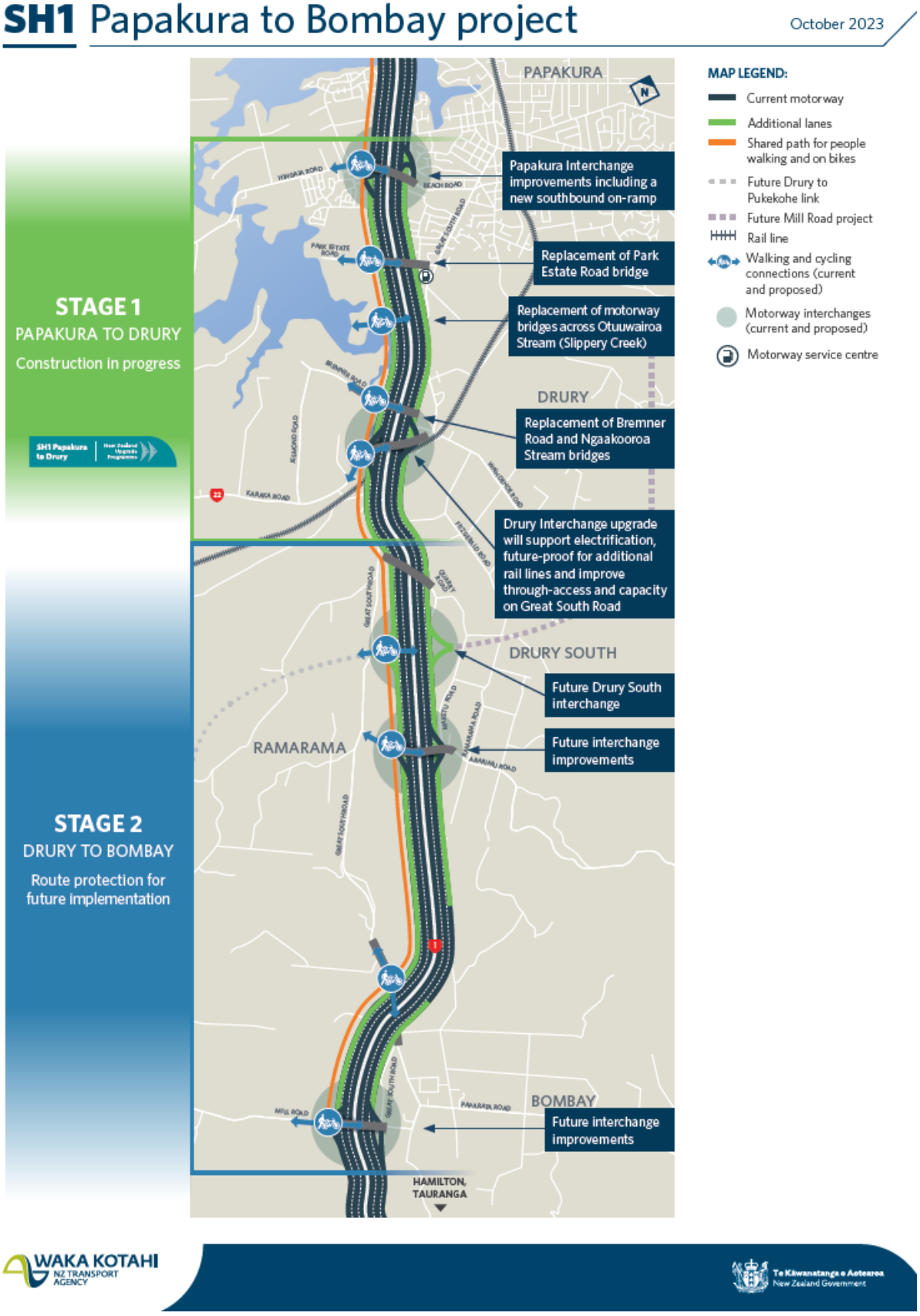

Figure 1-1 Location plan showing the Project

1.2 Structure of this Report

The Report is structured as shown in **Table 1-2** below.

Table 1-2 Structure of this Report

Section	Heading	Description
1	Introduction	Purpose and structure of the Report.
2	Background	Provides an overview of the background context of these adjacent projects and how they necessitate construction of the Project.
3	Assessment of Alternatives Methodology	Overview of the assessment of alternatives methodology used to develop and assess route options for the Project and ultimately determine the preferred design option. Including a gap analysis of the DBC recommendations, and the application of these findings to the P2B design requirements.
4	Engagement	Summary of the key engagement undertaken regarding design options development, namely with mana whenua and key stakeholders.
5	Drury South Interchange (relevant to NoR 2, 4 and 5)	A key aspect of the Project, this section outlines the existing environment, proposed design options, and outcomes of alternative assessment undertaken for the design and location of Drury South Interchange.
6	Drury South Interchange Connections (relevant to NoR 5)	This section outlines the design options, and outcomes of alternative assessment undertaken for the design of link roads connecting to Drury South Interchange.
7	Ramarama Interchange (NoR 2)	This section outlines the design options, and outcomes of alternative assessment undertaken for the design of Ramarama Interchange and need to upgrade the Ararimu overbridge.
8	Additional site-specific assessments 2023 (relevant to all NoRs)	Following the specialist assessments of the Project, key areas of concern were highlighted, this section outlines the process taken to run a robust alternatives assessment for key areas of the Project.
9	Updated and additional information	Includes a spot analysis of design options at Bombay Interchange undertaken during 2023.
10	Consideration of Alternative Methods	Overview of the assessment of alternative statutory methods considered when progressing the application, ultimately finding NoRs to be the most appropriate mechanism for route protection.

2 Background

The purpose of the P2B project is to provide for upgrades to SH1 between Papakura and Bombay, improving accessibility for all road users (including active modes), and support regional growth through the investment in safety, functionality, and resilience of SH1.

The Project is Stage 2 of P2B project. Its purpose is to continue the improvements of Stage 1 of the P2B project, including increases in capacity and upgraded facilities for pedestrians and cyclists. The Project is required to achieve all the benefits of previous stages of P2B, and adjacent projects in the broader transport network, such as the Southern Strategic Transport Network.

This section provides an overview of the background context of these adjacent transport projects and how they support the need for the Project.

2.1 Papakura to Bombay Project

The P2B project involves the upgrade of the existing SH1 corridor from four to six lanes between Papakura and Bombay interchanges. These works are a continuation of the Southern Corridor Improvements (SCI) Project between Takanini and Papakura Interchanges.

In accordance with the Papakura to Bombay Detailed Business Case (DBC) delivery strategy, the Project has been separated into two stages as follows:

- Stage 1 – Papakura to Drury (or 'P2D'); and
- Stage 2[1] – Drury to Bombay.

As part of the New Zealand Upgrade Programme (NZUP) NZTA is currently delivering the P2D project, which corresponds with the Stage 1 P2B project area. The P2D project is broken into multiple stages and sub-stages. Further details about the staging of the P2B can be found in the application AEE at Appendix A.

2.1.1 Papakura to Bombay Detailed Business Case

The Transport for Future Urban Growth (TFUG) Programme Business Case (PBC) prepared by NZTA, Auckland Transport (AT) and Auckland Council (the Council), in 2016, set out funding direction from the National Land Transport Fund towards a preferred delivery programme and transport network for Auckland.

The PBC was commissioned following the confirmation of the (now superseded) FULSS in 2015, which specifically identified the proposed sequencing of growth in greenfield areas. Several projects were allocated funding from the TFUG including the Supporting Growth Programme (see Section 2.2 below), and the P2B project. Of note the FULSS has now been replaced by the Future Development Strategy (FDS), which is discussed in further detail in the application AEE at Appendix A.

Figure 2-1 below illustrates the relationship between the PBC project, the Project and Supporting Growth Programme.

[1] Note: Identified as Stage 2 and 3 in the DBC, which is now referred to as a single stage for route protection, 'Stage 2'. See Section 2 of the application AEE at Appendix A for further details.

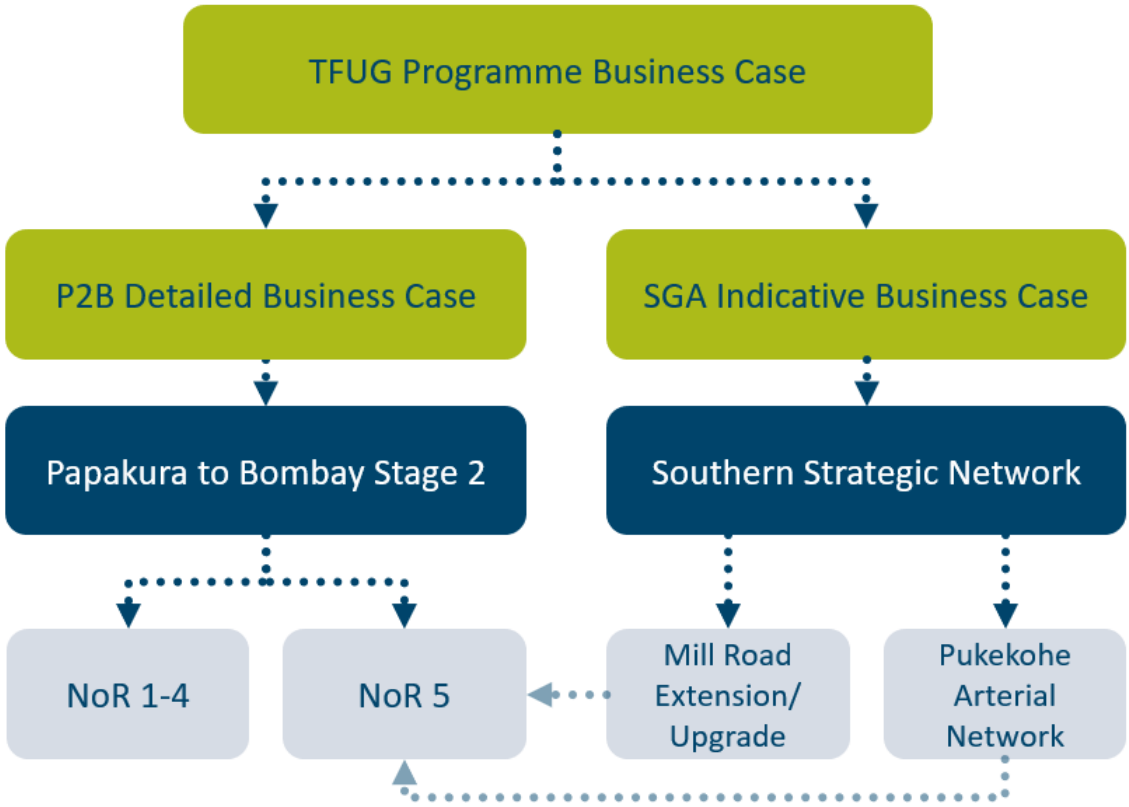

Figure 2-1 Flow chart illustrating the relationship between the Supporting Growth Programme and P2B

Following the PBC the Papakura to Bombay Detailed Business Case (DBC) was prepared in 2018 to identify the upgrades and staging of works required for the upgrades to the SH1 corridor between Papakura and Bombay.

The DBC identified significant benefits associated with the Project and recommended the need to act immediately to protect the land required to authorise the future upgrades, as rapid urban development will restrict the ability of NZTA to do this effectively in the near future.

The DBC included a suite of recommendations, which have been adopted as the basic design requirements for the Project, and summarised as follows:

- Corridor Width:
  - Six general traffic lanes (with additional capacity for shoulders),
  - Accommodate a 110 km/h design speed,
  - Shared use path (western side of the SH1 corridor); and,
  - Swales and wetland treatment train (100% treatment of impervious surfaces, full scale wetlands).
- Interchanges and structures at:
  - Drury South: new over-pass with roundabout,
  - Ramarama Interchange: modified roundabout with ramp signals,
  - Bombay interchange: signalised interchange with northbound signals[2]; and,
  - Mill Road Bridge: alter both abutments to allow realignment of the road beneath the Bombay Interchange.

[2] This recommendation from the DBC (2018) has since been bought forward under another project, which is discussed in Section 3.3 of the application AEE Appendix A.

Further detail regarding how the DBC emerging preferred design options that were adopted by the concept design is outlined in Section 3.2 below.

2.1.2 P2B Project Objectives

Based on the PBC, Government Policy Statement on Land Transport (GPS), DBC and NZTA's P2B project outcomes the following objectives have been developed for the P2B project:

- Improve the safety and resilience of the state highway network between Papakura and Bombay,
- Increase transport choice and accessibility to support growth in the south of Auckland,
- Support national and regional economic growth and productivity; and
- Support the inter and intra-regional movement of people and freight.

The Project has adopted these project objectives, although not all objectives apply to all parts of Stage 2. The P2B Project Objectives were included in the assessment criteria (discussed in Section 3.3) for all design options.

2.2 Supporting Growth Alliance Te Tupu Ngātahi

The purpose of the Supporting Growth programme is to identify and protect the preferred transport networks to support Auckland's planned greenfield growth over the next 30 years. The Supporting Growth programme and its projects are closely related to the P2B project. The assessment of projects within the Supporting Growth Programme has been guided by the TFUG PBC, which lead into the Supporting Growth Programme Indicative Business Case for Route Protection (IBC) in 2018, which identified the need for the Southern Indicative Transport Network. That Supporting Growth IBC identified a preferred transport network for early route protection in Auckland's southern growth area. The intent of the route protection approach was to save money and minimise social disruption in the long term.

