Supporting Waipapa Growth: Detailed Business Case

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VERSION - Final

Detailed Business Case

NZ TRANSPORT AGENCY WAKA KOTAHI

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More information

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EXECUTIVE SUMMARY

This Supporting Waipapa Growth Detailed Business Case (DBC) follows work completed to date, including the Strategic Case, and is a Single Stage Business Case combining both the Indicative and Detailed Business Case phases.

Background

The Waipapa Township is located on SH10, 5km northwest of Kerikeri. Along with Kerikeri, it is the most significant growth area in the Far North District and, over time, has developed to act as a service centre for Kerikeri and the wider East Coast and central areas of the District.

SH10 runs through Waipapa from north to south and acts as the spine for the road network. The busy commercial and industrial areas are located mainly to the west of SH10, with some direct access to and from SH10 and alternative access off Kahikatearoa Lane and Pataka Lane. A local road connection between Waipapa and Kerikeri is provided via Waipapa Road.

The Waipapa commercial area is a significant area of employment. Many of the people who work in this area travel by car as there is limited public transport and a lack of walking and cycling infrastructure.

Waipapa has been highlighted for strong future growth and development, with the Kerikeri Waipapa Structure Plan (2007) being the guiding document. The structure plan includes household and population predictions between 2001 and 2026, which indicates that the population is predicted to more than double over this timeframe. This predicted population growth will increase the demand for residential dwellings in the surrounding area. It will also increase the demand for land for commercial, industrial and retail development in the area with significant focus on Waipapa.

Problems and Opportunities

Problems for the Waipapa study area have evolved and been agreed to through the business case process based on stakeholder feedback and supporting evidence. These problems are:

- **Problem One: Lack of long term integrated planning and robust zoning controls has resulted in sub-optimal land use patterns and a deficient transport system (10%).**

  This problem statement relates to historic growth and development occurring in an ad hoc manner, with multiple direct accesses on the State Highway, and the existing roading network not being able to support further growth.

- **Problem Two: Disjointed and insufficient transport infrastructure is a major barrier to safe, efficient and reliable multi-modal passage, including visitor journeys, and realising community outcomes in Waipapa (45%).**

  This problem statement relates to the capacity of the existing SH10 / Waipapa Road intersection, the barrier of the State Highway to pedestrians and cyclists, and the proximity of the Skippers Lane intersection to the State Highway.

- **PROBLEM THREE: LAND USE DEVELOPMENT PRESSURE AND NETWORK CHANGES HAVE SIGNIFICANTLY ALTERED VEHICLE MIX AND JOURNEY PATTERNS ON THE STATE HIGHWAY AND ADJOINING LOCAL ROADS. THIS HAS LED TO INCREASED PRESSURE AT KEY POINTS ON THE NETWORK AND CHANGES TO CRASH PATTERNS (45%).**

  This problem statement relates to the increased traffic on Waipapa Road, which is also the Twin Coast Discovery Highway, and the over-representation of right-turn traffic into Kahikatearoa Lane and other business accesses.

Based on the problems and opportunities identified within the Waipapa study area, the following investment benefits were identified:

- **Benefit 1:** Improved Economic Growth for Waipapa and Kerikeri (10%)
- **Benefit 2:** Improved Network Efficiency (45%)
- **Benefit 3:** Increased Safety (15%)
- **Benefit 4:** Increased multi-modal travel (30%)

Option Development

Options were initially developed considering a range of alternatives based on addressing the above benefits. The identified "long-list" options were initially assessed using a multi-criteria analysis (MCA) framework which assessed option alignment with investment objectives and key project risks. The process allowed "long-list" options to be rationalised to a "short-list" of options to be assessed in further detail. Identified short-list options are listed below:

- **Right Turn Bay**
- **Roundabout**
- **Traffic Signals**
- **Head to Head Right Turn Bays**
- **Close Waipapa Loop Road South**

The short-list options were then assessed in further detail, including an assessment against anticipated environmental and social impacts, and high-level cost estimates.

Based on the findings of the MCA, supporting information, stakeholder and community feedback, the ***Roundabout*** was identified as the recommended option.

Why This Option is Recommended

The Roundabout is identified as the recommended option for further progression, as it:

- Provides the best overall efficiency benefits, in particular for Twin Coast Discovery Highway movements.
- Provides a gateway treatment to the Waipapa area and allows ease of movement for all users.
- Significantly reduces the number of conflict points at the intersection.
- Provides opportunity for uncontrolled crossing points on all roads.
- Received the most favourable feedback from the public.

Recommended Option

The recommended option includes the following treatments:

- Roundabout at the intersection of SH10 / Waipapa Road / Waipapa Loop Road.
- Providing a link from Waipapa Loop Road to Klinac Lane (Klinac Lane Extension).
- Closing the northern end of Skippers Lane and introducing a turning head.

- Closing the Waipapa Loop Road North intersection.
- Implementing corridor improvements to SH10 that include:
  - A shared footpath from Waipapa Road to the Kerikeri River.
  - Widening to provide a flush median and right turn bays.
  - Streetlighting for amenity.

To maximise the benefits of investing on the corridor and ensure desired project outcomes are fully realised in the short-term, it is proposed that the recommended improvements are implemented as a single package.

Achieving the Outcomes

The recommended option's outcomes are:

- Improve access opportunities without detrimental effects on the SH10 corridor.
- Decrease average delay at the SH10 / Waipapa Road intersection to under 10sec in opening year with no movement having more than 20sec delay.
- Provision of walking and cycling connectivity across SH10.
- 25% reduction in annual social crash cost.

Costs, BCR and Profile

The project Expected Estimate for the recommended option is **$7.1M**.

The BCR is **3.1** and the Assessment Profile is a **MHM.**

Next Steps

It is recommended that the option be advanced through pre-implementation, detailed design and implementation through traditional delivery methods in line with the NZ Transport Agency's standard procurement approach. We recommend that the construction be completed in the 2018/19 financial year.

THE CASE FOR CHANGE

1. INTRODUCTION

This document is a Single Stage Business Case for the State Highway 10 (SH10) / Waipapa Road intersection and includes both the indicative and detailed business case phases, referred to as a Detail Business Case (DBC) in this report.

This DBC outlines the investment story being promoted for SH10 corridor through Waipapa, building on the previous Strategic Business Case (Refer **Section 1.1**). Along with corridor improvements, the primary purpose of this DBC is to provide investors with an early opportunity to choose a SH10 / Waipapa Road Intersection layout option for further investment. The DBC outlines the ongoing engagement process for the recognition of problems and potential benefits, and the development of ideas into a long list of options. It goes on to identify and evaluate the risks and effects associated with each option; then determine a preferred option with target outcomes.

1.1 Work Completed to Date

SH10 / Waipapa Intersection Improvements, Scheme Assessment Report (Aecom, 2010)

This 2010 scheme assessment report by Aecom considered one and two lane options for a roundabout at the intersection; concluding that the former option should be adequate for 23 years.

Supporting Waipapa Growth – Strategic Business Case (NZTA, 2016)

A Strategic Business Case was developed by the NZ Transport Agency in Feb 2016 in partnership with the Far North District Council Transport and Planning teams.

The strategic case identified the problems and benefits presented in Table 1.

Table 1: Identified problems and benefits

THE PROBLEM	WEIGHTING	BENEFITS
Lack of long term integrated planning and robust zoning controls has resulted in suboptimal land use patterns and a deficient transport system	20%	Realised planned economic and targeted urban growth
Disjointed and outdated Waipapa corridor transport infrastructure is a major barrier to safe and efficient multi-modal passage and realising community outcomes	45%	An efficient and accessible Waipapa service centre and community hub
Land use and network changes have significantly altered vehicle mix, journey patterns and crash profile on the State Highway and adjoining intersections	35%	A fit for purpose and safe multi-modal transport network

The strategic case concluded that there is a good opportunity to enhance the economic prospects of Waipapa and the Far North District through investment in the transport network, including the SH10 corridor.

A recommendation of the strategic business case was to proceed with the project to a single stage business case to confirm the preferred network option(s) and corridor improvements on SH10 in Waipapa. This recommendation was endorsed by NZTA's Auckland / Northland Business Unit Decision Making Team.

Waipapa Road / SH10 Intersection Traffic Study (Opus, 2016)

The Waipapa Road / SH10 Intersection Traffic Study was completed in August 2016 by Opus for Far North District Council **(Appendix A)**. The study considered various forms of intersection control, together with various growth rate scenarios to provide an indication of possible intersection upgrades. Future road network changes were also considered to assess the change in traffic flows and any impact on the operation of the intersection.

It included an origin-destination survey to provide a better understanding of drivers' travel behaviours during different times of the day, as well as obtaining traffic movement data at the SH10 / Waipapa Road Intersection. The traffic study concluded that the existing SH10 / Waipapa Road / Waipapa Loop Road intersection experiences efficiency problems for the two minor approaches, especially of concern in the peak period, which is likely to limit future commercial and industrial growth in the area.

A single lane roundabout was identified as the favourable intersection layout with a significant improvement in intersection capacity. This increase in capacity would encourage commercial growth, and better accommodate State Highway and Local Road traffic growth. Importantly, a roundabout option would also be more resilient to changes in traffic flows in comparisons with the existing intersection layout.

2. CONTEXT

The Waipapa Township is located on SH10, 5km northwest of Kerikeri. Along with Kerikeri, it is the most significant growth area in the Far North District and, over time, has developed to act as a service centre for Kerikeri and the wider East Coast and central areas of the District.

SH10 runs through Waipapa from north to south and acts as the spine for the road network, as shown below. The busy commercial and industrial areas are located mainly to the west of SH10, with some direct access to and from SH10 and alternative access off Kahikatearoa Lane and Pataka Lane. A local road connection between Waipapa and Kerikeri is provided via Waipapa Road.

The Study Area covered in this Business Case is the length of SH10 from the bridge just north of Puketotara Road to Pungaere Road. This incorporates the major intersection with Waipapa Road/Waipapa Loop Road and with Kahikatearoa Lane.

Figure 1 below shows the location of the Study Area.

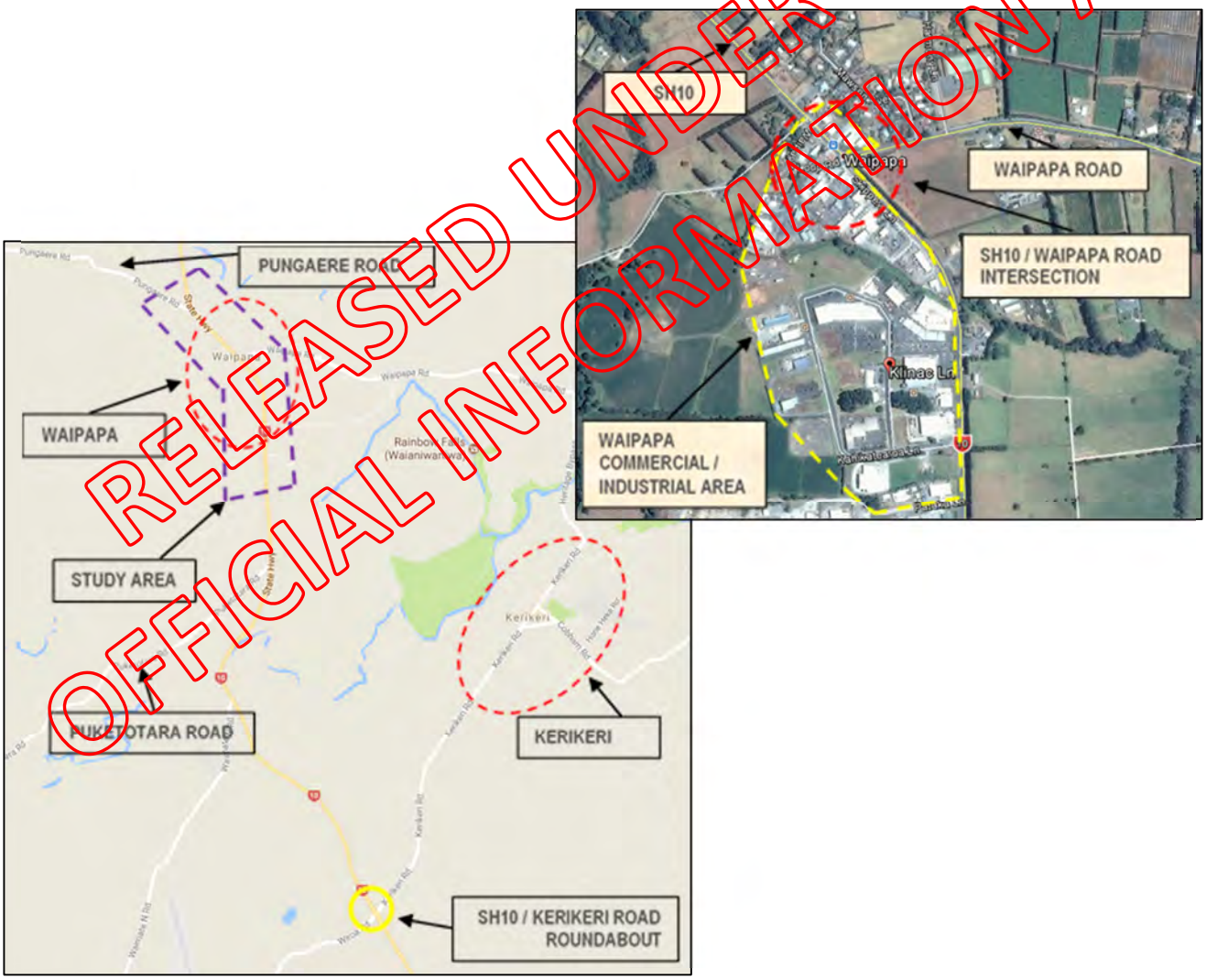


Figure 1: Study Area, showing Waipapa and Kerikeri area geographic proximity

2.1 Users

In addition to proving local connections, SH10 is classified as a 'Primary Collector' classification of road and plays an important role in connecting significant areas of forestry and tourism destinations with SH1.

The section of SH10 in the study area is also important for local trips carrying a mix of traffic including:

- Freight – both through traffic and servicing Waipapa
- Tourism – through traffic and the Twin Coast Discovery Highway (Waipapa Road and north on SH10)
- Local – particularly between Kerikeri and Waipapa commercial area (via Waipapa Road and Kahikatearoa Lane).

The Waipapa commercial area is a significant area of employment. Many of the people who work in this area travel by car as there is limited public transport and a lack of walking and cycling infrastructure. The following table provides an indication of a higher proportion of travel to work by car in the Far North District compared to Northland in general and to New Zealand as a whole.

Table 2: Transport to work

AREA	TRANSPORT TO WORK – PRIVATE OR COMPANY CAR* (%)
Far North District	82.5
Northland	73
New Zealand	70

**Car includes trucks and vans.*

2.2 Local Road Environment and Features

SH10 runs from south to north, before turning to the north-west through a moderate left-hand bend prior to the intersection with Waipapa Road and Waipapa Loop Road. The intersection is a priority crossroads, with both minor road approaches on a skew angle to the main highway. Both minor roads are stop controlled, single lane approaches.

Within the study area, heading north on the State Highway, the posted speed limit is 100km/hr with a shelter belt on the west side of the road and commercial/industrial properties on the east. After 500m, the speed limit drops to 70km/hr, just prior to the intersection with Pataka Lane. This is a relatively small priority controlled intersection providing access to several commercial and light industrial properties. 100m north of this is the larger intersection with Kahikatearoa Lane. This is the only road into the main commercial centre. There is a left turn slip lane and a right turn bay on the State Highway and the side road is give way controlled with a two-lane approach and traffic islands.

North of Kahikatearoa Lane, there are some commercial properties on both sides of the road, with access directly from the State Highway. Immediately after the left-hand bend there is access to Skippers Lane, which runs parallel to the State highway for approximately 250m, separated by a grass verge, providing access and parking for the adjacent shops and businesses.

Skippers Lane exits onto Waipapa Loop Road at the southwest corner of the main intersection of SH10/Waipapa Road/Waipapa Loop Road (referred to as SH10/Waipapa Road intersection from here

on). This is a priority controlled crossroads junction, with the side roads meeting the State Highway at a skewed angle. There is a dairy shop on the north-west corner and a service station on the north-east corner. On the south-east corner, currently is a vacant land with a shelter belt of trees.

Immediately north of the intersection is a narrow painted median treatment, approximately 200m long. There are various shops and food outlets on the east side and the northern end of Waipapa Loop Road intersects with the State Highway 100m north of the cross roads. Waipapa Loop Road provides access to commercial and light industrial properties, an electrical substation, dairy farm and the community hall. This will also provide the connection to the Klinac Lane extension, which will become an alternative route to the main commercial centre. *FNDC remains committed to developing the extension of Klinac Lane northwards to link with Waipapa Loop Road. FNDC and NZTA agree that this local road work would need to be integrated with the main State Highway intersection upgrade (in whatever form agreed), as extension of Klinac Lane on its own would likely make matters even worse.*

The northernmost 400m of the study area to Pungaere Rd is rural on both sides of the road and the speed limit increases to 100km/hr approximately 200m prior to the Pungaere Rd intersection.

The key connecting roads can be seen in Figure 2 below:

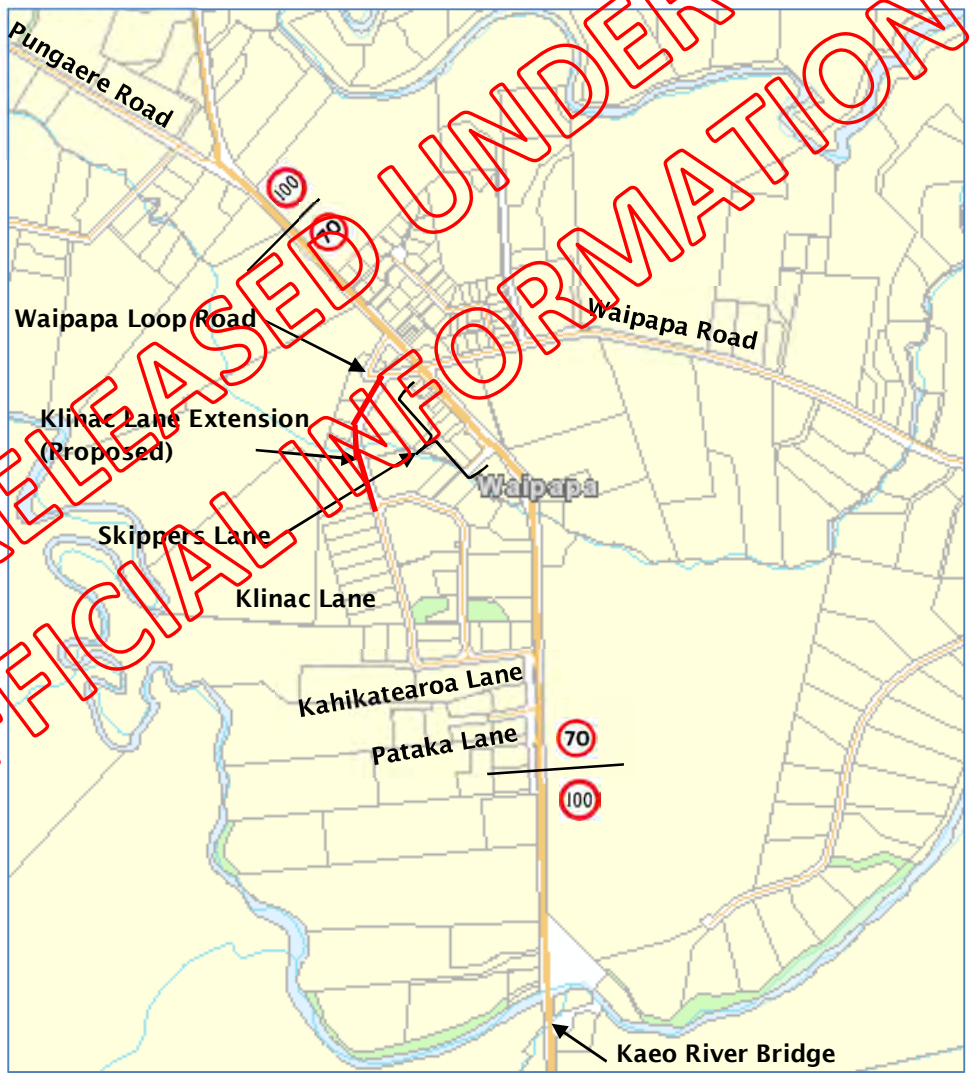


Figure 2: Waipapa Road Network

2.3 Surrounding Land Use

The following extract from the Far North District Plan shows the zoning in the study area which features a mix of residential, commercial and recreational and rural production zone.

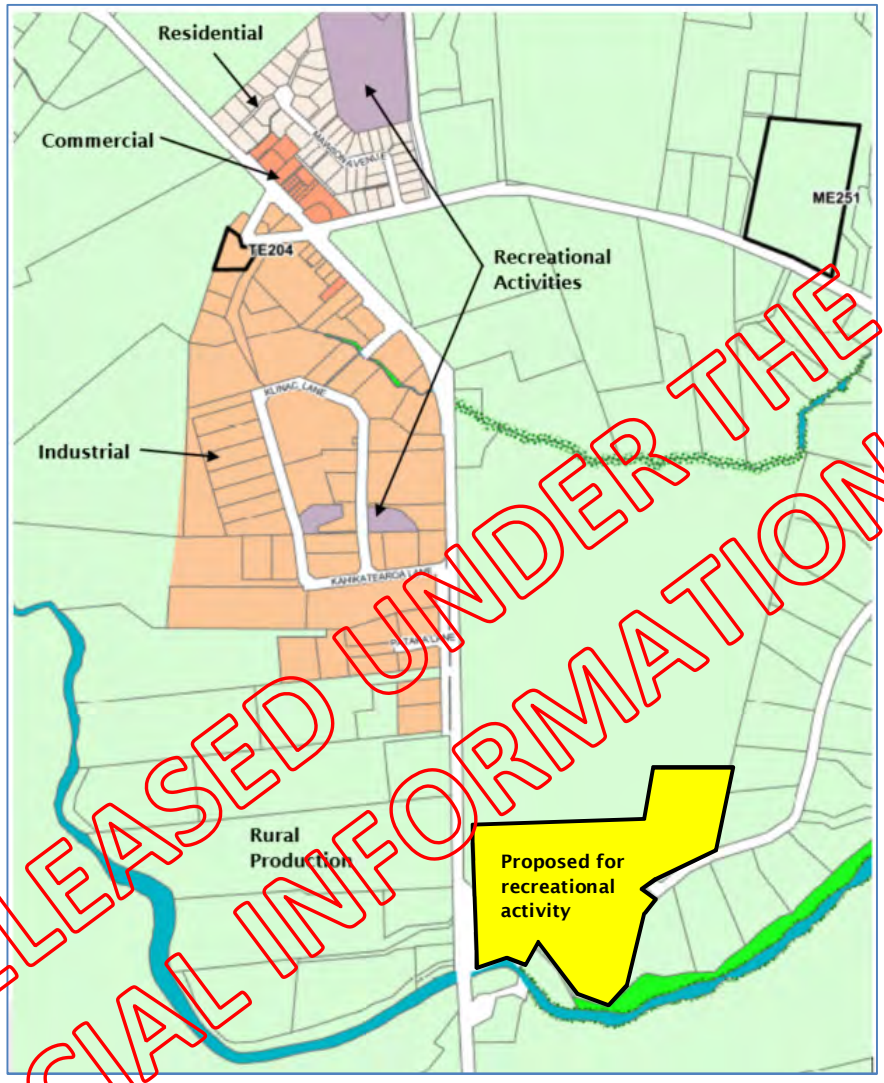


Figure 3: Zoning from FNDC District Plan

It should be noted, that the industrial zoned land is a mix of commercial and industrial, and that industrial developments have been permitted in the rural production zones.

The large parcel of land to the east of the State Highway is currently being considered as a location for a sports complex with access provided via SH10 and Waitotaria Drive.

2.4 Traffic and Other Growth

Waipapa has been highlighted for strong future growth and development, with the Kerikeri Waipapa Structure Plan (2007) being the guiding document. The structure plan includes household and population predictions between 2001 and 2026, which indicates that the population is predicted to more than double over this timeframe. This predicted population growth will increase the demand for residential dwellings in the surrounding area. It will also increase the demand for land for commercial, industrial and retail development in the area with significant focus on Waipapa.

Historic traffic growth on SH1 over the last 10 years has been approximately 2% per year based on the NZ Transport Agency's traffic count station at Springbank Road, located 4km south of the site. The count station at Takou Bay Road, located 8km north of the study area, shows a higher historic growth of 3% based on the last 28 years of traffic counts. It should be noted that both of these count stations are located outside of the study area and likely to predominantly measure State Highway through traffic. Both Kerikeri and Waipapa have important local function with local traffic travelling between these two centres. Any increase in this local traffic may not be captured in these count locations. Hence, the historic growth stated above may be lower than reality but still provide some indication of the traffic growth in the area.

A review of the traffic count data in the FNDC RAMM database indicates that the annual growth on Waipapa Road is over 5% since 2010. With both Waipapa and Kerikeri being identified for future growth, traffic volumes are expected to continue to grow.

3. GOVERNANCE AND ENGAGEMENT

3.1 Project Governance

The project responsibility will lie with the NZ Transport Agency, in partnership with the Far North District Council. Both these organisations have concerns about the current transport infrastructure and the need for further investment. Figure 4 shows the NZ Transport Agency's Project Governance structure which aims to deliver the Waipapa Business Case as per the national business case approach.

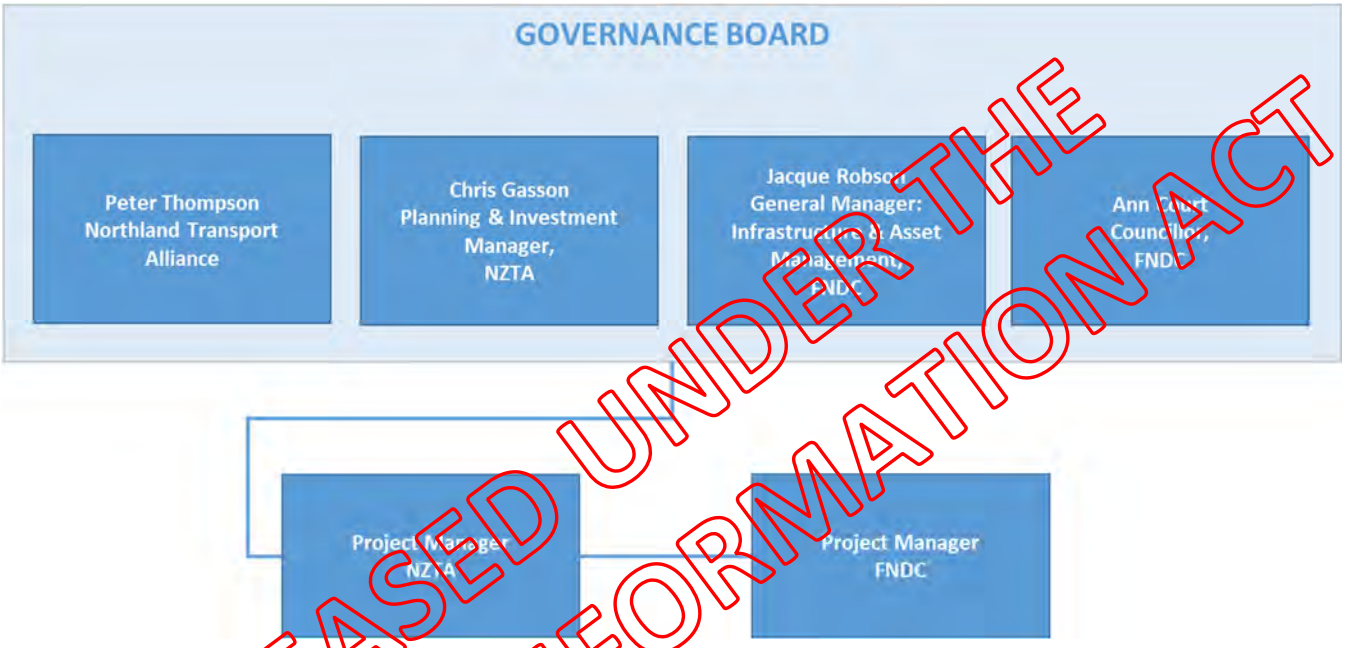


Figure 4: Project Governance Structure – Business Case

3.2 Engagement Approach

As part of the Strategic Case activities of the previous study phase, Investment Logic Mapping (ILM) workshops were organised by the NZ Transport Agency. Engagement was undertaken with the Far North District Council and the Waipapa Business Association to ensure the breadth of issues were well understood. The ILM diagram is included with the Strategic Case appended. It was then always expected that the subsequent Business Case stage would expand to a wider group of interested parties, which has duly occurred.

This stage of the business case was guided by the NZ Transport Agency State Highway Public Engagement Guidelines (then Draft, and which have since been finalised). Engagement partners were identified and grouped, and assigned appropriate levels of engagement, as follows:

- **Project Partners** – 'collaborate' and 'involve'
- **Stakeholders** – 'consult' and 'involve'
- **Community** – 'inform' and 'consult'

The engagement partners and knowledge areas are set out in Tables 3 and 4 respectively.

Table 3: Project Partners

PROJECT PARTNER	KNOWLEDGE AREAS
NZ Transport Agency (HNO + P&I) **(Project Manager)**	State Highway 10: traffic operation, safety, investment and planning.
Far North District Council	Local growth plans, community concerns, operation of the local roads, local travel demand and customer feedback concerns; also aware of State Highway influences.

Table 4: Project Stakeholders

PROJECT STAKEHOLDERS	KNOWLEDGE AREAS
Waipapa Business Association.	Local business needs / concerns.
Iwi	Cultural significance and ecologically important sites in the area.
Northland Regional Council	Flood management, Environment.
Ministry of Education	Future plans for schooling needs in Waipapa.
Ministry of Business, Innovation and Employment	Regional Economic Action Plan
Northland Inc	Regional Economic Development Agency encompassing the Regional Tourism Organisation (RTO)

3.3 Engagement Principles

A Communications Plan was developed by the NZ Transport Agency as part of the Detailed Business Case approach, attached as **Appendix B**.

The Communications Plan summarises the history of the SH10/Waipapa Road intersection, identifies the purpose and goals for the SBC engagement and specifies the level of influence that stakeholder and public participation would have on the SBC.

The consultation and communications approach in the Communications Plan was designed to deliver the following engagement objectives for both FNDC and the NZ Transport Agency:

- Gain stakeholder support by communicating the preferred option for improving the intersection to key stakeholders, iwi and road users;
- Inform affected parties and communities in order to achieve understanding of the proposed works and their effects;
- Minimise the number of public queries by being proactive in our approach and concise in our publications;
- Gather knowledge from the community and understand others viewpoints; and
- Fulfil the requirements of the Resource Management Act 1991, Land Transport Management Act 2003 and Local Government Act 2002.

To achieve these objectives, a structured sequence of events was implemented to ensure that key stakeholders were consulted on changes, landowners were informed of the preferred option before it became public knowledge and enabling the community to participate in consultation in an accessible manner.

The following provides further information on the delivery of the Communications Plan.

3.4 Key Stakeholders Involved

In partnership with FNDC, the NZ Transport Agency directly engaged with the Ministry of Education, the Local Business Association, the Bay of Islands-Whangaroa Community Board, Iwi and members of the Northland Transport Alliance; discussing the strategic case to improve the intersection. Recognising the need to narrow the focus of the transport needs of the community in relation to the SH10/Waipapa Road intersection, a Waipapa Project Steering Group was set up consisting of representatives from NZTA, Northland Transport Alliance, FNDC's infrastructure and assets group, and local community board member, Ann Court.

The Ministry of Education (MoE) administers a number of established educational facilities in the area that utilise the intersection. Through early engagement with MoE, it was identified that development of a vacant lot along Waipapa Road is planned. An improvement to the intersection would not only be beneficial for an education facility at this site in particular; but also for the other education centres around the township. MoE did not raise any concerns as part of this initial consultation.

The Local Business Association have been lobbying for a number of years for improvement to be made to the SH10 Waipapa Road intersection, so they were broadly very supportive. Their only concern was that improvements being investigated might not continue through to realisation.

The Bay of Islands (BOI)-Whangaroa Community Board were presented with the preferred option on 22 May 2017 at a closed meeting. Numerous questions were asked by the Board at the time of the meeting and these questions were answered satisfactorily by the Project team members. The Board had similar sentiment as the Local Business Association, in that it would be a disappointment for the community if the options for improvement did not continue to the next stages.

Waipapa is within the rohe of Ngâpuhi iwi with Ngâti Rêhia holding mana whenua of this area. Sebastian Reed, Keith Kent and Rewi Spraggon (NZTA Maori Liaison Co-ordinator) met with kuia Nora Tawhi Rameka to inform them of the progress with the business case, discuss project development and approach to delivering this information back to mana whenua. Neither Iwi nor the hâpu raised any particular concerns with the decision to proceed with an engineering solution to the traffic issues at the intersection. However, it is their aspiration to be involved in the planning and construction phases, particularly to manage any accidental discoveries of heritage or waahi tapu or taonga artefacts. A cultural value assessment has been requested by NZTA.

3.5 Public Participation

The NZ Transport Agency in partnership with the FNDC held a Public Open Day on 1 June 2017 at the local Waipapa Community Hall. Over 100 people came along to the Open Day, and gave the NZ Transport Agency and FNDC valuable feedback. It was confirmed that there is a high level of community support for a roundabout at this intersection, and also support for the extension of Klinac Lane; both helping to provide a simpler, safer and more effective connection between the eastern and western extents of the town.

4. PROBLEMS AND EVIDENCE

A facilitated workshop was held in November 2015 with key stakeholders from the NZ Transport Agency and FNDC exploring the issues being experienced in Waipapa during the Strategic business case stage. The stakeholder group developed and agreed on three problem statements.

