Raymond Bull & Black Swamp Road

Proposed Plan Change

Integrated Transportation Assessment Report

27 June 2025

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		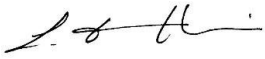	

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1 INTRODUCTION

Commute Transportation Consultants (Commute) has been engaged by Cabra Mangawhai Limited and Pro Land Matters Company Limited to prepare an Integrated Transport Assessment (ITA) report for the Mangawhai East Private Plan Change (PPC). Of note this version of the ITA replaces the November 2024 version as it incorporate the cl23 responses to Kaipara District Council requests for further information.

The PPC Site is currently zoned 'Rural' under the Kaipara District Plan. The proposal seeks to rezone the total area of approximately 93 hectares to a combination of Neighbourhood Centre Zone, Business Mixed Use Zone and a range of Residential zones, to allow the development of a master planned community comprising approximately 750 to 800 residential units, reserves, connected walkways and cycleways.

The key transportation considerations for this proposal are:

- The accessibility of the PPC area to the various modes of transport; and
- The ability of the surrounding road network to safely and efficiently support the proposed development.

These and other related transportation issues will be addressed in this report.

Given the nature of the transport network in this area (predominantly rural) and anticipated development, a number of transport upgrades are proposed to support the proposed rezoning. This document identifies changes and upgrades required to support development of the Urban Zone, including the Client's landholdings. In this regard, this report relies on the wider network assessment undertaken as part of the ITA to assess wider effects on the transport network.

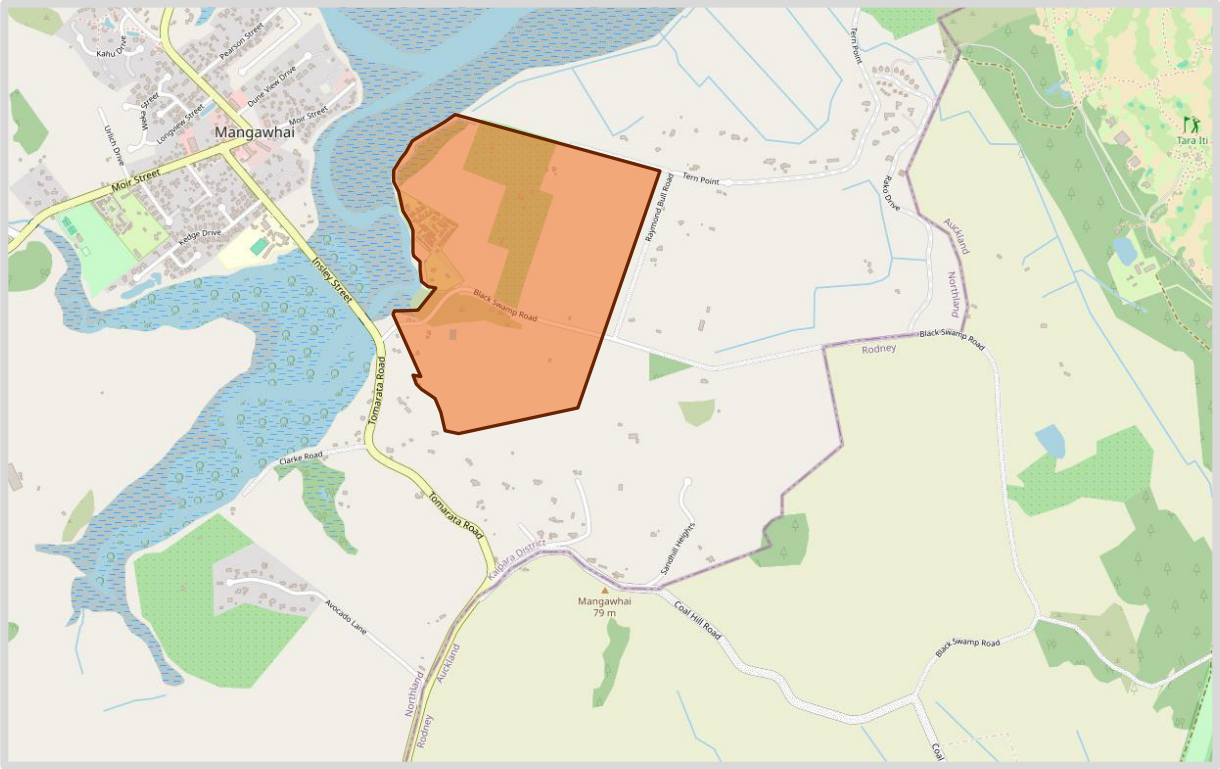
2 EXISTING ENVIRONMENT

2.1 SITE LOCATION

The development site is located in Mangawhai, Northland, on the eastern side of the Mangawhai Harbour. The site comprises a block of land on either side of Black Swamp Road, referred to throughout this ITA as the northern and southern lots.

Figure 1 shows the location of the proposed PPC sites in relation to the surrounding road environment.

Figure 1: Site Location



2.2 ROAD NETWORK

2.2.1 BLACK SWAMP ROAD

Black Swamp Road is not classified as an arterial or collector in the Kaipara District Plan, and currently has an approximate sealed carriageway width of 7.5 metres in the vicinity of the site, comprising one lane of traffic in each direction with an unsealed shoulder on each side of the road. There are no pedestrian footpaths, cycle lanes or bus stops along Black Swamp Road.

Photograph 1 and Photograph 2 show Black Swamp Road in the vicinity of Raymond Bull Drive looking west and east respectively.

Photograph 1: Black Swamp Road Looking West from Raymond Bull Drive

Photograph 2: Black Swamp Road Looking East from Raymond Bull Drive

Black Swamp Road has a posted speed limit of 60 km/hr along its length.

2.2.2 TOMARATA ROAD / INSLEY STREET

Tomarata Road and Insley Street (which essentially link together) are both classified as an Arterial Road in the District Plan. These roads run in a general north-west to south-east alignment, transitioning from Insley Street in the north-west to Tomarata Road in the south-east at the Black Swamp Road intersection. In the vicinity of Black Swamp Road, Tomarata Road has an approximate carriageway width of 7.2 metres, accommodating one lane of traffic in each direction. There are no footpaths along either side of Tomarata Road at the Black Swamp Road intersection. Tomarata Road has a speed limit of 80km/hr which changes to 60km/hr south of Black Swamp Road intersection (Insley Street is 60km/hr).

Photograph 3 shows the Tomarata Road / Black Swamp Road intersection.

Photograph 3: Tomarata Road / Black Swamp Road Intersection

2.3 ACCESSIBILITY

2.3.1 PRIVATE VEHICLES

The PPC site extends from Mangawhai Estuary east to Raymond Bull Road and north and south of Black Swamp Road as shown in Figure 1. It has access via Black Swamp Road and Raymond Bull Road. Black Swamp Road connects to Tomarata Road in the west, which provides connections to Mangawhai village as well as to Mangawhai Road to the south, which leads to State Highway 1. Insley Street also links to Kaiwaka Mangawhai Road that connects through to SH1 to the north. Black Swamp Road also provides connections to the Tara Iti and Te Arai golf courses and numerous beaches.

At peak times, travel times between the site and the Auckland City Centre range from 1 hour to 2 hours and are sensitive to SH1 motorway flows (south of Albany). Travel times to Mangawhai village are short and are generally not impacted by commuter peak hours.

2.3.2 EXISTING PUBLIC TRANSPORT

Public transport services are limited in the Mangawhai region, with the Bream Bay link running between Kaiwaka and Whangarei via Mangawhai village on Thursdays only.

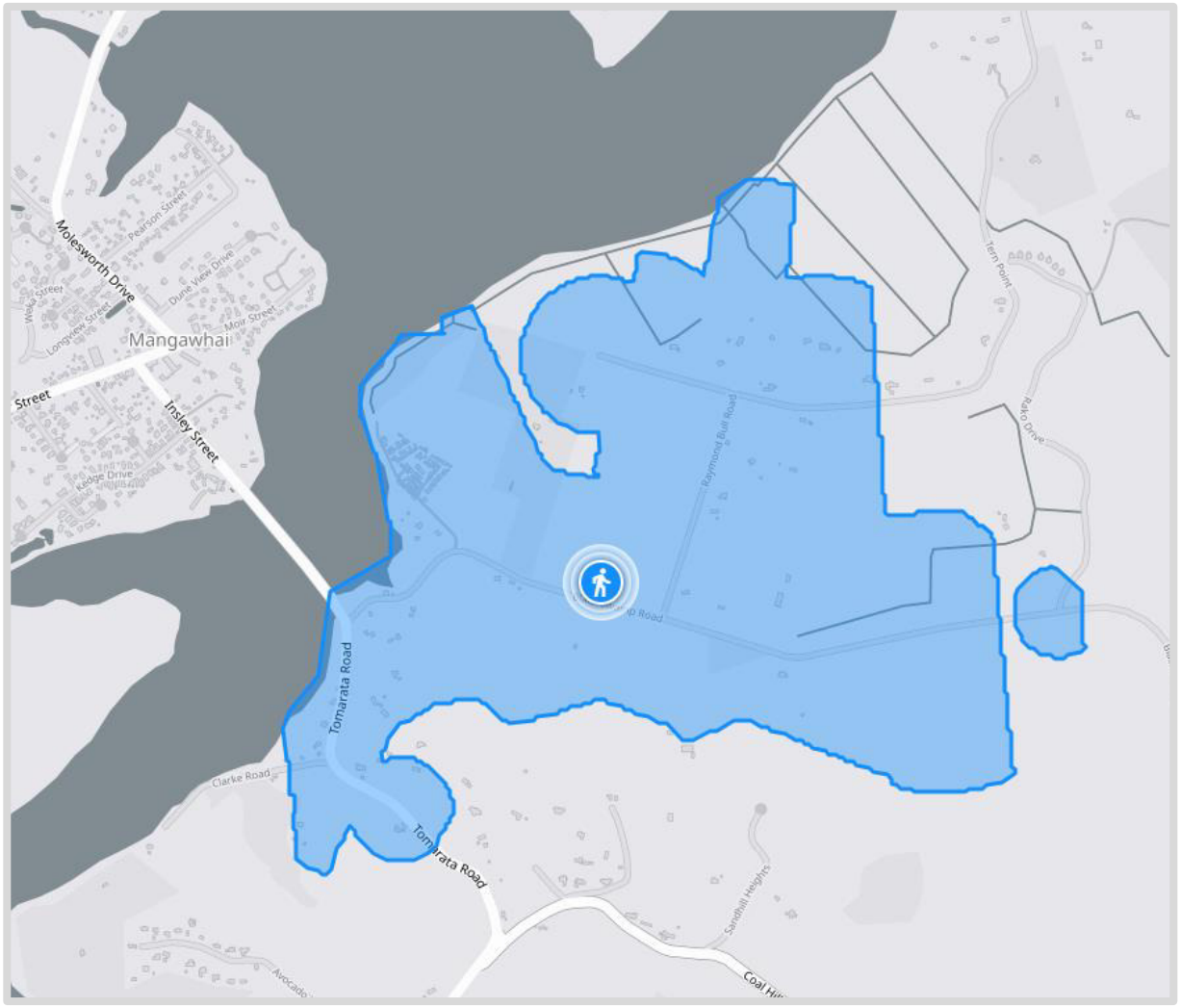
There is also a free bus service during the summer running between the Domain in Mangawhai village to the Heads beach.

2.3.3 WALKING

The Austroads Guide to Traffic Engineering Practice Part 13 – Pedestrians indicates that the practical walking distance for non-recreational walking trips is in the order of 1.5 km. Using the practical walking distance of 1.5 km and the 15th percentile walking speed of a typical fit, healthy adult of 1.3 m/s, gives a journey time of approximately 20 minutes. This is in line with New Zealand data in the Pedestrian Planning and Design Guide, which states that for walking trips, half are more than 10 minutes and 18% are more than 20 minutes.

The primary catchment area for pedestrians has therefore been based on a 1.5 km radius of the centre of the site as shown in Figure 2.