Key aspects of the Southern Indicative Transport Network, which interface with the Project, and have been considered in the preparation of the design options, are as follows:

- Mill Road Extension,
- Drury Arterial Network, and
- Pukekohe Arterial Transport Network.

In October 2023, Waka Kotahi and Auckland Transport lodged NoRs with the Council for the Mill Road and Pukekohe East Road Upgrade,[3] and Drury – Pukekohe Link,[4] which were both identified in the Southern Indicative Transport Network.

The agreed process between NZTA and the Supporting Growth Alliance project teams for integrating the design options on the projects inter-facing the Project, is as follows:

- Develop options for the two projects separately ensuring the projects are integrated,
- Supporting Growth assess Mill Road alignments through an Multi-Criteria Assessment (MCA) process in accordance with the Mill Road project objectives, and/or Pukekohe Arterial Transport Network project,
- P2B team to assess Drury South interchange locations through an MCA process in accordance with P2B Project Objectives; and,
- The results of the two MCAs to be reviewed and an integrated preferred option selected.

Further information about the specific Supporting Growth projects as they related to the Project are available in Section 3 of the application AEE at Appendix A.

[3] Pukekohe : Mill Road and Pukekohe East Road Upgrade (NoR 8) Waka Kotahi NZ Transport Agency (aucklandcouncil.govt.nz)
[4] Pukekohe : Drury – Pukekohe Link (NoR 2) Waka Kotahi NZ Transport Agency (aucklandcouncil.govt.nz)

The relationship between the Project and Southern Indicative Transport Network as it related to the extension of Mill Road is discussed further in Section 3.3 below.

3 Assessment of Alternatives Methodology

This section provides an overview of the assessment of alternatives methodology used to develop and assess design options for the Project NoRs. An overview of the alternative assessment process from the PBC phase of the Project illustrated in Figure 3-1 below.

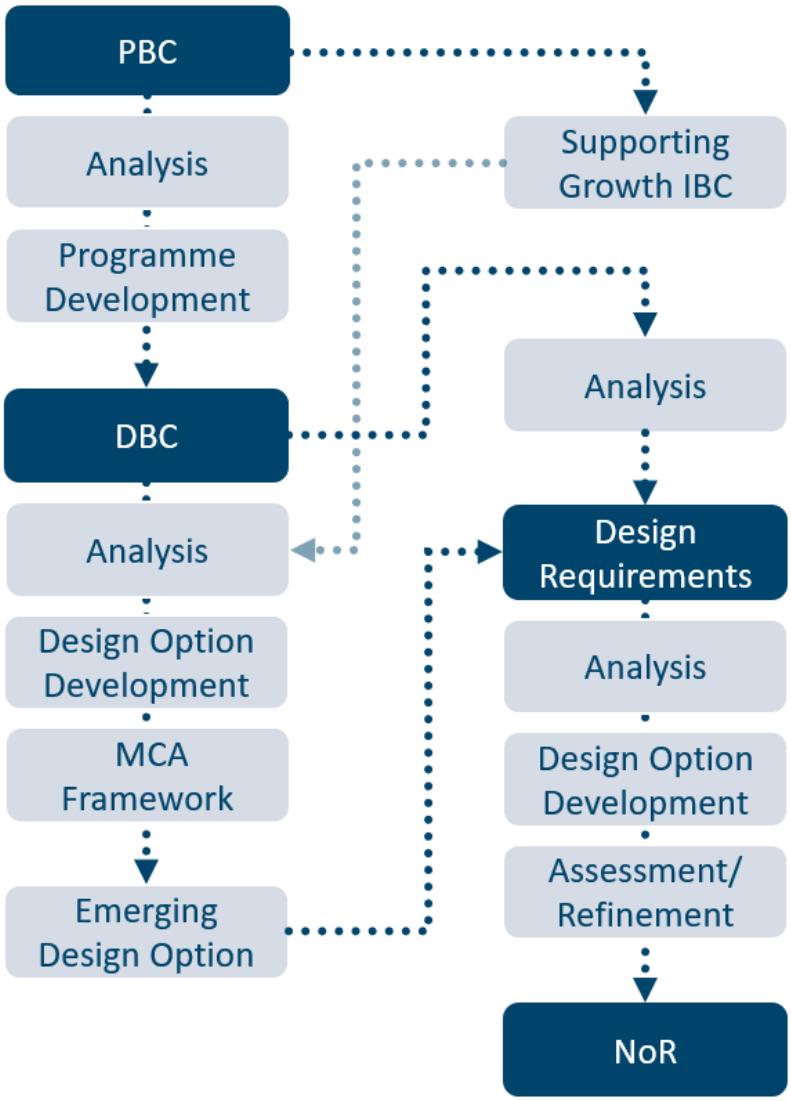

Figure 3-1 Alternatives assessment methodology for the Project

3.1 Overview

The land requirement for the construction and operation of the Project was determined through basic design requirements, which have been refined from the DBC, and applied to the entire Project alignment. Where the design options were located predominantly outside of the existing state highway corridor, and NZTA does not have sufficient interest in the land, and the design resulted in significant adverse effects on the environment, the Project team undertook an assessment of alternatives to determine an appropriate design option.

As outlined below the assessment of alternatives focused on the existing corridor, with particular attention given to the potential new interchange location. The assessment of alternatives varied across different phases of the Project, but generally included the following processes:

- **Development of a multi-criteria assessment framework**

MCA framework was created to evaluate and compare options. This framework was tailored and developed with input from the mana whenua and NZTA.

- **Options development**

  Options were developed based on previous assessments (DBC), with increasing levels of detail corresponding to the level of assessment.

- **Analysis and testing of results**

  The results of the assessment process were analysed and tested to identify the most viable options.

- **Engagement**

  Workshops were conducted with NZTA experts to gather input and feedback on the options and the MCA scoring. Regular hui were also held with the mana whenua to seek their feedback on the options.

- **Identification of technical preferred option(s)**

  The Project Team determined the emerging technical preferred option(s) based on the findings from the assessment workshops.

- **Engagement with stakeholders and the community**

  The preferred options were shared with stakeholders and the wider community for feedback and input.

- **Analysis and testing of results**

  After the engagement period, the Project Team reviewed the technical preferred option(s) considering the feedback received and made any necessary refinements or developed new options. For some locations this involved development of further options and iterative redesign and consultation.

- **Recommendation by the Project Team**

  Once the preferred options were confirmed and the recommended network was identified, they were grouped into projects for individual NoR. The overall recommendation was then presented for endorsement from NZTA.

3.2 DBC Gap Analysis

A significant period of time has passed since the preferred design options emerged from the DBC phase in 2018. The following section provides an overview of the design option refinement process that has occurred since this time to test the appropriateness of the basic Project design requirements and how these requirements have been used to inform the concept design for the Project NoRs.

3.2.1 Supporting Growth IBC – Mill Road Corridor

The Supporting Growth IBC for Route Protection was prepared to further test and develop the recommendations of the PBC (discussed in Section 2.1). As part of the Supporting Growth IBC process, it was concluded that Mill Road Corridor should connect to Drury South Interchange. This would occur via an extension of the transport corridor to SH1 via Maketu/Quarry Road, identified as ‘Segment 4’ in **Figure 3-2** below as it was illustrated in the Supporting Growth IBC.

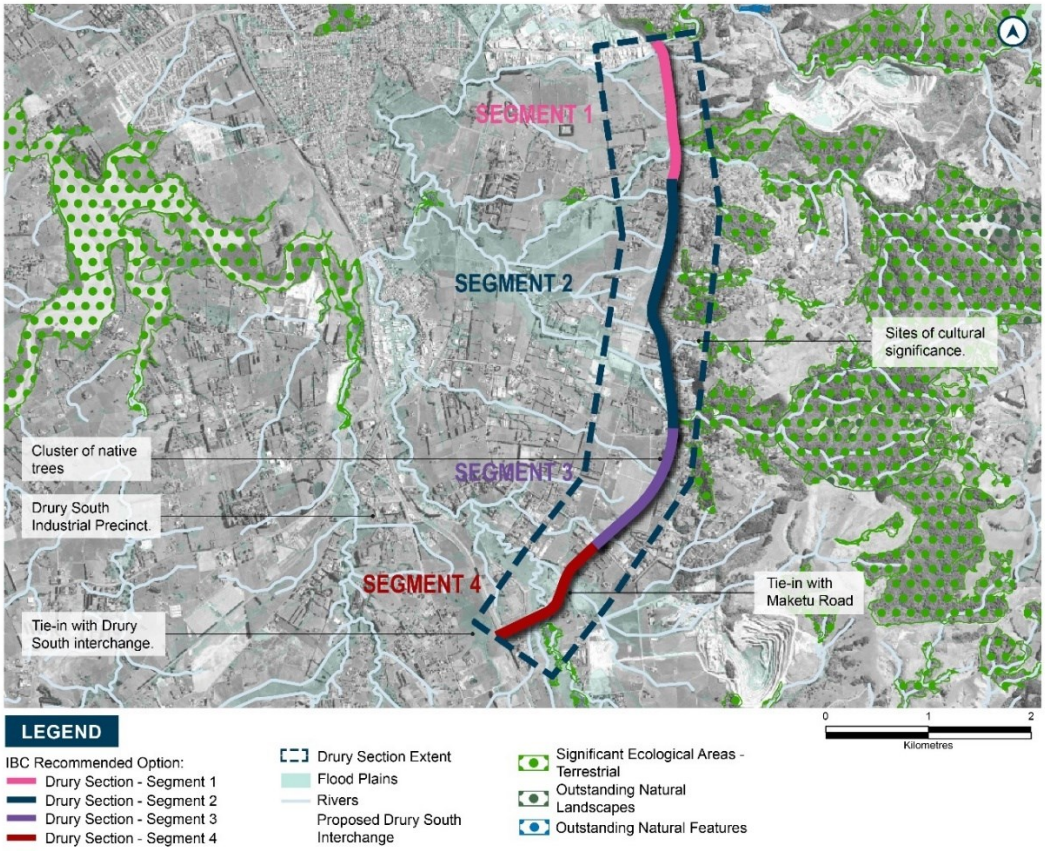

Figure 3-2 Mill Road Corridor as illustrated in the Support Growth IBC (SGA, 2019)

In June 2021 the Government decided not to proceed with the construction of the full Mill Road corridor, and asked NZTA to rescope the project to deliver upgrades to the existing Mill Road/Redoubt Road corridor (Manukau to Takanini) and to invest in the Drury arterial road network[5]. While the Government withdrew funding for upgrades/extension of the Mill Road corridor, it remains part of the Southern Indicative Transport Network. Long-term route protection for Mill Road remains an option. To address this requirement, NZTA has decided to in part deliver the Mill Road corridor extension between Maketu/Quarry Road and Great South Road into scope of this Project. Route protection for the Mill Road Corridor will in part be delivered as part of the Drury South Interchange Connections (NoR 5), detailed in Section 6 below.

3.2.2 DBC Design Requirements

The entire P2B project has adopted a basic set of design requirements which has guided the land requirements to authorise the planned upgrades to the SH1 motorway corridor. The following section outlines how this design requirements emerged from the DBC and have been applied to the concept design.

3.2.2.1 Optimising the Capacity of the Motorway

The DBC identified the preferred way forward as adding an additional northbound and southbound lane between Papakura and Bombay. All modes were assessed to be coming under pressure to meet the demands for travel and there was an opportunity for new road capacity to continue from the SCI, to influence people's travel patterns and behaviour, and move more people, more efficiently than can be moved by a conventional 'all traffic' motorway.

The DBC assessed the relevance of Special Vehicle Lanes (SVL) to facilitate efficiency on the state highway network but was not carried forward as a preferred option as detailed below.

[5] Mill Road | Waka Kotahi NZ Transport Agency (nzta.govt.nz)

Special Vehicle Lanes

SVLs on SH1 were considered and were not adopted in the concept design on any stages of the P2B projects.

The DBC found the benefits of providing a SVL compared to a general traffic lane are heavily reliant on people's change in behaviour from switching to single occupant vehicles to high occupant vehicles. As such they were not considered to be beneficial to the design objectives, and instead the addition of a general traffic lane in each direction was considered to be appropriate way to increase the capacity of SH1. Alternatively, the recommendation was adopted to further evaluate a SVL in the pre-implementation phase of the P2B project. The design incorporates a wider shoulder on the carriageway of the road, to allow for the opportunity in the future of having a public transport connection within the motorway, which can be re-evaluated later.

3.2.2.2 Waling and Cycling

Walking and cycling facilities were envisaged in the DBC to enable mode choice and connect communities with the Project Area, as well as provide regional access to the wider network north of Papakura via the SUP, which has been constructed along the SCI.

The design options investigated during the DBC are summarised in **Table 3-1** below, with the preferred emerging highlighted in green. Summarised as:

- Shared path along the western alignment,
- Facility with concrete / AC finish between Papakura and Drury South,
- "Trail type" facility south of Drury South, until Bombay, and:
- Grade separated crossings at the existing interchanges[6].