The Detailed Business Case team revisited these at another workshop in November 2016. This involved a group of representatives from FNDC, NZTA and Opus. A 'Constraints & Opportunities' drawing was developed to capture a number of the main issues raised, which is presented in **Appendix C** of this report.

4.1 The Problems

The revisited problem statements below better reflect the issues faced within the SH10 study area.

Problem one: *Lack of long term integrated planning and robust zoning controls has resulted in sub-optimal land use patterns and a deficient transport system (10%)*

Problem two: *Disjointed and insufficient transport infrastructure is a major barrier to safe, efficient and reliable multi-modal passage, including visitor journeys, and realising community outcomes in Waipapa (45%)*

Problem three: *Land use development pressure and network changes have significantly altered vehicle mix and journey patterns on the State Highway and adjoining local roads. This has led to increased pressure at key points on the network and changes to crash patterns (45%)*

A broader overview of each of these problem statements is presented below.

PROBLEM ONE: LACK OF LONG TERM INTEGRATED PLANNING AND ROBUST ZONING CONTROLS HAS RESULTED IN SUB-OPTIMAL LAND USE PATTERNS AND A DEFICIENT TRANSPORT SYSTEM (10%)

This problem has arisen due to the permissive nature of planning controls in the FNDC District Plan, which provides little differentiation between zones, and as such growth and development have occurred in an ad hoc manner. Development occurring in such a way can make it difficult (and sometimes expensive) for infrastructure to be effectively planned and delivered. This is especially true in Waipapa where light industrial and commercial development has spread into the *Rural Production* zone.

Without strategic direction, development has tended to occur by piecemeal, with each site seeking access directly from SH10, undermining the safety and efficiency of the major road corridor, including through a proliferation of conflict points.

Waipapa has had available land for development and, along with Kerikeri, has seen significant growth in population and employment in recent years. Development without sufficient planning controls and direction has largely followed market forces, and this has resulted in the situation of different and sometimes incompatible land uses adjoining each other. Although a key concern for both the FNDC and NZ Transport Agency, it is not within the scope of improvements recommended in this business case to try to address these planning problems. It is understood that this is a separate matter and should continue to receive attention in parallel in terms of Council-led improvements.

FNDC is undertaking a consolidated review of its District Plan. The process is tracking towards producing a draft review document for public feedback by the end of June 2018. The appropriateness of zoning land in Waipapa to accommodate some or all of the industrial and commercial demand will be tested through the District Plan review process. Council has endorsed a hybrid approach to the style of future District Plans, enabling an 'activities approach' to the control of land use. This is a move away from the more permissive effects-based District Plan currently in place. This change is expected to lead to better coordinated associations between land use and zoning.

PROBLEM 2: DISJOINTED AND INSUFFICIENT TRANSPORT INFRASTRUCTURE IS A MAJOR BARRIER TO SAFE, EFFICIENT AND RELIABLE MULTI-MODAL PASSAGE, INCLUDING VISITOR JOURNEYS, AND REALISING COMMUNITY OUTCOMES IN WAIPAPA (45%).

The problem identifies that the existing transport network is deficient. The intersection is already at capacity with ineffective local road access, which means that any additional traffic will result in further delays, queues and safety problems. There are a number of issues which contribute to this:

- Lack of facilities for turning traffic, so vehicles slowing or stopping to turn impede the through-traffic; this results in unnecessary delay to the traffic that is travelling straight-on through the intersection.
- The layout of the intersection confuses motorists on Waipapa Road and Waipapa Loop Road creating uncertainly regarding priority, resulting in additional delay and risk.
- The speed of vehicles makes it more difficult to find appropriate gaps in the traffic. This reduces the capacity of the intersection as motorists are unsure whether or not it is safe to make their turning manoeuvre.
- The number of other traffic movements around the intersection – into the shops, service station, parking manoeuvres, etc. This adds confusion and motorists wait for bigger gaps in the traffic before making their turning manoeuvre, reducing the capacity of the intersection.
- Skippers lane access from Waipapa Loop Road does not meet intersection separation requirements (NZTA, FNDC and Austroads).

PROBLEM 3: LAND USE DEVELOPMENT PRESSURE AND NETWORK CHANGES HAVE SIGNIFICANTLY ALTERED VEHICLE MIX AND JOURNEY PATTERNS ON THE STATE HIGHWAY AND ADJOINING LOCAL ROADS. THIS HAS LED TO INCREASED PRESSURE AT KEY POINTS ON THE NETWORK AND CHANGES TO CRASH PATTERNS (45%)

In 2009 the FNDC opened the Kerikeri Heritage Bypass as a local road link, which significantly shortened (time and distance) the road connection between Kerikeri and Waipapa and resulted in this becoming the preferred route from Kerikeri for trips to the north. In addition to this new roading link; in recent years, new sports fields and residential developments on the eastern side of Kerikeri, and additional light industrial developments along Waipapa Road have also sprung up. As a result of the associated and general traffic growth, delays and congestion at the Waipapa Road and SH10 intersection have notably increased.

Traffic travelling to the commercial centre of Waipapa from Kerikeri not only needs to navigate the difficult Waipapa Road intersection, but also turn right into Kaihikatearoa Lane. This movement has resulted in three injury crashes in the past five years.

High operating speeds on SH10 also pose a safety risk and act as a deterrent to active travel modes that the NZ Transport Agency would like to encourage.

Table 5: Comparison of journeys between Waipapa and Kerikeri

CONNECTION BETWEEN WAIPAPA AND KERIKERI	TIME	DISTANCE	WALKING AND CYCLING FACILITIES
via Waipapa Road + Heritage Bypass	7min	5.6km	Yes
via SH10 + Kerikeri Road	10min	9.3km	No

The Problem Statements drafted at the earlier stage (Strategic Case) were then refined to better capture the situation, including a change in their percentage weighting.

Table 6: Refined Problem Statements

STRATEGIC BUSINESS CASE	DETAILED BUSINESS CASE	COMMENT / JUSTIFICATION
Lack of long term integrated planning and robust zoning controls has resulted in suboptimal land use patterns and a deficient transport system (20%)	**Lack of long term integrated planning and robust zoning controls has resulted in sub-optimal land use patterns and a deficient transport system (20%)**	*No change in wording. Weighting amended for relevance to the SH10 corridor*
Disjointed and outdated Waipapa corridor transport infrastructure is a major barrier to safe and efficient multi-modal passage and realising community outcomes (45%)	**Disjointed and insufficient transport infrastructure is a major barrier to safe, efficient and reliable multi-modal passage, including visitor journeys, and realising community outcomes in Waipapa (45%)**	*Minor changes to capture tourist trips*
Landuse and network changes have significantly altered vehicle mix, journey patterns and crash profile on the State Highway and adjoining intersections (35%)	**Land use development pressure and network changes have significantly altered vehicle mix and journey patterns on the State Highway and adjoining local roads. This has led to increased pressure at key points on the network and changes to crash patterns (35%)**	*Recognising recent growth within Waipapa*

4.2 Status of Evidence Base

This section sets out the status of the evidence that supports the identification and assessment of the key problems and potential benefits, and identifies any gaps in the evidence base as may be required to further support the investment story. In line with the problems and potential benefits defined above, the evidence base primarily covers:

- SH10 / Waipapa Road / Waipapa Loop Road Intersection Modelling
- Travel behaviour / Journey patterns
- Local growth
- Land use
- Safety record
- Vehicle Speed through the Waipapa Township

4.2.1 SH10 / Waipapa Road / Waipapa Loop Road Intersection Modelling

KEY ISSUE	PROBLEM ALIGNMENT		
Site observations and traffic modelling at the SH10 / Waipapa Road indicate that the intersection has capacity constraints for local traffic entering onto the SH10 corridor especially of concern in the PM Peak period. Average delay in the intersection is nearly 60 seconds in the PM peak period. Right turning traffic from Waipapa Road has been recorded to reach delays over 300 seconds in some situations. These delays are considered unacceptable for both local traffic and for State Highway through traffic as they do not meet the NZ Transport Agency Level of Service requirements.	Problem 1	Problem 2	Problem 3

The SH10 / Waipapa Road intersection (shown in Figure 5) is the main intersection in Waipapa and provides a vital connection between Waipapa and Kerikeri. The existing intersection has two key problems that contribute strongly to the delays:

- Insufficient lane width on SH10 south approach prevents SH10 northbound through traffic to pass a slow moving or stationary vehicle waiting for a gap in the traffic to turn right from SH10 into Waipapa Road.
- Steady SH10 through movement from both the southern and northern approaches, limits gaps in the traffic stream thereby causing delays to right turns from both Waipapa Road and Waipapa Loop Road into SH10. It is reported that risky manoeuvres often eventuate.

Figure 5: SH10 / Waipapa Road / Waipapa Loop Road Intersection
(Source: Far North Maps)

The diagram in Figure 6 shows average delay for right turn and straight ahead movements from Waipapa Road to be nearly 5 minutes for the PM peak (16:00-17:00). The figure also shows that right turn and straight-ahead movements from Waipapa Loop Road face delays of approximately 25 seconds. The delays on this approach are less because there are fewer vehicles using this approach in comparison with the Waipapa Road approach. Long delays result in lower levels of services (LOS) as shown in the figure below.

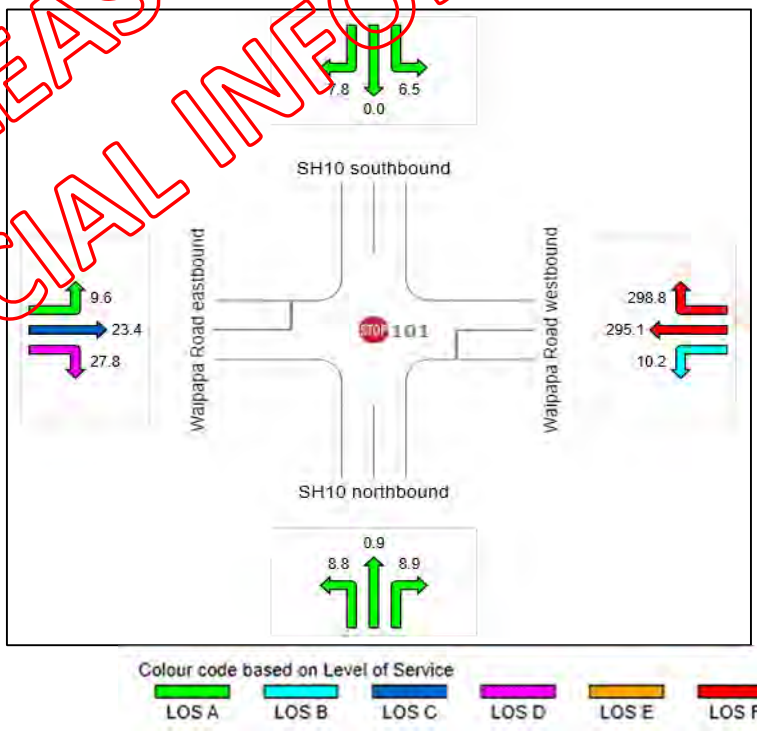


Figure 6: Average delays (seconds), Sidra modelling results for the SH10/Waipapa Road intersection (2016, 60 min peak period 16:00-17:00)

Figure 7 shows the posted and operating speeds on SH10 through Waipapa Township. Both southbound and northbound traffic speeds are higher than the posted speed limit with the exception of the SH10 stretch around the Waipapa Road. This reduction in speed limit observed is once again evidence that the turning traffic impedes proper through-traffic movement on SH10.

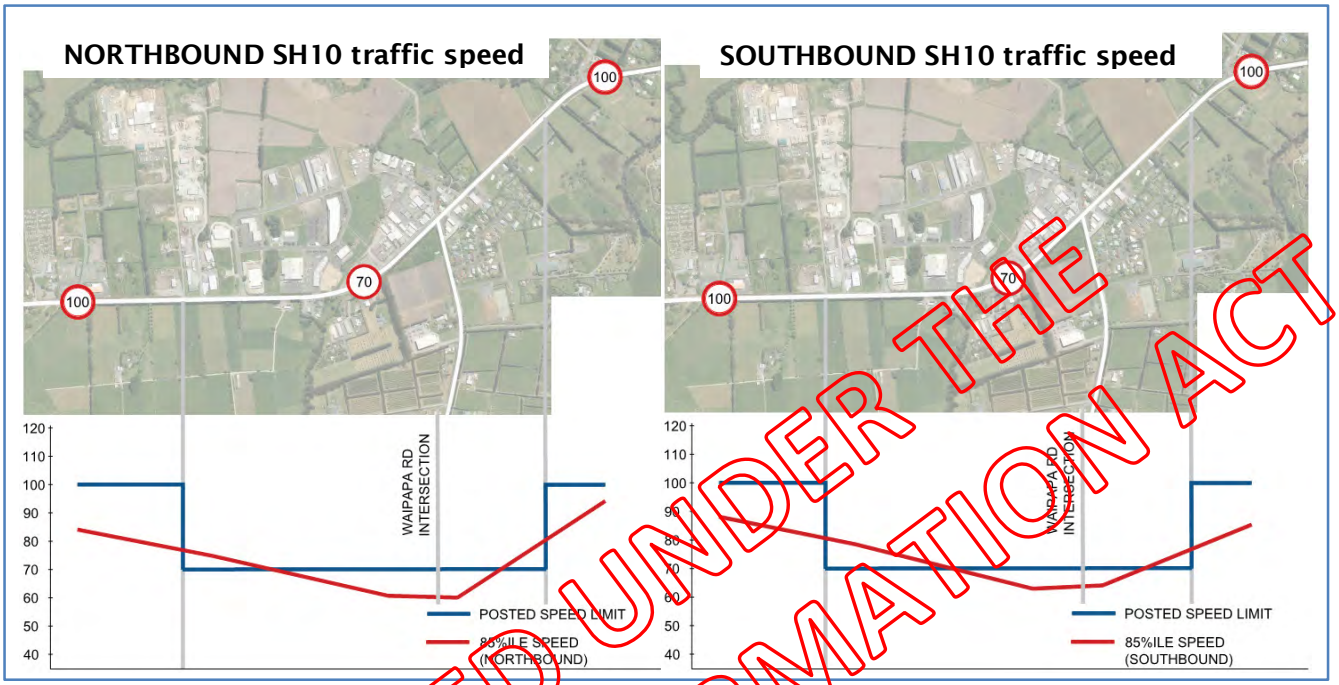


Figure 7: Recorded speed on SH10 Waipapa – Posted vs Operating (Km/hr) (Northbound and Southbound)

The project team recognises that a reduction in speed through the Waipapa Town centre has benefits for vulnerable road users and for creating a cohesive town centre.

There is an opportunity to purposely reduce the speed of operation by designed traffic engineering solutions, to alleviate the current situation where the speed reduction is happening as a result of caution around a suite of problems, including vehicle conflicts between local turning traffic and through traffic.

4.2.2 Travel Behaviour/Journey Patterns

Key Issue	Problem Alignment		
Blip track surveys clearly show that drivers change their travel behaviour in the busy PM peak period. The likely explanations for this change in travel behaviour include that drivers avoid being delayed when trying to turn right out from Waipapa Road, by instead diverting via Kerikeri Road.	**Problem 1**	**Problem 2**	**Problem 3** ●

Vehicles currently travelling from Kerikeri to north of the SH10/Waipapa Road intersection have two routes to choose from as illustrated in Figure 8. The northern route via Waipapa Road (shown in red) is approximately 5.5km long and the southern route via Kerikeri Road (shown in green) is approximately 9.5km long.

Figure 8: Journey choice from Kerikeri to North of SH10/Waipapa Road Intersection

Blip track survey was used to locate the origin-destination of vehicles and to record travel time for vehicles using the two routes. The travel distances and travel times in the PM peak hour for each of the routes is given in Table 7. This shows that even though the southern route has almost double the length of travel distance, the travel time is only 1.5minutes longer in the weekday PM peak.

Table 7: Travel distances and speeds

DESCRIPTION	TRAVEL DISTANCE (KILOMETRES)	TRAVEL TIME - PM PEAK (MINUTES)
Northern route (K to A)	5.5km	06:00
Southern route (J to A)	9.5km	07:28

The blip survey was also used to analyse travel behaviour and driver choice of route at different time periods. Figure 9 provides a comparison between journey choice in the AM and PM peak periods. It shows fewer trips being made between Kerikeri and Waipapa (southern route) in the weekday morning peak compared to weekday evening peak. A likely explanation for this change in behaviour is that drivers avoid Waipapa Road in the PM peak when the delays at the SH10/Waipapa Road intersection are expected to be longer.

This is a telling behaviour that the drivers choose a longer, and overall slower route to avoid the frustration of queues, and potentially unsafe situations, at the Waipapa intersection.

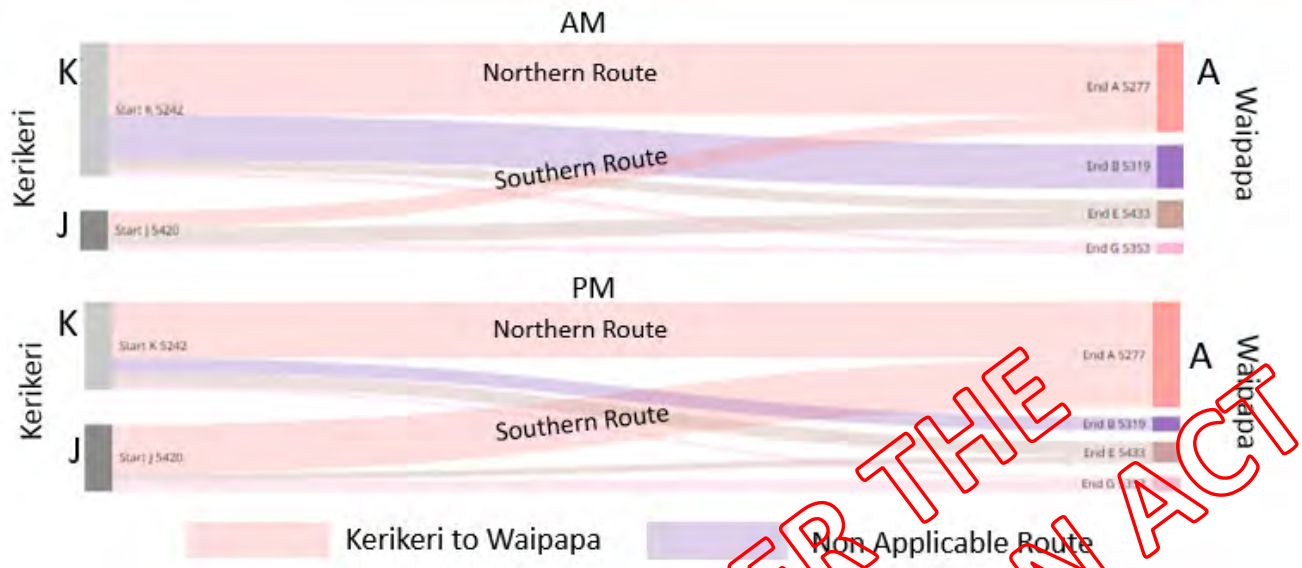


Figure 9: Journey choice weekday AM and PM peak

This change in travel behaviour supports the Problem 3 statement in that some people markedly change their journey behaviour because of pressure points in the network. Improvements to the SH10/Waipapa Road Intersection will release a dominant pressure point in this part of the road network.

4.2.3 SH10 and Local Traffic Growth

Key Issue	Problem Alignment		
The Kerikeri-Waipapa area is the fastest growing area in the Far North District in relation to population and associated commercial and industrial developments. Tourism activities in the north have also increased greatly over the last decade. The population and other development growth is directly related to traffic growth. With the existing SH10/Waipapa Road intersection already being at capacity, any increase in traffic driving through this intersection will exacerbate the existing intersection problem.	Problem 1 ●	Problem 2 ●	Problem 3 ●

As per the evidence in the preceding discussion, SH10/Waipapa Road intersection is already at capacity, causing long delays for side road traffic turning into SH10. Further traffic growth on SH10 and/or the two side roads will worsen the intersection delays if no significant improvements are made.

Figure 10 and Figure 11 below show the traffic growth at the two NZ Transport Agency SH10 count stations located 8km north and 4 km south of the study area respectively.

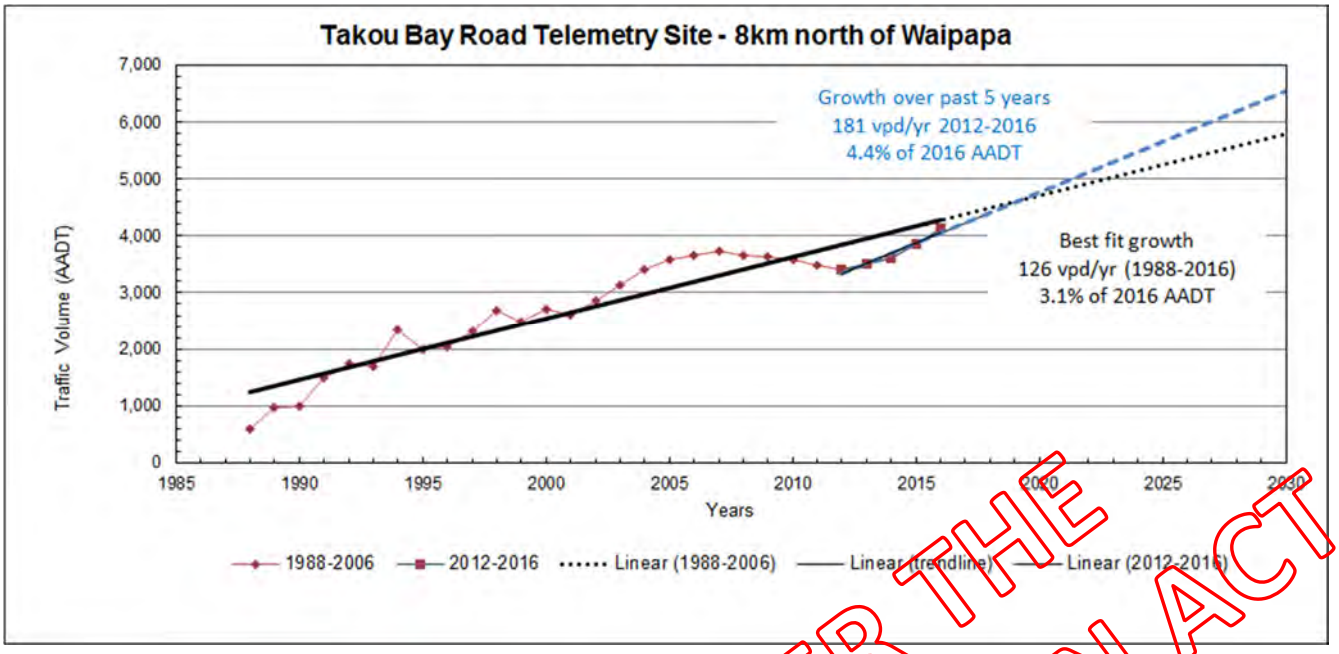


Figure 10: Recorded AADT and Trendlines for SH10 Telemetry Site at Takou Bay Road

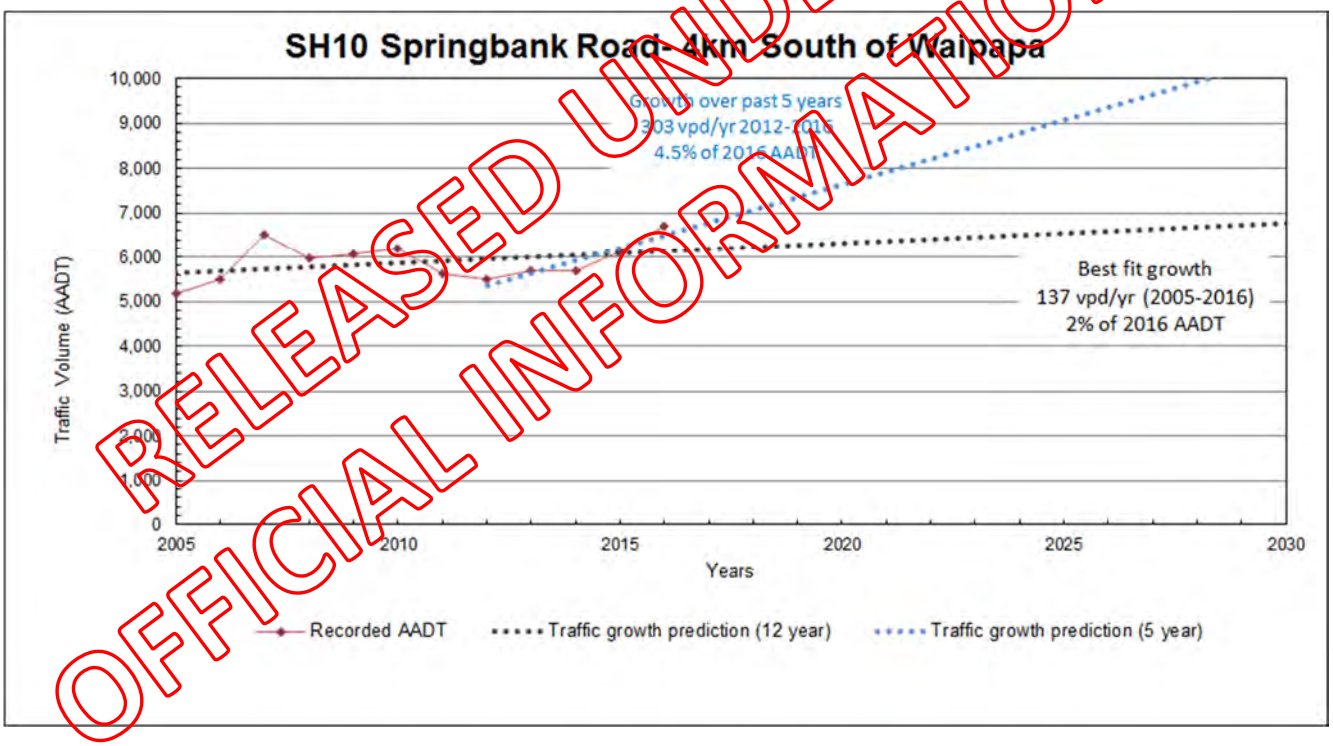


Figure 11: Recorded AADT and Trendlines for SH10 Count Site at Springbank Road

As shown in Figure 10, growth at the Takou Bay Road Telemetry sites indicates a historic growth of 3.1% over the last 28 years and 4.4% growth over the last 5 years. Figure 11 indicates higher growth scenario at the southern telemetry site on Springbank road in comparison with a historic growth of 2% over the last 10 years and a 4.5% growth over the last 5 years.

Taking the most conservative approach between the two sites (long term best fit growth scenario for Springbank Road), traffic would continue to grow with around 130 vpd per year for the foreseeable future. Even in this scenario, given that the intersection is already at capacity, any additional vehicles through the existing will increase the delays and exacerbate the issues at the existing intersection.

However, it is justifiably the more likely scenario that the marked increase in investment in Northland seen in recent years will run for many more years, driven in no small part by the Tai Tokerau Economic Action Plan, and sustained growth will continue to push traffic growth on a sustained steeper trajectory. The increasing demands of Northland freight and tourism, as well as those arising from the Kerikeri-Waipapa area being a recognised as a Northland growth 'hotspot', will more seriously expose the shortcomings of the SH10/Waipapa intersection if major improvements are not put into effect in the near future.

4.2.4 Land Use Population Growth

Key Issue	Problem Alignment		
	Problem 1	Problem 2	Problem 3
Waipapa is a key industrial and commercial hub within the Far North District. Currently approximately 75% of this area is occupied. The structure plan identifies the Waipapa area to intensify industrial, commercial and retail land uses. At present, intensifying this area is restricted because of the poor internal road network within the industrial zoned area and the reliance on access on and off SH10.	●		●

The Waipapa Kerikeri Structure Plan prediction is that both population and the number of households will double between 2001 and 2026 within the Waipapa Kerikeri area. The population growth according to census data shows growth tracking towards this prediction with significant population growth in the last two census periods (2006 and 2013, Statistics New Zealand). This growth in population increases the pressure for residential development but also supporting commercial, industrial and retail developments, all of which generates traffic.

As shown in Figure 12, there are five district landuse zones in Waipapa:

- Commercial
- Industrial
- Residential
- Recreational
- Rural Production

The industrial zone is the largest, and is located on the west side of SH10. This industrial zone includes a mix of traditional heavy industrial activities at the southern extent, large retail stores at the centre, and mixed industrial and retail activities at the northern extent of the study area.

Based on the large car parking space provided, this retail area in the centre of the industrial area is the largest trip generator, and access is provided via Kahikatearoa Lane and Klinac Lane.

The northern part of the industrial zone is a mix of industrial and retail, with access provided via Waipapa Loop Road and Skippers Lane.

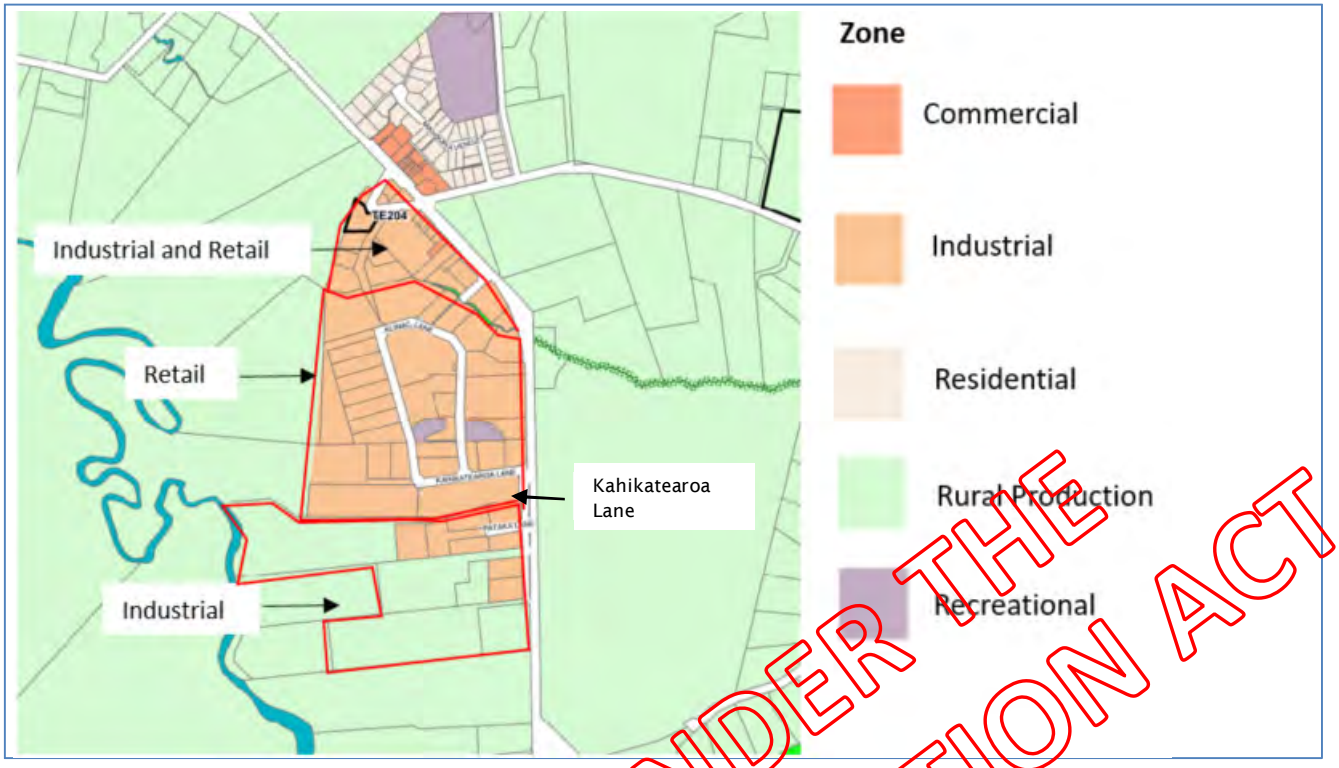


Figure 12: Existing District Landuse Zones (Source: Far North District Plan – Zone Map)

Currently there is no local road link between the three different parts of the industrial area, and any internal trip between any of these parts needs to use SH10. The largest trip generator is the central part of the industrial zone with access provided via Kahikatearoa Lane. There is an opportunity to connect the central and northern part of the Industrial zone with a road which is now referred to as the Klinac Lane Extension.

The Klinac Lane Extension would provide better internal connectivity between the different parts of the industrial zone, and should also reduce pressure at the Kahikatearoa Lane/SH10 Intersection. For example, trips to and from the north into the central part of the Industrial zone will be able to use the Klinac Lane Extension and Waipapa Loop Road to access SH10 instead of using the longer route via Kahikatearoa Lane.

Whilst the Klinac Lane Extension would put more pressure on the SH10/Waipapa Road intersection, if constructed in isolation, FNDC and the NZ Transport Agency have agreed that this new link road should be considered integral to the major intersection upgrade, to achieve a harmonious outcome.

4.2.5 Safety

KEY ISSUE	PROBLEM ALIGNMENT		
Analysis of crash data provided by NZTA's Crash Analysis System (CAS) database indicates that "rear end" and "crossing/turning" crashes are clearly over-represented on SH10 here in comparison with other State Highways, both regionally and nationally.	**Problem 1**	**Problem 2**	**Problem 3** 

Since 2006, a total of 59 crashes were recorded on SH10 between the Kerikeri River and 300 metres north of Waipapa Road. Of these crashes, 12 were minor injury crashes, 1 serious crash and 1 fatal crash. The remaining 45 crashes were non-injury or property damage only crashes.

The crash record over the last 5 years (2011-2016) shows a total of 28 crashes. Of these crashes, 7 were recorded as minor injury crashes and 21 non-injury or property damage only crashes, with none serious or fatal.