Figure 2: Approximate Walking Catchment (to Approximate Site Access)

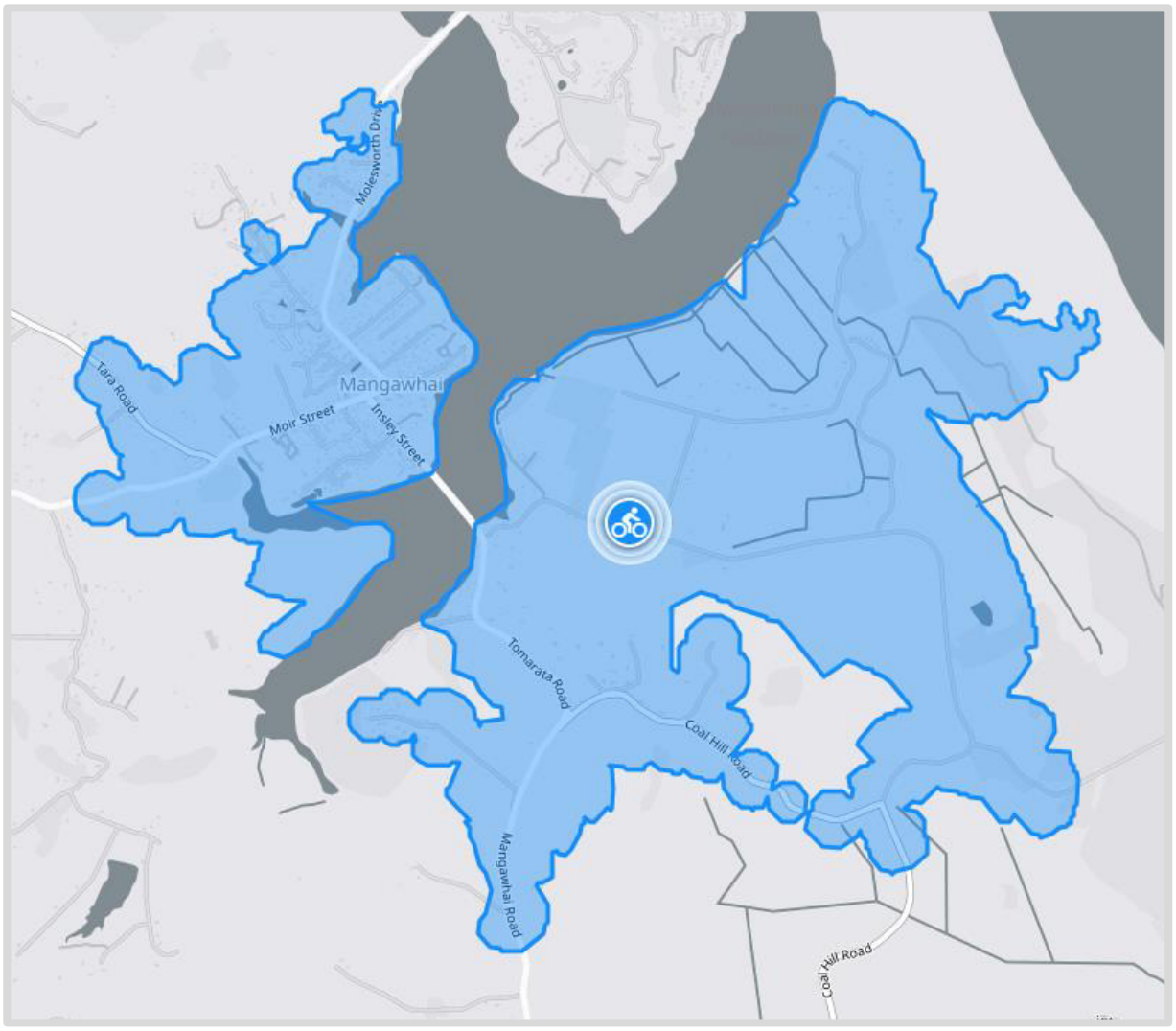


As can be seen from the figure, Mangawhai village is located just outside of walking distance of the site, however it is noted that there are currently no pedestrian facilities along Insley Street or Black Swamp Road. Of note the site and surrounding area is generally flat in nature thereby promoting walking.

2.3.4 CYCLING

Based on New Zealand Transport Agency Research Report 426, the average cycling trip length is approximately 3 km. Figure 3 shows an indicative cycling catchment for the site.

Figure 3: Approximate Cycling Catchment (to Site Entrance)



As shown above, Mangawhai village is located within cycling distance of the site. Overall, while the cycling catchment of the site captures the majority of the Mangawhai area, there are no existing dedicated cycle facilities within the cycling catchment area. Again it is noted that the site and surrounding area is generally flat in nature thereby promoting cycling.

2.4 TRAFFIC VOLUMES

2.4.1 NORTHLAND TRANSPORT ALLIANCE

Northland Transport Alliance recorded the vehicle volumes on Black Swamp Road in March 2021, between Tomarata Road and Raymond Bull Road, and found the daily vehicle volume to be 833 vehicle movements per day (vpd). Of note the surveys undertaken outlines in Section 2.4.2 and 2.4.3 below indicated current (2024) volume in the summertime period indicate the daily volume increases to 1500-1800 vpd.

2.4.2 SURVEYED TRAFFIC VOLUMES - INTERSECTIONS

Manual traffic counts were undertaken on Thursday 18 January 2024 at the Black Swamp Road / Tomarata Road intersection and the Black Swamp Road / Raymond Bull Road intersection. The surveys were undertaken during the weekday morning commuter peak period (7:00 to 9:00 am) and the weekday

evening commuter peak period (4:00 to 6:00 pm). The AM and PM peak hour survey results are shown below in Figure 4 to Figure 7.

Figure 4: Surveyed Weekday AM Peak Hour Turning Volumes – Black Swamp Road / Tomarata Road

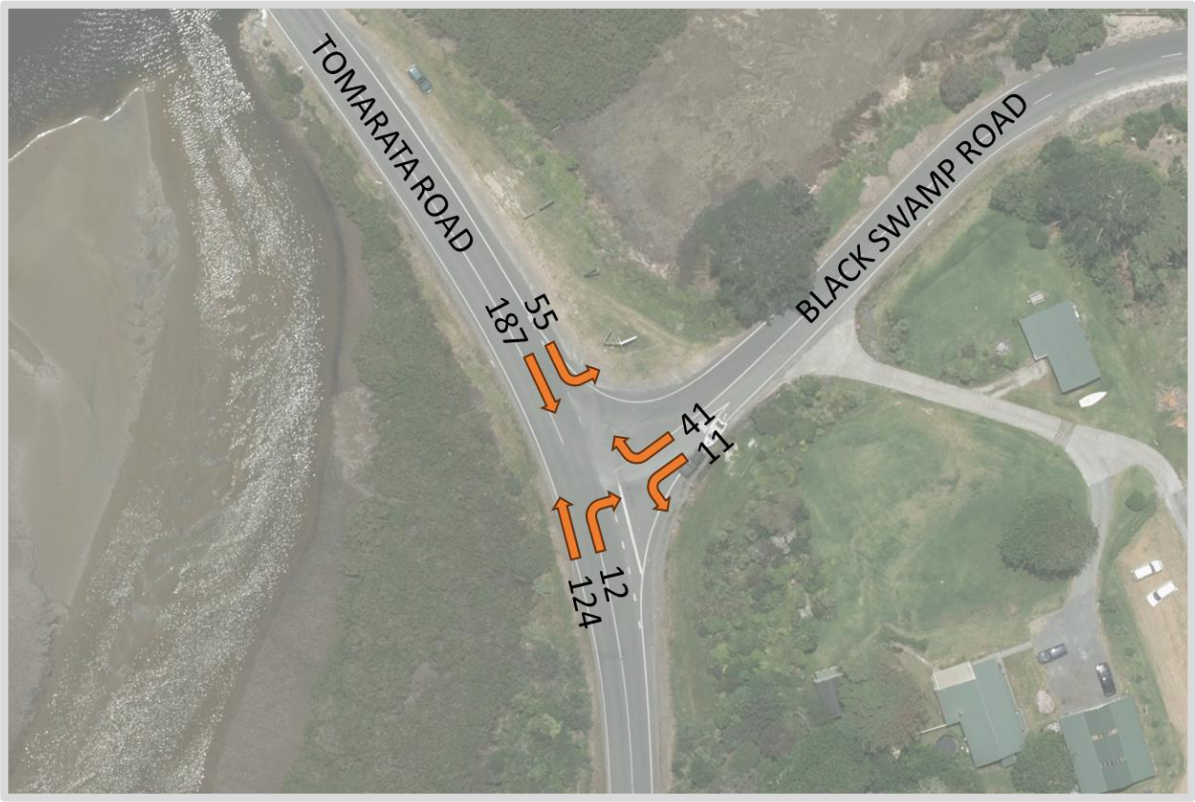


Figure 5: Surveyed Weekday PM Peak Hour Turning Volumes – Black Swamp Road / Tomarata Road

Figure 6: Surveyed Weekday AM Peak Hour Turning Volumes – Black Swamp Road / Raymond Bull Road

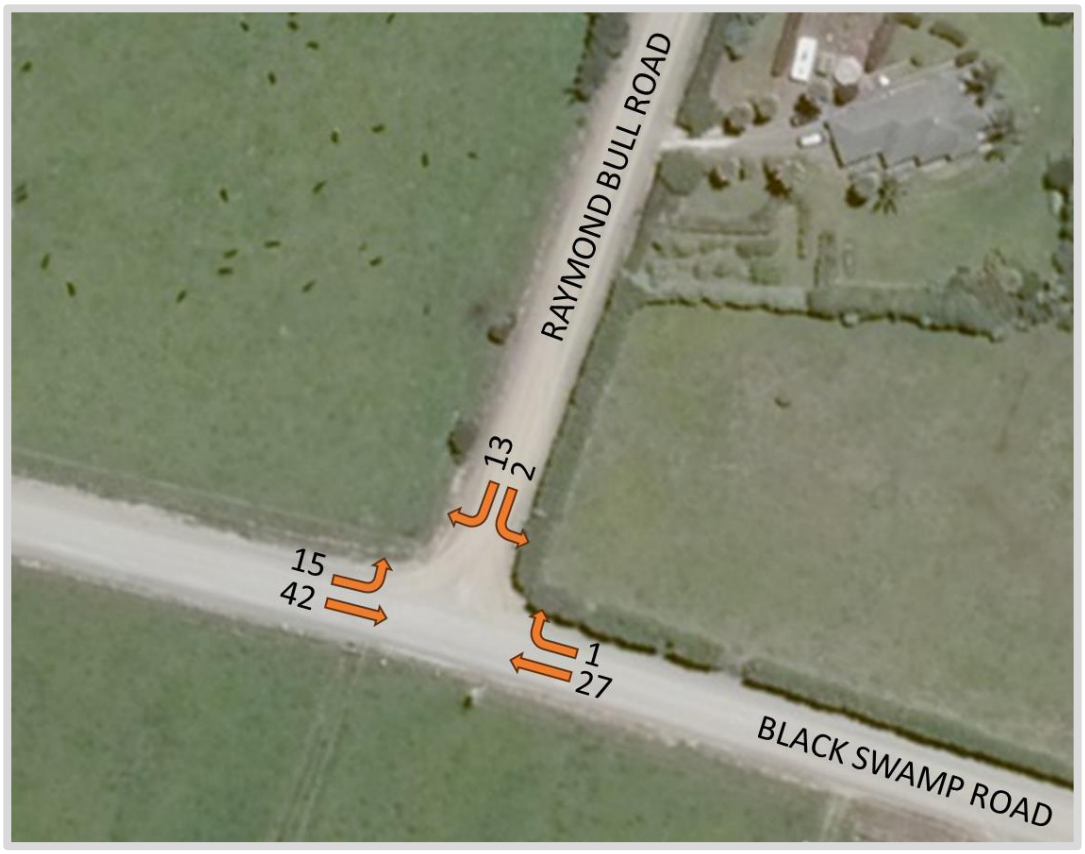
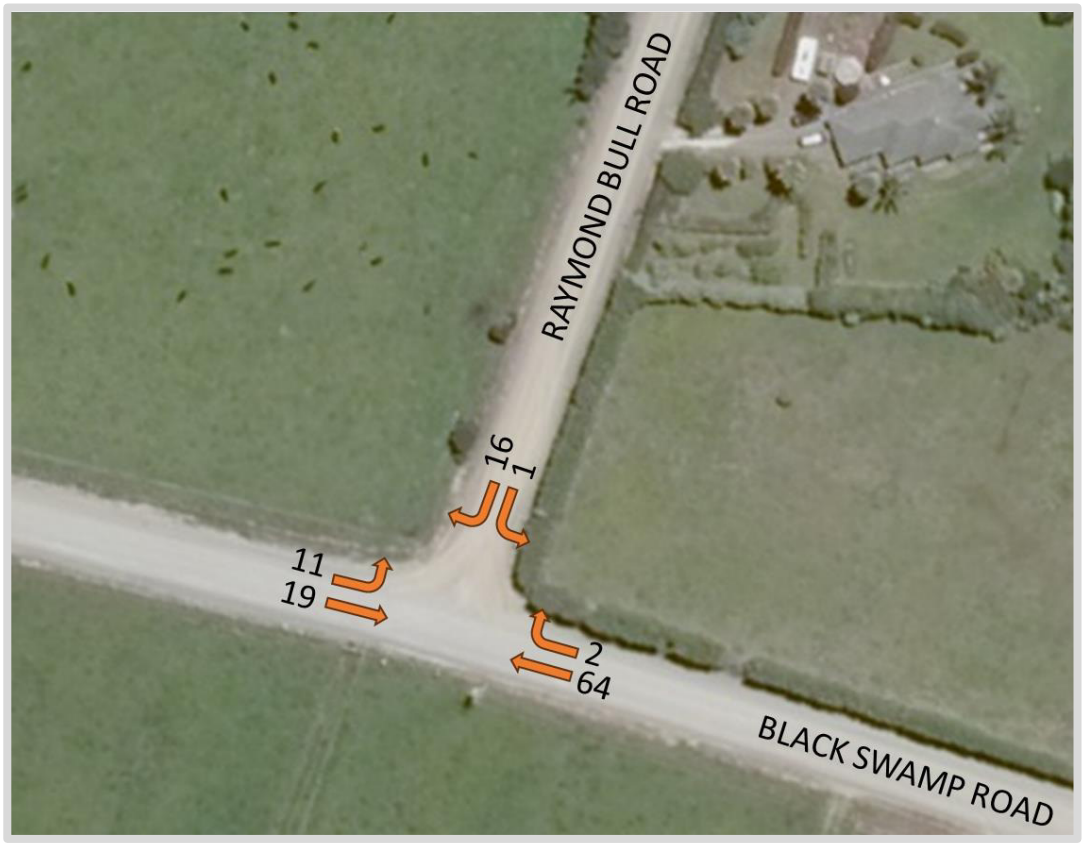


Figure 7: Surveyed Weekday PM Peak Hour Turning Volumes – Black Swamp Road / Raymond Bull Road