Table 3-1 Walking and cycling options as per the P2B DBC (NZTA, 2018)

Walking and Cycling Option	Facility Options	Crossing Type Options
No shared path along SH1 (Do Minimum)	Standard width with concrete / AC finish	No crossing / maintain existing crossings
Shared path along the western alignment		At-grade crossings
Shared path along the western alignment	"Trail type" cycling facility	Grade separated crossings
Using the local road network via Great South Road		Divert and connect to local road crossings

The emerging preferred design option was based on the benefits for reduced trip distances, the attractiveness/safety benefits of a separation from general traffic, faster travel times[7], and connectivity benefits with local centres via the SH1 interchanges.

3.2.2.3 Interchanges

The emerging preferred design options for the new/upgraded interchanges has been developed from an operating concept and the activity objectives that encourage users to use their nearest interchange. Therefore, there is no alternative consideration of locations for the existing interchange locations, and the following upgrade requirement were recommended in the DBC:

[6] This aspect of the design is subject to costing and will need to be incorporated into the scope of the pre-implementation phase.
[7] The DBC showed that two thirds of trips had time savings of between 1 and 5 minutes.

- Manage access to the motorway by way of ramp signals and provide priority access to EV's, and freight at all interchanges,
- Ramp signalling to manage queues so that they do not impact on the operation of the intersection roads, and;
- Efficient interchange operation by designing the interchanges to meet a target Level of Service of D.

The detailed design options assessment for how each of the existing interchanges at Ramarama and Bombay achieved these design requirements is discussed in Section 7 and 9 respectively below.

3.2.2.3.1 Drury South Interchange

The DBC identified the need for a new interchange at Drury South with higher capacity form and function to match the expressway standard of the Mill Road Extensions /Pukekohe Expressway corridor. As such, the indicative location of the interchange was determined to align with these adjacent projects. The design options for interchange layout were determined through a design options assessment detailed in Section 6 below.

The design options take into account the emerging preferred design requirements for the interchange, adopted from the DBC, and summarised as:

- The motorway will have a design speed of 110km/h and the on and off-ramps will also have a design speed of 110km/h at the merge and diverge areas respectively,
- A SUP (along the western side of SH1) will be provided through the interchanges that links the proposed SUP with the east/west links,
- Stormwater drainage shall be designed in accordance with ASM P46 standards. The design will remain cognisant of the AUPOP requirements and demonstrate compliance can be achieved by adopting the design philosophy defined in Auckland Council's TP108 and GD01 documents, and;
- Ground investigations have not been completed and therefore ground conditions are uncertain. As a result, cut and fill slopes are currently designed to 1:3 which provides a conservative footprint. This will be refined upon completion of the ground investigations.

3.2.2.4 Stormwater

The Project crosses through three stormwater management areas that include two key stream catchments, including Drury West (Ngakoroa Stream) and Drury East (Hingaia Stream). Currently, stormwater runoff from SH1 to these streams is not treated. Design options have been considered to minimise reduced water and soil quality, particularly from contaminated stormwater run-off and sediment during construction.

The emerging preferred design option was to provide for mitigation of 100% of the impervious area of the motorway. This is assumed to only include the motorway carriageway, while the SUP will be impervious, it is not expected to carry vehicles.

Based on the DBC, the emerging preferred design options were:

- Longitudinal Wet Swales (with wetlands where swales are not viable) have been adopted as the preferred design option to achieve 100% treatment and control, and to define the draft designation because:
  - Swales provide a more conservative designation than proprietary devices, while representing the lowest cost 'green' solution,
  - Swales are likely to meet minimum requirements in conjunction with defendable limitations and constraints on additional wetlands (in full or part) that would otherwise form a treatment train, and;
- If swales are located at the base of grassed batter slopes, sheet runoff from the road can provide some initial treatment.

3.2.2.5 Summary

The above design requirements derived from the DBC have been adopted by the Project Team in preparing the concept design for Project NoRs. In locations where the DBC has not undertaken into account detailed design options assessment, further investigation has been required, which is discussed in Section 5 to Section 8 of this Report. These design options are summarised as:

- Drury South Interchange,
- Drury South Interchange Connections (link roads),
- Ramarama/Ararimu Road over-bridge replacement,
- Bombay/Mill Road over-bridge upgrade, and;
- St Stephens School (Notable Trees).

The detailed option assessment methodology is discussed in the sections below.

3.3 Detailed Design Options Development

3.3.1 Multi-Criteria Assessment Framework

The Project Team has used an MCA framework to evaluate and compare the design options. The MCA was divided into base criteria with various subject matters to be assessed under them. Specialists were appointed to undertake assessments of the options within their area of expertise. The extent to which the Project team engaged specialists varied between each of the MCA processes. The criteria and scoring methodology are discussed in the following section.

3.3.1.1 Criteria

Five base criteria were used, which were each assessed using specific measures. The application of criteria framework varied based on the circumstances of the assessment, and not all base criteria were applied consistently. The application of the MCA framework for each assessment area is explained in **Sections 5.5**, **6.4**, **7.4** and **8.2.3** below.

The criteria used for the P2B framework are outlined in **Table 3-2** below.

Table 3-2 P2B MCA Framework

Criteria	KPI	Measure
Project Objectives	Project Objectives	Improve the safety and resilience of the state highway network between Papkura and Bombay.
		Increase transport choice and accessibility to support growth in the south of Auckland.
		Support national and regional economic growth and productivity.
		Support the inter and intra-regional movement of people and freight.
Cultural	Heritage	Extent of effects on sites and places of valued heritage buildings, scheduled trees (with heritage value) and places.
		Extent of effects on sites and places of archaeological value.
	Trees	Extent of effects on scheduled trees.

	Mana Whenua	Extent of effects on sites and places of cultural heritage value to Mana Whenua (including those in the Sites and Places of Significance to Mana Whenua Schedule, Auckland Unitary Plan) taking into consideration: - mauri - wāhi tapu - kōrero tūturu - rawa tūturu - hiahiatanga tūturu - whakaaronui o te wa.
Social	Integration with planned land use	To what extent will the option impact on the future development of land (adjacent to it and impacted by it), in relation to: - integration with the future land use scenario (including any Structure Plans or Plan Changes) - access to and use of land impacted.
	Urban design	To what extent does the option support a quality urban environment (both current and future planned state) particularly relating to: - scale of long-term impact on the amenity and character of the surrounding environment .
	Land Requirement	Scale of public / private land (m^2 / number of properties / special status of impacted property) required to deliver the option.
	Consentability	To what extent does the option present a potential inconsistency with a national policy statement or national environmental standard to the degree that consent could be refused.
Environment	Landscape and visual	The extent of effects on: - the natural landscape and features such as streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area in light of future urban land use / zoning.
	Landscape and visual	The extent of the effects on: - natural character and outstanding natural features/landscapes including geological features (mapped and protected features) - nearby properties during construction and once project is operational.
Economic	User Safety	Extent of safety effects on all transport users.
	Construction costs/risks/value capture	Assessed cost for construction of options including: complexity and risk in construction (including consideration of constructability).
	Construction costs/risks/value capture	Assessed cost for construction of options including: - ongoing operational costs, based on ease or complexity of maintenance.
	Climate change impacts	Mitigation - How does the asset impact on climate change (e.g. embodied carbon, maintenance carbon). Adaptation - How climate change may impact on the asset (i.e. is the asset resilient to the effects of climate change).

3.3.1.2 Scoring

The MCA used a graduated scoring scale, describing the scale of effect ranging from -5 (very high adverse impact) to +5 (very high positive impact), as shown in **Table 3-3** below. To achieve scoring scale consistency across experts, correlation was made with the longevity of effects/impacts (e.g. long-term/permanent, short-term/<1 year), and the extent of effect an option would have on the environment (e.g. local, regional, national).

Table 3-3 MCA scoring system

Scoring Scale
-5 Very High Adverse Impact
-4 High Adverse Impact
-3 Moderate Adverse Impact
-2 Low Adverse Impact
-1 Very Low Adverse Impact
0 Neutral Impact
1 Very Low Positive Impact
2 Low Positive Impact
3 Moderate Positive Impact
4 High Positive Impact
5 Very High Positive Impact

Scoring was completed by the specialists. The reasoning behind the proposed score was provided, including any particular trade-offs made in the assessment making process. The assessment findings were tested with the project team and partners, and the scores were challenged during the MCA workshops.

3.4 Consideration of Statutory Authorisation Pathways

NZTA undertook an analysis of the feasibility of implementing route protection measures to achieve the most cost-effective outcome in terms of consenting and property acquisitions, while staying aligned with any changes in Government Policy.

Following the completion of the DBC, the Project team prepared a consenting strategy for the statutory authorisation of the Project. This process is detailed in Section 10 below and recommended the use of designations for the purposes of route protection.

The Project requires the lodgement of NoRs for the alteration to the existing SH1 designations and NoRs for new designations to construct the SUP and Drury South Interchange Connections.

4 Engagement

Engagement with key stakeholders and mana whenua has been comprehensive through the P2B porject, beginning with the PBC project in 2016. Further discussion in relation to engagement is provided in Section 9 of the application AEE at Appendix A.

This section summarises the key engagement process as they relate to the detailed design options assessment.

4.1 Mana Whenua

A collective iwi and NZTA forum, called the Southern Iwi Integration Group (SIIG), was established in mid-2014 to discuss and consider matters of interest in relation to the development and delivery of various NZTA projects in South Auckland.

At the SIIG design hui, the Project Team presented and sought feedback on the development and assessment of options. **Table 4-1** outlines the iwi representative attendance at each hui.

Mana whenua raised the following matters of concerns relating to the design options:

- Interactions with wetlands and freshwater are particularly sensitive,
- Futureproofing for climate change is essential, including longevity of assets in relation to stormwater and flooding,
- Ideally, impacts to highpoints, knolls/puke should be avoided, and if earthworks do occur the readability of the landform should be maintained,
- Loss of habitats, and biodiversity was a particular concern,
- Impacts from sediment discharge, erosion, dust, emissions and light pollution were a particular concern,
- Avoiding impacts on SEAs and Notable Trees[8],
- The Project landscaping opportunities, and re-planting of native species,
- Interest in opportunities in cultural expressions in particular at Ramarama,
- Impacts of register archaeological, heritage and unrecorded sites, and;
- Impacts on te mana o te wai, Hingaia and Ngaakaaroa streams/catchments

The P2B MCA framework (see Section 3.3) included a consideration of mana whenua values, and the scores for these criteria were agreed upon with representatives of the SIIG during design hui, as outlined in Table 4-1.

The key dates which correspond to the design options assessment, are as follows:

- MCA workshop (August 2020)

  Project Team presented design options for the Drury South Interchange and scores were determined for the mana whenua criteria in the P2B MCA Framework.

- MCA workshop (February 2023)

  Project Team presented design options for the Drury South Interchange Connections (Maketu Road Intersection) and scores were determined for the mana whenua criteria in the P2B MCA Framework.

- Southern IIG design hui (December 2023)

[8] Note: The removal of Notable Trees at St Stephen's School was discussed with mana whenua representatives at an Southern IIG design hui in December 2023, where mana whenua indicated they were comfortable with the removal of these trees, with appropriate mitigation in place.

Project Team presented design options for St Stephen's School, including initial findings of the specialists (ecology, arboriculture, and heritage), design recommendations were discussed and helped inform scoring the P2B MCA Framework.

4.2 Stakeholders and Community

4.2.1 Supporting Growth

As detailed in Section 2 above, there are several Supporting Growth projects which interface the Project. The DBC outlined the engagement approach required for ensuring alignment between the Project and the Supporting Growth programme, which is detailed in **Section 2.2** above. As such engagement has been ongoing with representatives of Supporting Growth Pukekohe Arterial Network project, since the DBC in 2018.

Key areas of interest have been:

- The vertical alignment for Drury South Interchange,
- Location of the Great South Road intersection with the Pukekohe Arterial Network, and;
- The proposed Mill Road upgrades at Bombay Interchange.

4.2.2 Landowners

Engagement with property owners potentially affected by the project was initiated in mid-2019. Since this time, further meeting opportunities have been provided in 2022 and 2023 to discuss with individual owners the emerging impacts on their properties and to provide opportunity for their further feedback as the design options progressed.

4.3 Network Utility Operators

As part of the initial engagements with the NUOs, a number of critical existing assets were identified that may be impacted by the design, including:

- Transpower overhead pylons approaching the existing substation located immediately northeast of the proposed Drury South interchange,
- A number of Vector Gas and First Gas pipelines that fall within the proposed designation boundary,
- Counties Energy have identified the construction of a Counties Energy Zone Substation at 201 Quarry Road, and;
- Counties Energy also highlighted that they have a number of overhead lines in this area that may require relocation depending on the proposed road alignment.

4.3.1 Transpower

Transpower is a key stakeholder in the Project, for the potential impact of the Project on the Substation located at Drury South. The detailed design options for the proposed Drury South Interchange (NoR 2) is outlined in Section 5 below.

Transpower has been engaged through various stages of the P2B project, spanning from 2016. Specific engagement regarding the design options at Drury South took place throughout 2021, during various design meetings between NZTA and Transpower. Further design refinement was undertaken in 2023. During these design meetings design options were presented to Transpower. The main concerns were:

- Avoid limiting the future development potential of the Transpower site, and
- Avoiding adverse flood impacts on the site.

NZTA has taken these concerns into account by maintaining ongoing consultation with Transpower and sharing the findings of the detailed flood model at the site, to ensure the potential impacts on the substation are minimised. How the design options have accounted for this feedback is detailed in Section 5 below.