The crash record indicates that the two main crash types are "rear end/obstruction" crashes and "crossing/turning" crashes. As Table 8, below illustrates these two crash types are over represented when compared to regionally and nationally state highways.

Table 8: Crash record

CRASH TYPE	SH10 WAIPAPA CORRIDOR (%)		ALL NORTHLAND SH (%)	ALL NZ SH (%)
	10 years 2007-2016	5 Years 2011-2016	10 years 2007-2016	5 Years 2011-2016
Rear end / Obstruction	36	50	22	34
Crossing / Turning	39	29	11	13

An over-representation of "rear-end" and "crossing/turning" movement crashes indicates that SH10 at this location has an intersection/access problem. We believe the explanation includes that there are a number of direct property access points off SH10, and that there is a lack of safe/effective right turning facilities at intersections and at property accesses on SH10.

Figure 13 shows the time distribution of the "rear end" and "crossing/turning crashes".

Apart from 3 crashes, all recorded crashes occurred during the day. Interestingly, 50% of the recorded "rear end" and crossing/turning" crashes occurred between 14:00 and 18:00hrs. There is also a cluster of crashes that occurred between 9:00 and 13:00hrs.

The day time carries the most traffic with highest peak in traffic flows being between 15:00 and 18:00hrs. During these peaks, there are only small gaps in the traffic to undertake turning movements to and from the side roads, which may contribute to the high number of "rear end" and "crossing/turning crashes".

Any increase in traffic would result in even smaller gaps and can be expected to increase the risk of these crash types.

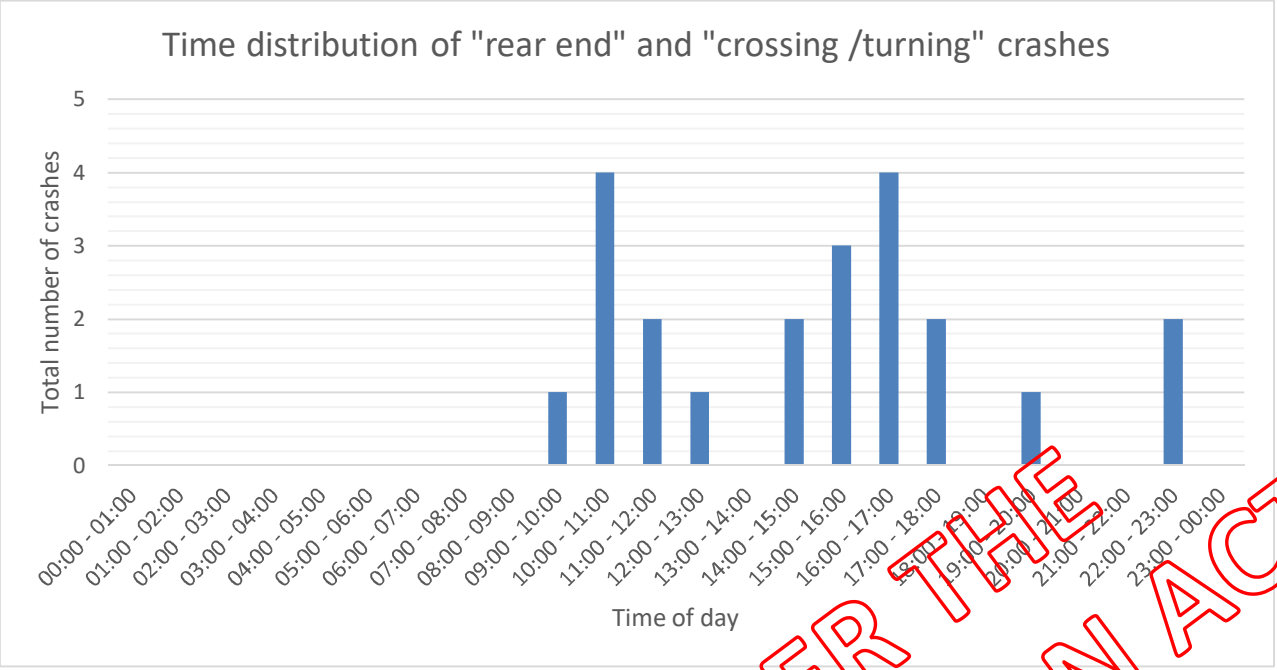


Figure 13: Time distribution of "rear end" and "crossing/turning" crashes

Analysing the data for seasonal variation in crashes, shows that there are no significant seasonal patterns, with both non-injury and injury crashes being randomly distributed over the year.

Skippers Lane acts as service lane on the western side of SH10 that usefully reduces the number of direct property accesses from/to SH10. However, this lane in turn is currently accessed off Waipapa Loop Road, which is awkwardly positioned in very close proximity to the SH10/Waipapa Road. The position of the Waipapa Loop Road and Skippers Lane intersection does not comply with minimum access requirements and adversely influences the safety of the adjacent SH10/Waipapa Road as shown in Figure 14 below. *The corridor and intersection upgrade provides an excellent opportunity to address this safety issue.*

Figure 14: Existing intersection separation deficiencies

4.2.6 Walking/Cycling Facilities

Key Issue	Problem Alignment		
SH10 acts as a barrier to pedestrians and cyclists, with the absence of links to connect the facilities in the Waipapa commercial area with those on Waipapa Road and Kerikeri Road.	Problem 1	Problem 2 	Problem 3

Although some footpaths are provided in the commercial centre and for short sections in the town centre to the north of Waipapa Road, no facilities are provided to assist in crossing the State Highway, nor are existing facilities connected. Pedestrians currently use the painted median as a 'hopefully safe' island when crossing the road. Quite high traffic speed on SH10 is also an impediment to pedestrian movement across SH10.

The FNDC have invested in quality pedestrian and cyclist facilities on Waipapa Road and Kerikeri Road, encouraging active mode trips between Kerikeri and Waipapa (and beyond). However, the footpaths and cycle lanes on Waipapa Road are curtailed approximately 100m before the intersection with SH10, limiting the benefits of these facilities.

This project provides the ideal opportunity to improve pedestrian and cycling opportunities within the study area, and compliment a more coherent overall provision for active modes by the two main agencies responsible, the NZ Transport Agency and FNDC.

A good example would be improved connection across the State Highway linking up existing walking and cycling facilities and an improved walking and cycling connection to the Te Araroa trail that crosses the State Highway at the Kerikeri River bridge (at the south end of the study area).

5. OUTCOMES

5.1 Strategic Context

The followings documents are some of the most important among a number of references that strongly endorse the strategic alignment of NZTA's and FNDC's joint intention to soon implement major road intersection upgrade works at Waipapa.

Table 9: Strategic Alignment

STRATEGIC DOCUMENT OR CONTEXT		PROJECT ALIGNMENT	COMMENTARY
NATIONAL	Government Policy Statement (2015/16-2024/25)	✓	Project outcomes are well aligned to the following objectives identified in the GPS: • A land transport system that addresses current and future demand for access to economic and social opportunities • A land transport system that provides appropriate transport choices • A land transport system that is a safe system, increasingly free of death and serious injury • A land transport system that delivers the right infrastructure and services to the right level at the best cost. It also specifically states: "New Zealand is still in the process of addressing some critical constraints on the network, particularly, but not exclusively, in the upper North Island." – this reinforces the focus on supporting Northland that is referenced in other initiatives supported by government, such as relate to Tourism.
	'Draft' Government Policy Statement 2018/19 – 2027/28 (GPS 2018)	✓	• Whilst this next GPS is Draft, and will not be instituted until next year, importance is placed on factors directly relevant to Waipapa (and Kerikeri): o "needing local economies to thrive" o "support regional freight and tourism" o "high quality resilient connections"
REGIONAL	Tai Tokerau Northland Economic Action Plan	✓	• In February 2015, The Ministers for Economic Development, Primary Industries and Maori Development launched the Northland Growth Study, Opportunities Report, confirming part of the Government's gaze was firmly on the Northland economy. • The underpinning of economic development by associated transport development is recognised, including statements like - "Further investment is required in much needed road enhancements to ensure that the network will be able to cater for forecast growth in freight and visitors and provide for the dual needs of tourism and primary industries for transport and safety."

STRATEGIC DOCUMENT OR CONTEXT		PROJECT ALIGNMENT	COMMENTARY
REGIONAL			• That study led to a targeted plan called the Tai Tokerau Northland Economic Action Plan, which made a headline statement that the first of four "Game Changers" is transport, with the summary comment: "better connectivity with Auckland, within the region and with export markets. Northland is a place-based economy. Roading in particular is critical for Northland to develop and affects virtually every part of the economy" • Another principal goal is "Twin Coast Discovery Route Revitalisation". The Twin Coast Discovery Highway passes through the Waipapa Intersection which, until it is substantially upgraded, represents an increasingly significant constraint to visitor movements.
	Regional Land Transport Plan (RLTP)	✓	• This Regional plan echoes Central Government's drivers of economic growth and productivity, road safety and value-for-money. • In covering Integrated Transport Planning, this plan makes particular reference to Waipapa in the context of the following roading priority: - "The 'Triangle in the North' – the road system linking Waipapa, Kerikeri and Paihia. These areas have been identified as priority growth areas by Far North District Council, and as such there is significant value in upgrading this link to allow efficient traffic flow, particularly in regard to tourism. - The RLTP also highlights the Twin Coast Discovery route as showcasing "the best the region has to offer". - Again, with congestion and safety issues highlighted at the current Waipapa Intersection layout, roading improvements are needed to help show the region at its best. - The Heritage Bypass in the Kerikeri-Waipapa area was a huge roading investment in recent times that specifically recognised the high profile of the area's attractions, with particular relevance to the Old Stone Store and other historic buildings alongside. - That investment is somewhat muted in value for money if access from the State Highway is left seriously deficient.
LOCAL	Kerikeri-Waipapa Structure Plan	✓	The local area structure plan sets out some key elements at a high level: • Address lack of direction for growth • Protect village character through preservation of amenity and good urban design • Clustering of growth around existing settlements • Promote sustainable development and responsive design, particularly for infrastructure.

STRATEGIC DOCUMENT OR CONTEXT		PROJECT ALIGNMENT	COMMENTARY
LOCAL	Long Term Council Community Plan 2006-2016	✓	Looking closer at the specific objectives endorsed in the district's long term planning (LTCCP), the following statements are selected as wholly aligned to this Business Case: • Continuing to work with NZTA towards upgrading the intersection of State Highway (SH) 10 Waipapa Road / Waipapa Loop Road "to a roundabout" • Continuing to purchase land for a new link road between Kahikatearoa Road and Waipapa Loop Road • Continuing to widen and improve walking and cycling facilities on Waipapa Road.

5.2 Project Outcomes

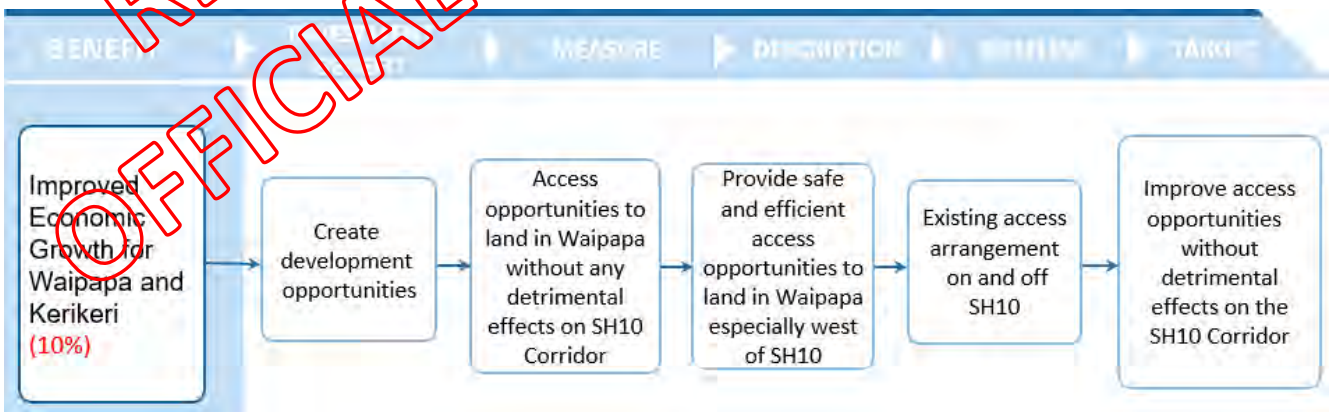
The benefits of successfully investing to address these problems were identified as part of the Investment Logic Mapping process at the second Strategic Case stage workshop in December 2015. At that time, three benefits were identified for the corridor if the problems are addressed.

The Single Stage Business case team has also revisited the description of benefits being pursued, and built on the benefits from the Strategic Business Case:

- **Benefit One:** Improved Economic Growth for Waipapa and Kerikeri (10%)
- **Benefit Two:** Improved Network Efficiency (45%)
- **Benefit Three:** Increased Safety (15%)
- **Benefit Four:** Increased multi modal travel (30%)

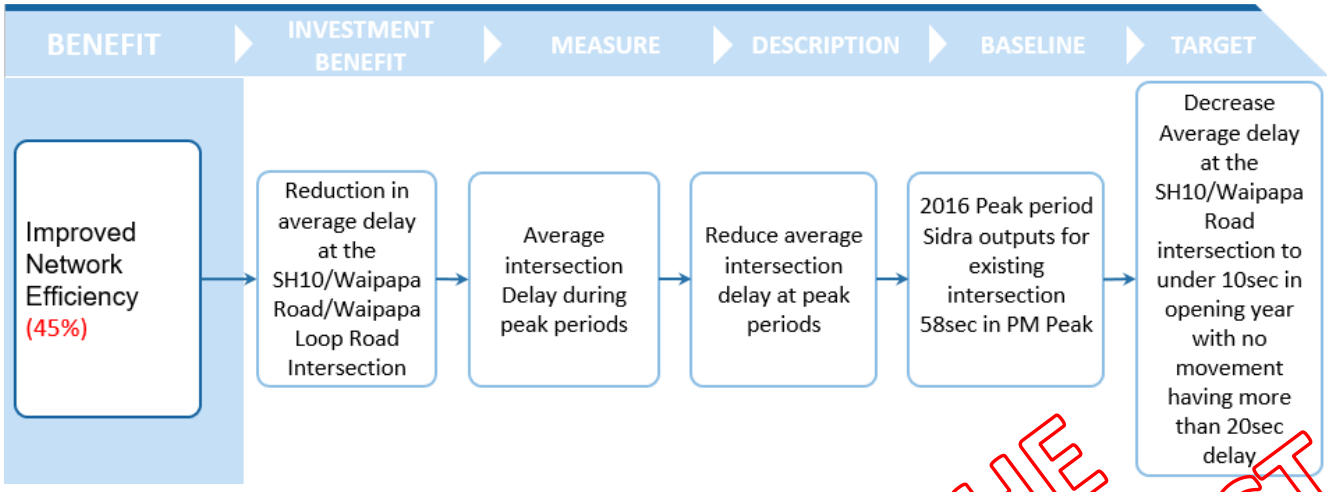
The discussion below provides a summary of the narrative around the expected benefits.

BENEFIT ONE: IMPROVED ECONOMIC GROWTH FOR WAIPAPA AND KERIKERI



By improving access to the State Highway network, the current constraints on development due to traffic will be lifted. As such, transportation improvements will act as an enabler for development especially west of SH 10 and support the growth in the region.

Benefit Two: Improved Network Efficiency

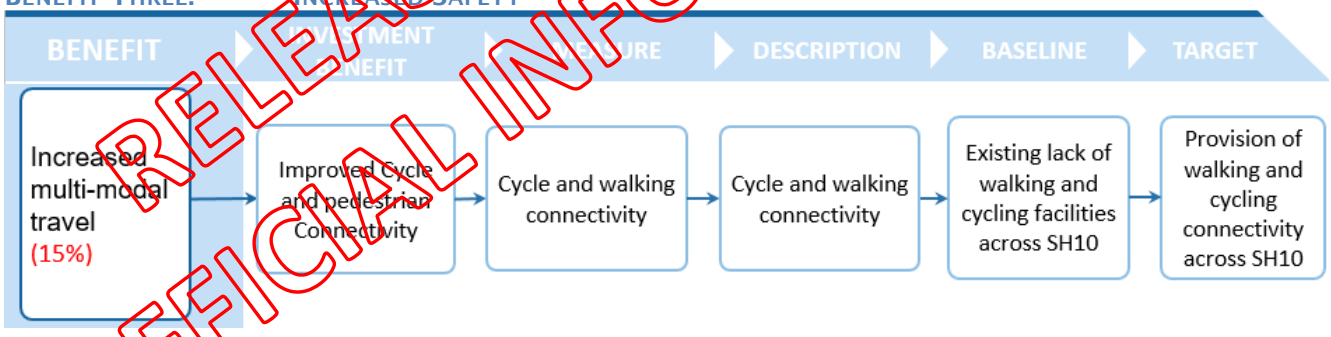


Improved network efficiency is a key aim of the project. Currently, the SH10 / Waipapa Road intersection is one of the pressure points in the network and reducing the delays at this intersection is an essential outcome for the success of this project. The reason for this is:

- Local traffic will no longer be faced with an intersection that delays their journey and presents serious difficulties in turning.
- Increase in capacity at this intersection creates the opportunity for an increase in traffic to be accommodated from Waipapa Loop road providing alternative access to and from Waipapa commercial centre towards the north; in turn, this will reduce traffic on SH10 corridor.
- Through traffic, including regional freight and tourists, will not be impeded by turning traffic.

Other corridor-wide improvements and/or network improvements may also bring improved network efficiency, which will help meeting the reduced intersection delay targets.

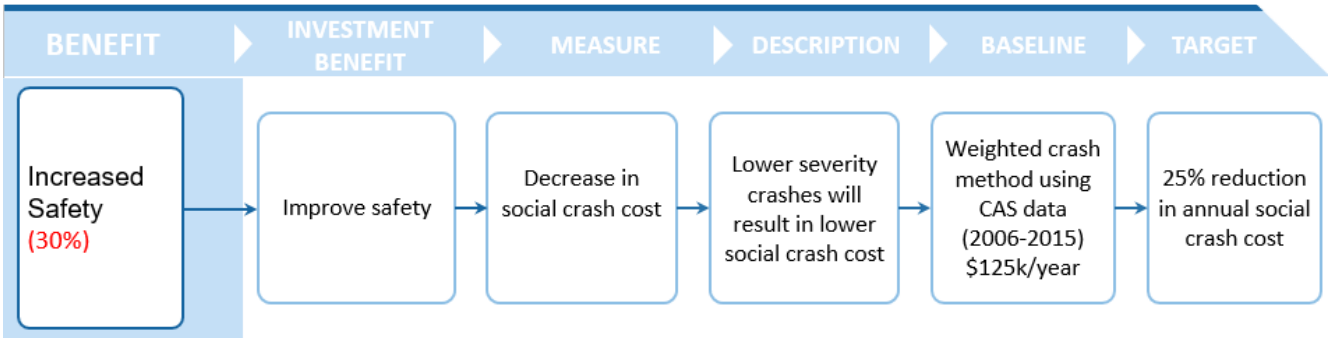
Benefit Three: Increased Safety



Addressing the efficiency of the network will also result in an improvement in road safety.

By providing a design that follows the Safe System approach, the number and severity of crashes should be reduced and motorists will find using the corridor to be more intuitive. When considered alongside other measures planned, this will increase the attractiveness of Waipapa and improve the experience for the local community and all users.

BENEFIT FOUR: INCREASED MULTI-MODAL TRAVEL



A project solution that increases multi-modal travel is also important, and interlinks with the other benefits targeted. There are already shared paths on Waipapa Road and part of Kerikeri Road, with the last section of Kerikeri Road designed and ready to be constructed. Providing a link between these facilities as part of this project would promote the route as an attraction in itself, as well as encouraging sustainable journeys to destinations such as the shops, sporting facilities and the Te Araroa trail.

There are also wider cyclist benefits that could be accessed. SH10 is currently a barrier to walking and cycling trips between Kerikeri and the Waipapa commercial area, due to the speed and volume of traffic using the main road. This currently discourages active modes and encourages people to travel by car, thus exacerbating delays and increasing the risk of accidents.

By implementing new provisions for cyclists, and linking them with existing infrastructure, this will enhance this function of the Twin Coast Discovery Route, which already attracts cycle tourists.

By implementing new and better pedestrian access around the intersection will encourage the residents to opt for walking instead of driving.

5.3 Key Performance Indicators / Targets

The diagram below provides a summary of the Problems, Objectives and Key Performance Indicators / Targets identified for this project.

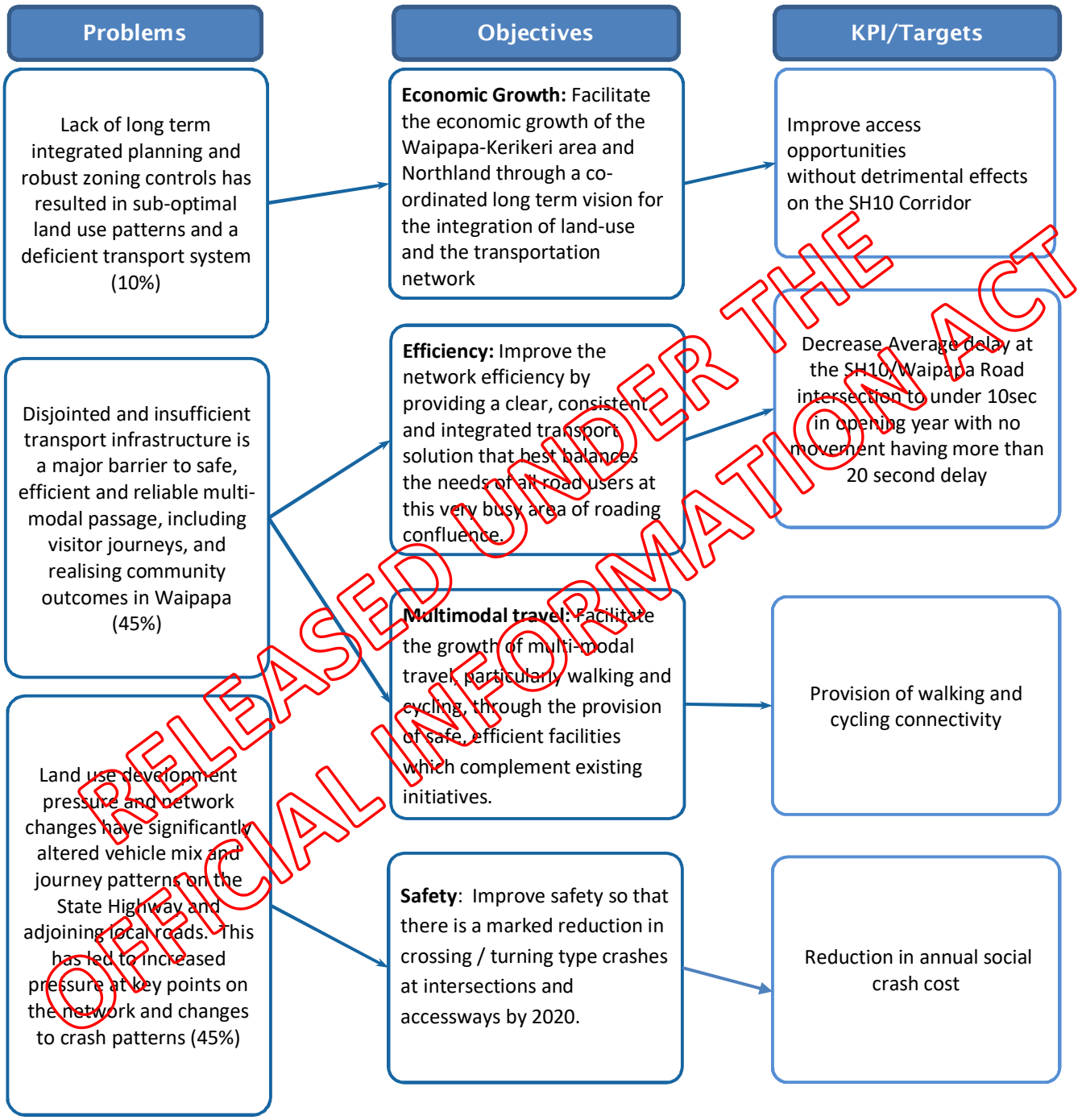


Figure 15: Key performance indicators

OPTION DEVELOPMENT

6. OPTIONS DEVELOPMENT

6.1 Option Development and Evaluation Framework

The alternatives and long list option assessment is based on the NZ Transport Agency's Business Case Process. In summary, the option identification and evaluation process was undertaken as follows:

Figure 16: Option development process diagram

6.2 Alternatives and Interventions (Long List)

A workshop was held on 17th November 2016, where a broad range of improvement options were developed, setting aside any preconceived ideas of what solutions might be 'best', or limitations of cost.

Based on the multitude of ideas that were identified in the Stakeholder Workshop, the project team produced the following list of options which then informed the long list of options.

Table 10: Long list of options

OPTION	DESCRIPTION
Do Minimum	This assumes that the Klinac Lane extension has been constructed without any improvements to the State Highway.
Grade Separation	SH 10 is raised to allow Waipapa Rd and Waipapa Loop Rd to connect underneath. On and off ramps would be required to connect local traffic with the State Highway.
Roundabout	Roundabout at intersection of SH 10 / Waipapa Rd / Waipapa Loop Road
Traffic Signals	Signalise the intersection of SH 10 / Waipapa Rd / Waipapa Loop Road

OPTION	DESCRIPTION
Left Turn Slip Lane from Waipapa Road into SH10	Provide additional widening to the Waipapa Rd approach to allow left turning vehicles to bypass the queue of vehicles waiting to turn right.
Right Turn Bay into Waipapa Road	Provide a right turn bay on SH 10 for vehicles turning right into Waipapa Rd.
Re-align Waipapa Road	Relocate the intersection of SH 10 with Waipapa Rd further south to create a staggered T-intersection arrangement with Waipapa Loop Road.
Left In / Left Out Waipapa Loop Road	Provide concrete islands to prevent vehicles turning right into, and right out of, Waipapa Loop Road and from going straight across from Waipapa Loop Rd to Waipapa Rd.
Bypass	Provide a new highway to the west of the commercial area so that through traffic can completely bypass the intersection.
Close Waipapa Loop Road South	Close off the south end of Waipapa Loop Road so that all traffic must use the north end.
Speed reduction	Reduce the speed through the Township from 70 to 60 or even 50.

6.3 Option Development

The long list of options was further developed, refer **Appendix D**. The narrative below more describes each option.

6.3.1 Do Minimum Option

FNDC is committed to installing the Klinac Lane Extension to its north once the NZ Transport Agency upgrades the main intersection. Because of this, and because that extension is practically essential for any outcome that tries to properly balance traffic on the local road approaches to the main intersection, it was decided to include the Klinac Lane Extension in the base case.

While it is recognised that the Klinac Lane Extension will assist with the current land use and enable the intensification of both industrial and retail activities within the Waipapa area, earlier studies have confirmed that the link should not be constructed until the necessary improvements have been made on the State Highway connections.

6.3.2 Grade Separation

This would involve raising the State Highway so that local traffic could drive between Waipapa Road and Waipapa Loop Road directly. This would remove all conflicting vehicle movements and would remove the “barrier” to pedestrians and cyclists.

However, in order to maintain access to and from the State Highway, on and off ramps would be necessary, which would require significant land acquisition on all four quadrants, affecting the majority of the surrounding businesses. This would have a detrimental social and environmental impact, and to all intents and purposes is not practical.

Grade separation is usually associated with motorways and expressways where there are much higher volumes of traffic, and the potential for large areas of land-take is more in proportion with the scale of

such projects. This option was rejected early, as the traffic volumes at this location would not justify the cost and adverse social impacts.

There are currently no grade separated intersections in Northland.

6.3.3 Roundabout

Constructing a roundabout at the intersection of SH10, Waipapa Road and Waipapa Loop Road would make it safer and easier for vehicles to turn right from SH10 and right out of the side roads. Urban roundabouts typically have a 55% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit), when constructed at existing priority crossroads. Facilities for pedestrians and cyclists will need to be a key consideration in the design.

Disbenefits of the roundabout option include the relatively large amount of land required compared to simpler intersection controls, and the slowing down of all State Highway traffic (although traffic already has to slow down when someone is waiting to turn right). Some slowing down of State Highway traffic is considered inevitable with any solution that gives reasonable weight to alleviating the delays and difficulties here with State Highway access/egress from the main side roads.

6.3.4 Traffic Signals

Installing traffic signals at the intersection of SH10, Waipapa Road and Waipapa Loop Road would remove the conflict for turning vehicles, making it easier for all right turning movements. It would also provide a safe crossing place for pedestrians and off-road cyclists. Traffic Signals typically have a 30% - 35% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit) when constructed at existing priority crossroads, depending on whether or not the right turn phases are fully controlled.

Disbenefits include significant delays to through traffic, compared to the existing arrangement, particularly during the inter-peak periods. Being the only signalised intersection north of Whangarei, it could lead to problems with compliance as motorists may not be expecting to have to stop, resulting in increased rear-end crashes. It may also lead to deliberate non-compliance at off-peak periods if motorists are kept waiting for a green light. The consequence of any non-compliance would be significant as there is a greater risk of a high speed, high severity collision as traffic with the green light will not be expecting anyone to run a red light.

6.3.5 Left Turn Slip Lane from Waipapa Road into SH10

Motorists turning left onto the State Highway from Waipapa Road experience delays due to the queue of right turning traffic. A left turn slip lane would involve widening the approach to the State Highway to allow enough room for two lanes of traffic, allowing left turning vehicles to exit much more readily, needing only the near lane of the State Highway to be clear.

The option does not address the main cause of the problem – delays caused by right turning traffic. There is anecdotal evidence that vehicles turn left here and do a U-turn on the State Highway, rather than queuing to turn right. The option makes this manoeuvre an even more attractive option.

Also, the number of left-turning vehicles is relatively low based on current evidence and the creation of a new connection to Klinac Lane will reduce it further so the benefit of investment in this option is not expected to be great.

6.3.6 Right Turn Bay into Waipapa Road

Due to the existing width of the road, vehicles waiting to turn right into Waipapa Road block the through traffic causing unnecessary delay. Providing a Right Turn Bay would allow the through traffic to continue unimpeded, and provide right turning traffic with a safe place to wait.

The disbenefit of this option is that the speed of through traffic will likely increase and add to the difficulty of exiting the side roads.

6.3.7 Re-align Waipapa Road

This would involve shifting the intersection of Waipapa Road further south on the State Highway, away from Waipapa Loop Road, in order to create a staggered pair of T-intersections. Separating these two local roads should remove some of the uncertainty associated with vehicles turning right from opposing side roads.

The right-left stagger requires drivers to initially turn right into the major road, then left into the opposite minor road leg. This treatment is only for low volume situations, but is often more cost-effective than a left-right stagger if converting a four-way cross intersection into a staggered T-intersection. Austroads recommends a stagger of only 15 to 30m. Crash reduction effectiveness is in the order of 25% to 35%, but design life is short (Austroads Road Safety Engineering Toolkit).

This option alone is unlikely to provide the benefits that are required, but could be incorporated into some of the other Options, such as the Right Turn Bay into Waipapa Road or the Left In / Left Out at Waipapa Loop Road.

6.3.8 Left In/Left Out at Waipapa Loop Road

This option involves constructing a traffic island at the southern intersection of Waipapa Loop Road, which would prevent right turns in and out. Motorists who wish to turn right could use the northern intersection of Waipapa Loop Road. This intersection may need some safety improvements if there were significant increases in traffic.

While the majority of motorists will be guided by signs and islands to prevent them from turning right, it is very difficult to stop drivers who are determined to ignore the banned movements. This can create additional safety hazards. This option was therefore rejected early.

6.3.9 Bypass

Bypassing the Waipapa commercial centre does not meet the objective of improving the economic growth of the area, as this would remove the majority of passing trade. It would improve the overall safety and efficiency of the network, but would have a significant social and environmental impact on the area. The construction would require considerable land acquisition and would be prohibitively expensive.

6.3.10 Close Waipapa Loop Road South

This is similar to the Left In / Left Out option, but would completely close the intersection and divert all traffic to Waipapa Loop Road North. This intersection would need additional safety improvements incorporated into the design.

This option has the benefit over the Left In / Left Out option in that there is no risk of motorists carrying out any banned manoeuvres, instead would force all traffic through the WL(N) intersection is undesirable due to a crest in SH10 limiting sight line restrictions to the north.

6.3.11 Speed Reduction

Reducing the 70km/hr speed limit to 60km/hr or even 50km/hr would have the benefits of increasing the opportunity for motorists to pull out of side roads, as they would accept smaller gaps in the traffic. It would also reduce the severity of any crashes that did occur.

However, a reduction in speed alone will not be enough to address the main issues.

The new Speed Management Guide, which came into effect this year, aims to ensure a consistent sector-wide approach is adopted to manage speeds. One of the results of the document is that the 70km/hr speed limit will no longer be an option. While there is no immediate requirement to replace existing 70km/hr speed limits with either 60km/hr or 80km/hr, this will be the eventual outcome, so could be incorporated into this project.

6.3.12 Corridor Improvements

While all of the above options address issues at the intersection with Waipapa Road to some degree, there are improvements that could be made to the whole State Highway corridor within the study area.

The improvements may include road widening with right turn bays and flush median, proper cycleway/footpath provision, improved lighting and speed-related provisions such as threshold treatments.

6.4 Long-List Options Assessment (Initial Multi-Criteria Analysis)

A workshop forum was used for a qualitative assessment of the Long List options, comparing how they measure up against each other in an initial Multi-Criteria Analysis (MCA).