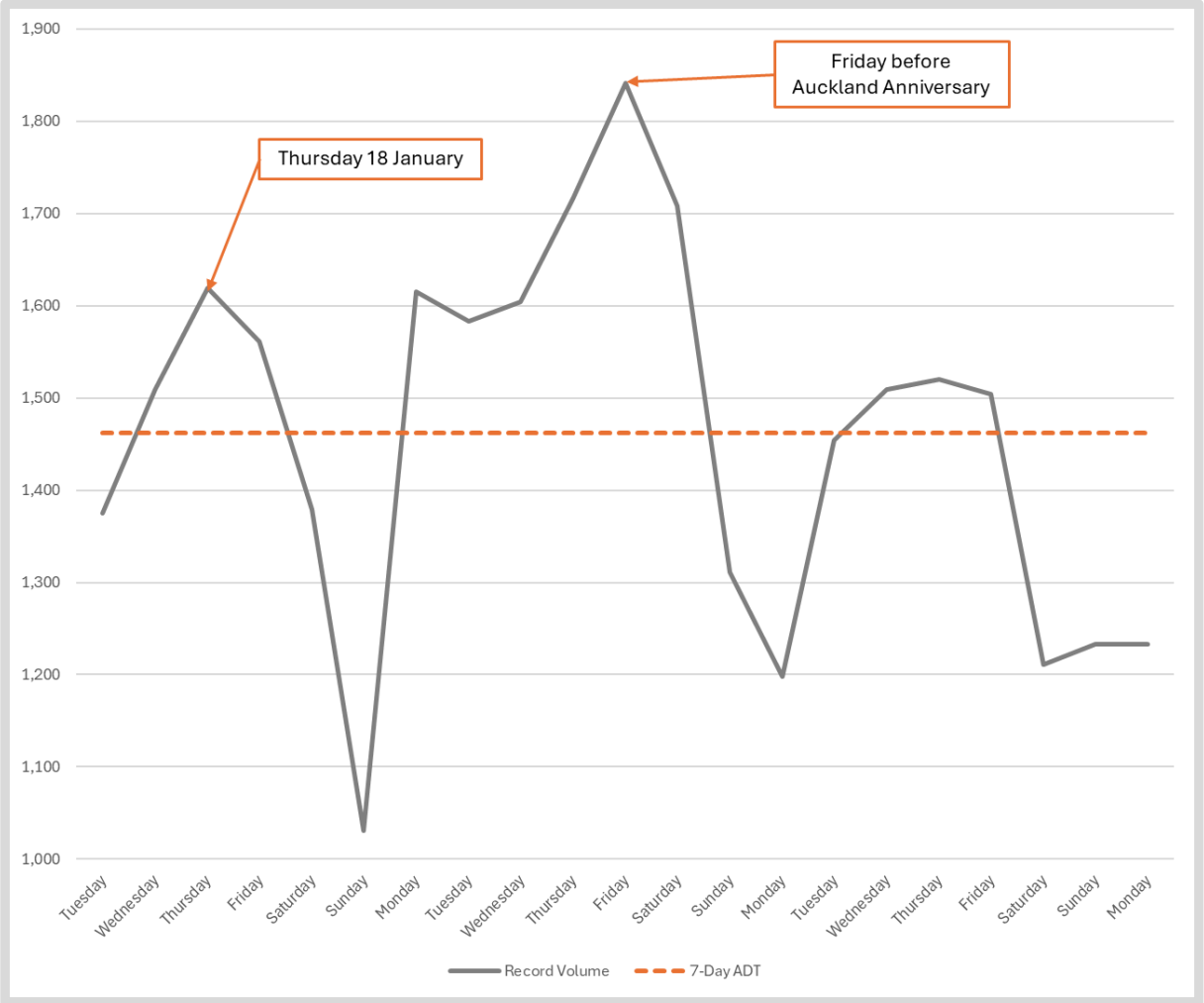


The local peak hours were found to have occurred between 8:00am and 9:00am and between 4:15pm and 5:15pm.

2.4.3 SURVEYED TRAFFIC VOLUMES - ROADS

Manual tube counts were undertaken from Tuesday 16 January 2024 to Monday 5 February 2024 on Black Swamp Road near 35 Black Swamp Road. The survey period captured one public holiday (Auckland Anniversary Day on Monday 29 January 2024, and the weekend and Monday before Waitangi Day on Tuesday 6 February 2024. The results are shown in Figure 8.

Figure 8: Weekly Daily Traffic Volumes on Black Swamp Road



As can be seen from the above, the daily volume generally peaks toward the end of the week, with a maximum recorded volume of 1,841 vpd. The 7-day average daily traffic rate for the survey period was 1,463 vpd.

Of note, on the day of the turning count survey (18 January), the daily volume recorded was 1,619 vpd and thus represents a higher than average period and (given the survey period occurred during the summer holiday period) this is a higher volume day of the year.

2.5 CRASH HISTORY

A search of the road safety record using Waka Kotahi's (NZTA) Crash Analysis System (CAS) has been carried out to identify all reported crashes near the site during the five-year period from 2019 to 2023 as well as all available data from 2024. The search focused on all reported crashes occurring on Black

Swamp Road between Tomarata Road / Insley Street and Raymond Bull Road, as well as along Tomarata Road / Insley Street within 100 metres of the Black Swamp Road / Tomarata Road intersection.

The crash search revealed a total of 1 crash, which occurred along Insley Street when the driver of a vehicle fell asleep at the wheel. The crash is classified as a minor injury crash.

As will be described late in this report, the proposed development is considered to add relatively moderate additional traffic movements onto the local road network, and roads are proposed to be upgraded and sealed and thus safety improved.

3 PLANNING POLICY

The following sections outline key strategy and planning documents that exist for the Mangawhai area over the past five years.

3.1 WHANGAREI TO AUCKLAND PROGRAMME BUSINESS CASE (PBC)

The Whangarei to Auckland PBC was published in August 2017. This PBC considered a corridor strategy to improve transport access within a multi modal environment.

The PBC identified a long-term goal of providing a divided carriageway on a good alignment between Auckland and Whangarei. To implement this, four key infrastructure projects have been identified:

- A dual carriageway between Whangarei (SH14) and Port Marsden Highway;
- A Brynderwyn Hill bypass;
- Warkworth to Wellsford (designations in place); and
- Puhoi to Warkworth (completed).

Safety improvements on the remaining sections will be progressed as well as reducing the impact of traffic on townships and upgrading existing detour routes.

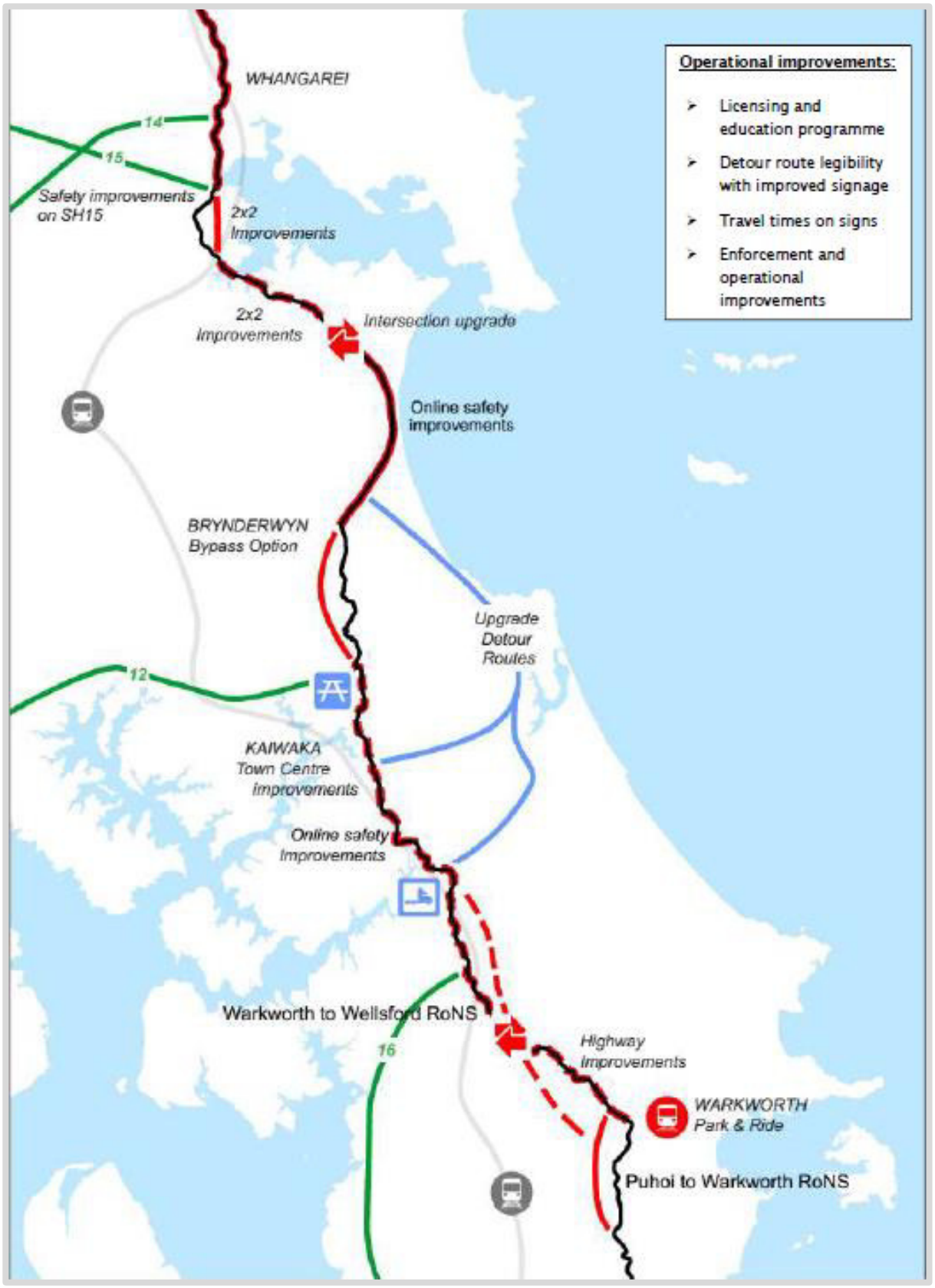
Of note the recently released draft Government Policy Statement (GPS) on Land Transport 2024 lists 15 new Roads of National Significance (RoNS). The RoNS are to support economic growth and productivity and ensure our land transport system allows people and freight to move quickly and safely. The government's plan is to "*begin construction on the Roads of National Significance over the next three years and establish a 10-year construction pipeline*".

Within these 15 RoNS are three of the projects identified above including:

- SH1 Whangārei to Port Marsden Highway;
- Alternative to Brynderwyn Hills; and
- Warkworth to Wellsford.

The recommended programme is shown below in Figure 3.

Figure 9: Whangarei to Auckland PBC



As can be seen these identified detour routes (shown in blue), include Kaiwaka-Mangawhai Road, Molesworth Drive and Mangawhai Heads Road. In this regard the Brynderwyn Hills have been recently closed for earthworks and slip protection, with the Mangawhai route being used as one of the alternatives.

3.2 MANGAWHAI SPATIAL PLAN (2020)

A Spatial Plan for Mangawhai has been developed which aims to guide the town's growth and development over the next 20 to 25 years. Planners anticipate Mangawhai's current population of about 5,000 will reach more than 15,000 by 2043.

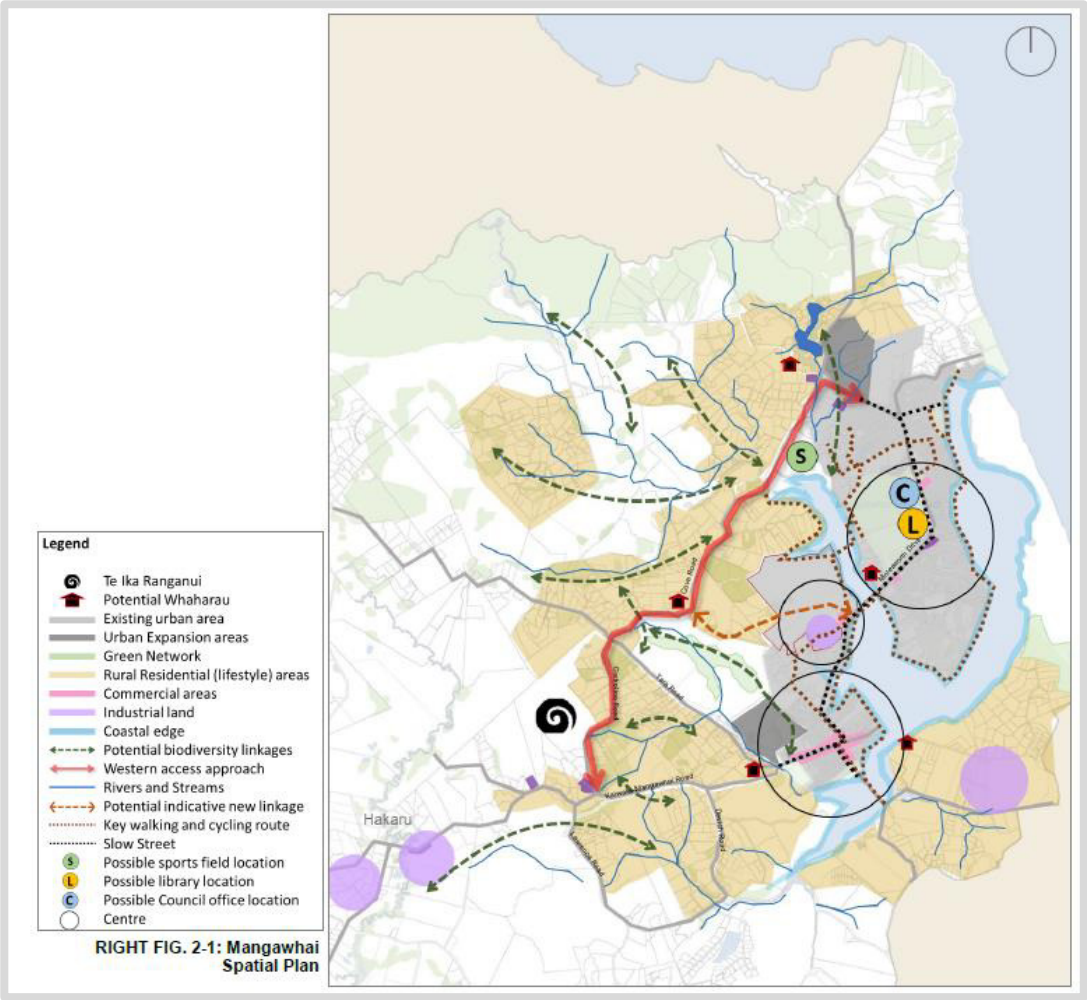
To successfully meet the demands of a growing population, planners have identified key challenges the town will have to overcome.