5 Drury South Interchange (NoR 2 and NoR 4)

5.1 Overview

The proposed new interchange at Drury South will tie-into the future Mill Road corridor and Pukekohe Arterial Network. This section outlines the existing condition of the Project Area, and options investigated for the new interchange.

A key component of the interchange is the connection with the Pukekohe Arterial Transport Network. The NoR for this project was lodged with Auckland Council in 2023 and was publicly notified with the submission period closing in November 2023. The NoR connects to the Drury South Interchange at the intersection of Great South Road.

5.2 Opportunities and Constraints

5.2.1 Location

The proposed Drury South Interchange is located approximately 2800m south of Drury Interchange and 2000m north of Ramarama Interchange (refer to Figure 5-1 and Figure 5-2). The new interchange will connect to Great South Road to the west and Quarry Road to the east.

The Drury Transpower substation is situated to the north-east of the proposed interchange. A 220kV transmission line runs in an east-west direction to the north of the new interchange, a 220kV line runs parallel to the east of SH1 and a 110kV line parallel to the west of SH1. Additionally, a First Gas easement crosses SH1 to the north of the proposed bridge.

Harrison Road is situated to the east of the new interchange and connects the Transpower substation and several properties to Quarry Road. To the south-east, the Hingaia Stream and two tributaries run parallel to SH1 before redirecting north-east parallel with Harrison Road towards Quarry Road. Privately owned farmland is situated to the west of SH1 at the new interchange location.

Drury South Crossing, a Drury South ltd development, is currently under construction to the east of the proposed interchange location. As part of the development, a flood compensation zone is proposed to be installed directly south-east of the new interchange.

Figure 5-1 Aerial photographs of the Drury South site (Auckland Council)

Figure 5-2 Site of the proposed Drury South Interchange (Auckland, 2019)

5.2.2 Existing geometry

The motorway follows a straight north-south horizontal alignment at the location of the new interchange. The existing vertical alignment is at a consistent 0.5% grade resulting in large cuts and fills as the motorway makes its way through relatively undulating terrain.

The existing motorway cross section consists of 2 x 3.5m traffic lanes with 3.0m right-side shoulders and 0.5m left-side shoulders leading to a grass median and wire rope.

5.2.3 Stormwater

Detail of the stormwater and flooding impact of the Drury South Interchange is contained in the Flood Impact Assessment Report at Appendix J of the application AEE. The following is a high-level overview of the existing stormwater scenario:

- There is currently no formal stormwater treatment along the existing motorway and interchange,
- SH1 runs mostly parallel to the Hingaia Stream in the east,
- The existing alignment interacts with surface flooding immediately south of the proposed Drury South location, approximately from chainage 17500 to 17940,
- The existing motorway alignment includes five stormwater sub-catchments, where the proposed Drury South Interchange presents the high point separating the middle and southern sub-catchments:
- The central sub-catchments, separated by the road median crest, drains to their respective sides before the north-bound road catchment crosses SH1 through a likely culvert into the Hingaia; and
- The southern sub-catchments, separated by the road median crest, drains to their respective sides before the north-bound road catchment crosses SH1 through a likely culvert into the Hingaia. Note that the south-western sub-catchment is extensive with 110ha contributing area;
- Two overland flow paths with potential culvert crossing cross the existing SH1 at the proposed interchange location based on Auckland Council's GeoMaps, however the infrastructure have not yet been verified:
- At chainage 16640, adjacent to the Transpower Substation, draining the west-central SH1 sub-catchment and approximately 37ha; and

- At chainage 17340, immediately south of the proposed Drury South Interchange, draining the south-western SH1 sub-catchment and approximately 110ha.

5.2.3.1 Flooding

As part of the Drury South ltd development, located to the east of the proposed Drury South Interchange, a flood storage compensation zone will be constructed. The Drury South ltd development plans extensive floodplain reclamation for development. To ensure flooding is not increased in the upstream and downstream environment the flood compensation zone will be constructed to offset the flood storage lost by the reclamation works.

As the Drury South ltd development has been consented the flood compensation zone will form part of the existing conditions. Any alteration required to accommodate the Drury South Interchange will need to ensure that flood risk is not increased from that consented for the development.

Further detail of the stormwater and flooding impact of the Drury South Interchange is contained in the Flood Impact Assessment Report at Appendix J of the application AEE.

5.2.4 Geotechnical

There is limited geotechnical information available in this area, however the available data, and recently drilled boreholes for the Stage 1B1 P2B ground investigation (AU19-BH207), suggest: ground conditions covering the study area likely comprised of Fill, Tauranga Group (TG) - Alluvium and Puketoka Formation, South Auckland Volcanic Field (SAVF) and Kaawa Formation (KF).

5.3 DBC gap analysis

The DBC indicated the requirement for a new interchange between the existing Drury and Ramarama interchanges on SH1. Drury South Interchange will be required to achieve the complete benefits of the adjacent Supporting Growth projects (i.e. Pukekohe Arterial Network and Mill Road Upgrade), which aim to re-enforce the roading hierarchy by directing traffic away from the local road network onto SH1, as well as previous stages of the P2B project (i.e. Stage 1B1).

The proposed vertical alignment of the proposed Drury South Interchange was positioned to align with the proposed Pukekohe Arterial Network intersection with Great South Road. The DBC indicated a dumbbell interchange as the preferred option, located approximately 2800m south of Drury Interchange and 2000m north of Ramarama Interchange. The indicative location plan is shown in **Figure 5-3** below.

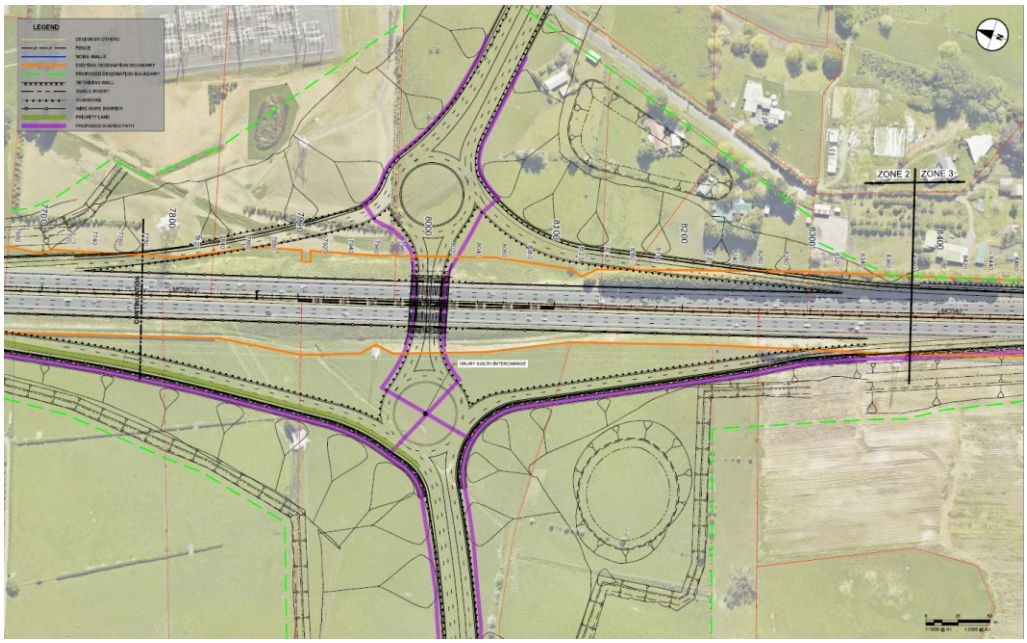

Figure 5-3 Drury South Interchange Location Plan

The DBC proposed design had a significant impact on the Transpower substation, necessitating land acquisition that would impact on the future ability for Transpower to expand if needed. Subsequently, two new design options were developed to avoid this issue. These options are detailed further in Sections 5.4.1 and 5.4.2 below.

5.3.1 Supporting Growth IBC

In parallel to the Project consideration of the Drury South Interchange location, the SGA project team considered alignments for the Mill Road corridor to the east of SH1 in accordance with the Supporting Growth IBC. The assessment of interchange options was undertaken independently of the Mill Road alignment options assessment with the conclusion being that any future Mill Road option could be implemented regardless of the interchange location.

5.4 Design Options

Two design options for Drury South Interchange were assessed through the Project MCA framework taking into consideration more detail in the design constraints, the design options are described in Sections 5.4.1 and 5.4.2 below.

5.4.1 Drury South Interchange Option 1 (Option 2020-1)

Option 2021-1 comprises a dumbbell style interchange with direct ramps to and from the motorway. In this option the interchange sits further south than the DBC design to eliminate any need for acquisition of Transpower land. The proposed connection from the interchange 400m westwards towards Great South Road where a new roundabout intersection is proposed, as shown in Figure 5-4 below.

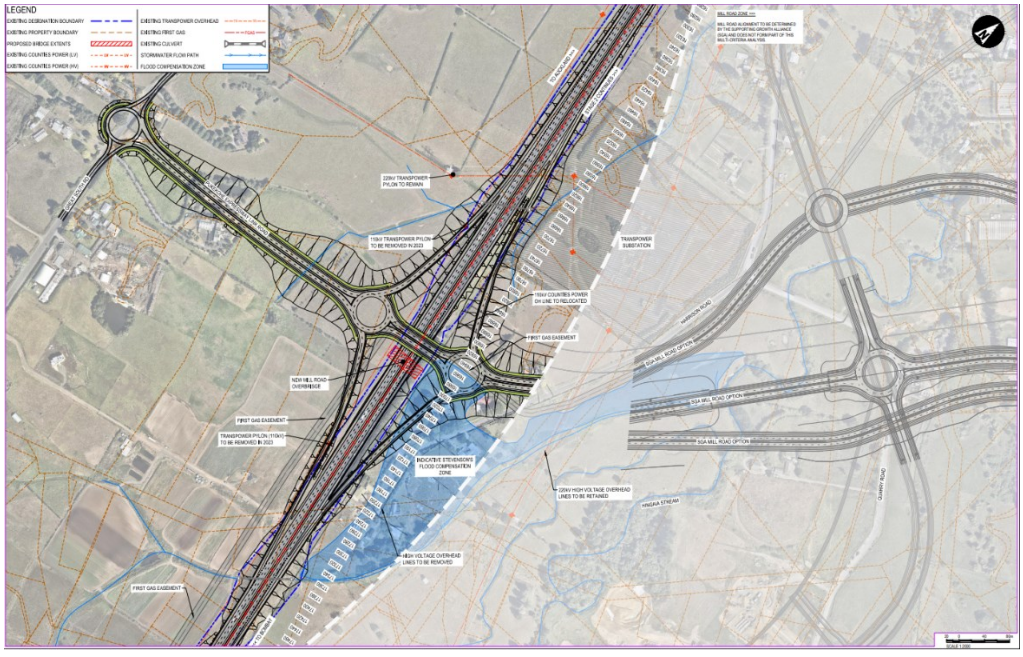

Figure 5-4 Drury South Interchange Option 1 (Option 2020-1)

The vertical alignment of the interchange has been determined to allow for a direct connection to Great South Road, no further consideration of vertical alignment has been undertaken.

5.4.2 Drury South Interchange Option 2 (Option 2020-2)

Option 2021-2 is a hybrid interchange with conventional on and off-ramps on the western side of SH1 and a loop ramp on the eastern side. The loop ramp allows the interchange to be further north in comparison to Option 2020-1, but the loop ramp and southbound on-ramp require more land. The design is illustrated in Figure 5-5 below.

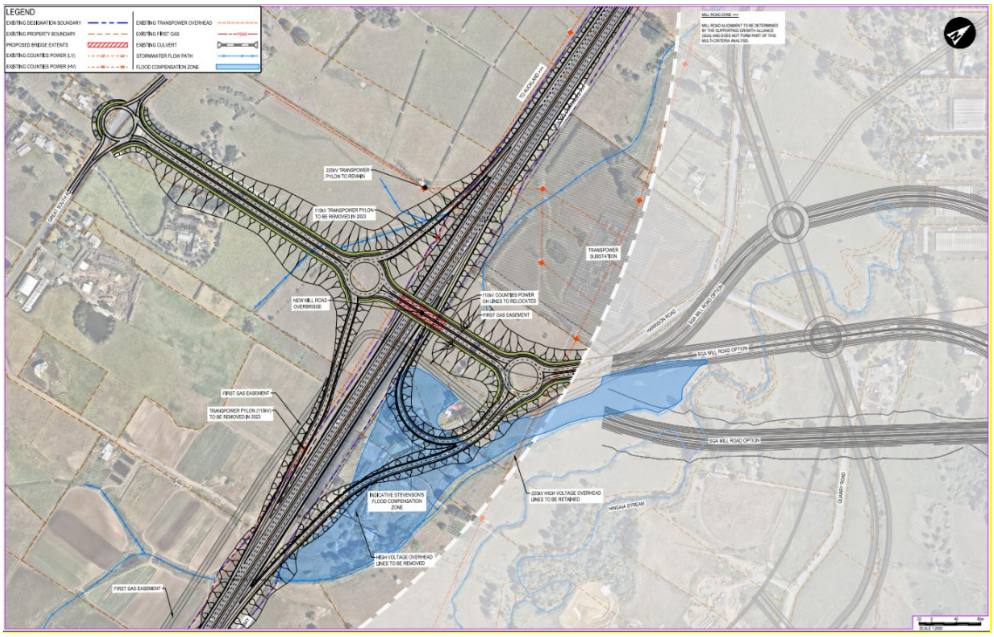

Figure 5-5 Drury South Interchange Option 2 (Option 2020-2)

As with Option 2020-1, the newly proposed Pukekohe Expressway extends 400m westwards towards Great South Road where a new roundabout intersection is proposed.