This initial high-level MCA used the four stated project Objectives as core criteria:

1. **Economic Growth** – does the option support the growth of Waipapa and Northland
2. **Efficiency** – does the option improve efficiency for through traffic and/or local traffic
3. **Safety** – does the option improve safety for motorists, pedestrians, cyclists or other users
4. **Multi Modal Travel** – pedestrians and cyclists.

In addition, the team felt that two new criteria would be valuable to include at this stage:

- **Constructability** – how easy the option would be to implement
- **Environmental / Social** – high level assessment of the effects on the environment and community.

As discussions evolved, it was recognised that a few of the wider treatments that could be complimentary to any of the main options should be considered in their own right as sub-options, and separately scored in the MCA. Thus, 'speed limit reduction', 'walking/cycling facilities' and 'corridor treatment' were included so their attributes could be understood against the same criteria, although they may not ultimately be used as stand-alone treatments.

The team debated the issues and, by consensus, came up with the scoring summarised below:

OBJECTIVES / CRITERIA	MAIN OPTIONS					SUB-OPTIONS				
	Grade Separation	Roundabout	Traffic Signals	Left Turn Slip Lane / Right Turn Bay / Left In/Left Out	Re-align Waipapa Road	Bypass	Close Waipapa Loop Road South	Speed Limit Reduction	Walking / Cycling Facilities	Corridor Treatment
Improved Economic Growth	2	1	2	3	3	5	3	3	3	3
Improved Network Efficiency	1	2	4	2	2	1	3	4	3	3
Increased Safety	1	1	2	2	2	2	2	2	2	2
Increased Multi-Modal Travel	3	2	1	2	2	3	2	2	1	1
Constructability	5	3	2	2	3	5	3	1	2	1
Environmental / Social	5	2	2	3	3	5	3	3	2	2
MCA SCORE	**17**	**11**	**13**	**14**	**15**	**21**	**16**	**15**	**13**	**12**

Figure 17: Initial Multi-Criteria Analysis (High Level)

6.5 Short-Listed Options

From the initial MCA, two options (Grade Separation and Bypass) were discarded, and five options (see below) were shortlisted as meriting closer examination.

Grade Separation, which is not a solution that is normally associated with low traffic volumes, was also discarded due to the massive impact it would have on the surrounding business properties. It was also deemed to have a detrimental social and environmental impact.

The Bypass was discarded because it goes directly against the objective of supporting economic growth by removing the passing trade that many of the local businesses rely upon.

The following options were shortlisted:

- **Right Turn Bay**
- **Roundabout**
- **Traffic Signals**
- **Head to Head Right Turn Bays**
- **Close Waipapa Loop Road South**

The five shortlisted options have been drawn to a reasonable first order accuracy on a series of plans that are included in **Appendix E**. These plans illustrate the main features of each option.

Reduced-size versions of these drawings are provided below for ease of reference.

Please note that all options are deemed to be accompanied by the Klinac Lane Extension (as the Do Minimum).

Also, for options that show Waipapa Loop Road (North) closed, that closure is only one of a series of feasible sub-options and that element is therefore only indicative at this stage. Other sub-options for Waipapa Loop Road (North) could for example include 'Left Turn In & Left Turn Out'. It was decided to defer closer examination until a preferred option was identified, and then canvas opinion during upcoming public consultation to help inform any decision.

6.6 Option Assessment

6.6.1 Methodology

The project team met again, in a workshop, to carry out a more detailed analysis of the shortlisted options in a final MCA to determine the preferred option.

The criteria the options were weighed against included:

1. **Objectives**
2. **Feasibility / Constructability** – Property risks, consenting risks, Whole of Life operation / maintenance costs
3. **Affordability** – Funding risks, operating cost risks
4. **Public/Stakeholders** – public expectations
5. **Cultural, Social, Environmental Effects** – Community cohesion, connectivity
6. **Economy** – based on traffic modelling outputs
7. **Customers** – local users, freight users visiting users.

The team composition spanned a good range of skills, with both local and regional knowledge. They readily arrived at agreement on scores for many criteria, while for others they arrived at consensus scores following a healthy debate. A final review was undertaken and some small adjustments made to ensure overall balance.

Planning issues were considered neutral at this stage for the options analysed.

The team was comfortable that the final ranking of options was arrived at, through fair consideration, with the outcome of the process detailed in Section 6.6.2.

6.6.2 Key Findings

Summary and Comparison of the Short-listed options follows.

Option 1: Right Turn Bay

Description:

Minor intersection improvements with the implementation of a right turn bay for vehicles turning from SH10 into Waipapa Road. Option also includes a splitter island on Waipapa Loop Road that restrict movements from this approach to a left out only. The northern access to Waipapa Road remains open and option design encourages vehicles to use this intersection for the right turn from SH10 to Waipapa Loop Road, right turn from Waipapa Loop Road to SH10 and movements from Waipapa Loop Road to Waipapa Road.

Access between Skippers Lane and Waipapa Loop Road remains unchanged.

KEY POINTS OF DIFFERENCE:

Alignment to investment objectives: Low alignment to investment objectives.

Risks: Option is considered to have negligible construction risk as proposed improvements are minor in comparison with the other options.

Effects: Option is considered to have low effects as proposed improvements are minor in comparison with other options. Potential social effects with confusing road network with banned movements from Waipapa Loop Road that can also be somewhat disruptive to the businesses particularly on the eastern side of Waipapa Loop Road.

Outcome: Option only provides some efficiency improvements for SH10 northbound traffic with minimal improvements right turning traffic from the side roads. It is therefore considered that this option does not address the main objectives. Other similar cost options have better alignment to investment objectives and are therefore favoured in comparison with this option.

Cost: $5.75M

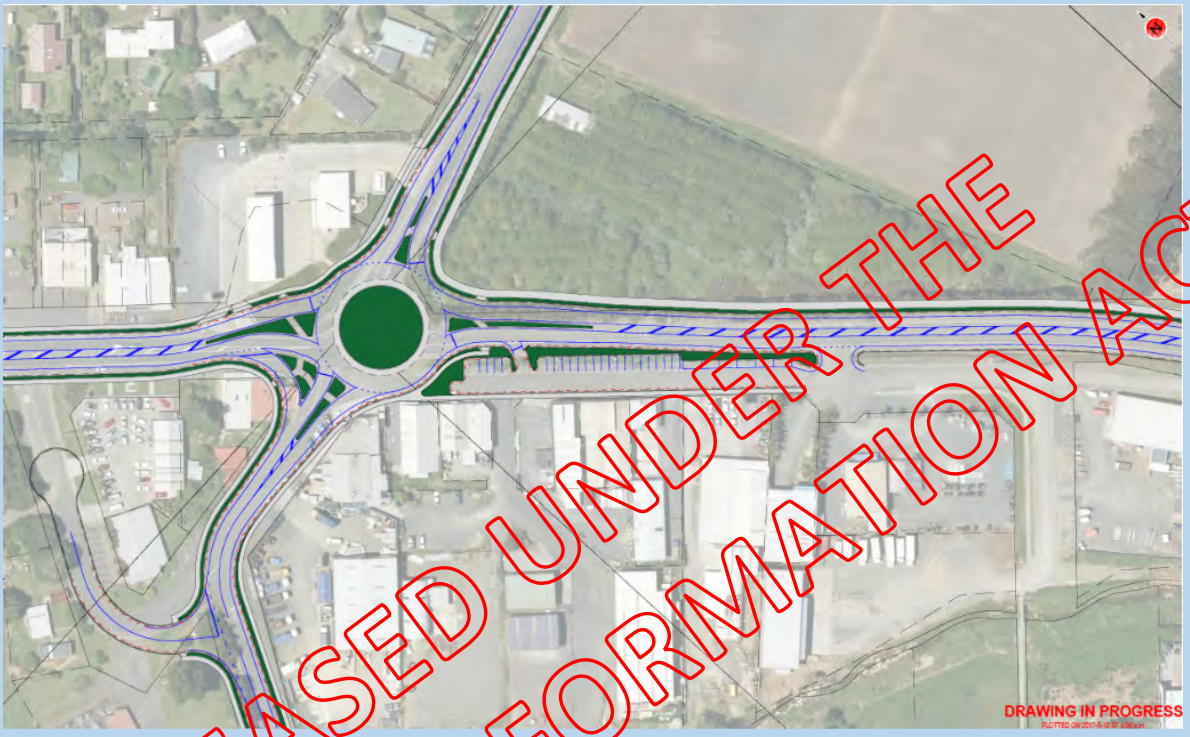
BCR: 2.9

Funding Profile: LLM

Option 2: Roundabout

Description:

This option includes the conversion of the existing crossroads to a single lane roundabout. This option also includes intersection rationalisation with both the northern Waipapa Loop Road access to SH10 and Skipper Lane access onto Waipapa Loop Road being closed.



Key points of difference:

Alignment to investment objectives: This option has the highest alignment to investment objectives of all considered options. The option alignment is also improved if this option is implemented at the same time as Klinac Lane extension.

Risks: The option is considered to have low overall risk, however, the risk are slightly higher in comparison with other options as the footprint of the intersection is higher. Important that the roundabout is designed according to design standards and deflections through the roundabout are considered.

Effects: The overall effect of this option is considered to be low and business as usual. Some social effects through property acquisition and the closure of two intersections.

Outcome: The roundabout option has very good alignment to the investment objectives. It addresses the current issue of intersection delays for side road traffic at the same time as providing opportunity for more development within the Waipapa area. It is recognised that there will be some increase in delay for SH10 through traffic but these disbenefits are outweighed by improved access for the side roads. Option also has manageable risks and effects.

Cost: $7.1M

BCR: 3.1

Funding Profile: MHM

Option 3: Traffic Signals

Description:

SH 10, Waipapa Road and Waipapa Loop Road are all signalised with two lane approaches on each leg. This option also includes intersection rationalisation with both the northern Waipapa Loop Road access to SH10 and Skipper Lane access onto Waipapa Loop Road being closed.

Pedestrian crossing facilities are incorporated into each leg.

Key points of difference:

Alignment to investment objectives: Mixed alignment to investment objectives, but low on average.

Risks: Option is considered to have some construction risk as proposed footprint is relatively high. It also poses a serious safety risk for motorists who are not expecting to have to stop.

Effects: The overall effect of this option is considered to be high as average travel times will increase. Some social effects through property acquisition and the closure of two intersections. Potential social effects with there being no signalised intersections in the Far North.

Outcome: Option provides good connectivity for pedestrians and full access into the Waipapa area. However, delays to all traffic movements, particularly during the inter-peak mean that his option is not viable.

Cost: $6.6M

BCR: N/A

Funding Profile: LLL

Option 4: Head-to-Head Right Turn Bays

Description:

This option involves shifting the Waipapa Road approach further south creating a staggered T-intersection arrangement with Waipapa Loop Road, with right turn bays into both.

This option also includes intersection rationalisation with both the northern Waipapa Loop Road access to SH10 and Skipper Lane access onto Waipapa Loop Road being closed.

Pedestrian links, including central refuges on the State Highway, would also be provided.

Key points of difference:

Alignment to investment objectives: Low alignment to investment objectives

Risks: Option is considered to have minimal construction risk as proposed improvements are minor in comparison with the other options.

Effects: Option is considered to have low effects as proposed improvements are minor in comparison with other options.

Outcome: Option only provides some efficiency improvements for SH10 northbound traffic with minimal improvements right turning traffic from the side roads. It is therefore considered that this option does not address the main objectives. Other similar cost options have better alignment to investment objectives and are therefore favoured in comparison with this option.

Cost: $6.2M

BCR: 2.7

Funding Profile: LLL

Option 5: Close Waipapa Loop Road South

Description:

This option would completely close the intersection at the south intersection of Waipapa Loop Road, diverting all traffic through the north intersection and Skippers Lane. Access to Skippers Lane from the State Highway would only be from the south end.

Pedestrian links, including central refuges on the State Highway, would also be provided.

Key points of difference:

Alignment to investment objectives: Does not align well with investment objectives.

Risks: Option is considered to have negligible construction risk as proposed improvements are minor in comparison with the other options.

Effects: Option is considered to have low effects as proposed improvements are minor in comparison with other options. Potential social effects with confusing road network with circuitous route to access commercial area.

Outcome: Option only provides some efficiency improvements for SH10 northbound traffic with minimal improvements right turning traffic from the side roads. It is therefore considered that this option does not address the main objectives. Other similar cost options have better alignment to investment objectives and are therefore favoured in comparison with this option.

Cost: $5.7M

BCR: 2.8

Funding Profile: LLL

6.6.3 Assessment of Effects

The traffic signals option is the most favourable in terms of avoiding environmental, health, heritage and social impact overall.

The Roundabout is the second most favourable in terms of avoiding overall environmental, health, heritage and social impact – however, this is the case provided that adequate community consultation and temporary traffic management occurs to mitigate any concerns.

The remaining options are relatively equal in terms of avoiding environmental, health, heritage and social impact.

The following narrative provides a brief description of the Environmental and Social Responsibility Screens (ESRs).

The detailed ESRs are presented in **Appendix F**.

6.6.4 Natural Environment

All options are relatively equal in this regard. The road reserve and surrounds are all previously disturbed areas and contain no significant ecological, flora/fauna values. Important to note is that all options will involve alteration of the SH10 and Maritime Road[1] crossings over Whiriwhiritoa Stream. Details of these crossings are yet to be developed. Design must ensure that alterations do not worsen the 100 year ARI upstream flood level, and do not worsen fish passage provision up to the 1 year ARI.

6.6.5 Heritage/Archaeology

All options are relatively equal in this regard. The road reserve and surrounds are all previously disturbed and contain no significant Heritage/Archaeology values.

6.6.6 Land Acquisition

All options require some acquisition of surrounding land. All options require acquisition of land from the substation lot (corner of Loop Rd and Maritime Road). The traffic light option requires the least amount of land from the SH10 intersection, the remaining options all require similar amounts of land – therefore they are relatively equal in this respect.

6.6.7 Contaminated Land

One of the major constraints for the project is that the road is surrounded by land that is likely to be classified under the Hazardous Activities and Industries List (HAIL). As a result, if land needs to be acquired from these properties, or work needs to occur on these properties, then the National Environmental Standard Contaminated Land (NES Contam) needs to be considered. This essentially means that the presence of potentially contaminated land needs to be investigated and managed accordingly. Therefore, reducing the extent to which an option encroaches outside of the existing road reserve may assist in reducing the degree of this risk or the scale of its impact.

For all options, it is recommended that a Stage 2 contaminated land investigation is undertaken on land which may be acquired (this involves sampling and laboratory analysis of soil samples). If any site

[1] Note: The part of Maritime Road that crosses the Whiriwhiritoa Stream and joins with Klinac Lane is not yet formed road. FNDC currently refer to this as "The Klinac Lane Extension".

is found to be heavily contaminated (which is probably unlikely), then the costs & practicalities of managing or remediating the land may weigh into final options assessment.

6.6.8 Social Impact

Social impact varies between the options according to how much change each option would have to people's way of life and the nature of that change, i.e., positive or negative. These impacts are assessed in two phases, identifying that impacts will differ between the actual permanency of the infrastructure and the temporary construction activities.

Impacts Resulting from Permanent Works

- The traffic signals option has least social impact as it retains the familiarity that the community has with the current intersection layout. However, this option does not improve the traffic congestion issue at the intersection with delays modelled in all traffic movements. The desire of the community is to have a safer and more efficient intersection layout which this option does not achieve. Traffic signals can be more costly in terms of maintenance and the potential for failure is also cause for concern in terms of a secure permanent intersection improvement solution.
- The Roundabout option achieves greater connectivity and movement from and to local roads in a reasonably efficient manner than the current intersection layout and the traffic signals option. The layout would be similar to the roundabout at SH10 and Kerikeri Road, which the community are familiar with. This option is also low maintenance and has low to nil risk of infrastructure failure meaning the community is well supported to continue with their way of life once installed.
- The right turn bay and head to head right turn bays options will be somewhat disruptive to local businesses and therefore social connectedness of the town, particularly on the eastern side of loop road as there would be minimal improvement to right-turning traffic from local roads. The roading layout in this option is more complex than the Traffic Signals and Roundabout options and would be unfamiliar to local road users. Both of these options would be low maintenance with low to nil risk of infrastructure failure providing stability to the community to be able to utilise the road network in an ongoing capacity.
- The closing of Waipapa Loop Road South would likely be highly disruptive to the businesses in its proximity, and make southbound entry onto SH10 difficult. The reduction of connectedness does not achieve the community's desires of being able to utilise and to promote their town as one whole service centre rather than two split communities. The roading layout for this option is deemed much more complex than any of the other options and would be unfamiliar to local road users. However, this option would be low maintenance with low to nil risk of infrastructure failure providing stability to the community to be able to utilise the road network in an ongoing capacity.

Impacts During Physical Works

1. The traffic signals option likely has the least impact on the community and environment as minimal alteration to the SH10 intersection is required resulting in less disruption to the way in which the community utilise the facilities in the town. Day-to-day operations of local businesses will be least affected under this scenario. Traffic flow will be manageable but would still have some disruption to an already congested intersection.
2. The right turn bay option would also have low social impact during construction with minimal alteration to the environment occurring resulting in less disruption to the way in which the community utilise the facilities in the town. Day-to-day operations of local businesses will be least affected under this scenario. Traffic flow will be disrupted to a greater extent than the

traffic signals option but this disruption would be minor in comparison to the remainder of the options.

3. The closing of Waipapa Loop Road South would likely be the next least disruptive option to the community, with greater alteration required to the existing environment than the traffic signals and right turn bay options. The scale of alteration would likely result in minor disruption to the community's experiences and use of their town. Businesses along Skippers Lane would also be immediately affected with closure to the Lane implemented early on in the works. Traffic flow can be managed during work with minor interruption through the use of existing roading infrastructure as detour routes.
4. The Roundabout option has a similar social impact footprint to that of closing of Waipapa Loop Road South. The option does not require much physical work outside of existing road areas therefore reducing the potential for environmental alteration, however, the overall scale of this work would impact on the community's sense of place and current rural feel of the township. Businesses along Skippers Lane would also be immediately affected with closure to the Lane implemented early on in the works. This option will also require a higher level of temporary traffic management to maintain highway flow which has the potential to cause the feeling of severance to the community and road-users if not managed well.
5. The head to head right turn bays option will be most disruptive to the community, road users and local businesses as the alteration in existing road alignments would require large-scale environmental alteration. The scale of environmental alteration will affect the way in which the community access facilities and utilise the transport networks as they will likely try to avoid the disruption. This in turn has the effect of a downturn in local business and trade, ultimately causing disruption to the community's way of life that cannot be easily managed.

6.6.9 Summary

A Summary of the MCA analysis is presented below. Refer to **Appendix G** for the detailed analysis of each option.

Table 11: Multi-criteria analysis results for each option

SUMMARY	DO MINIMUM – KLINAC LANE	RIGHT TURN BAY	ROUNDABOUT	TRAFFIC SIGNALS	HEAD TO HEAD RIGHT TURN BAYS	CLOSE WAIPAPA LOOP ROAD SOUTH
Objective 1 - Economic growth through integrated land-use	0	+	+++	+++	+	-
Objective 2 - Improve network efficiency	--	0	++	--	+	-
Objective 3 - Improve safety by reducing crossing/turning crashes	--	--	++	---	--	--
Objective 4 - Facilitate growth of multi-modal travel	0	++	+	++	+	+
Feasibility / Constructability	0	-	--	---	-	-
Affordability	0	0	0	0	0	0
Public / Stakeholders	---	--	++	---	--	--
Cultural, Social and Environmental Effects	0	++	+	+	+	+
Safety	--	--	++	---	--	--
Economy	0	+	++	+	+	-
Customers	-	++	++	0	+	0
Ranking	**6**	**2**	**1**	**4**	**3**	**5**

Planning issues were considered largely neutral to all options analysed.

The Roundabout Option ranked the highest, with positives in all the categories except Feasibility / Constructability and 'facilitate growth of multi-modal travel' due to the level of land-take required for this option and the perception of ease of use of a roundabout by cyclists respectively.

The short-listed options were also weighed in an economic analysis and again the **Roundabout Option** gave the best **BCR of 3.1**.

Therefore, the Roundabout Option emerged as the Preferred Option via this Business Case, and as such follows with a recommendation that the NZ Transport Agency proceed to the next phases of the project, i.e. Detailed Design and Implementation.

6.7 Recommended Option

The Recommended Option is the Roundabout, which scored well to very well on almost all main criteria.

It did score low on two criteria, '*feasibility/constructability*' and '*facilitate growth of multi-modal travel*' but this is only relative to the other options, and it remains perfectly feasible. The score simply recognises that this option has the largest physical 'footprint' and is likely to have higher ongoing maintenance costs than other options due to factors like seal stress and landscaping upkeep.

Importantly, the Roundabout is clearly the stand-out option in terms of meeting the main project Objectives. Some salient observations are noted as follows:

Objective 1 - Economic growth through integrated land-use

This option provides a significantly better situation than the Do Minimum in terms of ease of movement in all directions. This also provides a gateway treatment to the Waipapa area. For Tourism, this option is considered optimum, especially for Twin Coast Discovery Highway movements.

Objective 2 - Improve network efficiency

This option provides the best overall efficiency benefits. Pedestrian crossing points are necessarily some distance from the desire lines for crossing, but careful design can still accommodate suitable facility.

Objective 3 - Improve safety by reducing crossing / turning crashes

Roundabouts significantly reduce the number of conflict points and, for most users, will represent a safe and easy option. Even though they can have a higher number of crashes compared to some other intersection treatments, incidents tend to be of a lesser severity due to lower speeds. It is reasonably assumed that safe cycling provision can be addressed satisfactorily by careful design.

Objective 4 - Facilitate growth of multi-modal travel

Pedestrian movements are well provided for with uncontrolled crossing points, but some of the designed walking routes across the intersection will unavoidably be at some distance from the 'desire lines' due to practical constraints.

Cycling provision can be carefully designed for but less confident cyclists may find roundabouts less desirable.

As noted earlier, all options were normalised to be treated as if including the Klinac Lane extension; and also to include some prudent level of complimentary corridor treatment (regardless of whether such corridor treatment would be implemented concurrently or phased in later).

Full area drawings of the Recommended Option, covering the Klinac Lane link and the probable corridor treatment are included in **Appendix H**. The following drawing shows the general arrangement plan outlining the proposed treatment.

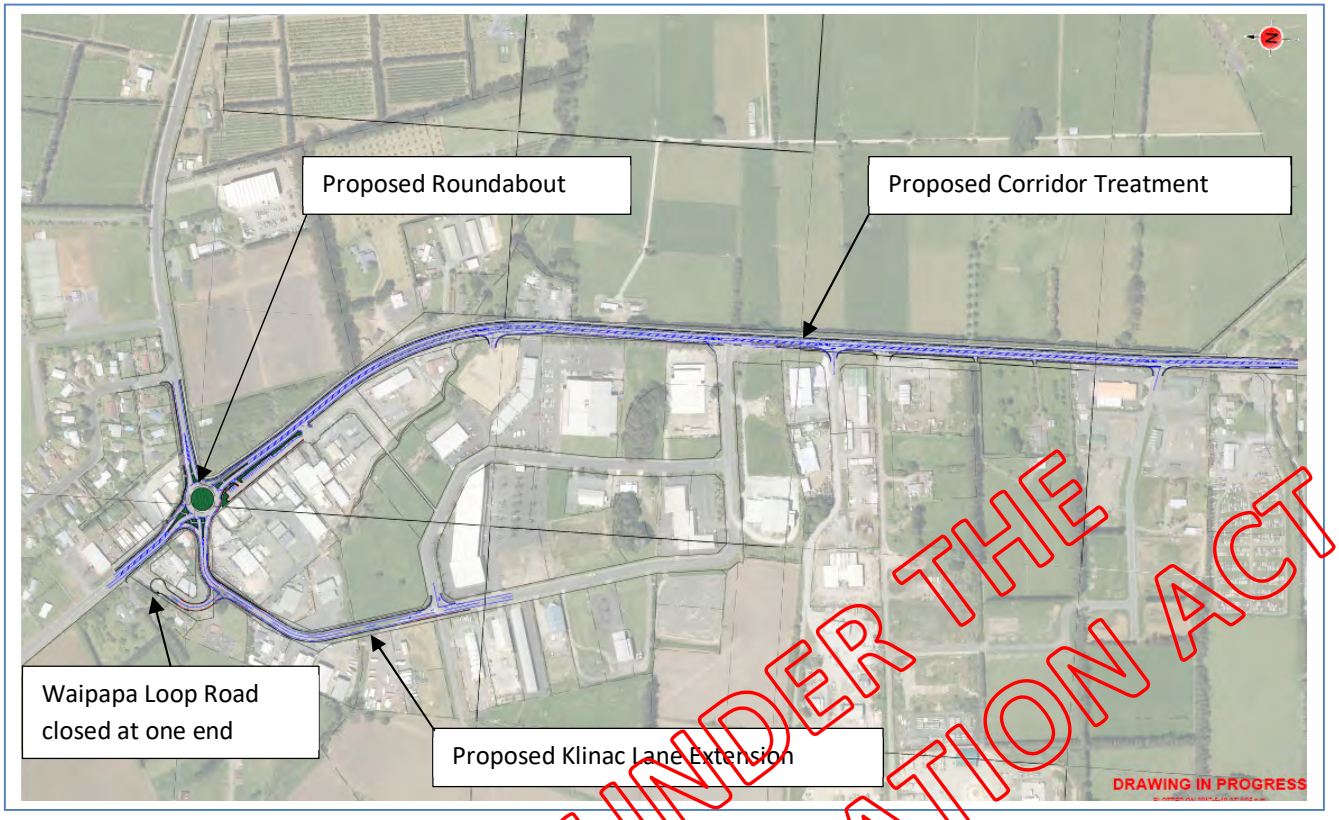


Figure 18: Recommended option – general arrangement

6.8 Engagement

The focus of engagement has largely been focused on the SH10 / Waipapa road intersection which is the centre of community concern. Ongoing stakeholder consultation and community engagement has been undertaken as part of this business case to understand affected parties' needs, behaviours and attitudes to the SH10 Waipapa Road intersection, and the preferred option.

The outcomes of the consultation and engagement on the preferred option demonstrated that the community and key stakeholders believe that investment is needed to improve the SH10 Waipapa Road intersection and that they are supportive of improving safety, efficiency and network resilience.

6.8.1 Affected Parties

Figure 19 depicts the landowners identified as being directly affected by the preferred intersection layout, and/or the extension to Klinac Lane, either as adjacent landowners or as owners where land is to be acquired. They were identified with the assistance of FNDC.

Figure 19: Property acquisition for preferred option

Landowners whose property may need to be acquired for the preferred roundabout design have been generally receptive of acquisition by agreement. However, tenants of two properties have not been as receptive as their landlords to the change that the roundabout option would represent for them, although at the same time not necessarily being against the idea altogether. Their concerns are outlined as follows:

- The Pioneer Bar resides on Lot 5 DP 429319 on the south-west corner of the intersection (owned by Wiroa Properties) and, while the preferred option is to avoid the land and the building, parking on the roadside in front of The Pioneer will be removed to accommodate a roundabout option. The owner and operator of The Pioneer is concerned about the impact the loss of car parks would have on the business. They are awaiting the outcome of this business case, and would like to be involved in the ensuing project phase, detailed design.

- The Price-cutter shop, on the north-west corner of the intersection (Lot 2 DP 72659), is in a state of conditional purchase by the shop owner, and acquisition discussions have been transferred to the new owners (Mr and Mrs Patel). They anticipate being able to continue to operate a smaller-scale Price-cutter under the preferred roundabout option, although this may not be the case, so discussions are continuing between Mr Patel, the NZ Transport Agency project manager and Crown Properties. On-street parking in the immediate vicinity of the property is critical to the viability of business, given its 'convenience store' function. However, parking on SH10 in front the shop is very likely to be lost to ensure the safe and efficient operation of the intersection.

- Portions of properties on both corners of Waipapa Road will need to be acquired. Both property owners have been consulted and are not opposed to negotiating an agreement.

- The Waipapa Garage operation, on the north-east corner of the intersection, is not affected as the land portion required is not used by the business. When the garage was redeveloped a number of years ago, it was set back from the State Highway to avoid being impacted by any future improvements at the intersection.

- On the south-east corner of the intersection, the land is currently vacant. Although the owner has development aspirations, he is willing to work with the NZ Transport Agency and FNDC to accommodate the intersection upgrade, which he views as a likely benefit to any on-site business, provided his access needs, etc. are accommodated.

- A partial realignment of Waipapa Loop Road would impact on a portion of a property owned by Top Energy. Top Energy has indicated that no essential services are located on the subject portion and they are happy, in principle, to negotiate land purchase.

To summarise, property effects are considered to be manageable. Compulsory land acquisitions are not expected to be necessary due to the constructive relationships that have been developed through early conversations with the potentially affected land owners. However, effects on tenant businesses have been identified as a concern, potentially alleviated to some extent by inviting these parties to be involved during detailed design.

7. ECONOMIC ANALYSIS

7.1 Methodology

7.1.1 Outline Economic Approach

A Benefit Cost Ratio (BCR) calculation was undertaken for the five shortlisted options, using the NZ Transport Agency Economic Evaluation Manual (EEM), January 2016 process. The travel time, vehicle operation cost and CO_2 were all based on SIDRA traffic modelling (**Appendix I**) outputs.

The existing crash cost was derived from weighted crash procedures, based on crash prediction models and the past five full calendar year (1 January 2011 – 31 December 2015) crash history from the NZ Transport Agency Crash Analysis System (CAS). Future accident cost has been estimated according to the EEM and the Crash Estimation Compendium effective from 1 January 2016.

7.1.2 Assumptions

General assumptions made for this Single Stage Business Case economic analysis include:

- *Base date* – 2016
- *Time Zero* – 2017
- *Start of Construction* – 1 Oct 2018
- *Discount Factor* 6% over a 40 year project period (Sensitivity on 4% and 8% discount rates)
- *Excludes* any maintenance, noise and road roughness costs
- *Trip reliability* benefits have been ignored
- *All options have a construction period of 6 months*
- *Traffic flows* based on BLIP survey in 2016 adjusted for seasonal variations
- Annual linear growth of 2.2% on SH10 through movement and on Waipapa Road turning movements. This growth is based on last five-year (2011-2015) data on SH10 approximately 4.5km south of the site. Sensitivity test on 1% and 3% annual growth.
- Growth between 2036 and 2056 based on 0.5% growth on SH10 through movement and on Waipapa Road turning movements.
- All movements are capped at 300s delay (conservative assessment as existing intersection creates considerably longer delays than assessed options)
- Growth on Waipapa Loop Road derived from development west of SH10. Assumed 50% of land developed by 2026 and 100% developed by 2036.
- AM (245hr/year), IP (1960hr/year), PM (490hr/year), Sat (312hr/year) and Sun (408hr/year). Evening period of 5345/year has been included for the roundabout to take into consideration any geometric delay.
- Urban Arterial Road
- TT, VOC, CO_2 for intersections based on Sidra default outputs except for a 100% peak flow factor
- Crash cost estimated based on Crash Estimation Compendium.

7.1.3 Reference Case

The 'Do Minimum' option has been assumed to retain the existing intersection configuration. However, the economic evaluation assumes that the Klinac Lane link has been built as part of the Do Minimum network. Accordingly, the Do Minimum network has some change in trip distribution in the network, with more traffic using Waipapa Loop Road.

A sensitivity test has been carried out that excludes the Klinac Lane link in the Do Minimum network.

For all options (including the Do Minimum) and sensitivity tests only the benefits from the SH10/Waipapa Road intersection have been considered. Hence, any cost and benefits from the Klinac Lane extension has been ignored. The reason for is to simplify the economic evaluation and capture the main benefits which are associated with the SH10/Waipapa Road intersection.

7.2 Economic Summary: Assessed Options

Table 12 provides a summary of the assessed options for the SH10/Waipapa Intersection. The values in the table all reflect the net cost or benefit for the Preferred Option in comparison with the Do Minimum option. All values are the net present values over the 40-year analysis period using a discount factor of 6%.

Table 12: NPV net cost and benefits for Preferred Option in comparison with the Do Minimum

SHORTLISTED SCHEME OPTIONS	OPTION 1 RIGHT TURN BAY	OPTION 2 ROUND-ABOUT	OPTION 3 TRAFFIC SIGNALS	OPTION 4 HEAD TO HEAD RIGHT TURN BAYS	OPTION 5 CLOSE WAIPAPA LOOP ROAD
NPV Option Cost (k)	$5,061	$6,260	$5,837	$5,434	$4,998
BENEFITS					
NPV Travel Time Savings (k)	$11,199	$14,572	-$8,840	$11,200	$10,834
NPV Vehicle Operating Costs (k)	$3,180	$4,086	$2,826	$3,181	$2,897
NPV CO2 Emissions (k)	$195	$273	$180	$195	$181
NPV Accidents (k)	$320	$452	$23	$320	$320
NPV Total (k)	$14,895	$19,384	-$5,810	$14,896	$14,232
BCR	**2.9**	**3.1**	**N/A**	**2.7**	**2.8**

As the table above illustrates, all assessed options have a BCR between 2.7 and 3.1, with the exception of the signalised option that has negative benefits and hence a BCR on this option was not considered further. The Roundabout option has the highest benefits in comparison with the Do Minimum option but also has slightly higher costs.

The economics assessment worksheets are presented in **Appendix J**.

The Roundabout is the preferred option in this analysis because it is the only option that increases the capacity in the intersection. This means that the initial investment for the roundabout will provide benefits for a longer period of time, will best manage high traffic growth and will not be as sensitive to change in traffic turning patterns. The roundabout also caters well for all traffic movements in the intersection, whilst most other options except traffic lights prioritise SH10 movements at the expense of, a still quite poor level of service for, side traffic.