These included:

- Lack of public transport;
- Lack of cycling and pedestrian networks;
- Limited community facilities;
- Lack of business-zoned land;
- Limited information on stormwater catchments;
- Traffic congestion; and
- Low visibility of Māori and early settlers' history and culture.

The following sets out the proposed plan.

Figure 10: Proposed Spatial Plan for Mangawhai Area



3.3 MANGAWHAI COMMUNITY PLAN (2018)

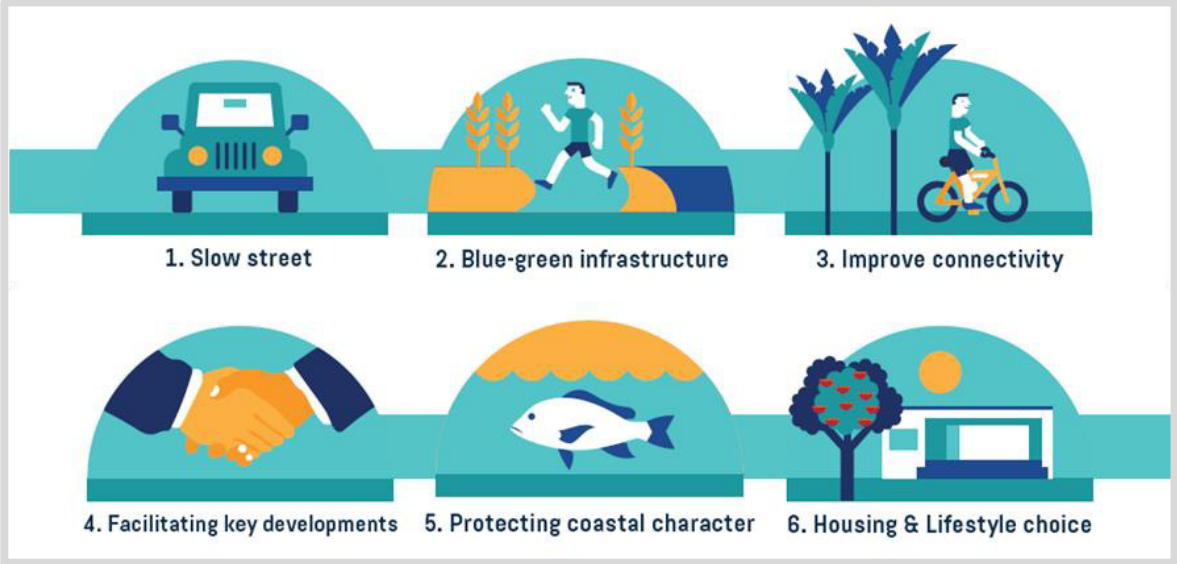
The Mangawhai Community Plan (MCP) is a document to provide guidance to Kaipara District Council in the management of growth in Mangawhai.

This plan is confined to the roles of Council, these being planning and regulation, and investment in services and infrastructure for transport, water supply, stormwater, wastewater, and parks and reserves. It does not include services provided by central government or the private sector.

In mid-2016, Council set up a panel of community representatives to make recommendations for this plan. The recommendations were received by Council in July 2017 and this draft Community Plan is consistent with these recommendations.

Six key Moves were identified as outlined in the figure below. The draft MCP also integrates the Council's vision through each key move.

Figure 11: Council's Six Key Moves



3.4 MANGAWHAI TRANSPORT STUDY (2018)

The WSP Opus Mangawhai Transport Study is predominately a traditional traffic study considering predicted traffic growth and junction capacity. It considers three problem statements:

1. Parts of the urban road network lack capacity to support the current or projected volume of traffic on the arterial road network over the next 10 years (40% of the problem).

2. The existing road network provides limited alternative routes in the event of disruptions on the State Highway network, increasing pressure on arterial network capacity during closure periods (20%).

3. Provisions on the arterial road network for pedestrians and cyclists are poor, resulting in a lack of connected and cohesive links for these modes between urban centres (40%).

The road network was assessed in a 2017 base year, a 2027 future year condition for two growth scenarios – medium (3%) and high (7%). Analysis indicated that mid-block sections of road had sufficient capacity under future growth scenarios, but some junctions would experience congestion which would need improvements to provide acceptable levels of service.

It recommends improvements are carried out to the following intersections with the indicated time periods.

- Insley Street / Moir Street intersection is upgraded within the next 4 years **(Completed)**.
- Moir Street intersection with Molesworth Drive upgrade within the next 6 years **(Completed),**
- Old Waipu Road intersection with Molesworth Drive upgrade within the next 9 years or earlier in conjunction with Mangawhai Central development and/or connection with Old Waipu Road North; and
- Thelma Road intersection with Estuary and Molesworth Drive upgrade within the next 10 years (or in conjunction with a Thelma Road link connection).

The Study develops an infrastructure implementation plan for the above intersection improvements along with a programme to upgrade and implement shared paths mainly along Molesworth Drive linking Mangawhai village with Mangawhai Heads.

The Study does not recommend a bypass to resolve the State Highway lack of resilience issues within a 10-year programme but indicates that a diversion route via Cove Road would alleviate the need to travel through Mangawhai and Mangawhai Heads.

3.5 MANGAWHAI SHARED PATH CONNECTIONS OPTIONS REPORT (2018)

Kaipara District Council commissioned WSP to undertake The Mangawhai Shared Path Connections Options Report. The report is a detailed evaluation of options for the shared path routes identified in the MCP for the greater Mangawhai area, connecting Mangawhai village to Mangawhai Heads Town Centre and Mangawhai Heads Beach (School to Beach). The report delivers specific detail around the various options considered for each section of the complete shared path and provides specific recommendations for the final option for each stage and for design and implementation of these options. Implementation of this plan is well underway.

3.6 MANGAWHAI AND MANGAWHAI HEADS INFRASTRUCTURE PLAN TRANSPORTATION (2016)

Kaipara District Council commissioned MWH to undertake the Transportation section of the Mangawhai Town Infrastructure Plan.

Issues considered included arterial road function, road safety including traffic speeds, Wood Street function as a village centre, Mangawhai village including junction capacity and alternate junction design, pedestrian facilities (lack of), cycling facilities, shared paths and parking facilities. The infrastructure plan considered deficiencies to these transport facilities and recommended improvements such as:

- A shared path from Mangawhai to Mangawhai Heads Beach via Wood Street;
- Transition speed limits;
- Safety improvements to roadsides;
- Footpath improvements;
- Intersection improvements at Molesworth Drive / Wood Street potentially a roundabout;
- Roundabouts at Estuary Estate, Moir Point Road and Thelma Road with Molesworth Drive;
- Feasibility drawings of different junction arrangements at Insley / Moir and Moir / Molesworth; and
- Parking improvements to Wood Street - Fagan Place car park and Mangawhai Heads Beach car park.

3.7 KAIPARA WALKING AND CYCLING STRATEGY (2017)

Kaipara Walking and Cycling Strategy is a district wide strategy which considers national, regional and local cycling and walking frameworks that walking and cycling initiatives in Kaipara District seek to align with. The guidance is generally high level, advising on priorities for the district to join in with larger walking and cycling networks. However, the Implementation Plan proposes several cycleways and footpath improvements in Mangawhai.

3.8 INFRASTRUCTURE STRATEGY 2015 – 2045 KDC (2017)

The Infrastructure Strategy considers roads, water, wastewater, stormwater and flood protection at a district wide level.

Many of the issues in Mangawhai, in particular related to a growing population and increasing levels of congestion are not issues for the rest of Kaipara, and consequently the strategy provides limited advice on the specific transport issues in Mangawhai.

3.9 MANGAWHAI & MANGAWHAI HEADS – REVIEW OF SPEED LIMIT PROVISIONS (2017)

This is a technical report which considers speed limits in accordance with NZTA's "Guidelines for setting speed limits and procedures for calculating speed limits". It recommends changes to speed limits (in many cases the recommended speed limit is lower than the current speed) and suggests that there may be the ability to reduce the speed limits further if road infrastructure was altered to encourage such lower speeds.

4 PROPOSED PLAN CHANGE

4.1 OVERVIEW

Commute Transportation Consultants (Commute) has been engaged by Cabra Mangawhai Limited to prepare an Integrated Transport Assessment (ITA) for proposed residential subdivision developments at Black Swamp Road in Mangawhai.

The Exposure Draft of the Kaipara District Plan Review proposes to zone the site as Rural lifestyle zone.

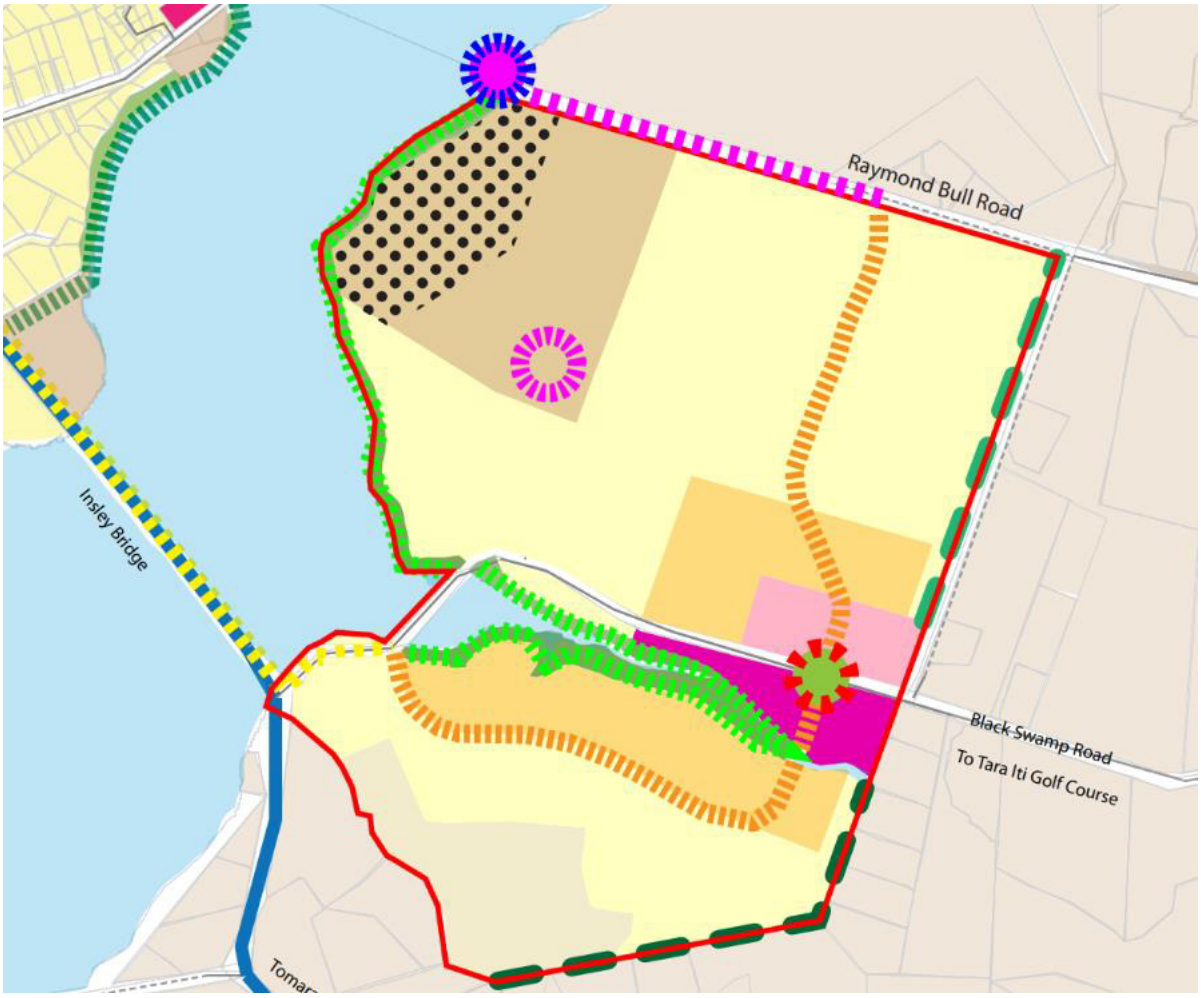
The Plan Change seeks to rezone the land to a mix of the following zones (minimum lot sizes):

- Rural Lifestyle Zone (220m^2);
- Medium Density Residential Zone (140m^2);
- Low Density Residential Zone (180m^2);
- Large Lot Residential Zone (220m^2);
- Neighbourhood Centre Zone (6,370m^2 GFA), and
- Mixed Use Zone (5,365m^2 GFA of industrial).