5.5 Drury South Interchange MCA

5.5.1 2021 Options Assessment

Options 2020-1 and 2020-2 were assessed against the P2B MCA framework. This framework was tailored for the P2B programme and developed in consultation with NZTA and mana whenua. In the case of Drury South Interchange, the full set of base criteria were adopted for assessing the design options. The design options were scored by specialists then discussed and challenged at MCA workshop attended by project team, specialist, NZTA and Mana Whenua, during a workshop held on 12 August 2020.

Through the MCA process, Option 2020-1 emerged as the preferred way forward. The option has benefits in terms of requiring slightly less land compared to Option 2020-2 and the design consisted of a conventional interchange form, which is known to have a good safety record for vehicle traffic.

Both options were relatively similar impacts, however Option 2020-2 was discounted for the following reasons:

- It was generally more expensive as more earthworks and pavement works are required, and;
- There are safety issues associated with the loop off-ramp within the interchange design, as it can cause loss of control type crashes and potential rear end crashes due to queues on the off-ramp.

5.5.2 2023 Options Refinement – Transpower

Option 2021-1 was developed in further detail during the concept design stage in anticipation of the NoR application. A key risk associated with any of the interchange options being considered in this area is their impact on the flood plain and flood storage, with particular regard to the Transpower site at Drury South.

The adjacent Drury South development proposes extensive floodplain reclamation and flood storage for development and is therefore sensitive to any further changes that impact this flood management. The interchange will therefore likely require mitigation to accommodate the flood storage lost by the construction and operation of infrastructure within the flood plain and flood storage areas.

As the Drury South ltd development has been consented and is under construction, the flood compensation area forms part of the existing environment. Any alteration required to accommodate the Drury South

Interchange will need to assess the change in flood risk from that consented for the Drury South ltd development. This process is detailed further in the Flood Impact Assessment at Appendix J of the application AEE.

Review and assessment of the proposed flood compensation area indicated that refinement of the design to shift the interchange to the north would reduce flood impacts on the immediate development areas. Any shift of the interchange to the north would impact on the Transpower substation property.

Engagement with Transpower was undertaken to understand the optimum location of the interchange balancing impacts on flood plain with encroachment into the Transpower site. Based on feedback received, a refined option was developed Option 2023-1 illustrated in Figure 5-6 below.

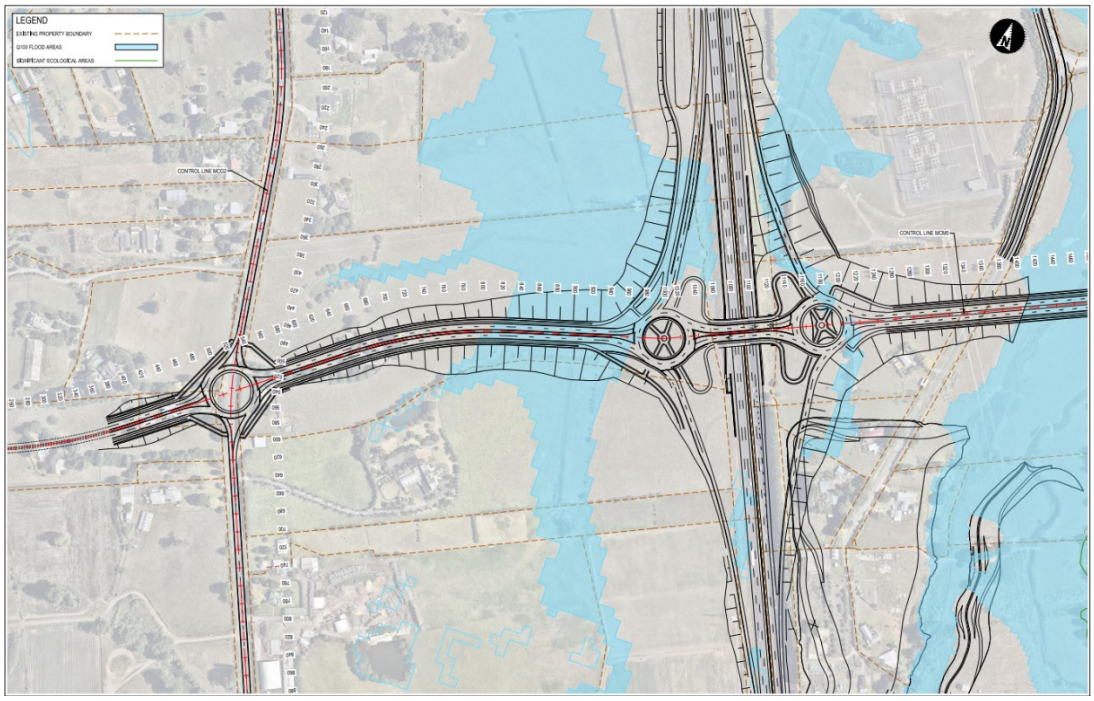

Figure 5-6 2023 Drury South Interchange Concept Design (Option 2023-1)

The interchange is further north than Option 2021-1 (Figure 5-4), but still south of that proposed in the 2017 DBC (Figure 5-3).

6 Drury South Interchange Connections (NoR 5)

6.1 Overview

The DBC recommended the construction of a new interchange at Drury South with direct connections into the adjacent transport network. As discussed in Section 3.2 above, the Mill Road Corridor is no-longer being delivered by the SGA, and will in part be delivered by the P2B project, where a new arterial link road will provide a direct connection between Drury and Pukekohe via SH1. The following section outlines how the design options for new link roads at Drury South Interchange were determined.

6.2 Opportunities and Constraints

The Drury South Interchange is proposed to connect to the east initially with a revised local road network proposed for the adjacent Drury South ltd development. Ultimately the connection could also form the southern extent of the future Mill Road Corridor.

The Drury South ltd development is currently under construction and is located immediately east of the proposed interchange, illustrated in Figure 6-1 below. The developer owns all of the land over which the eastern connection routes cross. As part of the development, Maketu and Quarry Road are being realigned. For the purposes of this Report, it was assumed that all routes can connect to the realigned Maketu Road/Quarry Road.

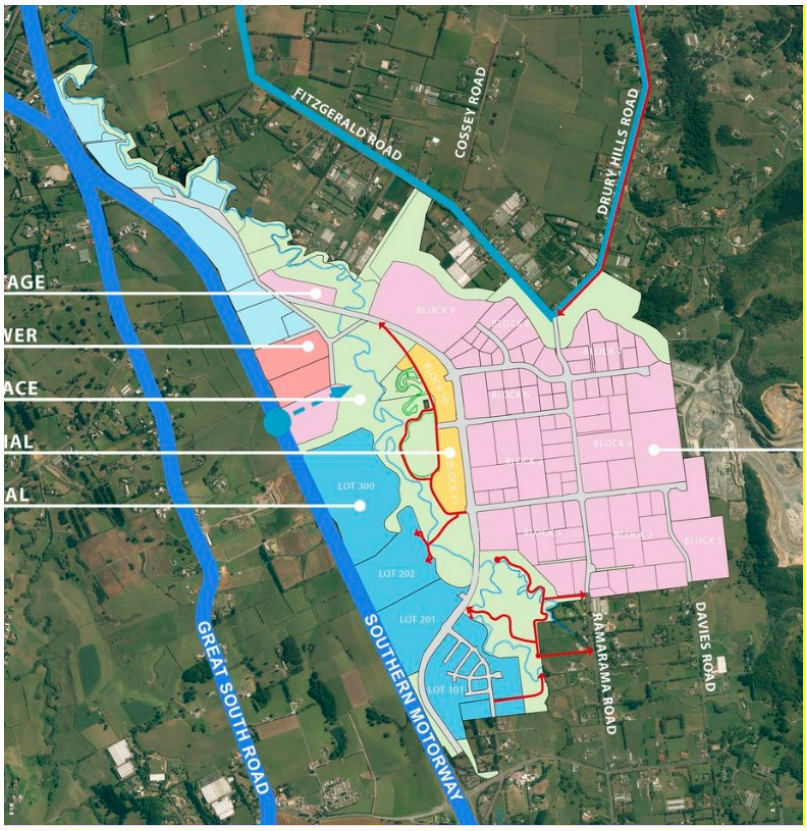

Figure 6-1 Drury South ltd Development Masterplan

Identified constraints within the Project Area for NoR 5: Drury South Interchange Connection include, but are not limited to:

- Three streams passing under the proposed connection:
  - Hingaia Stream
  - Rosslyn Stream
  - Harrison Stream

- Potential natural inland wetland areas,
- Transpower infrastructure (i.e. sub-station and over-head lines), and;
- The alignment traversing a flood plain and therefore impacting flood levels upstream.

6.3 Options Considered

Three design options were assessed for the eastern connection at Drury South Interchange and then assessed using an the P2B MCA, among other factors. Each route has a similar vertical profile, tying in with the motorway at its eastern extents where the interchange requires adequate clearance above the motorway. To meet this clearance, all routes must be constructed on a fill embankment.

6.3.1 Drury South Interchange Connections Option A Northern Alignment

Option A curves the connection with Maketu Road to the north of the interchange. To minimise the number of stream crossings relocation of Hingaia Stream and the construction of a retaining wall would be required. Figure 6-2 below illustrates this.

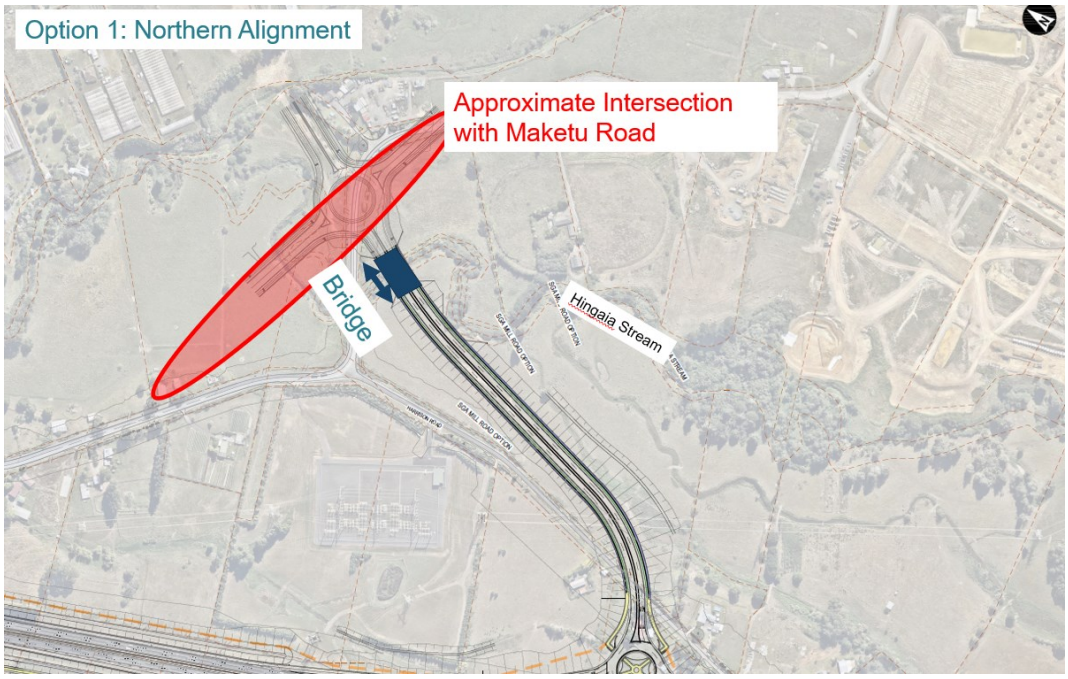

Figure 6-2 Drury South Interchange Connections Option A Northern Alignment

6.3.2 Drury South Interchange Connections Option B Southern Alignment Long Bridge

Option B extends eastward, requiring a bridge to cross the three intersecting streams. While short embankment sections between streams might be necessary for flood flow passage, due to anticipated soft ground conditions and restricted embankment lengths, a single bridge was assumed to be more efficient. An indicative pier arrangement is illustrated in Figure 6-3 below, however, further consideration of bridge form and materials will be required to confirm these locations. It was also assumed that the piers can be located outside of the existing streams.