7.3 Economic Summary: Recommended Project Option

Table 13 provides a summary of the recommended option for the SH10 / Waipapa Intersection. The values in the table all reflect the net cost or benefit for the preferred option in comparison with the Do Minimum option. All values are the net present values over the 40-year analysis period using a discount factor of 6%.

Table 13: NPV net cost and benefits for Preferred Option in comparison with the Do Minimum

PREFERRED OPTION	ROUNDABOUT
NPV Cost (k)	$6,260
BENEFITS	
NPV Travel Time Savings (k)	$14,572
NPV Vehicle Operating Costs (k)	$4,086
NPV CO2 Emissions (k)	$273
NPV Accidents (k)	$452
NPV Total (k)	**$19,384,597**
BCR	**3.1**

7.4 Comparison with Earlier Stages

This project is a Single Stage Business Case and no previous economics were undertaken for this project.

7.5 Sensitivity Analysis

Table 14 outlines the results of sensitivity testing undertaken on the SH10 / Waipapa Intersection economic outputs. The results of the sensitivity analysis indicate BCR's of ***between 1.9 and 3.7***. As with most economics, the intersection BCR is the most sensitive towards changes in the assumed traffic growth. The base case has assumed an annual growth of 2.2% growth up to 2036, which is not unreasonable as growth over the last 5 years has been in the range of 4% per annum.

In all scenarios, the Roundabout option has the highest BCR of the tested intersection layouts. The reason for this is that the roundabout layout has the longest intersection life expectancy for good capacity in relation to traffic growth, and is not sensitive to changes in traffic flows or travel patterns.

Table 14: Benefit Cost Ratio – Sensitivity Test

TEST PARAMETER	VALUE	BCR
Without Klinac lane Link	Remove the Klinac Lane from the Do Minimum (Reducing vehicles on Waipapa Loop Road)	1.8
Growth Rate	1%	1.4
	3%	4.3
Discount Rate	4%	4.6
	8%	2.1
Construction Cost	+20%	2.5
	-20%	3.8

7.6 Incremental Analysis

An incremental benefit analysis has been undertaken to illustrate the economic return for the additional investment between each of the options. However, it should be noted that the variation in construction cost estimates between the different options is relatively small, and there is little scope to implement this project in stages. As Figure 20 illustrates the construction cost for all options range from approximately $5M to $6.1M. It also shows that the Roundabout option provides the most benefits. In relation to the BCR, the incremental BCR for the Roundabout is 3.1 in comparison with Option 1: Right Turn Bay.

In other words, for the additional $1.4M invested in the Roundabout the economic return is around $5M. In addition, the capacity life of the roundabout is superior in comparison with all of the other options, which makes it the favoured option.

Figure 20: Incremental analysis

7.7 Assessment Profile

An assessment profile of **MHM** has been determined for the Preferred Option of the Roundabout and Corridor Treatment. The derivation of the assessment profile is discussed below.

7.7.1 Strategic Fit Rating

Assessing the project from both a national and local context, the project has been rated as a **Medium** strategic fit.

National Context

SH10 is part of Twin Coast Discovery Highway that was created in 1999, and is considered nationally significant. In 2016, the NZ Transport Agency, along with a number of local and regional councils, proposed to investigate future investment opportunities on the Twin Coast Discovery Route and developed the Twin Coast Discovery 'Corridor Plan'.

The Programme Business Case is currently under internal review. The aim of this Corridor Plan is to make the route safer and more reliable, as well as providing better accessibility to main centres for tourists, local communities and freight operators.

Regional Context

The project fits well with the Tai Tokerau Northland Economic Action Plan. Whilst that plan has an obvious economic focus, it also recognises the importance of a 'safe and efficient' road network to support the growth in freight and visitors, particularly through the revitalisation of the Twin Coast Discovery Route.

Furthermore, the Regional Land Transport Plan places considerable importance on the upgrade of the road network linking Waipapa, Kerikeri and Paihia, recognised as dominant centres of activity.

Waipapa has been identified as one of the key areas to support economic growth and opportunities to intensify industrial, commercial and retail development in the Waipapa-Kerikeri area. The Preferred Option in this DBC is an essential part of the plan to support this strategically important growth.

7.7.2 Effectiveness Rating

The preferred intersection upgrade option and attendant corridor improvement, in combination with the council-driven Klinac Lane Extension, has been rated **High** as a network improvement in relation to **Effectiveness**:

The preferred network, corridor and intersection option provides an effective solution to address the identified problems and achieve the project objectives. The proposed roundabout is the superior intersection layout to reduce the existing delays experienced by local traffic without significant effects on the SH10 through-traffic. A roundabout at this location also improves access to and from Waipapa Loop Road and therefore encourages further development opportunities with the Waipapa industrial/commercial zone. The proposed corridor improvement is a cost-effective solution to address a number of current safety problems and provide a more integrated road network. The proposed roundabout will provide safer local access and will also reduce speed through Waipapa on the State Highway, which will have safety benefits for both motor vehicles and vulnerable road users.

7.7.3 Efficiency Rating

The economic assessment undertaken for the SH10 / Waipapa Road intersection indicates the project would result in a **BCR of 3.1** and therefore the project has been ranked as **Medium** in relation to **Efficiency**.

The economic benefits outlined in the assessment are primarily from travel time benefits within the intersection. This ignores any wider benefits from the project such as inward economic investment into the Waipapa area. The project will enable growth within the area which is considered to be a positive, generating its own benefits. These latter factors suggest the Efficiency benefit is actually higher.

PROCESS FOR IMPLEMENTATION

8. FINANCIAL CASE

8.1 Summary

The Financial Case concentrates on the affordability of the proposal, its funding arrangements and technical accounting issues.

The total project 'Expected Cost' for the Preferred Option and Waipapa Corridor Treatment is $7,069,265 including property, pre-implementation and contingency, assuming commencement of pre-implementation in 2017 and implementation in 2018.

Ongoing periodic maintenance and renewal costs are estimated at $60,000 per year.

Methodology

The methodology for the cost estimation carried out for this report was as follows:

- Elemental breakdown cost estimation was completed for the Do Minimum and the Short List Options[2].
- Base Estimate is based on the elemental cost estimation.
- Expected Estimate is based on a percentage increase to the base estimate due to the level of uncertainty, either in terms of the design stage or the variability in the rates. This, in most cases, means a 10% addition for variation in the quantities/rates. For items with greater level of uncertainty including property, pre-implementation fees, and service relocations; a 20% contingency has been added.
- 95th Percentile Estimate is based on taking into account funding risk contingency and semi-quantitative risk analysis. This has resulted in the addition of 10% to the property cost, and 10% to the pre-implementation. Risk Cost (Item 13 of the Physical Works) has been worked out from the project risks identified in the Risk Register (**Appendix K**), weighed against the likelihood of the risk occurring.

8.2 Project Delivery Costs

The costs estimates have taken into consideration the following:

- Nett property costs
- Design costs
- Construction costs (including Preliminary & General (P&G))
- Risk Analysis: General Approach (semi-quantitative)
- 'State of market' premium

The Elemental Costs and Detailed Business Case Estimates (DBE) for each option are presented in **Appendix K**. The Expected Costs for the Preferred Option and associated works are presented in Table 15.

[2] The methodology is written for how the cost estimates were arrived at for all the Options, however only the Preferred Options costings are detailed in this section. The elemental cost and detailed business case estimates are presented in Appendix J.

Table 15: Summary of Detailed Business Case Cost Estimate for Preferred Option and associated works

CRITERIA	SUMMARY OF PROJECT COSTS	ASSUMPTIONS
Roundabout	$7,069,265	
Klinac Lane Extension[3]	$494,429	Part funding from Far North District Council.
Waipapa Corridor Treatment	$891,580 (*base cost only*)	Waipapa Corridor Treatment cost is included in the option cost.
TOTAL	**$7,563,694**	

Pre-Implementation

The following table outlines the key project delivery cost assumptions for the Preferred Option during the pre-implementation phase.

Table 16: Pre-implementation project delivery key costs and assumptions

CRITERIA	KEY COSTS AT PRE-IMPLEMENTATION - KLINAC LANE	KEY COSTS AT PRE-IMPLEMENTATION - PREFERRED OPTION (ROUNDABOUT)[4]	ASSUMPTIONS
Property Purchase, Management and Disposal Costs	$0	$1,198,500	Property purchase to forward as voluntary with no significant compensation costs.
Design & Procurement Costs	$43,752	$508,089	13%[5] of base physical works estimate. Klinac Lane Extension and Preferred Option to be procured as a package.
TOTAL	**$43,752**	**$1,706,589**	

[3] Klinac Lane Extension works are expected to form part of the solution alongside the Preferred Option to gain the full benefits of the scheme. FNDC are the partners to NZTA in this scheme and will provide part funding for the Klinac Lane Extension works.
[4] The costs for the Preferred Option: Roundabout include the costs for the Waipapa Corridor Treatment.
[5] The percentage assumption is used to derive the fees that forms the **Base Estimate.**

Implementation

Table 17 outlines the key project delivery cost assumptions for the Preferred Option during the implementation phase.

Table 17: Implementation project delivery key costs and assumptions

CRITERIA	KEY COSTS AT IMPLEMENTATION – KLINAC LANE	KEY COSTS AT IMPLEMENTATION – PREFERRED OPTION (ROUNDABOUT)[6]	ASSUMPTIONS
Implementation Fees	$36,715	$426,369	10% of base physical works estimate.
Statutory application costs	$0	$55,000	
Construction Costs	$413,962	$4,881,307	• Timing assumptions – x1 construction season in 2018. • Earliest implementation date – it is assumed that the project will commence in 2018. • Expected duration of implementation – it is assumed that the expected duration of implementation will be 6 – 9 months. • Supplier Market – it is assumed that there may be an increase in construction project costs as a result of market forces due to higher levels of construction activity, and that this will be reflected in increases in the cost of labour/materials and fees. • 15% accounted for Supplier market premium costs. Service relocation costs are estimated. P&G estimated at 8% of the physical works.
TOTAL	**$450,677**	**$5,362,676**	

The cost estimate in this report has been carried out based on the NZ Transport Agency's Cost Estimation Manual (SM014).

[6] The costs for the Preferred Option: Roundabout include the costs for the Waipapa Corridor Treatment.

DBE Notes:

These costs will require further refinement at preliminary design stage. The order of cost will be sensitive to further information and market forces. The costs for service relocation are estimates only.

It is understood that a cost estimate has not been previously produced for this project. It is the aim of this cost estimate to be as comprehensive as appropriate at this early stage of the project lifecycle, and reflects the cost risk analysis to provide some contingency and project costs (actual and forecast).

Property

Land Requirement Plans were drafted for the short-listed options to establish the extents of the property that would have to be acquired for each. Table 18 summaries the land requirements with rough order magnitude (ROM) cost estimates.

The Land Requirement Plans are presented in **Appendix L**.

Table 18: Property affected in the project site from the Preferred Option

SHORTLISTED OPTIONS	PROPERTY REQUIREMENTS	ESTIMATED AREA TO BE ACQUIRED	NETT PROPERTY PURCHASE COSTS
Do Minimum – Klinac Lane Extension		0	$ 0
Roundabout	Lot 2 DP 22952, Lot 2 DP 72659, Lot 1 DP 153739, Lot 1 DP95010, Lot 2 DP 153648	1504m² *(add the area for the dairy)*	$ 998,750
Waipapa Corridor Treatment*	Lot 1 DP 153739, Lot 4 DP 98489, Lot 3 DP 98489, Lot 4 DP 102236, Lot 5 DP 102236, Lot 3 DP 99619	491m²	46,750*
**Waipapa Corridor Treatment nett property purchase cost is included in each of the option costs.*			

Services

A desktop study of the services in the project site identified energy, potable water, storm water, and telecommunications services. The various service authorities were contacted for their initial relocation estimates based on the requirements of the Preferred Option. The Expected Estimate includes services relocation costs of **$1,548,000**.

These estimates are detailed in **Appendix J**.

The Concept Plans with the services overlain for the Preferred Option 1-11751.00 X02, X20-25 Revision C are presented in **Appendix H**.

Ongoing Maintenance and Operation Costs

The ongoing maintenance cost would involve the roundabout landscaping maintenance and the pavement maintenance including the corridor and the intersection. Table 19 gives an outline of the key ongoing expenditure assumptions for the recommended option.

Table 19: Ongoing operation and maintenance costs for the Preferred Option

CRITERIA	KEY COSTS	ASSUMPTIONS
Operating Costs	NA	NA
Maintenance Costs – short term	$60k Annually	Maintenance includes general maintenance and repairs (road signs, lighting, etc.), and roundabout landscaping, roadside landscaping (to maintain safety) and weed control.
Maintenance Costs – long term	$600k in 20 years' time	Maintenance includes road maintenance and repairs (pavement rehabilitation, etc.)
Other Costs (Insurances, etc.)	N/A	None

8.3 Option Cost Risk Analysis

The risk analysis was carried out in accordance with the NZ Transport Agency's Minimum Standard Z/44 – Risk Management Version 4, Apr 2015. As the estimated project cost is <$20M; the General Approach (i.e. interpretation of semi-quantitative data) to risk analysis has been undertaken.

17 risks have been identified so far including risk costs and time risk costs, of which 16 are threats and 1 is an opportunity. 5 threats have been identified as extreme risk and 8 as high risk.

The extreme risks (prior to any mitigation measures being implemented) are related to:

- consenting conditions that may be placed in reference to the flooding issues in the area.
- the potential requirement for the relocation of power poles at the north end of Loop Road and the western end of Skippers Lane (*Roundabout option only*).
- the lack of clarity around the funding for the treatment of Klinac Lane.
- the former orchard site, a portion of which will be required for the preferred option, and
- the petrol filling station, a portion of which will be required for the preferred option.

The Risk Register that details the identified risks with their owners and suggested mitigation measures is presented in **Appendix K**.

8.4 Project Revenues

No project revenues are forecast for this project.

8.5 Funding Options

Subject to meeting overall thresholds for investment, it is anticipated that the activity can be funded in the main from the National Land Transport Fund (NLTF) and Road Improvement Activity Class. There is some additional funding that can be obtained from the Far North District Council towards the Klinac Lane Extension.

8.6 Funding Risk

There are no funding risks foreseen at this stage.

9. COMMERCIAL CASE

This chapter provides evidence on the commercial viability for this DBC and the procurement strategy that will be used to engage the market.

9.1 Contract Form

It is proposed that the project is delivered using a traditional design approach considering the scale of the project, the anticipated timeline for delivery and the flexibility this provides the NZ Transport Agency.

A Measure and Value contract form is therefore anticipated, which will require a full detailed design with technical specification and a detailed schedule of quantities for pricing. There are no unusual processes identified at this time that could complicate the construction process.

Tenderers will need to be pre-qualified for construction level 4B with the required management, quality, safety and technical support systems.

9.2 Implementation Strategy

The implementation strategy has been developed consistent with the NZ Transport Agency's Procurement Manual, 1st Edition, Nov 2009.

The proposed implementation strategy is aimed at a mid-2018 contract award, assuming property acquisition proceeds by agreement. Table 20 outlines the proposed implementation programme, the indicative programme is presented in **Appendix M**.

Table 20: Proposed implementation programme

PROJECT IMPLEMENTATION MILESTONE	APPROXIMATE COMPLETION DATE
Approval of Business Case	20 October 2017
Appointment of Professional Services Supplier	27 October 2017
Stakeholder Engagement / Statutory Consenting – initial	20 October 2017
Stakeholder Engagement / Statutory Consenting	9 April 2018
Detailed Design and Specification for Request for Proposal (RFP)	25 June 2018
RFP to market (competitive tender – price quality)	9 July 2018
Close of RFP	10 August 2018
Preferred Respondent announced	7 September 2018
Contract Award	7 September 2018
Physical Works Commencement	10 September 2018
Handover of Capital Project	1 April 2019
Post-Project Evaluation	19 April 2019

NB. Fitting the whole of the Works into a single construction season may be tight, so the implementation strategy should look for opportunities during the detailed design phase to separate our early procurement of some advance works (e.g. services relocations).

9.3 Consenting Strategy

Most NZ Transport Agency projects require statutory authorisations ranging from a relatively simple outline plan of works for projects which can be constructed under the authority of an existing designation, to obtaining multiple resource consents, statutory authorisations and designations.

The Preferred Option, the Roundabout, was the second most favourable in terms of consenting and is not anticipated to be too difficult in its implement ability. The designation will only need to be extended by a small amount; towards the corner of the petrol station and orchard. It is expected that there will be sufficient detail available to provide to the territorial authority such that the works could be authorised through an alteration to the designation.

Activities regulated under other statutory instruments other than the District Plan will be assessed for compliance and applications lodged for consent where permitted activity provisions are unable to be met. This can include any breaches of Regional Plan rules or a National Environmental Standard.

The information supplied for statutory approvals should achieve the following objectives:

- To lodge applications with sufficient detail to avoid ongoing requests for further information.
- To obtain statutory authorisations with reasonable/practical conditions, which still allow for helpful innovation on site.

The Planning and Environment Assessment Report presented in **Appendix N** outlines the means of achieving this outcome.

9.4 Property Acquisition Strategy

Land acquisition will be required for this project and will be achieved by constructive agreement as best practical, which seems likely in most cases, but also in accordance with the Public Works Act 1981 where necessary. The NZ Transport Agency engage Crown Property Services Ltd[7] (CPS) to manage their land acquisition requirements.

A CPS Representative, the NZ Transport Agency Business Case Project Manager, and the FNDC Project Manager have been in initial conversations with all the landowners principally affected by the proposed Waipapa Intersection Improvement works. These initial conversations have involved familiarising the landowners with the project aims and scope, and listening to the landowners respective views. The Stakeholder Consultation and Engagement Report, presented in **Appendix O**, presents more detail regarding the parties affected and their reaction to the proposed works.

9.5 Procurement/Delivery Model

Table 21 discusses the criteria considered for selecting the procurement/delivery model as best suits the preferred option and its context (*as per Appendix B of the Procurement Manual*).

[7] CPS are a Land Information New Zealand (LINZ) accredited specialist.

Table 21: Delivery Model selection

CRITERIA	DEFINITION	PREFERRED OPTION ASSESSMENT	INFRASTRUCTURE: STAGED	INFRASTRUCTURE: DESIGN & BUILD	INFRASTRUCTURE: SHARED RISK (ADVANCED)	INFRASTRUCTURE: SUPPLIER PANEL (ADVANCED)
Complexity	Levels of complexity including: Structural complexity is the number of varied components and the interdependence of these components.	The Preferred Option: Does not comprise particularly varied components but a single roading component with enabling and associated works well within the remit of a roading contractor.	✓			
	Technical complexity is the extent to which untested or new technical issues need to be addressed in delivering the activity.	Is not envisioned to encounter any untested or new technical issues.	✓			
Uncertainty	Is there uncertainty existing in the methodology and expected outcomes?	No	✓			
	How many separate components exist in the activity?	The preferred option only has one component, namely the roading works including the widening of the Waipapa Corridor treatment, Intersection treatment in terms of a roundabout, and associated works (shared cycle, walkway, Klinac Lane extension).	✓			
	Are these components interdependent?	N/A	✓			
Scale	Scale of the contract including: Will more than contractor be required for the project implementation?	No	✓			

CRITERIA	DEFINITION	PREFERRED OPTION ASSESSMENT	INFRASTRUCTURE: STAGED	INFRASTRUCTURE: DESIGN & BUILD	INFRASTRUCTURE: SHARED RISK (ADVANCED)	INFRASTRUCTURE: SUPPLIER PANEL (ADVANCED)
Timing and urgency	What is the expected delivery date for this project?	2018-2019	✓			
	Which delivery model is likely to optimise activity delivery time?	It is recommended that the model likely to optimise delivery time is the Staged Delivery Model with Direct Appointment.	✓			
Innovation potential	Would the introduction of incentives encourage innovation such that: - project quality and efficiency are increased? - delays and risks are minimised?	There is scope for improvement in efficiency with incentives. There is scope for minimising delays and risks with incentives.	✓			
Supplier Market	Will the project attract a highly competitive market of potential suppliers? or is the activity profile likely to attract a supplier market that will be lacking in competition?	It is likely that due to the scale of the project and the current market activity the project may be more attractive to the suppliers if the turn-around from procurement to project delivery was short.	✓			
Risk management: What is the status of the following risks for the Preferred Option? (*The risks mentioned here are from the Risk Register (Appendix J) and comprise semi-quantitative*	Cost and time risks	The cost and time risks for this project are envisioned to be low with the exception of: 1) Property acquisition 2) Services relocation 3) Contaminated land (former orchard and petrol filling station)	✓			
	Quality risks	The quality risks for this project are envisioned to be low.	✓			
	Technical risks	The technical risks for this project are envisioned to be low.	✓			
	Scope risks	The scope risks for this project are envisioned to be low.	✓			

CRITERIA	DEFINITION	PREFERRED OPTION ASSESSMENT	INFRASTRUCTURE: STAGED	INFRASTRUCTURE: DESIGN & BUILD	INFRASTRUCTURE: SHARED RISK (ADVANCED)	INFRASTRUCTURE: SUPPLIER PANEL (ADVANCED)
assessment prior any treatment strategy.)	Third party risks	The third-party risks for this project are envisioned to be low - medium.	✓			

9.6 Implementation Trigger

The main trigger for implementing this project is that the intersection of SH 10 / Waipapa Road has already reached capacity, which means that any growth in traffic will result in longer queues and longer delays. As this Business Case more fully covers, there are various other shortcomings also supporting that trigger, such as increasing safety problems.

9.7 Risk Allocation and Transfer

Risk will be allocated in accordance with a traditional Client/Consultant/Contractor model and apportioned in accordance with the relevant standard conditions of contract (typically NZ3910:2013).

Start and end of phase risk assessments will be completed for design, tendering and construction.

9.8 Pricing Framework and Special Payment Mechanisms

The pricing framework will be based on similar works and traditional procurement. Given the relatively routine nature of the physical works envisaged, no financial performance based incentives will be made available to the Contractor.

9.9 Works Contract Length

It is expected that the bulk of the physical works will be completed within 6 months, although this may be quite tight so needs closer consideration in due course. It is recommended that during the pre-implementation phase, a procurement strategy is developed, which should consider to potentially split off packages of work to optimise the timing of the physical works.

9.10 Contract Management

The Professional Services provider will have end-to-end accountability for the works contract. The assigned Project Manager will manage the project through all phases, with active scheduling and management techniques expected to be employed. Support for in-service management should be sourced from the Professional Services provider's wider resources as appropriate for the task complexity.

The pre-implementation phase is likely to take six to nine months from approval, dependant on stakeholder consultation outcomes, and statutory requirements.

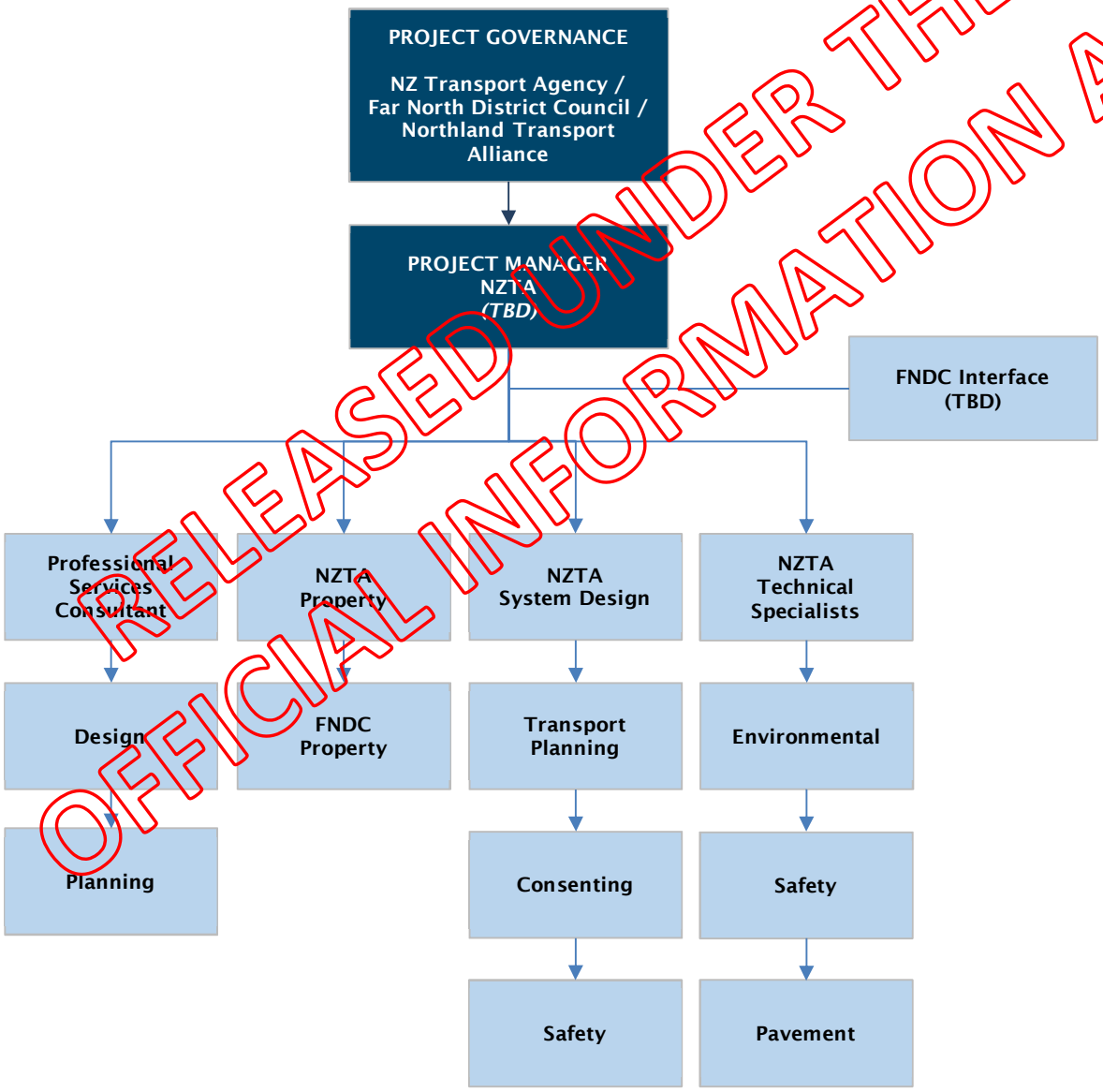
10. MANAGEMENT CASE

10.1 Governance Structure and Project Roles

This project will be delivered by the NZ Transport Agency working with their appointed consultants and contractor. The Regional DMT will be responsible for committing funds and accepting risk allocation.

The governance structure is established by the NZ Transport Agency, and includes stakeholders who will variously influence of the development and finalisation of the contractual, financial, and other arrangements. It is presented as Figure 21 below.

Figure 21: Project Governance Structure



10.2 Project Roles

The project team and roles will be confirmed by the NZ Transport Agency on business case approval and the subsequent project phases of pre-implementation and implementation.

10.3 Project Metrics

The project metrics include the following:

Business Case Approval

This Business Case will be put forward to the NZ Transport Agency's Investment Finance Team (IFT) seeking approval for the project. The Business Case will also be put forward to Dougal List, Manager Regional Development.

Project Assurance

The NZ Transport Agency HNO's acceptance criteria will be met by following the key project assurance protocols for the project pre-implementation and implementation phases, including IFT approvals for Funding and Implementation Phase, Detailed Design, Project reviews, and Procurement phases.

Detailed Design

The Detailed Design will be carried out by the nominated Professional Services Consultant who will develop the Preferred Option for the implementation phase. This design will be cognisant of and compliant with the NZ Transport Agency and Austroads Standards.

Reviews and Audit

The Detailed Design will be peer-reviewed at 90% completion by a suitably qualified and experienced person independent of the design team, and nominated by the NZ Transport Agency.

A Safety in Design (SiD) Review will be carried out at the following stages of the project prior to proceeding to the next stage:

- Scheme/Preliminary Design Stage
- Detailed Design Stage

The Safety Audit is similarly an independent review, and aims to identify any deficiencies potentially remaining in the design that could affect the safety of road users. The objective of a road safety audit is to help ensure a project achieves an outcome that is consistent with the "Safer Journeys" strategy and the "Safe System" approach, which of course seek to avoid occurrences of serious injury or death. As such specific safety audits will be undertaken at the following stages:

- Detailed Design
- Post-Construction

Consistent with these aims, a Safety Audit has been conducted at the current stage (Scheme/Preliminary Design) and is presented in **Appendix O**.

Any design departures that are approved by the NZ Transport Agency during the tender stage will be fed into the safety audit process for assessment.

Procurement and Contract Award

The procurement will be carried out as per the procurement procedure set out in the NZ Transport Agency's Procurement Manual, 1st Edition, Nov 2009. The procurement procedure to be followed for this project is Staged Delivery model, Professional Services supplier – Direct Appointment, and Physical Works supplier – Price Quality.

Post Project Evaluation Planning

The post project evaluation will be carried out as detailed in Section 10.8 of this report.

10.4 Change Control

An approval process to track change/s whether they receive approval or not is proposed. The Project Manager will brief anyone who is involved in completing a task as part of the Project on the Change Process.

Levels of change authorisation should be established at the outset of each phase. Any Change Request must include a detailed description of the proposed change and its impact on the Project as a whole, in respect to time, cost and quality.

Some changes could have significant impact and these would require PCG/Project Sponsor approval. It is for the Project Manager to determine the level of authorisation required. Once approved, the tasks will be updated and reissued.

10.5 Stakeholder Management

The stakeholder management process is set out in the Waipapa Intersections Upgrade, Stakeholder Consultation and Engagement, September 2017 presented in **Appendix P**. It discusses the consultation approach following the NZ transport Agency's guidance and indicates how this translates into an engagement process.

Consultation and engagement to date has been targeted at the strategic end of the Project profile and this has resulted in the Preferred Option: Roundabout receiving a high-level of support from the Waipapa community during a well-attended Open Day.

Continued engagement and consultation will be necessary during detailed design, particularly with key stakeholders, affected landowners and businesses. The purpose of consultation and engagement during this phase will need to be clear, particularly where decisions have already been made.

Consultation programmes therefore should be developed around the Project phases of procurement and construction to identify timelines, objectives of engagement, risks, purpose of engagement, methods, measurables and evaluative actions/feedback loops.

As such going forward, the project team will have a dedicated Stakeholder Manager responsible for involving and leading the key stakeholders through successive project phases.

10.6 Cost Management

The cost management will be carried out based on the *Scope and Cost Control Process* guidelines set out in the NZ Transport Agency's Cost Estimate Manual, SM014, Amendment 1, Oct 2015. The following statements are highlighted:

> "To ensure scope changes are identified, scrutinised, agreed and costed at the appropriate time;
>
> To ensure that there is a robust updated project cost estimate available at all times."

The project scope will be defined at the start of each phase. A cost control schedule will be set up for each phase of the project and will record scope changes (if any) and updated cost estimates. The cost control record form will be used to record in detail each individual scope change that may arise.

10.7 Risk Management

The risks identified thus far have been assessed in accordance to the NZ Transport Agency's Minimum Standard Z/44 – Risk Management (General Approach) Version 4, Apr 2015 and discussed in Section 8.3 and Appendix J: Risk Register. The Client may elect to conduct a review of the risk documents and satisfy itself of the risk management dimension of the project.

A risk management plan, including an activity risk file, and a risk adjusted programme, will be produced for the project at the Pre-Implementation stage. The risk owner(s) will be clearly defined in the risk management plan, with the process for risk identification, treatment, monitoring, and review set out along with the reporting procedures.

This plan will be managed by the Project Manager, and will remain a live document, as such will be reviewed and updated periodically.

10.8 Post-Project Evaluation Planning

The safety outcome of the project will be measured based on the number of deaths and serious injuries that are reduced. Crash records will be reviewed each year following implementation, although meaningful trends cannot be established until at least 3 years have passed since implementation so a full measure will evolve over time.

Lesson Learned

It is recommended that a *Lessons Learned* register be maintained throughout the project phases. This register is to be managed by the Project Manager and will be communicated within the team at reasonable intervals. Following project completion these lessons learnt will be fed back to the NZ Transport Agency, and any helpful follow-up action duly considered.

APPENDIX A
Waipapa Road / State Highway 10 Intersection Traffic Study

Waipapa Road / State Highway 10 Intersection Traffic Study

Waipapa Road / State Highway 10 Intersection

Traffic Study

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Date: 4 October 2016
Reference: 1-13046.00
Status: Final

Contents

Appendices

1 Background & Scope

1.1 Introduction

This traffic study has been produced for the Far North District Council (FNDC) to assess various forms of intersection control for the Waipapa Road and State Highway 10 (SH10) Intersection. The existing Waipapa Road/SH10 Intersection is designed as cross priority controlled intersection, which experiences efficiency and capacity issues for the two minor approaches especially in the peak periods.

Land use in the vicinity of the intersection is mainly commercial and the existing constraints within the intersection currently limit future commercial and industrial growth in the area.

The study aims to consider various forms of intersection control, together with various growth rate scenarios in order to provide an indication of possible intersection upgrades. Future road network changes are also considered to assess the change in traffic flows and any impact on the operation of the intersection.

An optimal form of intersection control is recommended together with the useful life (i.e. how long the recommended intersection control will operate in future years if implemented).

The location of the intersection is shown on Figure 1-1 below.