It is proposed to provide approximately 60% of all new residential dwellings on the northern site, along with a new internal road network and accompanying intersections. Vehicle and pedestrian access to the site will be via Black Swamp Road, and will accommodate potential future upgrades and connections to roads outside of the site, including Raymond Bull Road.

The southern site is proposed to comprise approximately 40% of all new residential dwellings, along with a new internal road network and accompanying intersections. Vehicle and pedestrian access to the site will be via the upgraded Black Swamp Road. The proposed plan change zone structureplan shown in Figure 12.

Figure 12: Proposed Site structureplan



4.2 TRANSPORT CONNECTIVITY

The proposed internal road schemes are detailed in Figure 12 above.

The site will gain access to the local road network via connections to Black Swamp Road. It is proposed to upgrade Black Swamp Road from Tomarata Road through to Raymond Bull Road to provide a footpath along one side of the road, as well as sealing the road through to the Raymond Bull Road intersection.

It is also proposed to upgrade Raymond Bull Road along the eastern and northern boundaries of the site, to include sealing of the roads and provision of a footpath along the western edge of the road.

No additional roading upgrades are being proposed outside of the site as part of this proposal.

5 TRIP GENERATION

5.1 DISTRICT PLAN TRIP GENERATION

Section 25F of the District Plan outlines the Traffic Intensity Factor (TIF) Guidelines applicable to new activities. The applicable TIFs for the proposed activities on the site are listed as follows:

- Dwellings 6 trips per dwelling (daily)
- Shops 70 trips per 100m^2 GFA
- Industrial Units 5 trips per 100m^2 GFA

It is noted that the exact classification of the retail activities depends on the type of retail tenants who will occupy the shops, which is expected to be determined in the resource consent stage.

It is proposed to change the site zoning to Residential, which permits 20 trips per day per site under Rule 13.10.18 of the District Plan; and Commercial, which permits 200 trips per day per site under Rule 14.10.18 of the District Plan.

Individual traffic analysis in regard to the District Plan will be undertaken in greater detail during the resource consent application process.

5.2 RTA GUIDE TRIP GENERATION

The RTA's (now RMS) *Guide to Traffic Generating Developments (2002)* (RTA Guide) is commonly used by traffic engineering practitioners in Australasia to assess the traffic generating potential of various land uses.

The proposed low density, large lot and rural lifestyle residential dwellings are considered to be best represented by "*dwelling houses*", and the RTA Guide suggests a peak hour trip rate of 0.85 trips per dwelling and 9.0 trips per dwelling daily.

The medium density residential dwellings are considered to be best represented "*medium density residential flat building*", and the RTA Guide suggests a peak hour rate with an upper limit of 0.65 trips per dwelling, and 6.5 trips per dwelling daily.

Retail activity is considered to be best represented by "*retail – shopping centres (specialty shops)*", with the RTA Guide suggesting a peak hour trip rate of 4.6 trips per 100m^2, with a daily trip rate of 55.5 trips per 100m^2.

The industrial activities within the Mixed Use Zone are considered to be best represented by "*factories*" (rather than warehouses), with a peak hour trip rate of 1 trip per 100m^2 GFA and a daily trip rate of 5 trips per 100m^2 GFA.

5.3 ASSUMPTIONS

As detailed development plans are yet to be finalised, a number of assumptions have been made in regard to the total areas for each zone proposed on the site, and to the trip generation characteristics of each zone. It is noted that these assumptions for yield of development within each zone align with the Urban Economics report "*Proposed Plan Change Mangawhai – Evaluation of Economic Costs &* Benefits" as detailed in Section 4 of this report. In addition, 25% of all trips generated by the development have been assumed to remain internal to the subdivision, as per the RTA Guide. Given the location and size of the proposed commercial area, and as it is purposed to serve the local residential area, the external commercial traffic generation has been reduced by 75%.

In order to assess future years, a linear growth rate of 3% per year for 10 years has been applied (30% total), with future scenarios adopting the same percentage completion of both the development and the final growth volumes, e.g. a 50% development completion would factor in 50% of the total growth (15% total).

5.4 PROPOSED TRIP GENERATION

The anticipated trip generation for the proposed development is summarised in Table 2, based on the above trip generation rates and assumptions (including the 25% reduction for residential and industrial internal trips within the subdivision, and 75% for retail trips). It is noted that the final number of dwellings, lot size, bedroom numbers etc. are all subject to the subsequent resource consent process and further design.

Table 1: External Trip Generation Rates

Activity	Trip Generation Rate[1]	Dwellings / GFA	External Trips (peak hour)	Trips (daily)
Low density / large lot residential / rural lifestyle	0.85 per dwelling (peak hour) 9.0 per dwelling (daily)	581	370	3,922
Medium density residential	0.65 per dwelling (peak hour) 6.5 per dwelling (daily)	207	101	1,010
Retail	4.6 per 100m^2 GFA (peak hour) 55.5 per 100m^2 GFA (daily)	6,370m^2	74	884
Industrial	1 per 100m^2 GFA (peak hour) 5 per 100m^2 GFA (daily)	10,600m^2	26	133
Total:			**571**	**5,949**

As detailed in the table above, the proposed development is estimated to generate in the order of 571 vph during the peak hours, and 5,949 vpd. As mentioned above, these estimates are based on a number of assumptions that are subject to change at the resource consent stage.

[1] RTA Guide specified rates. Calculations based on 75% of this rate for external trips.

5.5 TRIP DISTRIBUTION / MODEL GENERATION

5.5.1 DISTRIBUTION ASSUMPTIONS

The estimated residential peak hour trips are assumed to follow distribution patterns used in similar developments, listed as follows:

- AM peak hour – 70% outbound, 30% inbound; and
- PM peak hour – 30% outbound, 70% inbound.

In terms of directional split, 95% of vehicles are assumed to travel to / from the west toward Black Swamp Road / Tomarata Road, where traffic would then split to the west (Mangawhai village) and south (SH1 / Auckland) at a rate of approximately 40% and 55% respectively. The remaining 5% have been assumed to head to the east toward the beaches and golf courses.

For the commercial and industrial components, the peak hour trips are assumed to follow these distribution patterns:

- AM peak hour – 40% outbound, 60% inbound
- PM peak hour – 80% outbound, 20% inbound

These proportional splits have been established based on the existing volumes of the traffic surveys. Based on the road network, it is considered likely the predominant traffic flows would be to / from the west of the site, splitting to / from Auckland via Tomarata Road and Mangawhai Road, or to / from Mangawhai village and further north via Insley Street.

5.5.2 TRAFFIC MOVEMENTS

Figure 13 and Figure 14 below show the estimated volumes as a result of the proposed subdivision developments during the peak hour for both the AM and PM peak hours respectively.

Figure 13: Estimated Development Peak Hour Trip Generation

Figure 14: Estimated Development PM Peak Hour Trip Generation

Figure 15 and Figure 16 show the estimated peak hour traffic volumes following development of the proposal, including the surveyed base traffic as well as 10 years of growth of the surveyed volumes.

Figure 15: Estimated Post-Development AM Peak Hour Volumes

Figure 16: Estimated Post-Development PM Peak Hour Volumes

6 TRAFFIC MODELLING

6.1 PROPOSED PPC SCENARIO

The intersection of Black Swamp Road / Insley Street is considered the key intersection for the PPC has been modelled using SIDRA Intersection under existing 2024 survey volumes (referred to as 'Existing' scenario) with the PPC volumes added to form the 'Full development' scenario. Further, a base 30% growth has been applied to the existing volumes to represent 10 years of growth at 3% per annum.

6.2 SENSITIVITY TESTING

The intersection has been modelled with additional levels of development (applying a straight increase to percent yield) to determine the level of development that can be added before the intersection reaches capacity (either level of service D or degree of saturation 0.95), and requires an upgrade.

As a result of this method, it was found that the proposed development as discussed in Section 4 and 5 of this report could reasonably be increased by 80% before the requirement for an intersection upgrade at Black Swamp Road / Tomarata Road.

6.3 SIDRA RESULTS

The SIDRA modelling results are provided for reference in Appendix A. By way of summary, the SIDRA results show:

- The intersection requires an upgrade to include a right turn bay from Tomarata Road into Black Swamp Road with essentially any additional traffic; and
- The complete development can comfortably be accommodated by the upgraded priority-controlled intersection described above; and
- With this upgrade, the intersection can cater for up to an approximate additional 80% of the proposed development (total of 1,418 dwellings, 11,446m^2 GFA of retail activity and 9,657m^2 GFA

of industrial activity) until the right turn out movements from Black Swamp Road reach capacity. At this stage the likely upgrade would be a single lane roundabout.

Both the right turn bay and the roundabout can be accommodated within the existing road reserve. The concept designs of both intersections are contained in **Appendix B**.

7 SENSIVITY TESTING

7.1 INTERNAL CAPTURE

From discussions with Council reviewers, there was some comfort with the residential traffic assumptions. However, for the retail and industrial components, the 75% of trips internal to the PPC area was queried. As such a sensitivity test on this assumption has been undertaken if the internalisation rate of the retail / industrial were reduced to 50% and 25%. The traffic generation has been revised as follows.

The anticipated trip generation for the proposed development is summarised in Table 2 based on the same trip generation rates and assumptions above, together with the revised industrial internal capture in Table 3 and 4.

Table 2: External Trip Generation Rates

Activity	Trip Generation Rate	Dwellings / GFA	Total Trips (peak hour)	External Trips (peak hour) (percentage)
Low density / large lot residential / rural lifestyle	0.85 per dwelling (peak hour) 9.0 per dwelling (daily)	581	493	370 (75%)
Medium density residential	0.65 per dwelling (peak hour) 6.5 per dwelling (daily)	207	134	101 (75%)
Retail	4.6 per 100m^2 GFA (peak hour) 55.5 per 100m^2 GFA (daily)	6,370m^2	293	74 (25%)
Industrial	1 per 100m^2 GFA (peak hour) 5 per 100m^2 GFA (daily)	10,600m^2	106	26 (25%)
Total:			**996**	**571**

Table 3: External Trip Generation Rates (50% commercial internal)

Activity	Trip Generation Rate	Dwellings / GFA	Total Trips (peak hour)	External Trips (peak hour) (percentage)
Low density / large lot residential / rural lifestyle	0.85 per dwelling (peak hour) 9.0 per dwelling (daily)	581	493	370 (75%)
Medium density residential	0.65 per dwelling (peak hour) 6.5 per dwelling (daily)	207	134	101 (75%)
Retail	4.6 per 100m^2 GFA (peak hour) 55.5 per 100m^2 GFA (daily)	6,370m^2	293	146 (50%)
Industrial	1 per 100m^2 GFA (peak hour) 5 per 100m^2 GFA (daily)	10,600m^2	106	53 (50%)
Total:			**996**	**670**

Table 4: External Trip Generation Rates (25% commercial internal)

Activity	Trip Generation Rate	Dwellings / GFA	Total Trips (peak hour)	External Trips (peak hour) (percentage)
Low density / large lot residential / rural lifestyle	0.85 per dwelling (peak hour) 9.0 per dwelling (daily)	581	493	370 (75%)
Medium density residential	0.65 per dwelling (peak hour) 6.5 per dwelling (daily)	207	134	101 (75%)
Retail	4.6 per 100m^2 GFA (peak hour) 55.5 per 100m^2 GFA (daily)	6,370m^2	293	219 (75%)
Industrial	1 per 100m^2 GFA (peak hour) 5 per 100m^2 GFA (daily)	10,600m^2	106	80 (75%)
Total:			**996**	**770**

SDRA analysis has been undertaken for both scenarios.

The detailed outputs are contained in **Appendix A** however the results are summarised in Table 5 below:

Table 5: SIDRA summary (post PPC with growth with right turn upgrades)

Scenario	AM PEAK		PM PEAK	
	95%ile queue (worst m)	Worst degree of saturation	95%ile queue (worst m)	Worst degree of saturation
ITA (75% commercial internal)	14m	0.383	16m	0.444
ITA (50% commercial internal)	17m	0.442	18m	0.535
ITA (25% commercial internal)	20m	0.509	22m	0.625

As shown, under all scenarios the upgraded intersection performs well below capacity.

7.2 DIRECTIONAL SPLIT

The in modelling in Section 6.3 assumes 40% to Mangawhai, 55% to Auckland and 5% to the east (beaches and golf courses).

The Mangawhai (40%) / Auckland (55%) distribution is based on expected employment in the future (ie bias towards Auckland). However, this is somewhat subjective and as such a sensitivity test has been undertaken of reversing the above distribution with Mangawhai (55%) / Auckland (40%) and 5% to the east.

The SIDRA modelling results are provided for reference in **Appendix A**. By way of summary, the SIDRA results show:

- The PPC can comfortably be accommodated by the upgraded priority-controlled intersection (with right turn bay); and
- With this upgrade, the intersection can cater for up to an approximate additional 70% (previously 80% in the original analysis) of the proposed development until the right turn out movements from Black Swamp Road reaches capacity. At this stage the likely upgrade would be a single lane roundabout.