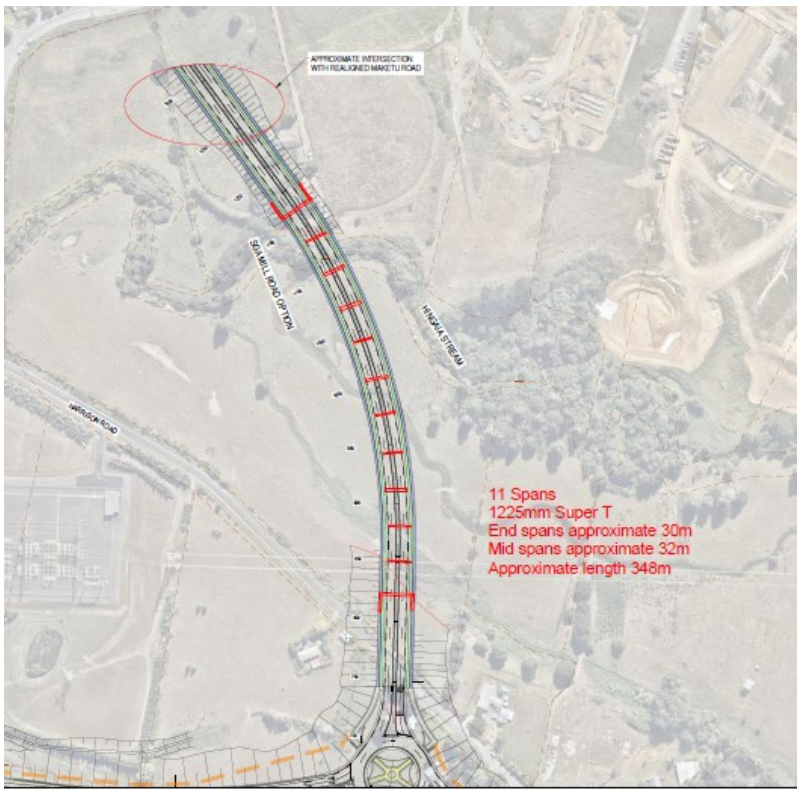

Figure 6-3 Drury South Interchange Connections Option B Southern Alignment Long Bridge

6.3.3 Drury South Interchange Eastern Connection Option C Southern Alignment Short Bridge

Option C follows the same alignment as Option B however, a short bridge is provided across the Hingaia Stream with the remainder of the alignment on a fill embankment. Culverts are proposed for the smaller streams crossed, as indicatively illustrated in **Error! Reference source not found.** below.

6.4 Drury South Interchange Connections MCA

6.4.1 Options Assessment

Options A, B and C were assessed against the P2B MCA framework. The options were scored by specialists then discussed and challenged at MCA workshop attended by project team, specialist, NZTA staff and mana whenua, during a workshop held on the 14 February 2023.

The Stage 2 – Drury to Drury South Interchange Optioneering Summary is attached at Appendix B contains the full results of this assessment however, key findings included the following:

- Option A required stream diversions and had flood impacts that may be difficult to mitigate,
- Option B required a long bridge with greater cost and associated embedded carbon requirements however, provided reduced risk around flood impacts and opportunities for ecological enhancement of streams, and;
- Option C had ecological impacts and potentially unmitigable flood impacts and therefore was regarded as the least preferred.

The flood impacts of Option A and B required further detailed modelling to confirm the preferred design option.

6.4.2 Options Refinement – 2023

A further assessment was undertaken in late 2023, based on the Drury South Interchange Option 2023-1 location (see above). Option A and Option B were reassessed based on the refined design option for Drury South Interchange.

Option B was preferred over Option A as:

- Further consideration of the flood impacts confirmed that for the long bridge option (Option B) impacts on flooding could be mitigated. Options that required large scale embankments (i.e. Option A) resulted in increases in flood levels upstream,
- The revised interchange location (2023-1) enables the Option B bridge to be reduced and therefore made cost variation between the options less,
- The revised interchange location (2023-1) results in poorer geometry for Option A with a curve required on the approach to the roundabout, and;
- The proposed Maketu Road alignment, provided by the Drury South ltd development proposes new bridges on Maketu Road immediately to the west of the proposed intersection at Quarry Road. Option A would likely require widening of the Maketu Road bridge to accommodate the intersection, increasing the cost and complexity of Option A.

7 Ramarama Interchange (NoR 2 and NoR 4)

7.1 Overview

The existing over-bridge at Ararimu Road provides connections into the local road network at Ramarama Interchange. The DBC identified upgrades are required to this interchange to provide links into the future adjacent residential areas.

The upgrades include modifications to the on and off-ramps to SH1 in both the north and south directions. In conjunction with these ramps, the Project Team identified an opportunity to upgrade the Ararimu over-bridge. This would be consistent with the objectives of the Project and the wider P2B project. The design options process considered multiple options for the upgrading or replacement of Ararimu Bridge and links into the upgrade of Ramarama Interchange, which are detailed in the section below.

7.2 Constraints and Opportunities

The existing Ararimu Road over-bridge currently carries one traffic lane in each direction and a footpath adjacent to the westbound lane.

The bridge was originally constructed in 1975 for a working design life of 50 years. The most recent principal bridge inspection was carried out by ASM in 2021. Key findings of the inspection are included below:

- Overall, the structure is in poor condition. This structure may form part of the upcoming capital works programme and consideration should be given to undertaking all required works or including upgrade or replacement of the structure to meet current requirements,
- Widespread cracking to main beams pattern indicative of possible ASR,
- Current barriers are below standard,
- Based on the condition of the existing structure, the Project Team considered it unfeasible to widen the bridge without significant strengthening and potential replacement of key structural elements. This would require significant investment and traffic management, and;
- Although the bridge will soon reach each 50 year working design life, the bridge is able to remain in service as currently operated (one lane each direction plus footpath).

7.2.1 Existing Roundabout

The existing roundabout on the eastern side of SH1 has two very closely spaced exits (for westbound traffic on Ararimu Road and for southbound on ramp traffic). Feedback from NZTA specialists indicated that opportunities to improve spacing between these exits should be considered.

7.3 Design Options

7.3.1 Option One

Option one keeps the east and westbound traffic lanes on the existing Ararimu Road Bridge. A new roundabout on the western side of SH1 is introduced. Tie-in to the existing roundabout on the eastern side of SH1 remains unchanged.

The SUP is carried over SH1 on a new structure adjacent, but independent to the existing bridge. Option One is illustrated in Figure 7-1 below.

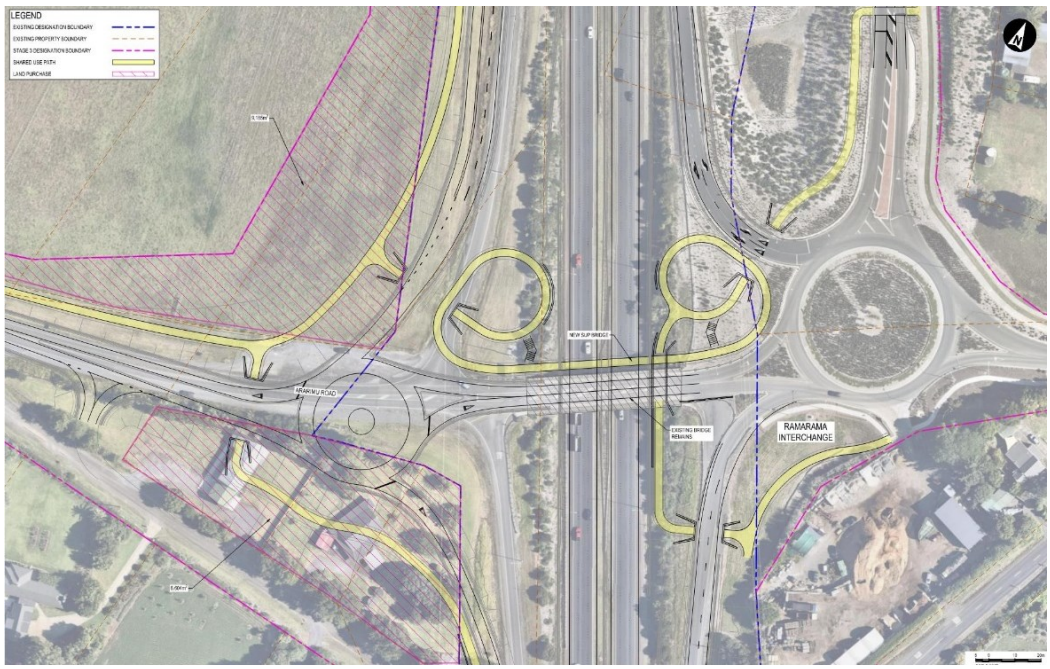

Figure 7-1 Ramarama Interchange: Option One General Arrangement Plan

7.3.1.1 Property

Engagement with property owners has been undertaken on Option One. A residential property and Ramarama Hall are impacted by this option. Through consultation with residents, various concerns were raised about the impacts of the design option and NZTA was requested to consider alternative options that resulted in less impact on privately owned land.

7.3.2 Option two

Option two provides a signalised crossing for the northbound off and on ramps to limit land take. To accommodate the signalised crossing, an additional westbound lane is required on the Ararimu Road bridge. The existing bridge is re-profiled to accommodate the two westbound lanes. A new bridge is constructed adjacent to the existing to accommodate the eastbound traffic lane and the SUP. Slight modifications, as well as off structure barrier protection is required at the tie into the existing eastern roundabout. Option Two is illustrated in Figure 7-2 below.

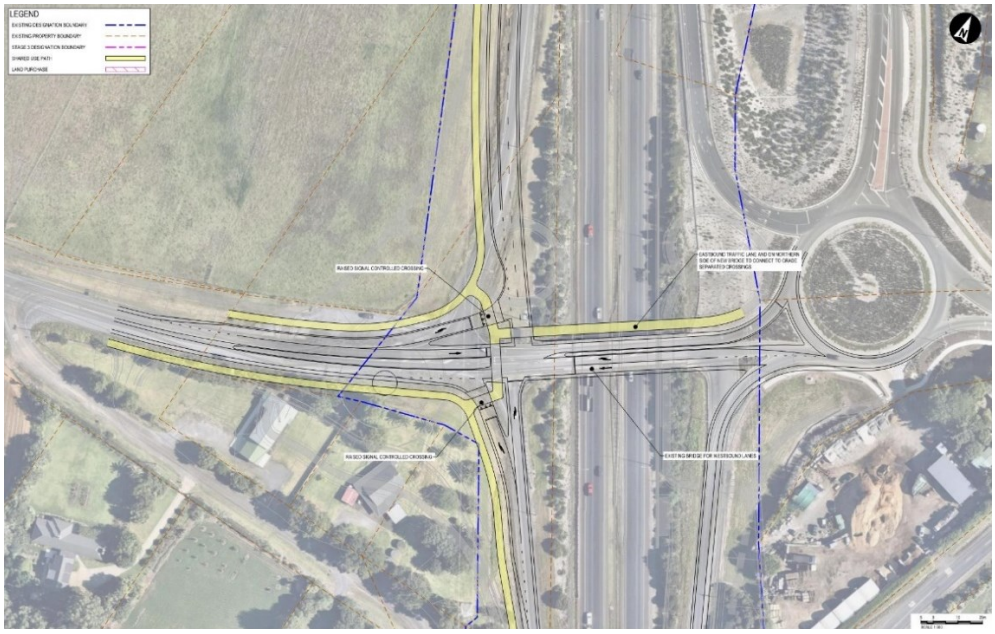

Figure 7-2 Ramarama Interchange: Option Two General Arrangement Plan

7.3.3 Option Three

Option three proposes the construction of a new bridge to the north of the existing Ararimu Road Bridge. Construction would take place 'offline' as to allow the existing bridge to operate while the new structure is constructed. The new bridge carries one lane in each of the east and westbound directions as well as a SUP. A new roundabout is introduced on the western connection to the north of Ararimu Road. The geometry of tie into the existing eastern roundabout is improved. Option Three is illustrated in Figure 7-3 below.

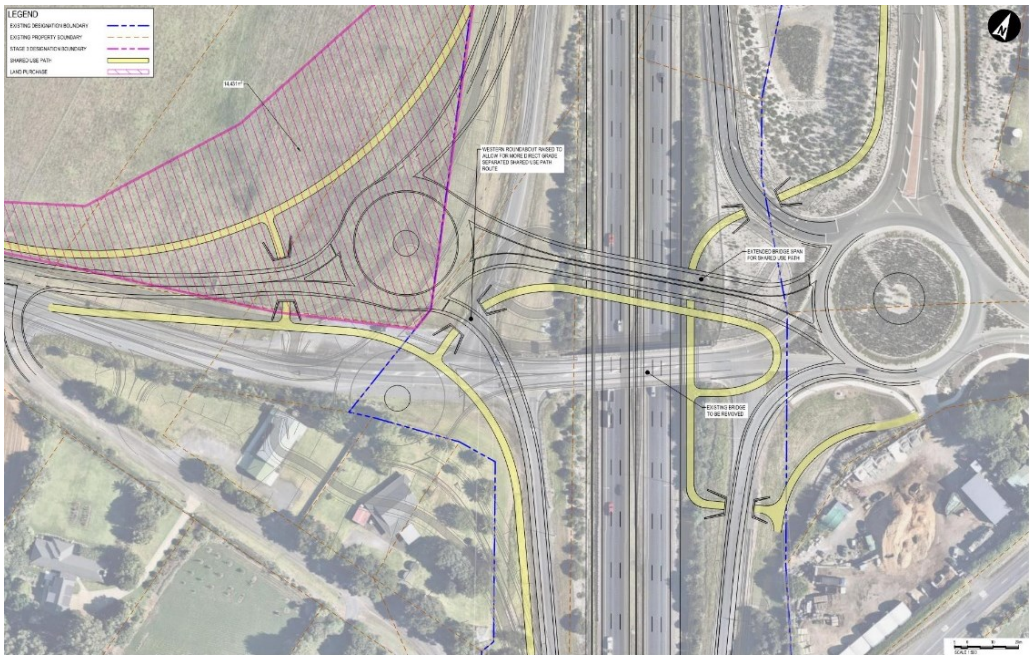

Figure 7-3 Ramarama Interchange: Option Two General Arrangement Plan

7.4 Ramarama Interchange MCA

Options One, Two, and Three were assessed against the P2B MCA framework. As the options had similar effects in relation to transport performance and environmental effects the options were assessed by the Project Team only.