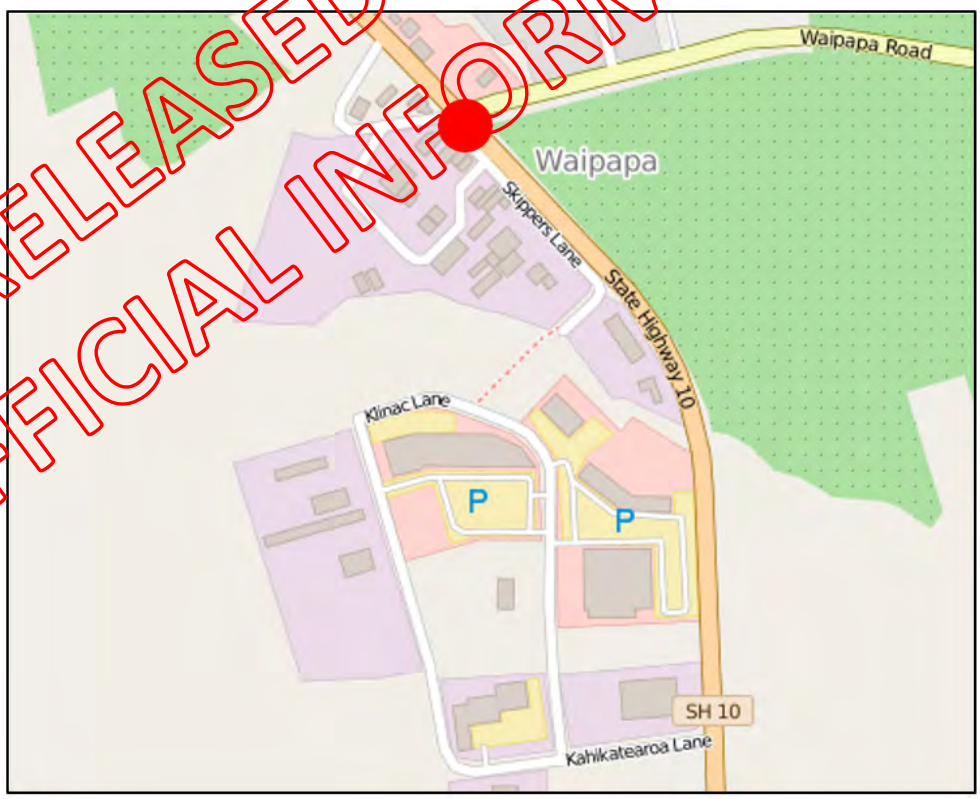


Figure 1-1 Locality Plan

The intersection is located in the Kerikeri District as shown on Figure 1-2.

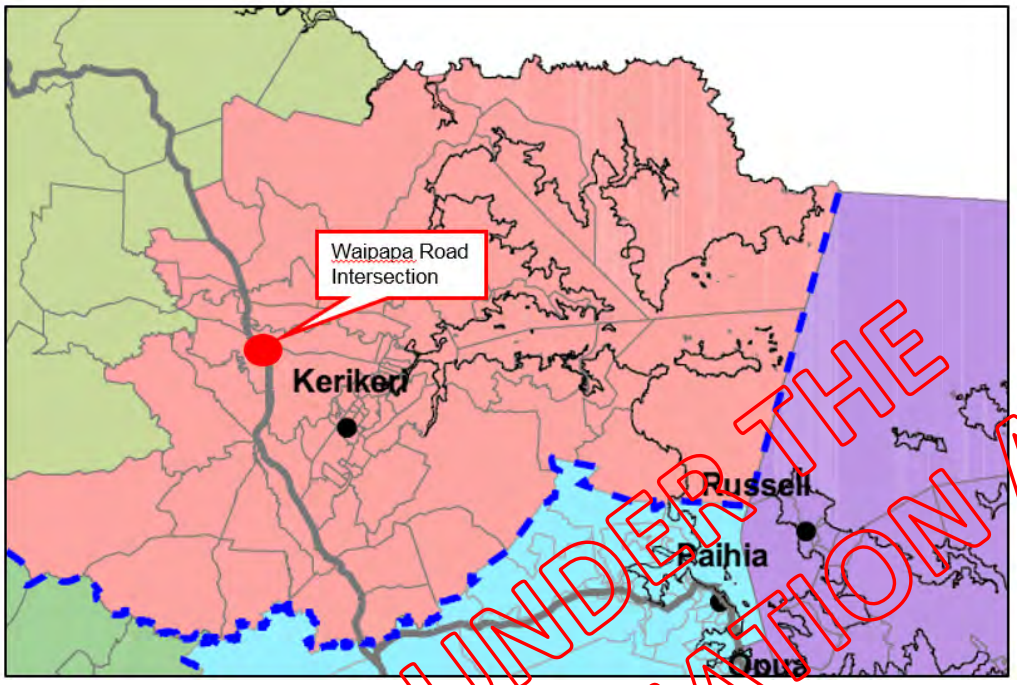


Figure 1-2 Kerikeri District

The existing intersection layout for the Waipapa Road and SH10 Intersection is shown on Figure 1-3 below.

Figure 1-3 Waipapa Road and SH10 Intersection

1.2 Objectives

The objectives of the study are to :

1. Undertake an efficiency and capacity assessment of different intersection layouts for the Waipapa/SH10 Intersection including the existing intersection layout.
2. Determine the expected life of an intersection upgrade using different growth and road network changes.

1.3 Intersection control considered

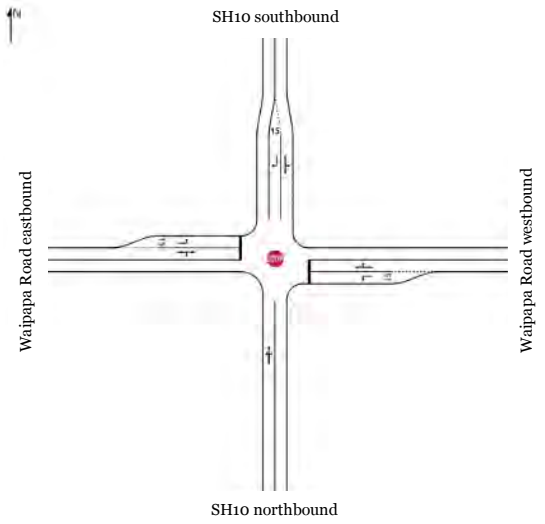
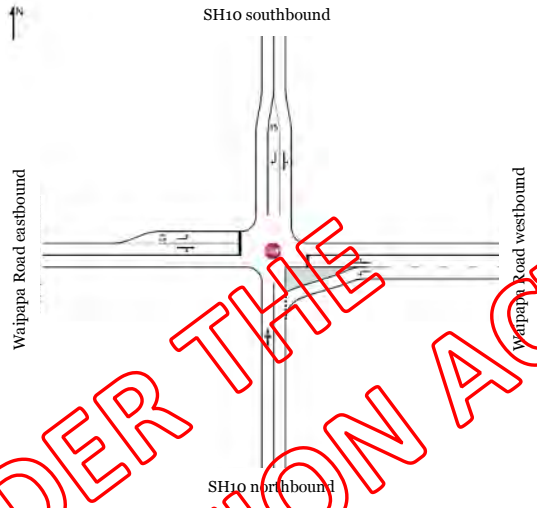
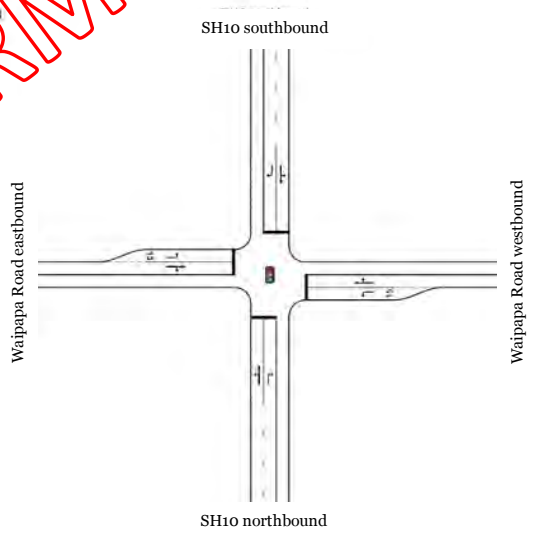
The aim of the assessment is to consider the following forms of intersection control at the Waipapa Road and SH10 Intersection:

- A priority controlled intersection (existing situation)
- An improved priority layout (left slip lane from Waipapa Road onto State Highway 10 southbound)
- A signalised intersection
- A roundabout

These layouts have been modelled in SIDRA Intersection version 7. SIDRA reports the performance of an intersection in terms of Level of Service (LOS) and Volume to Capacity (V/C) ratio. Level of service range from LOS A to LOS F with LOS A being free flow with no or very small delays and LOS F reflecting a congested environment with an average delay of over 60 seconds. In this location a LOS D and better during the peak periods would be considered acceptable. The V/C ratio is a function of the volume divided by the capacity. The volume for any approach can be defined as the actual number of vehicles passing a point of a road. The capacity can be defined as the maximum vehicles per hour that can pass a certain point or section of a road in a given time under ideal conditions. Any V/C ratio higher than 1 indicates unacceptable operation.

The intersection layouts considered in the study are shown in Table 1-1 below.

Table 1-1 Intersection layouts

Existing	Left Slip Lane
	
Roundabout	**Traffic Signal**
	

1.3.1 Existing layout

This is the existing operational layout at the Waipapa Road and SH10 Intersection as modelled using SIDRA Intersection 7. Short lanes for left turn movements have been provided on the western and eastern approaches and for the right turn movement on the northern approach. The existing line marking does not show these short lanes but the modelling recognises that the current approaches are wide enough to allow two turning vehicles to queue while still allowing other vehicles to pass.

1.3.2 Left slip lane

A left turn slip lane from Waipapa Road onto SH10 southbound (for which funding has been allocated in the Long Term Plan) has been considered. Short lanes were provided for turning vehicles as discussed for the existing layout above. The left slip lane was modelled with infinite lane length in order to determine required length from the queues. Using the output queue lengths from SIDRA we determined that a nominal length will be required (i.e. SIDRA showed that storage required will be less than 3 metres or 1 vehicle).

1.3.3 Roundabout layout

In 2010, AECOM undertook a scheme assessment report[1] for the Waipapa Road and SH10 Intersection. Two options were considered for the intersection :

- A single lane roundabout, with a 30m diameter central circular island
- A two lane roundabout

A single lane roundabout was recommended as the preferred improvement treatment (see Appendix A). This layout was analysed for the roundabout option in this study.

1.3.4 Signalised intersection

A signal controlled intersection with a three phase cycle was modelled. Northern and southern right turn lanes were considered on SH10.

1.4 Additional considerations

1.4.1 Klinac Lane Extensions

In addition to the above intersection options, two extensions of Klinac Lane were considered. These potential extensions will redistribute traffic using the Waipapa Road and SH10 intersection. The Klinac Lane extensions are shown on Figure 1-4.

[1] SH10 Waipapa Road Intersection Improvements, Scheme Assessment Report, AECOM New Zealand Limited, 6 September 2010.

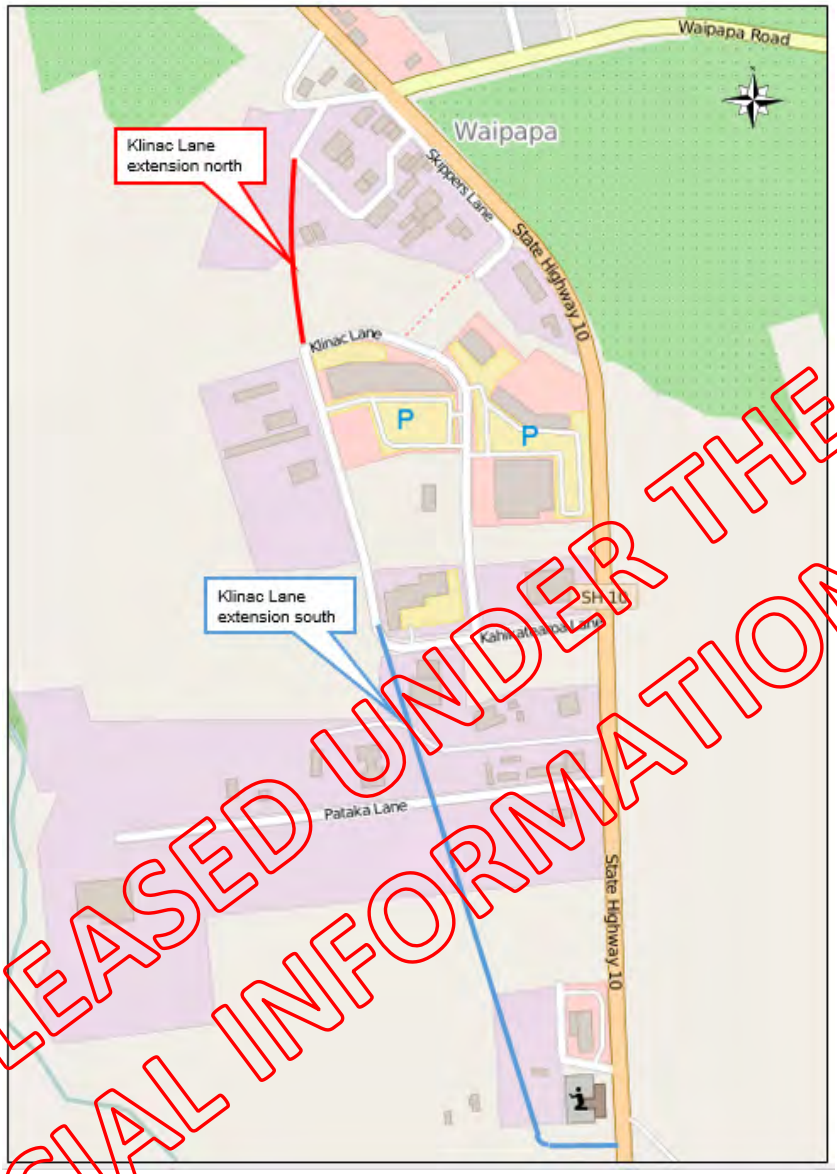


Figure 1-4 Klinac Link Extensions

1.4.2 Pungaere Road Extension

The consequence that the southern extension of Pungaere Road will have on the Waipapa Road and SH10 intersection was considered (see Figure 1-5). If Pungaere Road is extended southwards, the existing intersection of Pungaere Road and SH10 will be closed. The redistribution of traffic due to the southern extension will mean that there is a reduction in the flows on the northern leg and an increase of flow on the eastern, western and southern leg at the Waipapa Road and SH10 intersection. The SIDRA analysis showed that for the roundabout there is a negligible increase in delay (less than 1 second) at the Waipapa Road and SH10 intersection if the link is included together with the closure. The Pungaere road extension was not considered further as there is a negligible difference in delay at the Waipapa Road and SH10 intersection.

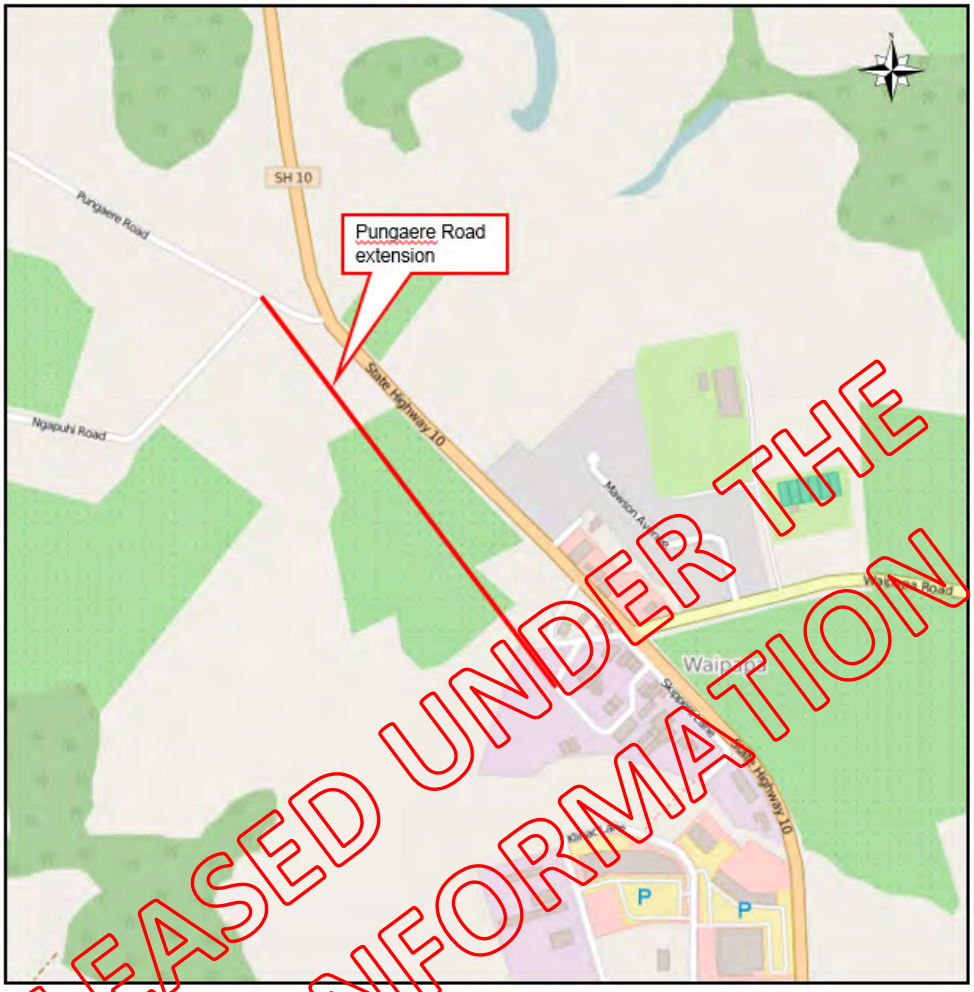


Figure 1-5 Pungaere Road Extension

1.4.3 Waipapa Recreation Ground

The District Council plans to develop an additional mixed sport and recreation facility to serve the Kerikeri area and is currently investigating potential sites. One of these sites sits to the east of SH10 and is considered sufficiently close to the study area to require consideration. The development will gain access from SH10 as shown on Figure 1-6. Only traffic on SH10 to and from the north will travel through the Waipapa Road and SH10 intersection. It is expected that the trips during the critical weekday peak periods will be low to the recreational ground development as the land uses proposed are not peak hour traffic generators. Sufficient provision for future recreation development traffic has been made in the overall background traffic growth on SH10.

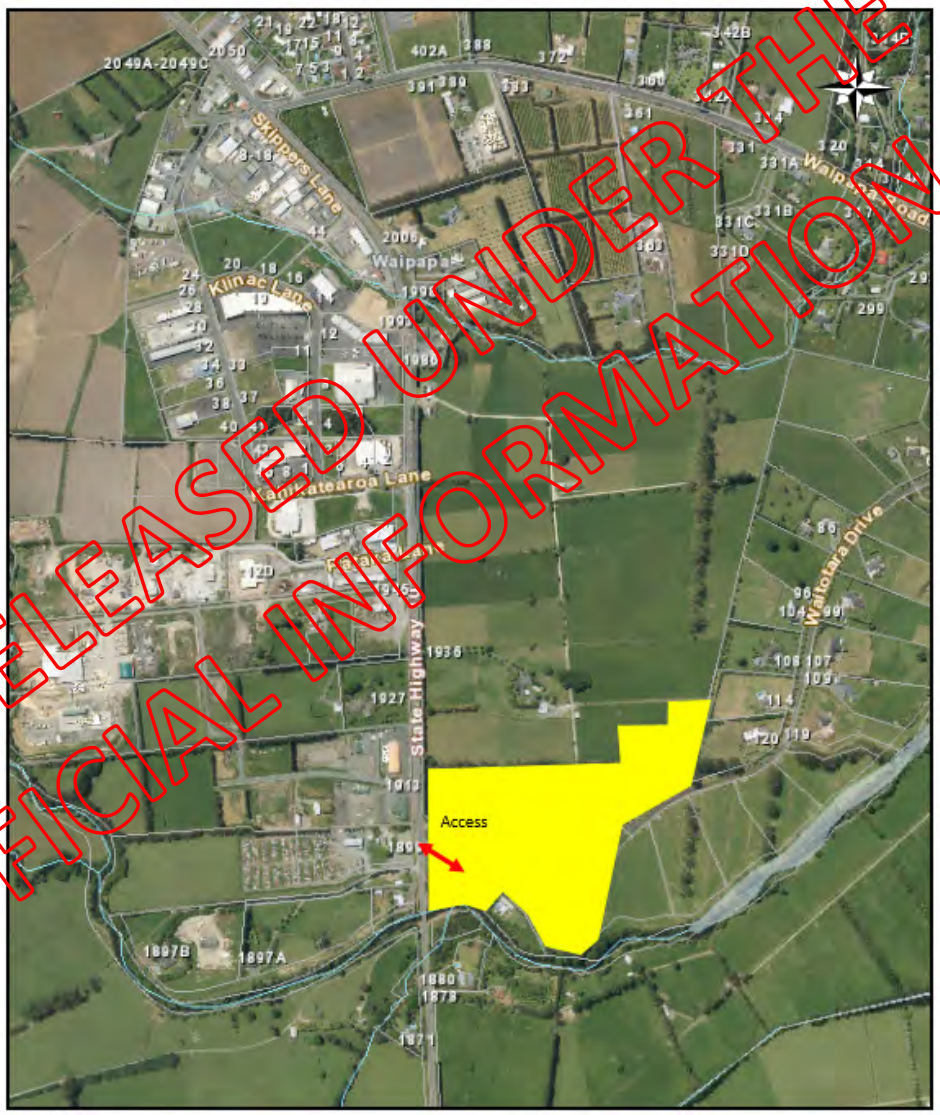


Figure 1-6 Waipapa Recreation Ground

1.4.4 Journey choice from Kerikeri

Vehicles currently travelling from Kerikeri to the north of the Waipapa Road and SH10 intersection have two routes to choose from (see Figure 1-7 below), the northern route (shown in red) and the southern route (shown in green).

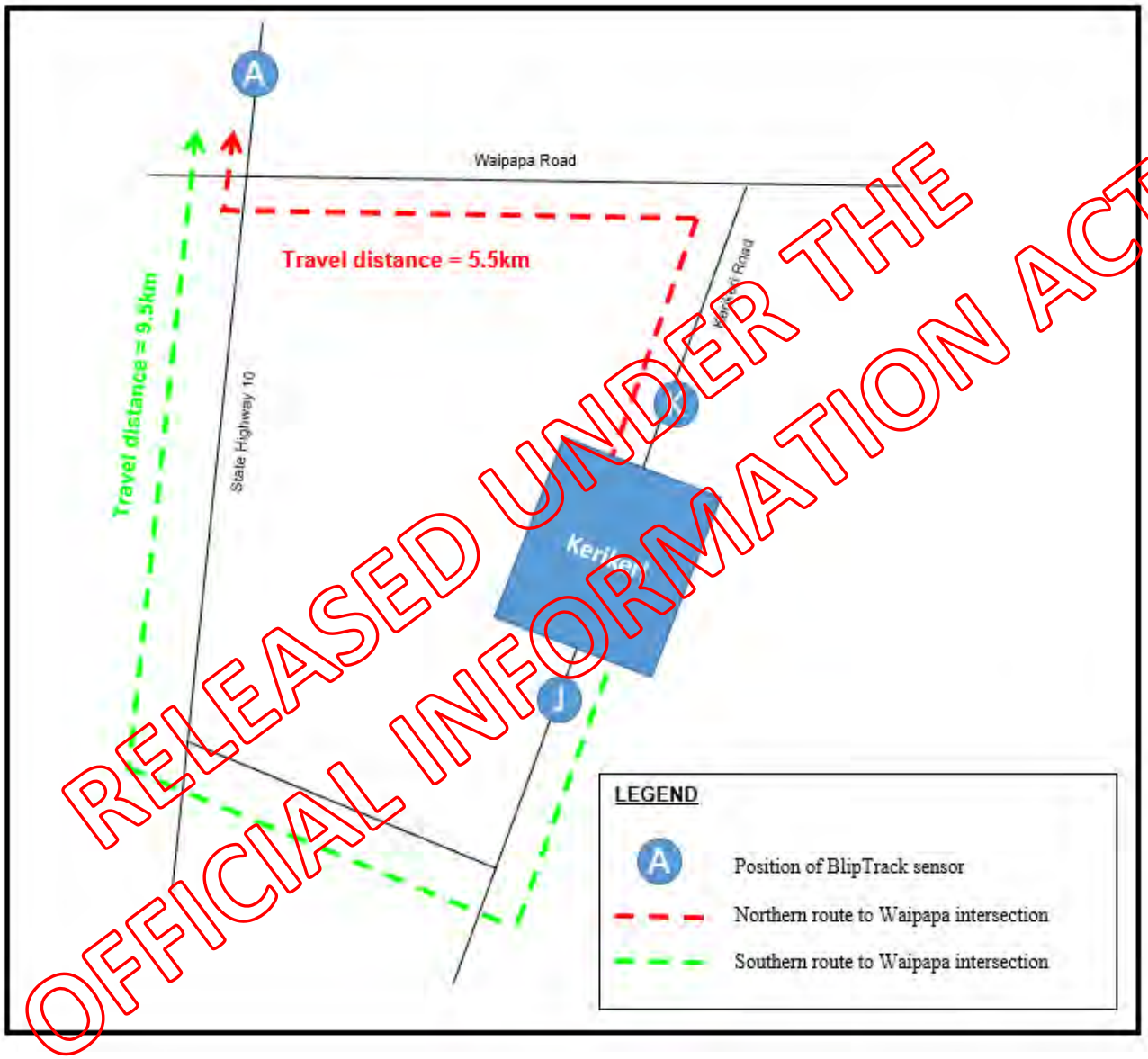


Figure 1-7 Journey choice from Kerikeri

The travel distances and travel times for each of the routes is given in Table 1-2 below. The travel times were extracted for the critical weekday PM peak from the BlipTrack data.

Table 1-2 Travel distances and Speeds

Description	Travel distance (kilometres)	Travel time - PM peak (minutes)
Northern route (K to A)	5.5km	06:00
Southern route (J to A)	9.5km	07:28

Table 1-2 shows that even though the southern route has almost double the length travel distance the travel time is only 1.5minutes longer in the weekday PM peak.

In order to determine the changes in route choice due to the long delays experienced at the Waipapa Road and SH10 intersection the BlipTrack data was further analysed. Figure 1-8 shows that fewer trips are made between J and A (southern route) in the weekday morning peak and Figure 1-9 shows that a higher proportion of trips are made between J and A in the weekday evening peak. This is due to the high delays experienced in the PM peak by right turn vehicles on the eastern approach of the Waipapa Road and SH10 intersection.

Figure 1-8 Journey choice weekday AM peak

Figure 1-9 Journey choice weekday PM peak

It is expected that if the Waipapa Road and SH10 intersection is upgraded that there will be a shift in journey choice to the northern route for trips from Kerikeri.

2 Traffic Data

2.1 General

Traffic surveys were undertaken to obtain traffic volumes, vehicle classification, origin and destination patterns and speed profiles. BlipTrack Sensors and Loop counts were used to obtain this data. The BlipTrack data was used to determine the turning volume splits and the origin destination patterns. The Loop data was used to determine the absolute traffic numbers, the vehicle classification and speed profiles. Results and findings for each of the surveys are discussed in detail below. From the BlipTrack and loop data the following peak periods were identified :

- Weekday AM peak 08:00 – 09:00
- Weekday PM peak 16:00 – 17:00
- Saturday Midday peak 11:00 – 12:00

2.2 BlipTrack sensor surveys

The BlipTrack Sensor surveys were conducted by Beca between 22 June 2016 and 29 June 2016. The mobile BlipTrack sensors record vehicles containing Bluetooth devices. Although a full week's data was obtained only specific data was used :

- For the AM and PM weekday the Tuesday and Thursday data was used. The Wednesday was discarded as it was not surveyed for a full day. The Monday and Friday data was discarded as these two days were not seen to be normal days from a traffic flow viewpoint.
- The Saturday midday was considered for the busiest weekend period.

Beca reports that usually about 15% of vehicles have Bluetooth devices. Opus can confirm that for the Waipapa Road surveys the Blip interception rate was between 7% and 12%. The positions where the BlipTrack surveys were undertaken is shown Appendix B.

2.3 Loop surveys

2.3.1 Count data

The Loop surveys were conducted between 23 June 2016 and 01 July 2016. The Loop data was used to normalise the BlipTrack turning data at the Waipapa Road and SH10 Intersection. The Loop counts were conducted in June which can historically be considered one of the quieter months of the year in terms of traffic flow. The volumes were factored to an equivalent Annual Daily Traffic using the New Zealand Transport Agency (NZTA), State Highway Traffic Monitoring System (TMS) data. A site was found near Kerikeri just south of the Waipapa Road and State Highway 10 Intersection. The NZTA State Highway Reference Station is shown in Appendix C. The site number is 17 near Kerikeri (Site ref : 01000029). The following seasonal adjustment factors were used :

- 1.16 for the weekday AM and PM peak
- 1.22 for the Saturday midday peak

The adjusted 2016 base traffic volumes are shown below on Figures 2-1 to 2-3.