8 SAFE SYSTEM ASSESSMENT

While there is an increase in turning movements, the intersection of Black Swamp Road/ Insley Street and Tomarata Road is also proposed to be upgraded as part of the provision of the PPC (right turn bay and pedestrian provision). A Safe System Assessment has therefore been undertaken for both the existing arrangement as well as the proposed upgraded arrangement (with full right turn bay and PPC traffic added). This is shown in **Appendix C**.

The SSA assessment does show a slight increase in score however this increase is only minimal due to the proposed upgrade to the intersection (right turn bay and pedestrian provisions). The overall score is considered low.

Any change in directional split of PPC traffic at this intersection is not expected to noticeably alter the SSA score as the modelling shows (regardless of directional split) the upgraded intersection is well below capacity and thus would not lead to unacceptable gaps in traffic being taken therefore leading to additional crashes.

9 WIDER NETWORK

Given the proximity of the Mangawhai village, an assessment has been undertaken of the nearest major intersection to the site being the Moir Street/Insley Street roundabout.

In this regard, the Mangawhai Transport Study undertaken by Opus dated May 2018 did assess this intersection and concluded a single lane roundabout was appropriate (recently constructed). An extract of this assessment is shown below. It shows with a "high growth" scenario, the single lane roundabout is still well below capacity in holiday peak period (high growth was assumed to be 7% growth per annum over 10 years).

Table 6: Mangawhai Transport Study results

Table 4-3: Results of Insley Street / Moir Street Mitigation Option Testing (SIDRA)

INTERSECTION	SCENARIO	AV DELAY	WORST MOVEMENT			
			v/c	Queue (m)	Delay	LoS
SIGNALISED INTERSECTION LAYOUT 2027 HIGH GROWTH	AM Peak	75.2	0.959	384.3	92.2	F
	Weekend Peak	30.6	0.865	144.2	40.0	D
	Holiday Peak	47.5	0.888	345.5	87.2	F
SINGLE LANE ROUNDABOUT LAYOUT 2027 HIGH GROWTH	AM Peak	11.5	0.778	84.9	18.8	B
	Weekend Peak	7.2	0.588	36.2	11.4	B
	Holiday Peak	11.7	0.781	82.5	22.4	C

As such, it is considered that the Moir Street/Insley Street roundabout has sufficient capacity in the future to accommodate the PPC.

10 PROPOSED ROAD NETWORK

10.1 GENERAL

The future road network provides for a range of travel modes including cycling & walking, private vehicles and enables for future transport services. Figure 18 shows the key routes.

Figure 18: Key Collector Roads

A hierarchy of road types (collector and local) are illustrated within the PPC area on the Precinct Plan (outlined in Figure 18 above) and have been designed to connect vehicles, cyclist and pedestrians to Mangawhai. The street network is generally considered legible and well connected both within the PPC area and to the wider road network.

The key upgrades identified within the PPC are as follows:

- Upgrade of Black Swamp Road to an urban Collector standard along the subject site through to the Insley Street intersection; and
- New collector road commencing from a new roundabout on Black Swamp Road (near the eastern end of the PPC area travelling in both southern and northerly direction through the site). The southern collector road then loops back to Black Swamp Road.

10.2 COLLECTOR ROADS

The proposed collector roads will connect the wider area with local roads, and function in a shared access and movement role. The spatial distribution of these over the PPC area can be seen in Figure 18 above.

Final road cross sections will be determined at the resource consent stage and will be in accordance with the required local engineering standards.

It is likely that the final cross sections will include a 6.0-7.0m carriageway, with 2.2-2.6m raingardens and indented parking bays on both sides along its length. The carriageway width will be dependent on whether it is to be public transport route (7.0m). A 3.0m shared path (which can be used by inexperienced cyclists) is provided on both sides of the road.

Vehicle crossings for driveways are avoided on Collector Roads. Where shared access lots/lanes cross footpaths, the footpath surface will be continued across the driveway to highlight legal footpath user right-of-way.

10.3 LOCAL ROADS

Final road cross sections/from will be determined at the resource consent stage and will be in accordance with the required local engineering standards.

It is likely that the final cross sections will be include 6.0m wide carriageways (3.0m traffic lanes). All cross sections will at least have 1.8m footpaths on both sides.

Where driveways cross footpaths, the footpath surface will be continued across the driveway to highlight legal footpath user right-of-way.

All cross sections provide 2.2-2.6m width for rain gardens, parking and tree build outs.

The combination of relatively narrow carriageways and side friction from on-street parking and residential driveways will create a low speed (30-40km/hr) environment appropriate for a residential area.

The lane widths and footpath dimensions that are proposed generally comply with Kaipara Engineering Standards. These are considered appropriate.

10.4 CYCLING

A comprehensive cycling network will serve the PPC area. The proposed cycling provisions include:

- Shared off-road (3m) path on the collector roads throughout the PPC area;
- Low speed environment with traffic calming; and
- Provision of a separate 3m shared path on Insley Street connecting the PPC area with Mangawhai including existing schools and shopping areas.

10.5 WALKING

A comprehensive pedestrian network will serve the PPC area. The proposed pedestrian provisions include:

- Pedestrian footpath on both sides of all roads
- Shared off-road (3m) path on the collector roads throughout the PPC area;
- Low speed environment with traffic calming; and
- Provision of a separate 3m shared path on Insley Street connecting the PPC area with Mangawhai including existing schools and shopping areas.
- Low speed environment with traffic calming in the local centre; and
- Low speed road design on all local roads.

Of note the PPC will significantly enhance the Mangawhai to Pakiri Te Araroa section walkway. This is shown in Figure 19 below.

Figure 19: Mangawhai to Pakiri Te Araroa Section Walkway

11 INTERNAL INTERSECTIONS

The exact formation of individual internal intersections should be considered as part of each detailed development application.

It is however noted that a roundabout is proposed at the intersections of all Collector Road (on Black Swamp Road).

12 ACCESS

Vehicle access for each individual site would be established during the resource consent phase for each dwelling and retail activity. Generally, the vehicle access points would seek to achieve separation from intersections, adjacent vehicle crossings, satisfy maximum vehicle crossing widths at the boundary, ensure gradients are compliant with AS/NZS 2890.1:2004, and minimise the number of vehicle crossings were possible.

13 CONSTRUCTION TRAFFIC

The majority of the development site is currently occupied by farmland and low-density residential dwellings (with some more commercial activity including brewery, garden centre, campground and engineering), and minor earthworks would be required before any new development could be constructed. It is expected that temporary accesses would be formed at the site access locations to enable truck movement to / from the site. Typically, roading and services would be established first, with individual sites following on.

The initial earthworks will be undertaken over an extended period to minimise traffic effects of the construction activities on the local road network. As is typical with a development of this scale, it is recommended that a Construction Traffic Management Plan (CTMP) should be required as a condition. It is considered that this Construction Traffic Management Plan should include:

- Construction dates and hours of operation including any specific non-working hours for traffic congestion/noise etc, aligned with normally accepted construction hours in the Auckland Region;
- Truck route diagrams between the site and external road network;
- Temporary traffic management signage / details for both pedestrians and vehicles, to manage the interaction of these road users with heavy construction traffic; and
- Details of site access / egress over the entire construction period and any limitations on truck movements. All egress points should be positioned to achieve appropriate sight distances.

Based on experience of constructing similar projects, and bearing in mind capacity within the existing road network, with the appropriate Construction Traffic Management Plan in place and the above measures implemented, it is considered that construction activities can be managed to ensure any generated traffic effects are appropriately mitigated.

14 CONSULTATION

The following consultation has been undertaken on transport matters relating to the PPC:

- Open day on 15th June 2024
- Meeting with Council / neighbours as per Engagement Report undertaken by TPC

15 IMPLEMENTATION PLAN

Table 4 summarises the proposed Implementation Plan. It sets out local and wider area works, that are considered relevant to this PPC.

In terms of timing, it is acknowledged that there is a certain amount of traffic increase enabled by activities that are established / establishing / or consented in the existing environment. Such activities include a garden centre at 45 / 45A Black Swamp and brewery at 25 Windsor Way. There is also a consented 20 lot subdivision on the land at 18B Black Swamp Road.

In addition to these existing environment activities, there is the opportunity for dwellings to establish on existing vacant sites, and it is expected (regardless of the PPC) that there would be some additional subdivision opportunities under the Operative District Plan.

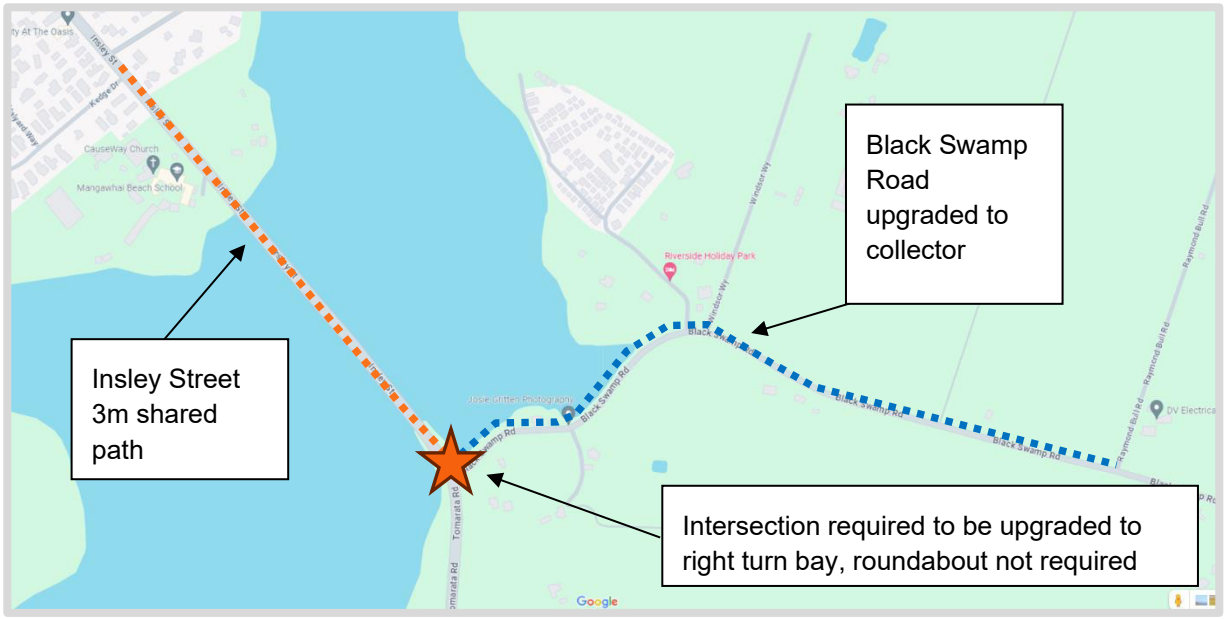
On this basis an existing environment traffic demand for the area, without the plan change, of an additional 50 dwellings has been estimated. The rules will therefore trigger the upgrades for the construction of a right turn bay and the construction of the walkway etc back to the village prior to the construction of the 51 dwelling in the plan change area.

Table 7: Implementation Plan

Project	Responsibility	Upgrade	Trigger / timing
Internal pedestrian / cycling connections to Black Swamp Road	Developer	Internal pedestrian footpaths to Black Swamp Road	Needed at initial dwelling
Insley Street upgraded pedestrian / cycling link	Developer / Council	Pedestrian and cycling component to existing road including across inlet	Needed at 51 dwellings
Black Swamp Road upgraded as an urban Collector Road	Developer outside site	Full Collector Road including walking and cycling	Any development with frontage to Black swamp Road. Partly needed at 51 dwellings to ensure pedestrian / cycling links are in place from any new dwelling to Mangawhai
New Collector Roads through the site	Developer	As the site develops the internal collector road identified in the Structure Plan should be provided (noting slightly different location).	Any site with frontage to new collector road
Upgrade of the Insley Street Road / Black Swamp Road intersection	Developer	1. Initial right turn bay 2. Upgrade to roundabout	1. Needed at 51 dwellings 2. Only necessary if development scale reaches 180% of PPC

Figure 20 shows the external connections / implementation plan.

Figure 20: External Upgrades



None of the upgrades above are included in the latest LTP. Of note the Insley Street pedestrian / cycling link was included in the 2018/28 LTP (called Insley Street causeway Bridge) however this is not in the newer 2021/31 LTP.

16 CONCLUSION

Based on the assessments undertaken in this report, it is concluded:

- The site, with the mitigation / improvement measures identified, has good accessibility to various transport modes: walking, cycling, and private vehicle.
- The effects of the proposed increase in vehicles are expected to be minimal assuming the recommended upgrades occur with the proposed roads, public transport and intersections capable of accommodating this additional traffic.
- Sufficient parking can be provided on-site; and
- The proposed development is consistent with, and encourages, key regional and district transport policies.

It is anticipated that any future residential development would provide the transport network upgrades described in Section 12 of this assessment. The traffic effects of the development potential that could be achieved under the zoning, with the implementation of the measures identified in Section 12, are considered acceptable and there is no reason, from a transport perspective, to preclude approval of the proposed Plan Change.