Technical Note attached at Appendix C contains the full results of this assessment however, key findings included the following:

- Option One requires a large land acquisition (approximately 15,800m^2), including a site containing a residential dwelling and one containing a Community Hall, online construction requires traffic management, limited service life in maintaining the existing ageing bridge structure, and use of existing roundabout and bridge barrier results in a poor safety outcome,
- Option Two raised safety concerns for SUP with signalised crossings, limited service life in maintaining the existing ageing bridge structure, construction would require significant traffic management, and;
- Option Three avoids acquisition of the residential dwelling and Community Hall. Off-line construction significantly reduces the traffic management required during construction, and design capacity is not limited by existing bridge geometry. Construction of a new bridge potentially achieves a higher clearance over the motorway. Construction cost is higher.

Based on the MCA, Option Three was progressed to design refinement, given the off-line construction had the benefit of minimising the impacts of construction on the transport network, and upgraded design to achieve a modern over-bridge with separated active mode connections.

8 Site specific assessments 2023

8.1 St Stephen's School (NoR 4)

8.1.1 Overview

Initial specialist assessment of the emerging design options identified the potential for significant adverse effects on the property at 1832 Great South Road (St Stephen's School) as a result of the removal of Notable Trees[9] from the site. For further details about these trees refer to Assessment of Arboricultural Effects at Appendix G of the application AEE.

The St Stephen's School site contains a group of London Plane trees marking the access to the site, illustrate in Figure 8-1 below. Construction of the SUP (NoR 4) and supporting structure (proposed as a batter slope) alongside the existing SH1 corridor will require removal of a number of these Notable Trees (between 12-37 trees).

Considering the potential for adverse effects resulting from the removal of Notable Trees and the policy provisions relating to Notable Trees in the AUP, further consideration of alternative methods of undertaking the works were assessed.

Map M – London Plane trees – 1832 Great South Road

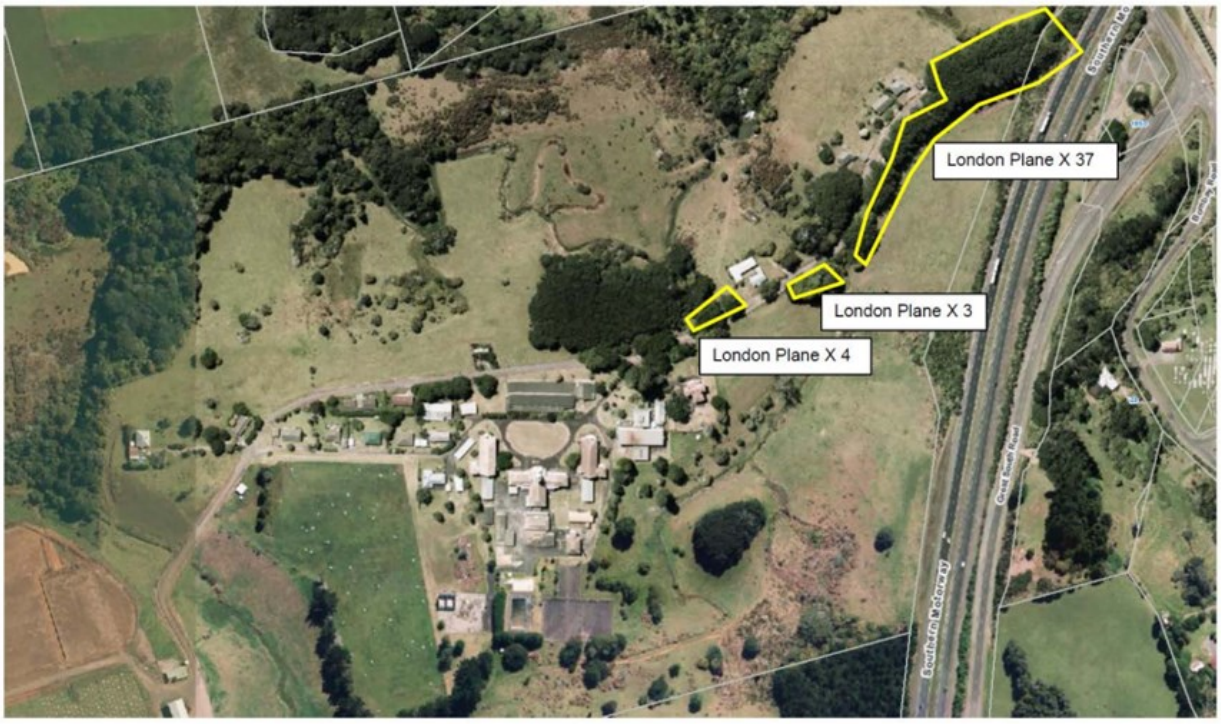

Figure 8-1 Aerial photograph of the St Stephen's School Site highlighting the protected London Plane Trees (AUPOP, 2019)

8.1.2 Opportunities and Constraints

The potential for alternative routes or locations of the Project is constrained by the location of the existing motorway corridor, which would be significantly complex to re-align, and would result in additional adverse effects.

The Project is constrained at the St Stephen's School site as the Bishop Selwyn cairn (CHI 01537) is located to the east of motorway corridor, while the grove of Notable Trees is located to the west. In order to minimise

[9] Reference:D13 Notable Trees Overlay.pdf (aucklandcouncil.govt.nz)

the impact on both sites, it is optimal to keep the motorway on its existing alignment and construct the new infrastructure (i.e. SUP) alongside this corridor. As discussed below, the SUP has been located along the western edge of the motorway corridor, as a continuation of Stage 1 of the P2B project. This was determined as the most optimal design option under the DBC, and consideration of re-directing users of the SUP to the eastern side of the motorway at Great South Road was not considered feasible. In addition, placement of the SUP on the eastern side of the motorway would result in adverse effects by intercepting the Selwyn Bishop cairn.

Based on these constraints two design options were developed for the site, as detailed below.

8.2 Design Options

The use of batter slopes has generally been adopted across the entire Project alignment to support the motorway upgrades and SUP, as it allows for:

- Construction requirements and reduced cost (when compared to retaining structure);
- Allows for mitigation of landscape and visual effects through planting, and;
- Lower ongoing maintenance and costs associated.

For locations where a batter slope was not feasible due to limitations on construction or impacts on existing structures or accessways, a retaining wall design has been investigated. This is the case at St Stephen's School where two design options were assessed, including a retaining wall and a batter slope option.

8.2.1 Batter Slope (Option One)

Option One adopts a batter slope to support the proposed SUP and widened motorway consistent with the design methodology adopted across the balance of the Project. The construction of the slope will result in removal of vegetation, including a group of notable trees (approximately 34 trees).

The driveway access to 1832 Great South Road will require realignment with this design option, as illustrated in **Figure 8-2** below.

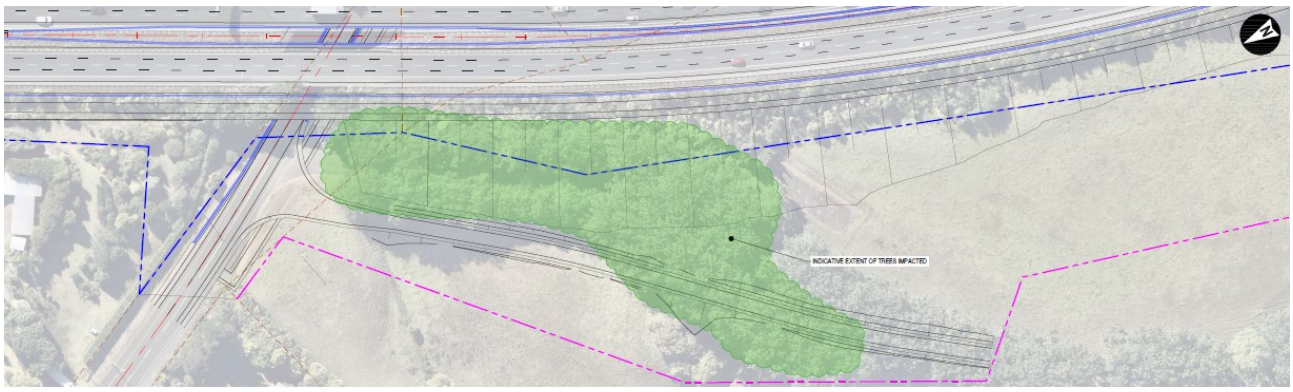

Figure 8-2 St Stephens School – Batter Slope (Option One)

8.2.2 Retaining Wall (Option Two)

Option Two will allow the driveway at 1832 Great South Road to be maintained in its existing location. To achieve this the proposed SUP will require the construction of a retaining wall to support the structure, which will be constructed to a height of 9m at its highest point. The proposal would require less trees to be removed from the site (approximately 12-13 trees), as illustrated in Figure 8-3 below.

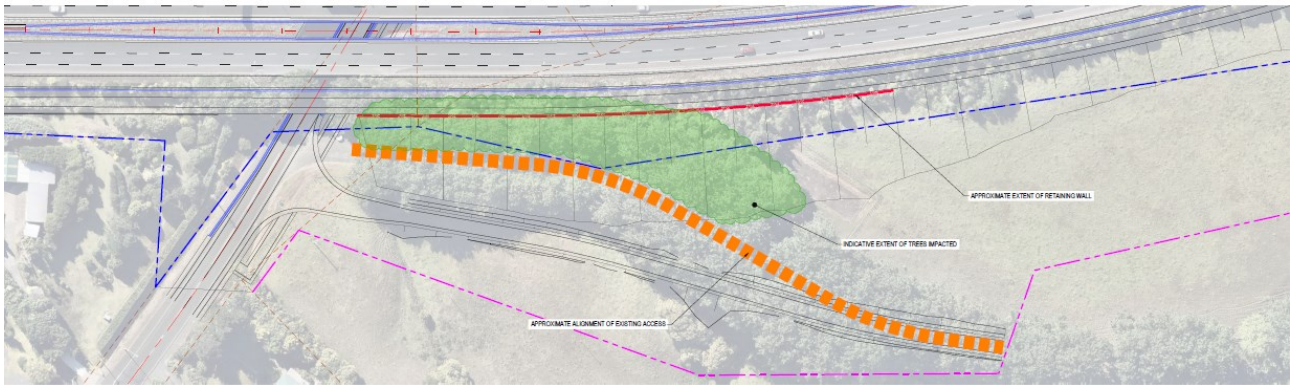

Figure 8-3 St Stephens School – Retaining Wall (Option Two)

8.2.3 St Stephen's Site MCA

To be consistent with other locations where the basic design requirements from the DBC cannot be applied (i.e. Drury South Interchange) the site-specific analysis of the St Stephen's School was assessed against the P2B MCA framework, with some amendments to base criteria.

Mana whenua were notified of the options assessment during an SIIG design hui on December 14 2023, in which iwi representatives were briefed on the historical values of the Notable Trees to be removed, and concerns were raised regarding the potential loss of habitat of native long-tailed bats.

Scoring was completed by NZTA specialists with justification provided. The design options were then shared with mana whenua during a hui held on 16 January 2024. Mana whenua preference was expressed for Option 1, for the following reasons:

- The batter slope design was considered to have lesser environmental impact,
- The benefit of accommodating planting on the batter slope to integrate with the surrounding natural environment, and;
- The opportunity to provide mitigation planting in place of the removed London Plane trees, indicating a preference for native trees and to be involved in the development of the design through the ULDMP.

The assessment findings were tested with the Project Team, and then discussed with NZTA at a workshop held on 22 January 2024. Based on this process Option One emerged as the preferred design option, for the following reasons:

- The design option would require a larger area of land acquisition, which accommodates more opportunity for mitigation planting within the designation;
- Allows for amenity planting to be incorporated into the batter slope design;
- Mana whenua expressed preference for the design option (outlined above); and
- The lower construction and on-going maintenance costs associated with a batter slope, and;
- The design option will result in the removal of more Notable Trees (approximately 34), which are expected to be mitigated by the positive impacts above.

Design Option 2 was discounted for the following reasons:

- The higher construction and ongoing maintenance costs, associated with a large retaining wall,
- The landscape and visual amenity impacts associated with a large structure, and the inability to integrate the structure with the surrounding landscape, with the use of planting; and,
- Potential for adverse safety effects as the access would be in close proximity to the retaining wall which could limit visibility for vehicles entering or exiting.

9 Updated and additional information

9.1 Bombay Interchange – Mill Road Overbridge

Bombay Interchange is an existing SH1 interchange located at the southern extent of the Project area. The interchange includes north and south access ramps in both directions. The interchange is an important link into the existing Mill Road, and existing residential areas at Bombay and Pukekohe.

The DBC predicted residential and employment growth South Auckland will reduce accessibility to SH1 (and therefore the wider network) due to the existing interchanges being undersized and unable to meet future demands. This was anticipated to occur at Bombay Interchange around the year 2036.

The required upgrades identified for Bombay Interchange are as follows:

- Signalised interchange with north bound ramp signals.

Following early discussions with the Franklin Local Board, the NZTA has carried out investigations and modelling to address safety, congestion, and access concerns at Bombay Interchange. The conclusion is that installing traffic lights would be the most suitable short-term solution for these issues. Construction of these upgrades is set to commence mid-2024,[10] and are no longer a part of this Project.