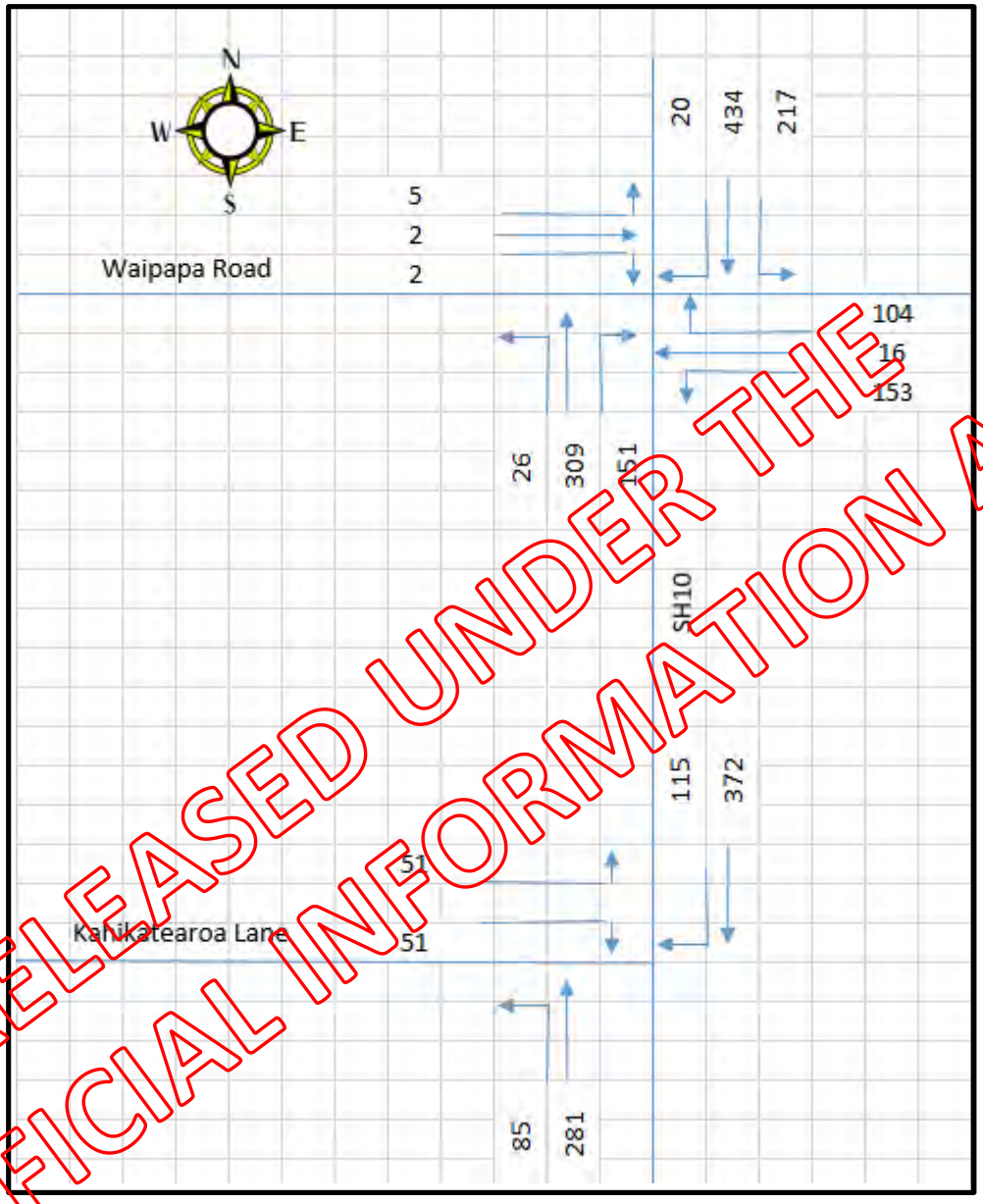


Figure 2-1 : 2016 adjusted weekday AM peak hour (08:00 – 09:00)

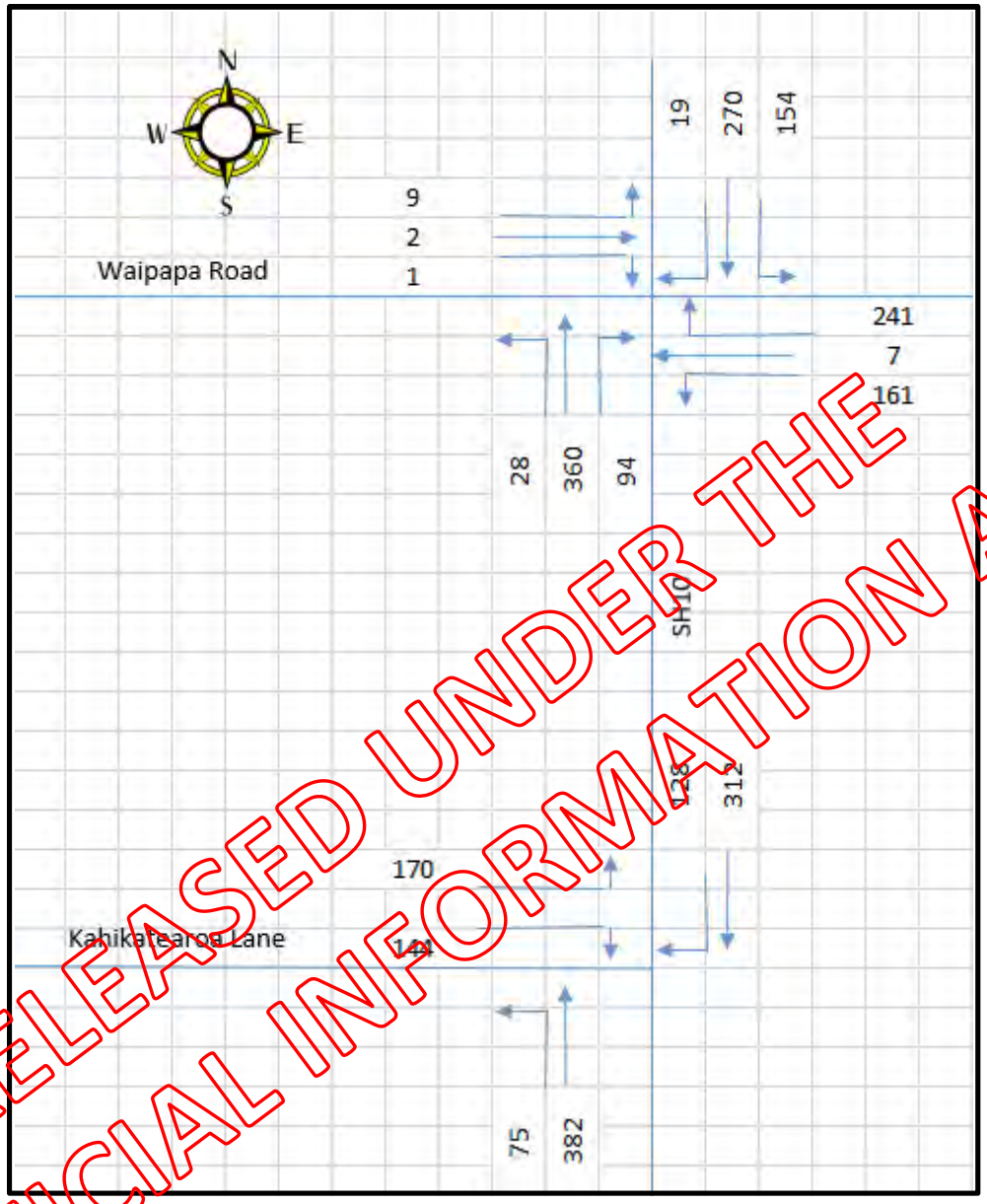


Figure 2-2 : 2016 adjusted weekday PM peak hour (16:00 – 17:00)

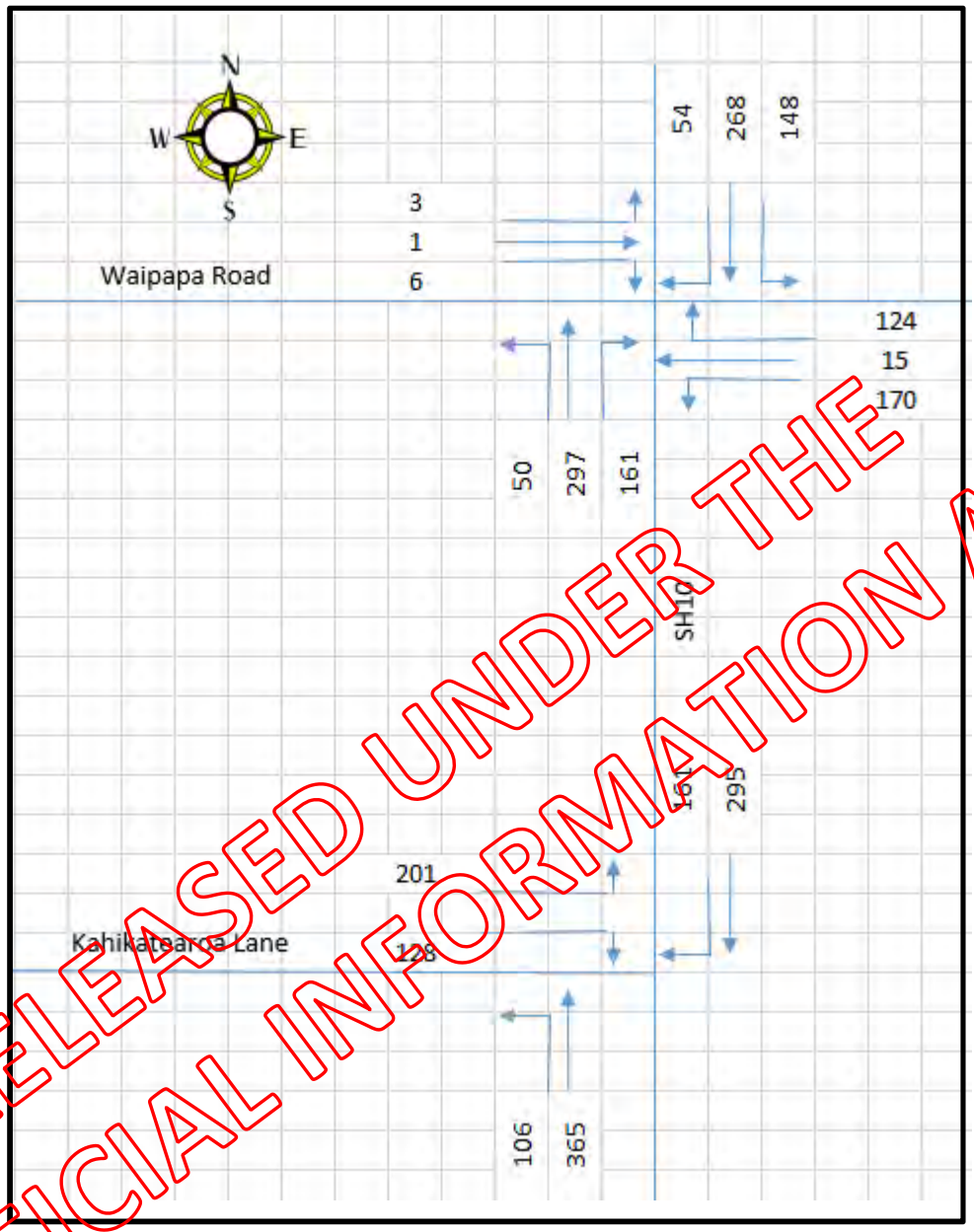


Figure 2-3 : 2016 adjusted weekend Saturday peak hour (11:00 – 12:00)

2.3.2 Speed data

The Loop data, shows all the 85th percentile speeds were under the speed limit, except at site E, where the 85th percentile speed was higher than the posted speed limit. The 85th percentile speeds are shown in Table 2-1.

Table 2-1 Measured speeds

Site ID	Description	Posted speed limit	85th percentile measured speed
A	SH10 – north of Waipapa Road / SH10 intersection	70 km/h	62 km/h
B	Waipapa Road – east of Waipapa Road / SH10 intersection	80 km/h	73 km/h
C	SH10 – south of Waipapa Road / SH10 intersection	70 km/h	62 km/h
D	Waipapa Road – west of Waipapa Road / SH10 intersection	50 km/h	31 km/h
E	SH10 – south of Kahikatearoa Lane / SH10 intersection	70 km/h	78 km/h
F	Kahikatearoa Lane – west of Kahikatearoa Lane / SH10 intersection	50 km/h	45 km/h

2.3.3 Vehicle classification

The vehicle classification used in the loop data is the Vehicle classification - TNZ 1999. TNZ 1999 is a scheme developed by Transit New Zealand and it has 14 classes[2]. There are three classes of vehicles :

- Light Commercial Vehicle (LCV)
- Medium Commercial Vehicle (MCV)
- Heavy Commercial Vehicle (HCV)

All LCV vehicles were classified as light vehicles while the MCV and HCV vehicles were classified as heavy vehicles as shown in Table 2-2.

[2] TNZ 1999, MTE User Manual – Classification Schemes, Version 3.18, MetroCount – Traffic Data Specialists, November 2007.

Table 2-2 Vehicle classification

Site ID	Description	Vehicle Type	
		Light	Heavy
A	SH10 – north of Waipapa Road / SH10 intersection	94.9%	5.1%
B	Waipapa Road – east of Waipapa Road / SH10 intersection	94.2%	5.8%
C	SH10 – south of Waipapa Road / SH10 intersection	95.1%	4.9%
D	Waipapa Road – west of Waipapa Road / SH10 intersection	90.7%	9.3%
E	SH10 – south of Kahikatearoa Lane / SH10 intersection	94.2%	5.8%
F	Kahikatearoa Lane – west of Kahikatearoa Lane / SH10 intersection	95.0%	5.0%
Average		94.0%	6.0%

Heavy vehicles make up 5% to 10% of the total traffic volumes. The average shown in the table above is a numeric average and not a weighted average.

2.4 Traffic growth data

2.4.1 Historic count data

To obtain the growth on SH10, historical data from State Highway AADT Data Booklet (2011-2015)[3] was obtained. Data from station 17 at Kerikeri on SH10 south of Waipapa Road was used. The growth rate calculations on SH10 between 2011 and 2015 are shown in Appendix E. The annualised compound growth of SH10 between 2011 and 2015 is 2.6% per annum. This growth rate was used to grow the through movement traffic on SH10 for the 2021 and 2026 scenarios.

2.4.2 Latent growth

The land use planning around the Waipapa Road and SH10 Intersection is shown on the Far North District Plan – Zone Map in Appendix E. The plan shows intended commercial intensification on the western side of SH10. To date a large portion of the potential commercial development has not occurred as shown on Figure 2-4.

[3] State Highway AADT Data Booklet 2011-2015, NZ Transport Agency, April 2016.

Figure 2-4 Latent Development

It was determined that about 55% of the potential commercial development has occurred. The trip generation for the additional 45% potential commercial development was calculated based on the existing trips currently entering the commercial area. For the purposes of this study it was assumed that 50% of the 45% potential commercial development will be realised by 2021 and 100% of the 45% potential commercial development will be realised by 2026.

3 Scenarios assessed

3.1 Future Years

As stated in section 2.4 of this report, two future years were considered, 2021 and 2026. The results focus on year 2026, which is the worst-case scenario with assumed SH10 growth of 2.6% per year 100% development of the commercial zoned land west of SH10.

3.2 Klinac Lane extensions

As stated in section 1.4 of this report, two Klinac Lane extensions have been considered. Diversions were calculated for each of the extensions and it was determined that only the northern extension is likely to have an effect on traffic volumes at the Waipapa Road / SH10 intersection. The Kahikatearoa Lane/ SH10 intersection will benefit from the southern extension as there will be a reduction of flows at this intersection due to the diversions.

4 Intersection Capacity Assessment

4.1 Traffic volumes used

The traffic volumes used for the SIDRA analysis for the critical PM peak hour are shown on Figure 4-1 below.

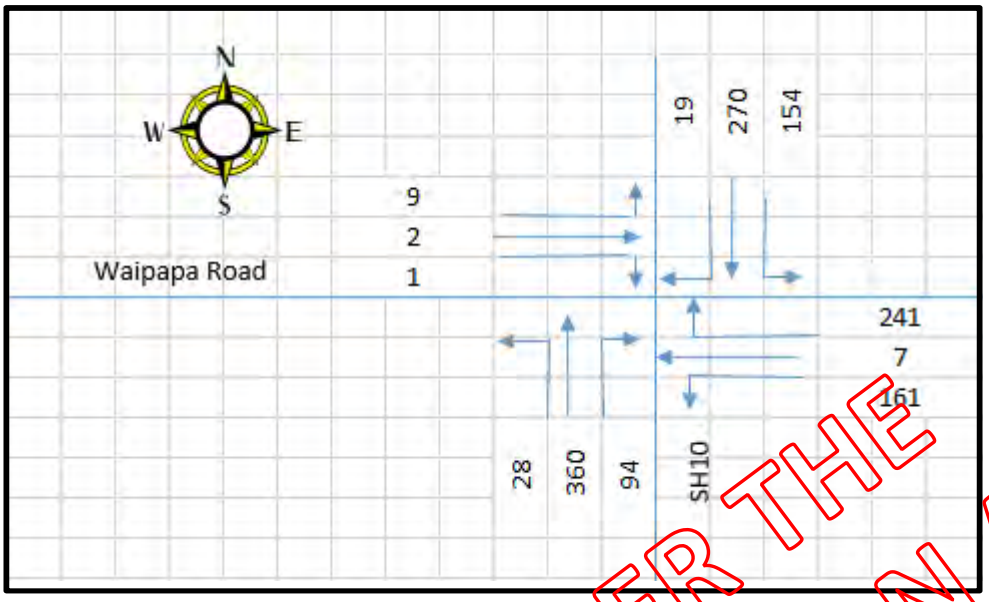


Figure 4-1 : 2016 adjusted weekday PM peak hour (16:00 – 17:00)

4.2 SIDRA base model calibration

From the Blip data, travel times could be estimated for each of the movements for the Waipapa Road and SH10 intersection. The Blip data showed lower delays than the SIDRA output, which is expected as Sidra outputs reflect stopline delay where blip data will record travel time upstream and downstream of the intersection. SIDRA queue outputs for the critical eastern approach showed similar queue lengths as were observed on site. There is reasonable confidence that the SIDRA output is calibrated for actual operating conditions at the Waipapa Road and SH10 intersection.

4.3 Base Year (2016) results

4.3.1 Existing layout and left slip

The priority control and left slip lane performance were assessed with existing (2016) typical weekday traffic. Table 4-1 shows the results of the SIDRA analysis for the weekday PM peak, which is the worst performing period.

Table 4-1 : Scenario 1 – 2016 Weekday PM peak hour

Priority Intersection (Existing control)						Priority Intersection with left slip					
Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS	Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS
North	L	154	0.24	6.5	N/A*	North	L	154	0.24	6.5	N/A*
	T	270	0.24	0.0	N/A*		T	270	0.24	0.0	N/A*
	R	19	0.02	7.8	N/A*		R	19	0.02	7.8	N/A*
East	L	161	0.16	10.2	B	East	L	161	0.14	7.8	B
	T	7	1.27	295.1	F		T	7	1.27	295.1	F
	R	241	1.27	298.8	F		R	241	1.27	298.8	F
South	L	28	0.31	8.8	N/A*	South	L	28	0.31	8.8	N/A*
	T	360	0.31	0.9	N/A*		T	360	0.31	0.9	N/A*
	R	94	0.31	8.9	N/A*		R	94	0.31	8.9	N/A*
West	L	9	0.01	9.6	A	West	L	9	0.01	9.6	A
	T	2	0.02	23.4	C		T	2	0.01	23.4	C
	R	1	0.02	27.8	D		R	1	0.01	21.3	D
Total		1345	1.27	58.3	F	Total		1345	1.27	58.0	F

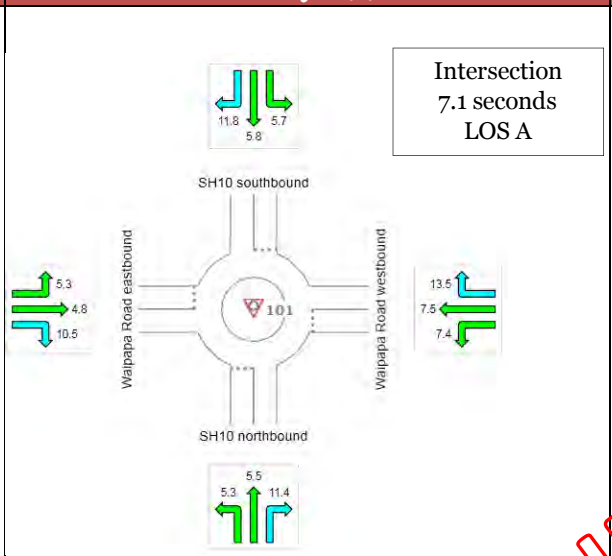
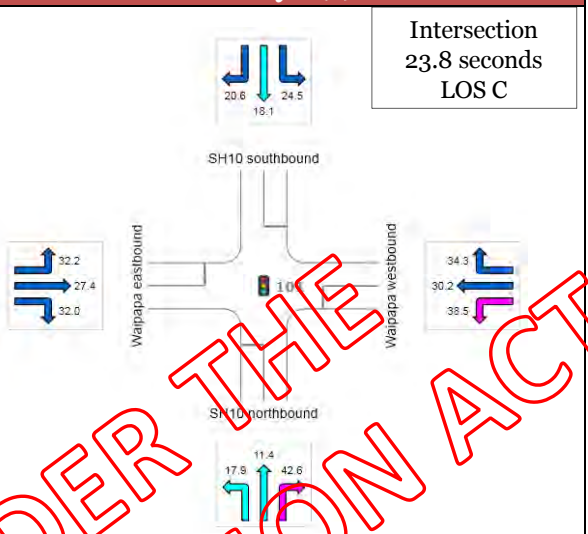
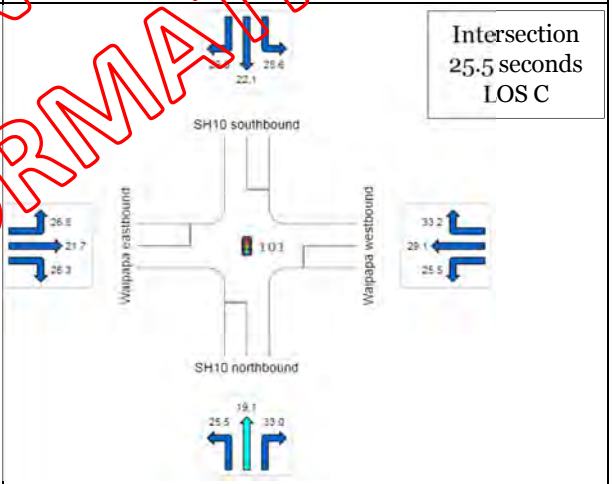
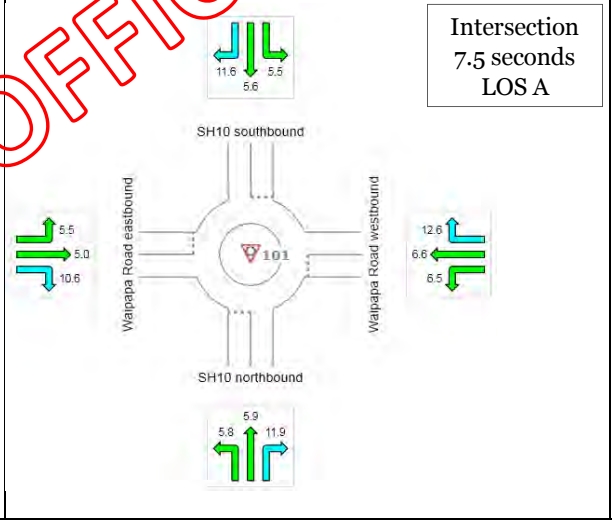
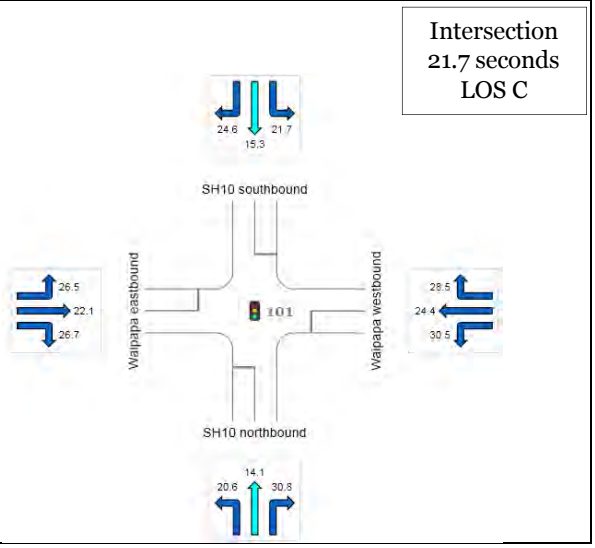
Note : * - Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements.

Table 4-1 shows the SIDRA results for 2016 Base year analysis and the results suggest that the priority and the left slip lane intersection control cannot accommodate the existing demand. Table 4-1 shows the eastern approach is operating unacceptably with existing traffic flow conditions. Therefore further analysis on the priority and left slip options was not undertaken.

4.3.2 Signal and roundabout

Table 4-2 shows the delays for 2016 Base year for the roundabout and signalised intersection. Both forms of intersection control operate acceptably; however, the roundabout operates much better. Therefore only the roundabout was considered for future year analysis.

Table 4-2 Base Year delays (s) for Signals and Roundabout

	Roundabout Delays (s)	Signal Delays (s)
AM peak		
PM peak		
Midday Saturday peak		

Some additional reasons why a roundabout is preferred to a signal are[4] :

- The severity of accidents are lower at a roundabout than at a signalised intersection due to the lower speed and speed differential
- The number of potential conflict points at a roundabout is 8 as compared to 32 for a signalised intersection
- There are more delays to all vehicles at a signal as compared to a roundabout
- Roundabout operation is more efficient during quieter periods of day where vehicles experience little or no delay whilst at signals delays can be long when there is very little traffic.

4.4 Year 2026 results for Roundabout

The 2026 analysis year represents the worst case scenario in terms of traffic flow. The existing layout capacity analysis results are included in the tables below for comparative purposes.

Based on the results shown in Table 4-2 above, it can be seen that the weekday PM peak performs the worst. Therefore, the PM peak was analysed as the critical peak.

4.4.1 No Klinac Lane Extensions

Table 4.3 shows the capacity analysis results for 2026 with no Klinac extension.

[4] Comparison of Traffic Signal vs. Roundabout, Wisconsin Department of Transport

Table 4-3 : 2026 Weekday PM peak hour – no Klinac Lane extension

Priority Intersection (Existing control)						Roundabout Intersection					
Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS	Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS
North	L	154	0.32	6.5	A	North	L	154	0.49	5.6	A
	T	413	0.32	0.0	A		T	413	0.49	5.7	A
	R	19	0.02	9.2	A		R	19	0.49	11.7	B
East	L	203	0.25	11.5	N/A*	East	L	203	0.51	8.4	A
	T	7	3.56	2370	N/A*		T	7	0.51	8.5	A
	R	241	3.56	2380	N/A*		R	241	0.51	14.5	B
South	L	42	0.51	11.7	B	South	L	42	0.69	8.1	A
	T	547	0.51	2.6	A		T	547	0.69	8.2	A
	R	148	0.51	12.0	B		R	148	0.69	14.2	B
West	L	9	0.01	11.3	N/A*	West	L	9	0.05	9.8	A
	T	2	0.29	66.3	N/A*		T	2	0.05	9.3	A
	R	12	0.29	90.3	N/A*		R	12	0.05	15.0	B
Total		1797	3.56	333	N/A*	Total		1797	0.69	8.9	A

Note : * - Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements.

Table 4-3 shows the existing priority intersection operates very poorly for 2026 Weekday PM peak hour with no Klinac Lane extension. The roundabout intersection operates at an average delay 8.9 seconds, which means there is ample capacity available.

4.4.2 With northern Klinac Lane Extension

Table 4.4 shows the capacity analysis results for the priority and roundabout layouts with the northern Klinac Lane extension in place.

Table 4-4 : 2026 Weekday PM peak hour – with Klinac Lane extension

Priority Intersection (Existing control)						Roundabout Intersection					
Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS	Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS
North	L	154	0.25	6.5	A	North	L	154	0.49	5.6	A
	T	283	0.25	0.0	A		T	283	0.49	5.7	A
	R	149	0.14	8.2	A		R	149	0.49	11.7	B
East	L	122	0.13	10.3	N/A*	East	L	122	0.51	8.4	A
	T	88	3.47	2263	N/A*		T	88	0.51	8.5	A
	R	241	3.47	2290	N/A*		R	241	0.51	14.4	B
South	L	42	0.31	8.6	A	South	L	42	0.58	9.7	A
	T	374	0.31	0.0	A		T	374	0.58	9.8	A
	R	76	0.31	9.1	A		R	76	0.58	15.7	B
West	L	182	0.32	10.2	N/A*	West	L	182	0.41	7.9	A
	T	74	0.61	47.4	N/A*		T	74	0.41	7.5	A
	R	12	0.61	61.8	N/A*		R	12	0.41	13.1	B
Total		1797	3.47	423	N/A*	Total		1797	0.58	9.4	A

Note : * Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements.

Table 4-4 shows that existing priority intersection operates very poorly for 2026 Weekday PM peak hour with the northern Klinac Lane extension. The roundabout intersection operates at an average delay 9.4 seconds, which means there is ample capacity available. The inclusion of the northern Klinac Lane extension helps balance the approach volumes by increasing the volume of traffic approaching from the west. This results in a slight increase in the overall delay of the roundabout intersection (from 8.9 seconds to 9.4 seconds). Balanced approach volumes is especially positive for roundabout layouts, as it provides equal opportunity for traffic to enter the intersection.

5 Useful life of a Roundabout

A sensitivity test was conducted to see how much growth can occur on SH10 per year before capacity is reached for the roundabout (i.e. what is the useful life of the roundabout). Reaching useful life means that one or more movements has reached capacity for a short time during the peak period. This will be when the intersection operates at a LOS E or higher. The traffic volumes on SH10 were compounded by 2.6% per annum in 5 year increments in the PM peak. Table 5-1 shows a summary of capacity analysis results with and without the northern Klinac Lane extension.

Table 5-1 Useful life of Roundabout

Design Year	Without Klinac Lane extension		With Klinac Lane extension	
	Delay	LOS	Delay	LOS
2026 (10 years from base year)	8.9	A	9.4	A
2051 (35 years from base year)	51.7	E	46.7	D

Table 5-1 shows the roundabout will operate acceptably until 2051 if an annual growth rate of 2.6% transpires on SH10.

6 Safety and economic evaluation

As part of this study a crash analysis or economic evaluation has not been undertaken. It is recommended that these two components will be assessed as part of the business case process for the project.

7 Conclusion/Recommendations

To conclude the existing Waipapa Road/SH10 Intersection is designed as cross priority controlled intersection, which experience efficiency and capacity issues for the two minor approaches especially in the peak periods. This current intersection constraints are considered likely to limit future commercial and industrial growth in the area.

Various forms of intersection control were considered namely, a priority controlled intersection (existing situation), an improved priority, a signalised intersection and a roundabout. The analysis undertaken shows that a single lane roundabout provides the best operation in terms of capacity. This roundabout also has spare capacity and is more resilient to changes in traffic flows due to planned road network changes.

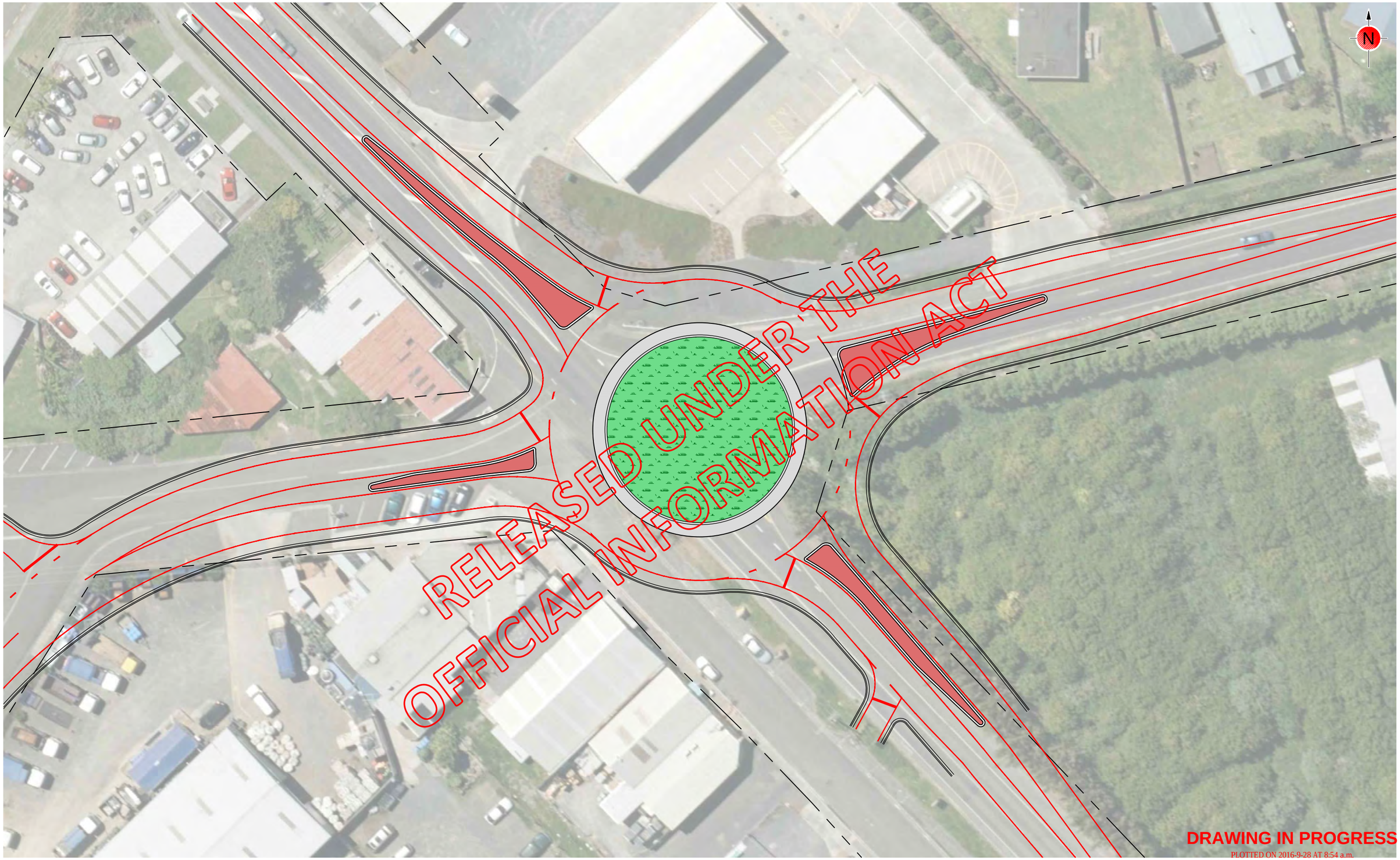
The assessment shows that the roundabout will operate acceptably until 2051 if an annual growth rate of 2.6% transpires on SH10.

It is recommended that :

- The left turn slip lane from Waipapa Road onto SH10 southbound (for which funding has been allocated in the Long Term Plan) not be implemented as this does not pose a viable long-term solution.
- From an efficiency and capacity perspective a single lane roundabout at the Waipapa Road and SH10 intersection is the preferred choice for intersection control.
- That further investigation in relation to safety and economic evaluation is considered as part of the business case process for the project.