Commute Transportation Consultants

APPENDIX A – SIDRA

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - AM (Site Folder: Existing)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
AM Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	131	16.1	131	16.1	0.084	0.1	LOS A	0.1	0.8	0.08	0.09	0.08	49.5
3	R2	All MCs	13	8.3	13	8.3	0.084	5.7	LOS A	0.1	0.8	0.08	0.09	0.08	48.0
Approach			143	15.4	143	15.4	0.084	0.6	NA	0.1	0.8	0.08	0.09	0.08	49.3
East: Black Swamp Road															
4	L2	All MCs	12	9.1	12	9.1	0.009	5.3	LOS A	0.0	0.3	0.29	0.51	0.29	45.2
6	R2	All MCs	43	9.8	43	9.8	0.052	6.4	LOS A	0.2	1.2	0.39	0.64	0.39	44.6
Approach			55	9.6	55	9.6	0.052	6.2	LOS A	0.2	1.2	0.37	0.61	0.37	44.7
North: Tomarata Road															
7	L2	All MCs	58	7.3	58	7.3	0.141	4.7	LOS A	0.0	0.0	0.00	0.12	0.00	47.9
8	T1	All MCs	197	10.7	197	10.7	0.141	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	49.2
Approach			255	9.9	255	9.9	0.141	1.1	NA	0.0	0.0	0.00	0.12	0.00	48.9
All Vehicles			453	11.6	453	11.6	0.141	1.6	NA	0.2	1.2	0.07	0.17	0.07	48.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - PM (Site Folder: Existing)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
PM Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	318	3.6	318	3.6	0.172	0.0	LOS A	0.1	0.4	0.02	0.02	0.02	49.9
3	R2	All MCs	7	0.0	7	0.0	0.172	5.0	LOS A	0.1	0.4	0.02	0.02	0.02	48.5
Approach			325	3.6	325	3.6	0.172	0.1	NA	0.1	0.4	0.02	0.02	0.02	49.8
East: Black Swamp Road															
4	L2	All MCs	6	0.0	6	0.0	0.005	5.1	LOS A	0.0	0.1	0.26	0.50	0.26	45.4
6	R2	All MCs	91	7.0	91	7.0	0.125	7.4	LOS A	0.4	3.0	0.48	0.73	0.48	44.1
Approach			97	6.5	97	6.5	0.125	7.3	LOS A	0.4	3.0	0.46	0.72	0.46	44.2
North: Tomarata Road															
7	L2	All MCs	41	17.9	41	17.9	0.119	4.8	LOS A	0.0	0.0	0.00	0.10	0.00	47.9
8	T1	All MCs	176	7.2	176	7.2	0.119	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	49.4
Approach			217	9.2	217	9.2	0.119	0.9	NA	0.0	0.0	0.00	0.10	0.00	49.1
All Vehicles			639	5.9	639	5.9	0.172	1.5	NA	0.4	3.0	0.08	0.15	0.08	48.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - AM - Sep 24 Yield (Site Folder: Post-Development Growth - RT Bay)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
AM Post-Dev 30% Growth
Sep 24 Yield
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	169	16.1	169	16.1	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
3	R2	All MCs	186	0.6	186	0.6	0.164	6.5	LOS A	0.7	5.1	0.51	0.67	0.51	44.8
Approach			356	8.0	356	8.0	0.164	3.4	NA	0.7	5.1	0.27	0.35	0.27	47.1
East: Black Swamp Road															
4	L2	All MCs	209	0.5	209	0.5	0.163	5.6	LOS A	0.7	4.9	0.37	0.58	0.37	45.1
6	R2	All MCs	187	2.2	187	2.2	0.402	13.6	LOS B	2.0	14.2	0.72	0.96	0.97	41.2
Approach			397	1.3	397	1.3	0.402	9.3	LOS A	2.0	14.2	0.53	0.76	0.65	43.2
North: Tomarata Road															
7	L2	All MCs	184	2.3	184	2.3	0.241	4.7	LOS A	0.0	0.0	0.00	0.23	0.00	47.4
8	T1	All MCs	256	10.7	256	10.7	0.241	0.1	LOS A	0.0	0.0	0.00	0.23	0.00	48.6
Approach			440	7.2	440	7.2	0.241	2.0	NA	0.0	0.0	0.00	0.23	0.00	48.1
All Vehicles			1193	5.5	1193	5.5	0.402	4.9	NA	2.0	14.2	0.26	0.44	0.30	46.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - PM - Sep 24 Yield (Site Folder: Post-Development Growth - RT Bay)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
PM Post-Dev 30% Growth
Sep 24 Yield
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	413	3.6	413	3.6	0.392	1.4	LOS A	2.2	15.4	0.39	0.44	0.43	47.9
3	R2	All MCs	205	0.0	205	0.0	0.392	6.9	LOS A	2.2	15.4	0.39	0.44	0.43	46.6
Approach			618	2.4	618	2.4	0.392	3.2	NA	2.2	15.4	0.39	0.44	0.43	47.4
East: Black Swamp Road															
4	L2	All MCs	184	0.6	184	0.6	0.139	5.4	LOS A	0.6	4.1	0.34	0.56	0.34	45.2
6	R2	All MCs	219	2.9	219	2.9	0.517	15.1	LOS C	2.3	16.5	0.80	1.05	1.22	40.4
Approach			403	1.8	403	1.8	0.517	10.7	LOS B	2.3	16.5	0.59	0.83	0.82	42.4
North: Tomarata Road															
7	L2	All MCs	185	4.0	185	4.0	0.226	4.7	LOS A	0.0	0.0	0.00	0.24	0.00	47.3
8	T1	All MCs	229	7.3	229	7.3	0.226	0.1	LOS A	0.0	0.0	0.00	0.24	0.00	48.5
Approach			415	5.8	415	5.8	0.226	2.1	NA	0.0	0.0	0.00	0.24	0.00	48.0
All Vehicles			1436	3.2	1436	3.2	0.517	5.0	NA	2.3	16.5	0.33	0.49	0.42	46.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - AM - Sep 24 Yield +80% (Site Folder: Post-Development Growth - RT Bay)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
AM Post-Dev 30% Growth
Sep 24 Yield +80%
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	169	16.1	169	16.1	0.317	2.2	LOS A	1.8	13.2	0.54	0.62	0.56	46.6
3	R2	All MCs	242	0.4	242	0.4	0.317	7.1	LOS A	1.8	13.2	0.54	0.62	0.56	45.5
Approach			412	6.9	412	6.9	0.317	5.1	NA	1.8	13.2	0.54	0.62	0.56	45.9
East: Black Swamp Road															
4	L2	All MCs	331	0.3	331	0.3	0.249	5.5	LOS A	1.1	8.1	0.36	0.57	0.36	45.1
6	R2	All MCs	275	1.5	275	1.5	0.487	11.8	LOS B	2.4	16.8	0.71	0.99	1.06	41.9
Approach			605	0.9	605	0.9	0.487	8.3	LOS A	2.4	16.8	0.52	0.76	0.68	43.6
North: Tomarata Road															
7	L2	All MCs	247	11.1	247	11.1	0.264	4.7	LOS A	0.0	0.0	0.00	0.28	0.00	47.1
8	T1	All MCs	233	1.8	233	1.8	0.264	0.1	LOS A	0.0	0.0	0.00	0.28	0.00	48.4
Approach			480	6.6	480	6.6	0.264	2.5	NA	0.0	0.0	0.00	0.28	0.00	47.7
All Vehicles			1497	4.4	1497	4.4	0.487	5.6	NA	2.4	16.8	0.36	0.57	0.43	45.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - PM - Sep 24 Yield +80% (Site Folder: Post-Development Growth - RT Bay)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
PM Post-Dev 30% Growth
Sep 24 Yield +80%
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	413	3.6	413	3.6	0.557	4.0	LOS A	5.8	41.0	0.58	0.73	0.95	45.9
3	R2	All MCs	351	0.0	351	0.0	0.557	9.4	LOS A	5.8	41.0	0.58	0.73	0.95	44.8
Approach			763	1.9	763	1.9	0.557	6.5	NA	5.8	41.0	0.58	0.73	0.95	45.4
East: Black Swamp Road															
4	L2	All MCs	229	0.5	229	0.5	0.174	5.4	LOS A	0.8	5.3	0.35	0.57	0.35	45.2
6	R2	All MCs	252	2.5	252	2.5	0.830	31.0	LOS D	5.1	36.4	0.95	1.41	2.43	34.3
Approach			481	1.5	481	1.5	0.830	18.8	LOS C	5.1	36.4	0.66	1.01	1.43	38.8
North: Tomarata Road															
7	L2	All MCs	291	2.5	291	2.5	0.283	4.7	LOS A	0.0	0.0	0.00	0.30	0.00	47.0
8	T1	All MCs	229	7.3	229	7.3	0.283	0.1	LOS A	0.0	0.0	0.00	0.30	0.00	48.2
Approach			520	4.7	520	4.7	0.283	2.7	NA	0.0	0.0	0.00	0.30	0.00	47.5
All Vehicles			1764	2.6	1764	2.6	0.830	8.7	NA	5.8	41.0	0.43	0.68	0.80	43.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [Tomarata / Black Swamp - AM - Sep 24 Yield +80% (Site Folder: Post-Development Growth - Roundabout)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
AM Post-Dev 30% Growth
Sep 24 Yield +80%
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	169	16.1	169	16.1	0.419	5.5	LOS A	3.3	24.6	0.67	0.60	0.67	44.5
3	R2	All MCs	242	0.4	242	0.4	0.419	9.5	LOS A	3.3	24.6	0.67	0.60	0.67	44.0
Approach			412	6.9	412	6.9	0.419	7.9	LOS A	3.3	24.6	0.67	0.60	0.67	44.2
East: Black Swamp Road															
4	L2	All MCs	331	0.3	331	0.3	0.548	5.0	LOS A	5.1	36.0	0.70	0.59	0.70	44.9
6	R2	All MCs	275	1.5	275	1.5	0.548	9.5	LOS A	5.1	36.0	0.70	0.59	0.70	44.5
Approach			605	0.9	605	0.9	0.548	7.0	LOS A	5.1	36.0	0.70	0.59	0.70	44.7
North: Tomarata Road															
7	L2	All MCs	247	11.1	247	11.1	0.462	5.2	LOS A	3.9	28.6	0.66	0.53	0.66	45.6
8	T1	All MCs	233	1.8	233	1.8	0.462	4.8	LOS A	3.9	28.6	0.66	0.53	0.66	45.9
Approach			480	6.6	480	6.6	0.462	5.0	LOS A	3.9	28.6	0.66	0.53	0.66	45.7
All Vehicles			1497	4.4	1497	4.4	0.548	6.6	LOS A	5.1	36.0	0.68	0.57	0.68	44.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101v [Tomarata / Black Swamp - PM - Sep 24 Yield +80% (Site Folder: Post-Development Growth - Roundabout)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
PM Post-Dev 30% Growth
Sep 24 Yield +80%
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	413	3.6	413	3.6	0.706	7.1	LOS A	9.2	65.5	0.86	0.68	0.94	44.0
3	R2	All MCs	351	0.0	351	0.0	0.706	11.5	LOS B	9.2	65.5	0.86	0.68	0.94	43.5
Approach			763	1.9	763	1.9	0.706	9.1	LOS A	9.2	65.5	0.86	0.68	0.94	43.8
East: Black Swamp Road															
4	L2	All MCs	229	0.5	229	0.5	0.451	4.8	LOS A	3.9	27.4	0.66	0.58	0.66	44.8
6	R2	All MCs	252	2.5	252	2.5	0.451	9.3	LOS A	3.9	27.4	0.66	0.58	0.66	44.4
Approach			481	1.5	481	1.5	0.451	7.2	LOS A	3.9	27.4	0.66	0.58	0.66	44.6
North: Tomarata Road															
7	L2	All MCs	291	2.5	291	2.5	0.573	6.9	LOS A	5.6	41.0	0.83	0.67	0.89	45.0
8	T1	All MCs	229	7.3	229	7.3	0.573	7.0	LOS A	5.6	41.0	0.83	0.67	0.89	45.2
Approach			520	4.7	520	4.7	0.573	7.0	LOS A	5.6	41.0	0.83	0.67	0.89	45.0
All Vehicles			1764	2.6	1764	2.6	0.706	7.9	LOS A	9.2	65.5	0.79	0.65	0.85	44.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Organisation: COMMUTE TRANSPORTATION | Licence: NETWORK / 1PC | Processed: Wednesday, 11 September 2024 2:56:47 PM
Project: C:\Users\Modelling\COMMUTE TRANSPORTATON CONSULTANTS LTD\Projects 2800 - Documents\J002860 Cabra Mangawhai \Traffic\SIDRA\2860 Sidra v2.sip9