The remaining upgrades to Mill Road over-bridge are required to achieve the DBC basic design requirements and ensure consistency with the SGA Mill Road and East Road Upgrade (refer to **Figure 9-1**).

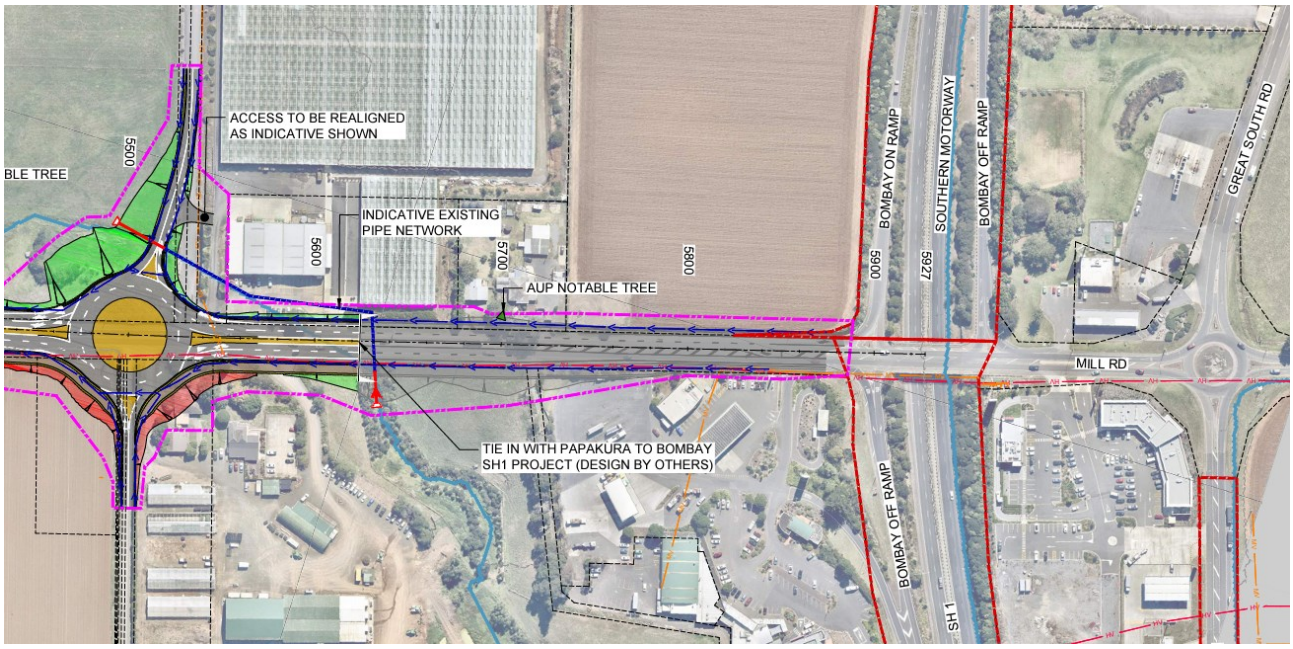

Figure 9-1 Layout plan Pukekohe: Mill Road and Pukekohe East Road Upgrade (NZTA)

Through concept design it was found that planned upgrades to Mill Road overbridge could be largely accommodated within the existing structure, with a minor addition to Mill Road overbridge to support the construction of the SUP. The decision to construct the addition along the northern edge of the bridge was made to minimise the impact on Property. The design alternative would be an additional bridge structure constructed along the southern extent of the existing bridge, which would require acquisition and impact property access for multiple commercial/retail properties.

The basic design requirements were considered adequate to achieve the Project Objectives at this location, and a detailed design options assessment was therefore not required.

[10] Additional information available here: Signalisation of Bombay Interchange | Waka Kotahi NZ Transport Agency (nzta.govt.nz)

10 Consideration of Alternative Methods

In accordance with Section 171(1)(b) of the RMA, an evaluation of alternative methods was undertaken as part of the design development for the Project. As part of the consideration of alternatives, the options that enable route protection considered a number of contextual elements including project strategic importance, project urgency/timing and project complexity risk profile.

A range of options for statutory authorisation were considered including:

- Designations,
- Resource consents,
- Landowner/developer negotiations,
- Plan changes (initiated or submitted on),
- Structure plans; and,
- Traditional property acquisition.

In the DBC phase, designations (new or alteration to existing) were identified as the recommended route protection method. This was on the basis that the principal task for NZTA in the context of this Project is to protect areas to authorise the necessary upgrades to the existing state highway corridor. Designations were considered to be the most logical and effective method to protect a route in an evolving environment for the following reasons:

- A designation provides certainty to all parties including the community and affected landowners,
- It is a well-recognised and understood tool for route protection which also enables land acquisition processes through the link to the Public Works Act,
- Maximises flexibility for future implementation,
- Negates the need for additional land use consents to implement works authorised under the district plan (s9(3) of the RMA); and,
- Will continually provide for future operation and maintenance requirements.

10.1 Consideration of Alternative Statutory Methods

This section provides a detailed overview of the statutory methods considered to deliver the Project.

Table 10-1 below summarises the strengths, weaknesses and suitability of each method for route protecting the Project. The planning context, key risks and considerations which may influence the preferred route protection method were reviewed and evaluated taking into account the planning environment and identified risks and considerations.

Table 10-1: Summary of route protection methods considered

Method	Summary of strength and weaknesses within an Auckland context
Auckland Unitary Plan 'Corridor Overlay'	AUP overlays can provide certainty to the community by publicly identifying the network, however they do not protect the land necessary for the works. Any overlays would require a plan change, and this approach may not be accepted by Council as the AUP:OP overlays are generally focused on RMA Section 6 and 5 matters (e.g., heritage, SEAs) rather than transport. There are existing infrastructure overlays in the AUP for noise (e.g., Airport Noise Overlay, City Centre Port Noise Overlay) as well as the National Grid Corridor Overlay, which is most reflective of how an overlay could appear for transport. However, it is noted that the National Grid implements the National Policy Statement on Electricity Transmission which sets out key protections from adverse impacts of third-party development. There is currently no National Policy Statement which would provide the required protection for key transport corridors. Progressing a 'Transport Corridor Overlay' within the AUP:OP is therefore not considered a viable route protection method for the P2B. A similar method would be to rezone the proposed corridors as Strategic Transport Zone. However, this would not provide sufficient protection for the network or control as landowners could apply for a resource consents to development their land or their own plan change to rezone the land. This would be a novel approach that has not been implemented before by NZTA and so is unproven, and would be inconsistent with the previous stages of the P2B Project.
Resource consents	A resource consent grants approval to use resources such as the land, water, air and coastal environment. A resource consent, if granted, is not shown publicly in a district plan and does not protect land or provide rights of exclusion that would hinder incompatible land use. Resource consent also only remain active for a period of five years. We therefore do not consider resource consents to be an appropriate route protection method for these Projects. It can be advantageous to seek resource consents (particularly for construction activities) under the RMA alongside route protection methods in instances where projects will proceed to construction once the route is secured. None of the Project NoRs have funding for short-term construction and delivery, therefore resource consents are not being sought.
Landowner/ developer negotiation	Landowner or developer negotiations can include private parties purchasing land and vesting roads that support development, or development agreements whereby a developer agrees to "set aside land for future transport corridor" and / or construction at a future point. Infrastructure Funding Agreements (IFA) are the preferred form of landowner / developer agreement to enable delivery of transport infrastructure. IFAs provide route protection where a developer agrees to design and implement a project. For landowner agreements to be efficient, the aspirations and timing of each party must be aligned. Where multiple independent properties and developers are involved, the final solution is likely to be delivered piecemeal due to the impracticalities and timeframes required to negotiate complex agreements with numerous landowners for each corridor, noting that there are generally a high number of property owners along the length of the existing SH1 corridor. Landowner agreements do not grant landuse approval in the same way that resource consents or designations do. IFAs with a large number of parties are generally impractical to implement and unlikely to protect the corridors within a reasonable time period. Additionally, it is not compulsory for landowners to enter into agreements. For linear corridors requiring a consistent network, agreement must be secured along the length of the route. A piecemeal approach significantly reduces the utility of this method for route protection purposes. Landowner agreements would only be useful for parts of the Project that are located outside the existing motorway corridor.

Traditional property acquisition	Traditional property acquisition to acquire the necessary land for the Project NoRs was also considered. Land is typically purchased a few years before projects go to construction and delivery, based on detailed design plans. Purchasing property at this stage ahead of detailed design may result in more or less land being acquired than is required to deliver the projects. It also may not enable construction areas to be protected which are required temporarily to construct the corridors. It may not enable mitigation areas to be protected. Like developer negotiations, traditional property purchase would not provide route protection until acquisition. Where multiple owners are present this is unlikely to be achieved in a timely or consistent manner. As none of the Project NoRs have funding for construction and delivery and have likely commencement timeframes of up to 20 years, this option risks 'build out' of the corridors in the meantime, especially as the urban development envisaged in FUZ areas occurs. As per the above point on landowner negotiations, acquiring the property would not alter the RMA requirements for consenting and these options have no benefits in this regard.
Designation	A NoR to designate land for a public work under the RMA provides a strong level of route protection from incompatible development particularly where development pressure is anticipated along the SH1 corridor. Once confirmed it also provides authorisation to undertake and operate/maintain the works. A NoR has interim route protection effect as soon as the notice is lodged with Council which ensures the corridors will be protected from incompatible development from that date, enabling a cohesive interim protection for linear networks like roads and Rapid Transit. This effectively manages risk of development within the corridor that may otherwise hinder the proposed works. Whilst only some of the Stage 2 of the project area is currently structure planned the wider Drury area has been subject of recent plan changes that has loved zoned land. There is potential for 'out of sequence' plan changes to be lodged in the short term, highlighting the need for a route protection method which provides immediate and ongoing route protection. A designation, if confirmed, is included in the relevant district plan as a publicly visible layer. This provides visibility to the public about the intended land use and project extent, and it also provides certainty to other infrastructure providers and developers about the future network location, enabling integrated development planning. A designation enables faster construction and delivery of a corridor following detailed design, by consenting the project requirements under the district plan and allowing regional consents and Outline Plan of Works to be sought at a later date. Lapse periods of up to 20 years will likely be sought for the Project NoRs where relevant to protect future transport corridors allowing flexible and efficient infrastructure. The longer lapse periods will provide long-term protection for longer implementation periods.
Alteration to existing designations	Lodging a NoRs for the alteration of an existing designation has the same strengths and potential risks as identified for a new designation. To facilitate the SH1 Improvements projects (NoR 1-3), an alteration to existing designations is required to existing SH1 designations 6706, 6700 and 6701. This method also provides for an efficient use of an existing corridor, reducing private property impacts.

The conclusion of the assessment process is that the Project is proposed to comprise new designations, as well as an alteration to the existing SH1 Motorway designations 6700, 6700, and 6701.

10.2 Preferred Methods

Based on these factors, designations (new or alteration to existing) are the preferred method. Designations provide certainty to the public by identifying the long-term transport network, enabling it to be implemented in stages as aligned with government funding and pace of growth, enabling effective investment, and is consistent with the approach to previous stages of the P2B project.

The method protects the required area by restricting activities or use that may prevent or hinder the Project and allows detailed design to be undertaken prior to project delivery. Designations provide an efficient and effective route protection method for projects in a changing environment. **Table 10-2** sets out the preferred method for each of the Project NoRs.

Table 10-2: Stage 2 preferred methods

Ref	Project	Preferred Method
SH1 Improvements		
NoR 1	SH1 improvements (SH1 widening (Drury to Bombay), including the Quarry Road over-bridge	Alteration to existing SH1 Designation 6706
NoR 2	SH1 improvements (SH1 widening (Drury to Bombay), including a new interchange at Drury South, and upgrades to Ramarama Interchange	Alteration to existing SH1 Designation 6700
NoR 3	SH1 improvements (SH1 widening (Drury to Bombay), including upgrades to Bombay Interchange	Alteration to existing SH1 Designation 6701
Shared User Path		
NoR 4	Construction of a shared user path between Quarry Road and Bombay Interchange	Notice of Requirement
Drury South Connections		
NoR 5	Construction of a new link road between the new Drury South Interchange, and Maketu Road (east) and Great South Road (west).	Notice of Requirement

10.3 Summary

A variety of route protection methods were considered with designations being confirmed as the recommended method for the Project at both the DBC and option assessment phases.

The Project NoRs will either be route protected via new designations or, in the case of NoR 1-3 only, via alterations to the existing SH1 designations.

Designations were selected because they:

- Provide certainty to the public by identifying the long-term transport network, enabling projects to be implemented in stages as aligned with government funding and pace of growth, and enabling effective investment,
- Protect the required area by restricting activities or use that may prevent or hinder the Project and allows detailed design to be undertaken prior to project delivery,
- Provide an efficient and effective route protection method for projects in a changing environment; and,
- Are consistent with the statutory method adopted by previous stages of the P2B project.

Overall, it is considered the assessment of alternatives undertaken meets the statutory requirements set out in section 171(1)(b) of the RMA.

APPENDICES

Appendix A

Assessment of Effects on the Environment

Appendix B

MCA Technical Notes (Part 1 to 3)

Appendix C

Design Construction Report

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