Appendix A :

Single Lane Roundabout Layout



CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	CONCEPT ISSUED FOR INFORMATION		

Far North District Council
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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:250 AT A1

Project
FAR NORTH DISTRICT COUNCIL
WAIPAPA TRAFFIC STUDY

Sheet
ROUNDABOUT OPTION
PLAN

Project No.	Sheet. No.	Revision
1-13046.00	C01	A

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1:500@ A3
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200
100
50
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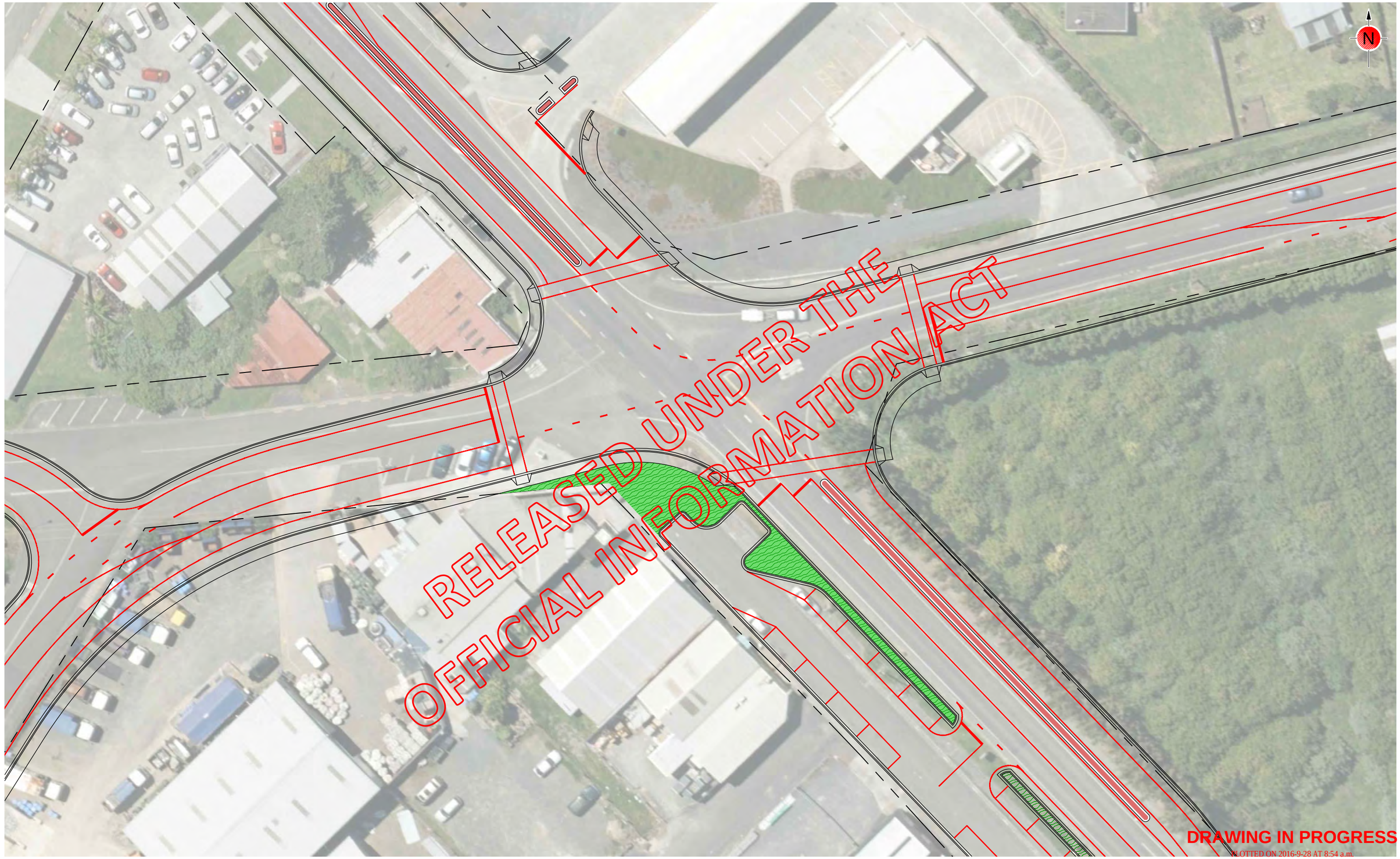

Revision	Amendment	Approved	Revision Date
A	CONCEPT ISSUED FOR INFORMATION		

Far North District Council
Te Kaunihera o Tai Tokerau Ki Te Raki

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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-
Drawn	**Scales**	
C. NIXON	1:250 AT A1	

Project
FAR NORTH DISTRICT COUNCIL
WAIPAPA TRAFFIC STUDY

Sheet
SIGNALISED OPTION PLAN

Project No.	Sheet. No.	Revision
1-13046.00	C01	A

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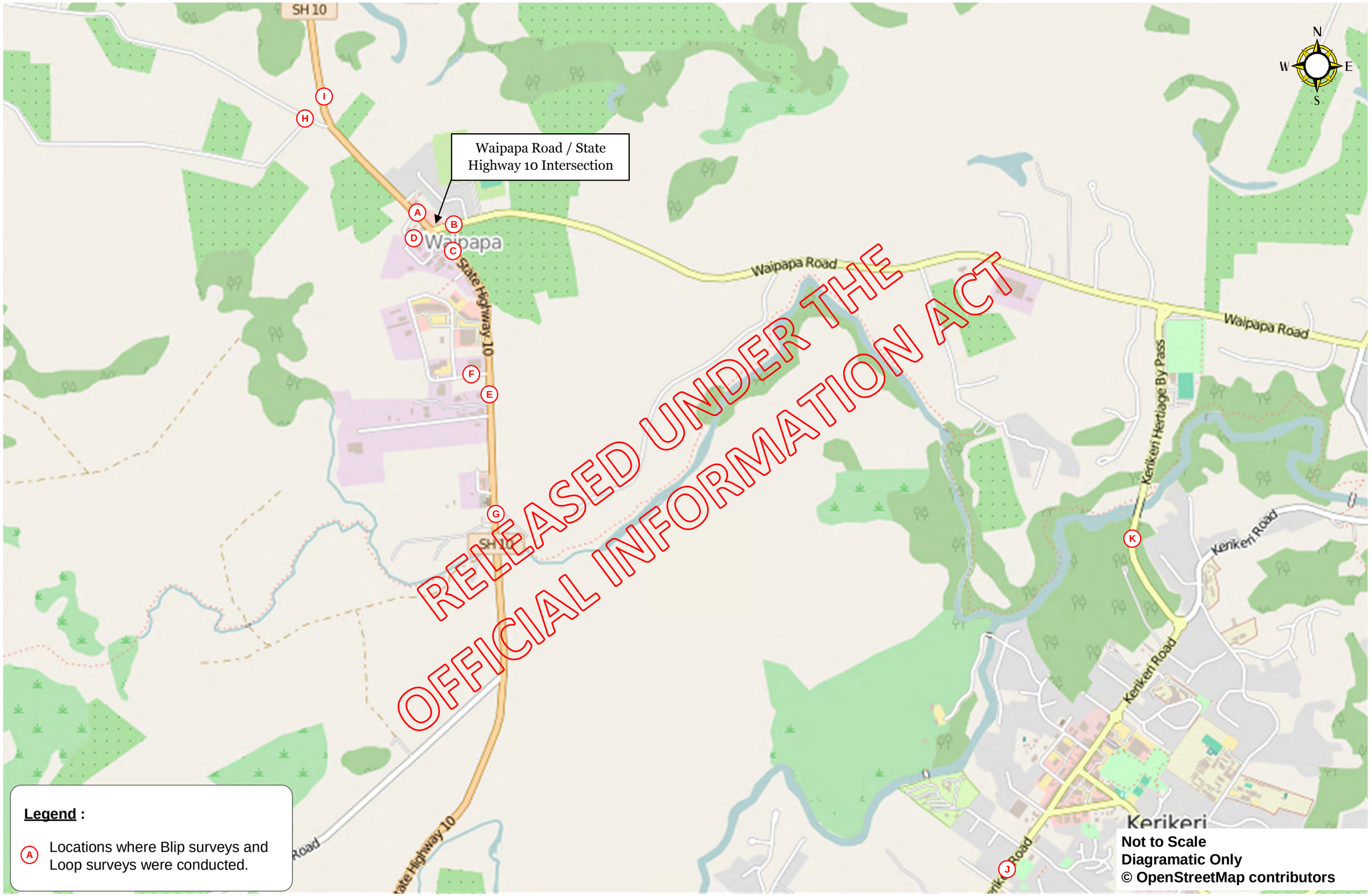
Appendix B :

Location of Traffic Surveys



Legend :

(A) Locations where Blip surveys and Loop surveys were conducted.

Not to Scale
Diagramatic Only
© OpenStreetMap contributors

No	Ammendment	Drawn	Checked	Approved	Date
5					
4					
3					
2					
1	First Draft	AK			08/16

Far North District Council
Te Kaunihera o Tai Tokerau Ki Te Raki

Far North District Council
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Private Bag 752
Kaikohe 0440

Drawn: Andre Koekemoer	Design: Andre Koekemoer
Drafting Check: Kris Hansson	Design Check: Kris Hansson
Approved: Date:	
Scale: NOT TO SCALE	

Project: Waipapa Traffic study
Title: Location of Traffic Surveys
Sheet: Location Plan

Original Size: A3 | Drawing No: 1-13046-1 | Rev: 1

Appendix C :

NZTA State Highway Reference Stations

NZ TRANSPORT AGENCY WAKA KOTAHI

State Highway Reference Stations
Northland

0 10 20 km

15/04/2016

Appendix D :

Growth Rate Calculations

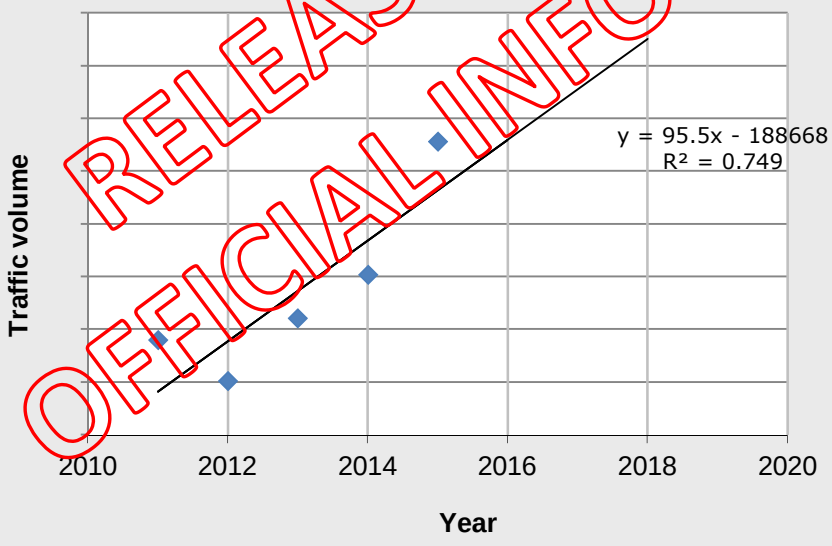
Worksheet A2 – Traffic data continued

Worksheet A2.4 – Time zero traffic volume and growth rates

1	Activity option	
2	Road/section/movement	SH10 at Waipapa Road intersection
3	Time period	AADT

Year (4)	AADT or average volume (5)
2007	
2008	
2009	
2010	
2011	3,480
2012	3,403
2013	3,522
2014	3,604
2015	3,857
2016	

	Regression output	
6	Constant	-188,668
7	X coefficient	95.5
8	R square	0.749



9	Time zero	**1 July 2015**
10	Time zero traffic volume	**3,764**
11	Growth rate at time zero	**2.54%**

Appendix E :

Far North District Plan – Zone Map

Waipapa

82

Scale 1:10000
2-12-2013

KOROPEWA ROAD
MAHSONA VENUE
KLINAC LANE
KAHIKATEAROA LANE
PATAKA LANE
WAITOTARA DRIVE
TE204
ME251

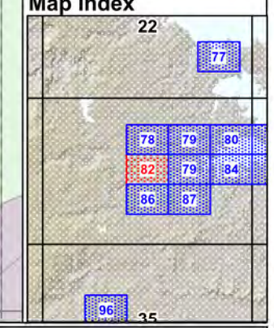
Legend

- Cemetery
- Historic Site
- Notable Tree
- Heritage Area
- Heritage Precinct
- Kerikeri Visual Buffer
- Russell Township Basin and Gateway Area
- Designations
- Coopers Beachfront Estate
- Esplanade Priority
- Pedestrian Frontage
- Maritime Exemption Area
- HV Powerline
- Railway

Zone

- Carrington Estate
- Coastal Living
- Coastal Residential
- Commercial
- Conservation
- General Coastal
- Horticultural Processing
- Industrial
- Kauri Cliffs
- Lakes & Rivers
- Minerals
- Motoroa Island
- Orongo Bay Special Purpose
- Point Veronica
- Quail Ridge Country Club
- Recreational Activities
- Residential
- Rural Living
- Rural Production
- Russell Township
- South Kerikeri Inlet Zone
- Waimate North Sensitive Area

Map Index



Far North District Plan - Zone Map

N

0 200 400
metres

Note:

Roads carry the same zoning as the adjoining land. If a boundary between zones follows a road, the zone boundary is located on the centerline of the formed road, or where unformed, the centerline of the legal road.

DISCLAIMER

Considerable care has been taken to avoid errors and omissions, and the latest information has been included in these District Plan maps. However, even with the greatest care inaccuracies may occur and therefore the Far North District Council cannot accept any responsibility for such errors and omissions.

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Appendix B
Communications Plan

Communications Plan SH10 Waipapa

Kelli Sullivan

20 April 2017

VERSION 1

SH10 Waipapa project. Communications and engagement plan for preferred option - May 2017

Engagement Plan

Introduction	Public engagement is proposed for late May to communicate the preferred option for the SH10 / Waipapa Road intersection and associated transport improvements as part of the Waipapa Single Stage Business Case. The Transport Agency, in partnership with the Far North District Council (FNDC), has considered a range of option to improve transport connections, safety and efficiency of the transport network in Waipapa. Public engagement on the preferred solution (a roundabout and associated improvements) will begin once local iw, directly affected land owners and key stakeholders have been consulted.
Engagement objectives	• Gain stakeholder support by communicating the preferred option for improving the intersection to key stakeholders, iwi and road users • Inform affected parties and communities in order to achieve understanding of the proposed works and their effects • Minimise the number of public queries by being proactive in our approach and concise in our publications • Gather knowledge from the community and understand others viewpoints • Fulfil the requirements of the Resource Management Act 1991, Land Transport Management Act 2003 and Local Government Act 2002
Background	Waipapa is an important regional centre in Northland, serving Kerikeri and the wider east coast of the Far North. There is no current investment strategy to address the strategic needs of the Waipapa township. There are existing problems with the operation and quality of the transport network in Waipapa. These problems not only limit the economic opportunities in Waipapa but also lead to sub optimal growth patterns in the wider area. In collaboration with FNDC, the Strategic Business Case (2016) outlined the problems and potential benefits in this corridor and sought approval to develop a Single Stage Business Case to develop options and approaches to maximise the opportunities available. One option under development is an upgrade of the SH10/Waipapa Road intersection.
Objectives and benefits	**Single Stage Business Case - Investment Objectives:** **Economic growth** - Facilitate the economic growth of the Waipapa-Kerikeri

	area and Northland through a co-ordinated long term vision for the integration of land-use and the transportation network. **Efficiency** - Improve the network efficiency by providing a clear, consistent and integrated transport solution that best balances the needs of all road users at this very busy area of roading confluence. **Safety** - Improve safety so that there is a marked reduction in crossing / turning type crashes at intersections and access ways by 2020. **Multi-modal travel** - Facilitate the growth of multi-modal travel, particularly walking and cycling, through the provision of safe, efficient facilities which complement existing initiatives. **Benefits:** **The SH10/Waipapa Intersection Improvements project will improve:** - Economic growth for Waipapa and Kerikeri - Network efficiency - Safety - Multi-modal travel
Inter-relationships	**Northland Economic Action Plan (2016)** – The SH10 corridor carries regional freight and is part of the Twin Coast Discovery tourism route. The Twin Coast Discovery Route is identified in the Tai Tokerau Northland Economic Action Plan as a key component in expanding Northlands economy through tourism. **Twin Coast Discovery Programme Business Case (late-2017)**– the outcome of the Waipapa Business Case are likely to support what the Twin Coast Discovery Route is trying to achieve
Stakeholders	Internal: • NZTA- Journey Manager, SHMTA, EUD • FNDC – Mayor, Councillors, Community Board, officers External: • Directly affected property owners/businesses • Local road users – Kerikeri and Waipapa • Relevant Iwi/Hapu • Ministry of Education • Waipapa businesses • Emergency services – NZ Police, NZ Fire and St John Ambulance • Media
Key messages	Key messages include: • The proposed roundabout at the SH10/Waipapa Road intersection will provide for safer turning movements across the state highway, reducing the number of vehicle crashes at this location • The project will reduce peak time congestion and vehicle queuing on SH10 by providing for safe and efficient turning movements via a roundabout design. • The proposed roundabout design will assist in slowing state highway traffic through the Waipapa town centre, making it more appealing and

	safer for pedestrians and cyclists • Improvements to cycling and pedestrian facilities are proposed to promote active modes of transport and improve connectivity between Waipapa businesses and community on either side of SH10
Risks/issues and mitigation	**Risk:** Property impacts and/or land acquisition **Mitigation**: Early engagement with potentially affected stakeholders and open communication as the preferred option develops **Risk**: Preferred option is not supported by local road users and businesses **Mitigation**: Communications to support the preferred option will be developed and delivered collaboratively by NZTA and FNDC. Collateral for engagement to explain the process to date in assessing the five options to identify the preferred option **Risk**: Key stakeholder confusion with Twin Coast Discovery PBC outcomes in relation to Waipapa Growth project **Mitigation:** Key messaging developed collaboratively with FNDC to support Transport Agency Twin Coast PBC communications programmed for late-2017
Key milestones	• Confirmation of public information day date by W/C 24 April • Briefing roles and responsibilities (as outlined below) W/C 24 April • XX May – key stakeholder briefing • XX May – affected property/business owner briefing • XX May – public information day • XX June – consultation summary and next steps
Evaluation measures	• Volume, tone and nature of any queries received by NZTA or FNDC relating to the preferred option • Stakeholder feedback received by NZTA and FNDC • Submissions from stakeholders during consenting phase • Volume, tone and nature of media coverage

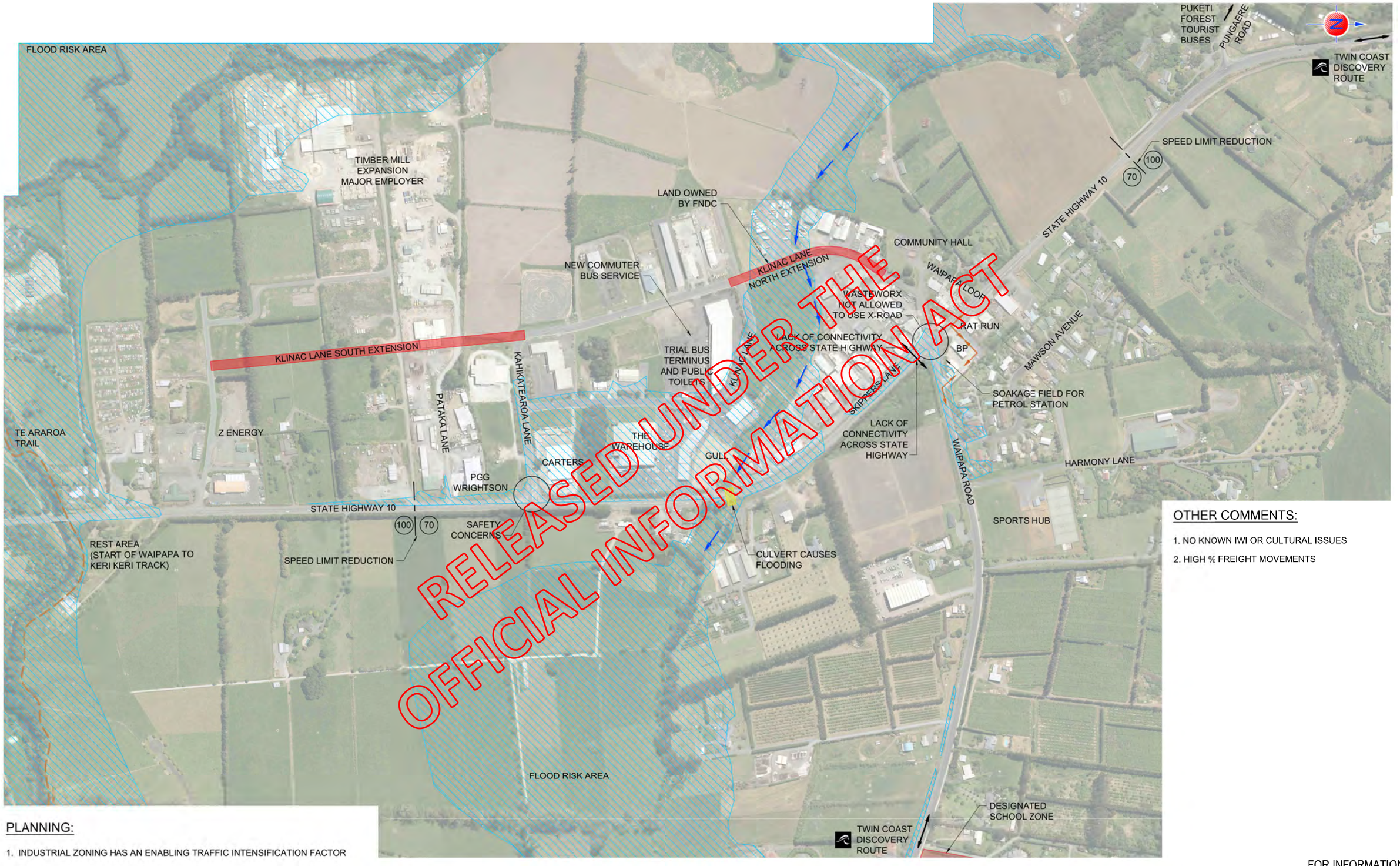
COMMUNICATIONS AND ENGAGEMENT ACTIVITIES					
TASKS	**ACTION/CHANNELS**	**TARGET AUDIENCE**	**LEAD RESPONSIBILITY**	**TIMING**	**STATUS**
Liaising with FNDC	Confirming date for briefing Community Board Confirming date for public information day event	Project partner	Sebastian Reed / Keith Kent	**Ongoing**	Once event date confirmed *(this plan works to a Thursday 25th May event date)*
Book community venue	FNDC venue options- Waipapa Hall ph Judy Remnant 09 407 5447 The Centre (Kerikeri) ph Kerikeri Community Trust 09 407 0260	Community venue	Kelli Sullivan	**To do**	Once event date confirmed
NZTA Internal Communications	Advise Brett Gliddon/SHMTA of engagement programme Seek direction on whether briefing to Minister's office is require pre-engagement	Brett, Tommy, Ernst, Minister's office?	Sebastian Reed	**To do**	Once event date confirmed
Collateral creation	Draft poster content with inputs from project team and Opus Poster content to include:	Key stakeholders, community, iwi, road users	Martell (Opus) develop with Kelli Sullivan guidance	**To do**	Draft for NZTA approvals W/C 8 May Collateral print date

	- Project overview incl. objectives/benefits -Urban design and Environment - Preferred option/Indicative design - Project timeline - Twin Coast Discovery PBC - Cultural values (TBC with hapu) To support engagement: -Information brochure with feedback form		FNDC/NZTA joint review/approval		18 May
Print advertising to promote public engagement	Book quarter page in Northern News, Bay Chronicle Brief PORT into creating print ad Supply advert to media Circulate PDF of advert to key stakeholders for distribution (incl. FNDC channels and NZTA social media	Wider communities of Waipapa, Kerikeri, Bay of Islands	Kelli Sullivan	**To do**	Advertising to commence W/C 15 May
Key Stakeholder/partner	Briefing sessions with key stakeholders/partners week	Key stakeholders and project partners	Sebastian Reed/Kelli Sullivan/Rewi	**To do**	Meetings to be set up for W/C 15 May

briefings	prior to public event. To include: - FNDC - Community Board - Waipapa Business Assoc. - Hapu/Iwi		Spraggon (iwi)		
One on one meetings with affected business/landowners	Meetings with Waipapa businesses and residences in proximity to intersection		Kelli Sullivan/Sebastian Reed / Keith Kent / Stu Graham (Crown Property)		Meetings to be set up for W/C 15 May
Online engagement	Update on Connecting Northland/Waipapa webpage promoting open day Open day collateral uploaded onto page	Customers	Kelli Sullivan	**To do**	Information 'live' by 23 May
Media/Social	Media release promoting open day Transport Agency Twitter/Facebook	Communities Customers	Sarah Azam FNDC (TBC) Kelli Sullivan	**To do** **To do**	W/C 15 May
Event resourcing	Confirm staffing of event (incl. FNDC team attending) Connecting Northland	Project team	Kelli Sullivan	**To do**	W/C 15 May

	branded banners Transport coreflute posters, display easels, feedback forms, furniture (if req) Liaison with venue for access on day Set up/pack down Take photos of event				
Feedback collation	Circulate hard copies of feedback form to community venues in Waipapa area after event Summarize into consultation report.	Internal approvers, key stakeholders on request	Kelli Sullivan	**Complete- Draft consultation report in InfoHub**	June.

APPENDIX C
Drawing: Constraints and Opportunities



OTHER COMMENTS:

1. NO KNOWN IWI OR CULTURAL ISSUES
2. HIGH % FREIGHT MOVEMENTS

PLANNING:

1. INDUSTRIAL ZONING HAS AN ENABLING TRAFFIC INTENSIFICATION FACTOR
2. RURAL PRODUCTION ZONING HAS A 60vpd THRESHOLD
3. NO PUBLIC WATER OR WASTEWATER SCHEME

SPEED:

1. INCONSISTENT SPEEDS THROUGH WAIPAPA
2. 70km/h FEELS UNSAFE
3. APPLICAITON OF NEW SPEED MANAGEMENT GUIDELINES

FOR INFORMATION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION	-	-

NZ TRANSPORT AGENCY WAKA KOTAHI

Far North District Council
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Designed	Approved	Approved Date
C. PARKER		
Drawn	Scales	
K. MEIN	NOT TO SCALE	

Project	
WAIPAPA IMPROVEMENTS	
Sheet	
CONSTRAINTS AND OPPORTUNITES	
Project No.	Sheet No. / Revision
1-11751.00	C01 / A

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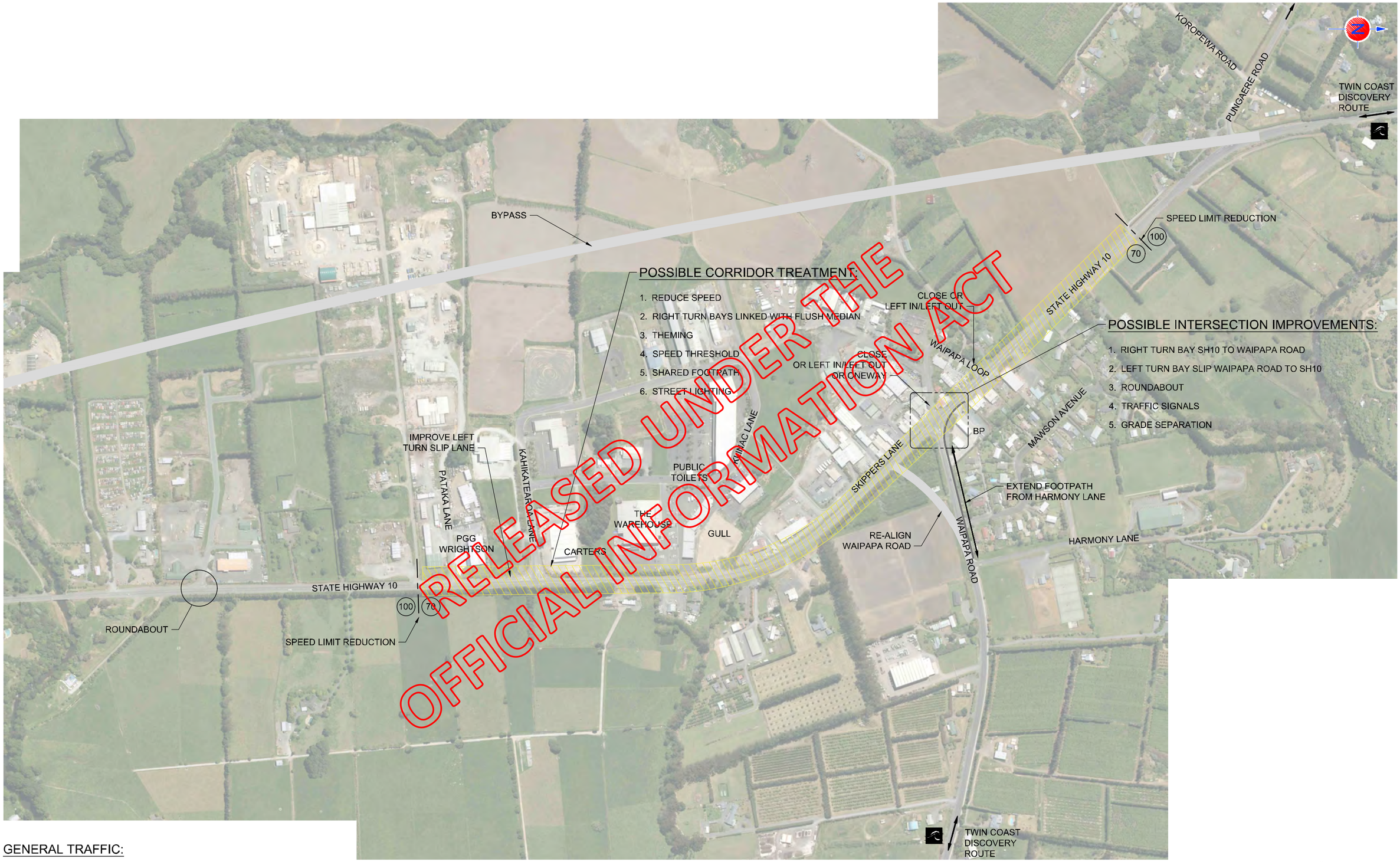
APPENDIX D
Drawing: Long List Options



GENERAL TRAFFIC:

1. IMPROVED PEDESTRIAN FACILITIES INCLUDING PEDESTRIAN CROSSINGS
2. IMPROVED CYCLING FACILITIES
3. REMOVE/BETTER DEFINE PARKING

PLANNING:

1. UPDATED STRUCTURE PLAN
2. MIXED USE ZONING AROUND WAIPAPA ROAD INTERSECTION

FOR INFORMATION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION	-	-

NZ TRANSPORT AGENCY WAKA KOTAHI

Far North District Council
Te Kaunihera o Tai Tokerau Ki Te Raki

OPUS
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125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
C. PARKER		
Drawn	Scales	
K. MEIN	NOT TO SCALE	

Project: WAIPAPA IMPROVEMENTS

Sheet: LONG LIST OF OPTIONS

Project No.	Sheet No.	Revision
1-11751.00	C02	A

	Survey	-	-
	Drawing	-	-
	Design	-	-
	Checked		
	Date		

Original Sheet Size A1 [841x594] Plot Date 2016-11-23 at 2:42:17 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-11751.00(C01).dwg C02

APPENDIX E
Drawings: Short List Options

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	CONCEPT IMPROVED		2017-02-22

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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
RIGHT TURN BAY OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X01	C

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

DRAWING IN PROGRESS

PLOTTED ON 2017-2-23 AT 3:30:45 p.m.

CONCEPT - NOT FOR CONSTRUCTION

300 mm
200
100
50
0 10 mm

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	ROUNDABOUT ELLONGATED AND MOVED		2017-02-15

NZ TRANSPORT AGENCY WAKA KOTAHI

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
ROUNDABOUT OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X02	C

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:30:45 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X02

DRAWING IN PROGRESS

PLOTTED ON 2017-2-23 AT 3:30 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	CONCEPT IMPROVED		2017-02-22

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
TRAFFIC SIGNALS OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X03	C

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

0 10 mm 50 100 200 300 mm

DRAWING IN PROGRESS

PLOTTED ON 2017-2-23 AT 3:30 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-11
B	CONCEPT IMPROVED		2017-02-22

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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

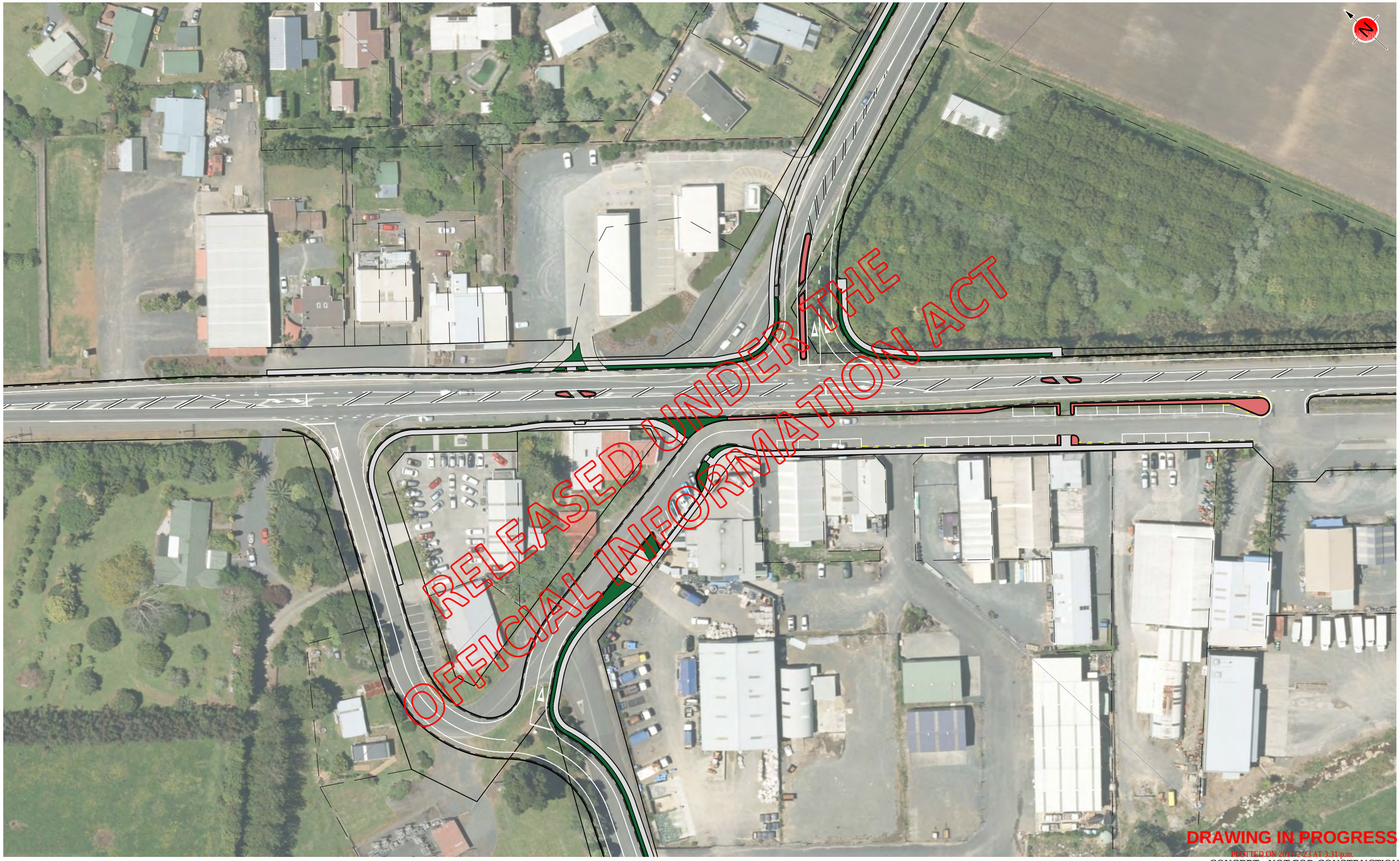
Sheet
HEAD TO HEAD RIGHT TURN BAYS OPTION PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X04	B

1:500@ A1
1:1000@ A3
0 5 10 15 20 25 30 35 40 45 50 m

300 mm
200
100
50
0 10 mm

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:30:55 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X04



DRAWING IN PROGRESS

PLOTTED ON 2017-2-23 AT 3:31 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22

NZ TRANSPORT AGENCY WAKA KOTAHI

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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
CLOSE WAIPAPA LOOP ROAD SOUTH OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X05	A

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

300 mm
200
100
50
10 mm
0

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:31:00 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X05