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - PM - May 25 75% (Site Folder: Post-Development Growth - RT Bay)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
PM Post-Dev 30% Growth
Sep 24 Yield
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	413	3.6	413	3.6	0.397	1.4	LOS A	2.3	16.2	0.40	0.45	0.45	47.8
3	R2	All MCs	211	0.0	211	0.0	0.397	7.0	LOS A	2.3	16.2	0.40	0.45	0.45	46.6
Approach			623	2.4	623	2.4	0.397	3.3	NA	2.3	16.2	0.40	0.45	0.45	47.4
East: Black Swamp Road															
4	L2	All MCs	135	0.0	135	0.0	0.102	5.4	LOS A	0.4	2.9	0.33	0.56	0.33	45.2
6	R2	All MCs	184	3.4	184	3.4	0.444	14.5	LOS B	1.8	13.0	0.78	1.00	1.09	40.7
Approach			319	2.0	319	2.0	0.444	10.6	LOS B	1.8	13.0	0.59	0.81	0.77	42.5
North: Tomarata Road															
7	L2	All MCs	188	3.9	188	3.9	0.228	4.7	LOS A	0.0	0.0	0.00	0.24	0.00	47.3
8	T1	All MCs	229	7.3	229	7.3	0.228	0.1	LOS A	0.0	0.0	0.00	0.24	0.00	48.5
Approach			418	5.8	418	5.8	0.228	2.1	NA	0.0	0.0	0.00	0.24	0.00	48.0
All Vehicles			1360	3.3	1360	3.3	0.444	4.7	NA	2.3	16.2	0.32	0.47	0.39	46.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - PM - May 25 50% (Site Folder: Post-Development Growth - RT Bay)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
PM Post-Dev 30% Growth
Sep 24 Yield
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	413	3.6	413	3.6	0.409	1.6	LOS A	2.5	17.8	0.42	0.47	0.49	47.7
3	R2	All MCs	222	0.0	222	0.0	0.409	7.1	LOS A	2.5	17.8	0.42	0.47	0.49	46.5
Approach			635	2.3	635	2.3	0.409	3.5	NA	2.5	17.8	0.42	0.47	0.49	47.2
East: Black Swamp Road															
4	L2	All MCs	181	0.0	181	0.0	0.137	5.4	LOS A	0.6	4.0	0.34	0.56	0.34	45.2
6	R2	All MCs	218	2.9	218	2.9	0.534	15.8	LOS C	2.4	17.1	0.81	1.06	1.26	40.1
Approach			399	1.6	399	1.6	0.534	11.1	LOS B	2.4	17.1	0.60	0.83	0.84	42.2
North: Tomarata Road															
7	L2	All MCs	197	3.7	197	3.7	0.232	4.7	LOS A	0.0	0.0	0.00	0.25	0.00	47.3
8	T1	All MCs	229	7.3	229	7.3	0.232	0.1	LOS A	0.0	0.0	0.00	0.25	0.00	48.5
Approach			426	5.7	426	5.7	0.232	2.2	NA	0.0	0.0	0.00	0.25	0.00	47.9
All Vehicles			1460	3.1	1460	3.1	0.534	5.2	NA	2.5	17.8	0.34	0.51	0.44	45.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tomarata / Black Swamp - PM - May 25 25% (Site Folder: Post-Development Growth - RT Bay)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Tomarata Road / Black Swamp Road
PM Post-Dev 30% Growth
Sep 24 Yield
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Tomarata Road															
2	T1	All MCs	413	3.6	413	3.6	0.421	1.8	LOS A	2.7	19.6	0.43	0.50	0.52	47.5
3	R2	All MCs	234	0.0	234	0.0	0.421	7.3	LOS A	2.7	19.6	0.43	0.50	0.52	46.3
Approach			646	2.3	646	2.3	0.421	3.8	NA	2.7	19.6	0.43	0.50	0.52	47.1
East: Black Swamp Road															
4	L2	All MCs	227	0.0	227	0.0	0.171	5.4	LOS A	0.7	5.2	0.34	0.57	0.34	45.2
6	R2	All MCs	251	2.5	251	2.5	0.625	17.6	LOS C	3.1	22.1	0.85	1.13	1.48	39.3
Approach			478	1.3	478	1.3	0.625	11.8	LOS B	3.1	22.1	0.61	0.86	0.94	41.9
North: Tomarata Road															
7	L2	All MCs	205	3.6	205	3.6	0.237	4.7	LOS A	0.0	0.0	0.00	0.25	0.00	47.2
8	T1	All MCs	229	7.3	229	7.3	0.237	0.1	LOS A	0.0	0.0	0.00	0.25	0.00	48.4
Approach			435	5.6	435	5.6	0.237	2.2	NA	0.0	0.0	0.00	0.25	0.00	47.9
All Vehicles			1559	2.9	1559	2.9	0.625	5.8	NA	3.1	22.1	0.37	0.54	0.50	45.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

APPENDIX B – UPGRADES

Revision notes:

Rev:	Date:	Notes:

Drawn by: LH

Client:

Project: Cabra Mangawhai Plan Change
Black Swamp Road / Tomarata Road Intersection

Drawing Title: Concept Design
Right Turn Bay Upgrade

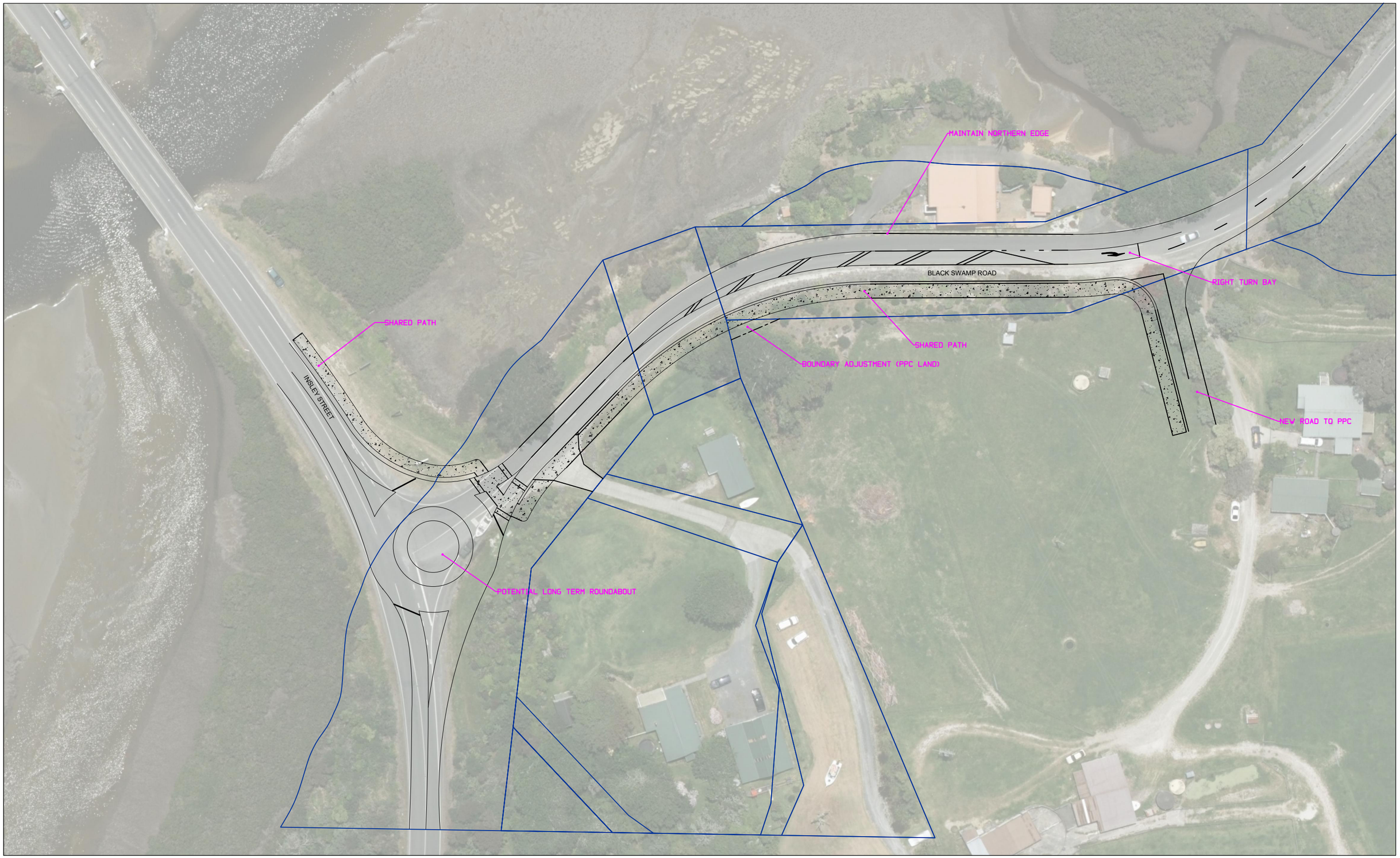
Date: 11 September 2024

Scale @ A3: 1:750 @ A3

Revision: A (Concept Only)

commute TRANSPORTATION CONSULTANTS

Figure: 1



Revision notes:

Rev:	Date:	Notes:

Drawn by: LH

Client:

Project: Cabra Mangawhai Plan Change
Black Swamp Road / Tomarata Road Intersection

Drawing Title: Concept Design
Future Single Lane Roundabout

Date: 11 September 2024

Scale @ A3: 1:750 @ A3

Revision: A (Concept Only)

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Figure: 2

APPENDIX C – SAFE SYSTEM ASSESSMENT

EXISTING							
	Run-off-road	**Head-on**	**Intersection**	**Other**	**Pedestrian**	**Cyclist**	**Motorcyclists**
Exposure Comments:	**Volumes of vehicles that might be involved in a particular crash type are moderate, therefore exposure is moderate. AADT is 4000-5000vpd (in summer peak).**	**Volumes of vehicles that might be involved in a particular crash type are moderate, therefore exposure is moderate. AADT is 4000-5000vpd (in summer peak).**	**Volumes of vehicles that might be involved in a particular crash type are moderate, therefore exposure is moderate. AADT is 4000-5000vpd (in summer peak).**	**Volumes of vehicles that might be involved in a particular crash type are moderate, therefore exposure is moderate. AADT is 4000-5000vpd (in summer peak).**	**Moderate AADT, volumes are 10 to 50 people per day.**	**Moderate AADT, volumes are 10 to 50 people per day.**	**Moderate AADT, volumes are assumed to be 1% of the total AADT, giving a volume of 40-50 per day.**
Exposure Score:	2/4	2/4	2/4	2/4	2/4	2/4	2/4
Likelihood Comments:	**Factors that increase the likelihood include:** • **moderate speed** • **low radius curve** • **minimal signage** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the likelihood include:** • **moderate speed** • **low radius curve** • **lack of right turn bay** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the likelihood include:** • **Moderate speed** • **limited visibility** • **high speed** • **low radius curve** • **lack of turning bay** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the likelihood include:** • **Moderate speed** • **low radius curve** • **lack of turning bay** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the likelihood include:** • **no facilities** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the likelihood include:** • **no facilities** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the likelihood include:** • **moderate speed** • **low radius curve** • **lack of right turn bay** **Factors that decrease the likelihood include:** • **N/A**
Likelihood Score:	2/4	2/4	2/4	2/4	2/4	2/4	1/4
Severity Comments:	**Factors that increase the severity include:** • **moderate speed** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the severity include:** • **moderate speed** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the severity include:** • **moderate speed** • **high impact angle** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the severity include:** • **moderate speed** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the severity include:** • **moderate speed** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the severity include:** • **moderate speed** **Factors that decrease the likelihood include:** • **N/A**	**Factors that increase the severity include:** • **moderate speed** **Factors that decrease the likelihood include:** • **N/A**
Severity Score:	1/4	2/4	2/4	1/4	3/4	3/4	2/4
Product (multiply scores above for crash type)	**4/64**	**8/64**	**8/64**	**4/64**	**12/64**	**12/64**	**4/64**
						TOTAL	**52/448**

PROPOSED WITH UPGRADE							
	Run-off-road	**Head-on**	**Intersection**	**Other**	**Pedestrian**	**Cyclist**	**Motorcyclists**
Exposure Comments:	Volumes of vehicles that might be involved in a particular crash type are high, therefore exposure is moderate. AADT is 9000-11,000vpd (in summer peak).	Volumes of vehicles that might be involved in a particular crash type are high, therefore exposure is moderate. AADT is 9000-11,000vpd (in summer peak).	Volumes of vehicles that might be involved in a particular crash type are high, therefore exposure is moderate. AADT is 9000-11000vpd (in summer peak).	Volumes of vehicles that might be involved in a particular crash type are high, therefore exposure is moderate. AADT is 9000-11,000vpd (in summer peak).	High AADT, volumes are 100+ people per day.	High AADT, volumes are 100+ people per day.	Moderate AADT, volumes are assumed to be 1% of the total AADT, giving a volume of 100+ per day.
Exposure Score:	4/4	4/4	4/4	4/4	4/4	4/4	4/4
Likelihood Comments:	Factors that increase the likelihood include: • moderate speed • low radius curve • minimal signage Factors that decrease the likelihood include: • right turn bay • Shared path kerb	Factors that increase the likelihood include: • moderate speed • low radius curve Factors that decrease the likelihood include: • right turn bay	Factors that increase the likelihood include: • Moderate speed • limited visibility • high speed • low radius curve Factors that decrease the likelihood include: • turning bay	Factors that increase the likelihood include: • Moderate speed • low radius curve Factors that decrease the likelihood include: • turning bay	Factors that increase the likelihood include: • n/A Factors that decrease the likelihood include: • Pedestrian crossing facilities	Factors that increase the likelihood include: • no facilities Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • moderate speed • low radius curve Factors that decrease the likelihood include: • Right turn bay
Likelihood Score:	1/4	1/4	1/4	1/4	2/4	2/4	1/4
Severity Comments:	Factors that increase the severity include: • moderate speed Factors that decrease the likelihood include: • N/A	Factors that increase the severity include: • moderate speed Factors that decrease the likelihood include: • N/A	Factors that increase the severity include: • moderate speed Factors that decrease the likelihood include: • N/A	Factors that increase the severity include: • moderate speed Factors that decrease the likelihood include: • N/A	Factors that increase the severity include: • moderate speed Factors that decrease the likelihood include: • N/A	Factors that increase the severity include: • moderate speed Factors that decrease the likelihood include: • N/A	Factors that increase the severity include: • moderate speed Factors that decrease the likelihood include: • N/A
Severity Score:	1/4	2/4	2/4	1/4	3/4	3/4	2/4
Product (multiply scores above for crash type)	**4/64**	**8/64**	**8/64**	**4/64**	**24/64**	**24/64**	**8/64**
						TOTAL	**80/448**