# Neil Construction Ltd

## Whenuapai Business Park Plan Change (WBPPC)

### Integrated Transport Assessment

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| **Project** | Whenuapai Business Park Plan Change |
| **Client:** | Neil Construction Ltd |
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| **Prepared By:** | E. Hebner, A. Arthanari & M. Chang |

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# Executive Summary

Neil Construction Ltd (NCL) owns or has agreements with landowners for approximately 36 hectares of developable land located in Whenuapai East (47.6 hectares total area). This land area is referred to in this Integrated Transport Assessment Report as the Whenuapai Business Park Plan Change (WBPPC). This area has been recognised as a key growth location in Council planning documents since the late 1990's, where it was first identified for urbanisation in the Auckland Regional Council's regional growth strategy.

When Auckland Council's proposed Unitary Plan was released in 2013 Whenuapai was intended to be urbanised by being zoned as Future Urban Zone (FUZ). The Whenuapai Structure Plan was released in 2016 and identified the WBPPC area for business use. Subsequently the WBPPC area was then identified as development ready between 2018-2022 in Council's Future Urban Land Supply Strategy (FULSS), and proposed Plan Change 5 (PPC5) that was publicly notified in September 2017. PPC5 sought to rezone 360 hectares of mostly FUZ land in Whenuapai to a mix of business and residential zones, with the WBPPC area to be zoned mostly Business – Light Industry Zone. PPC5 was withdrawn by Auckland Council on 16th June 2022.

Auckland Council's Future Development Strategy (FDS) superseded the FULSS on 2nd November 2023. The FDS identifies the WBPPC land as falling within an area identified as being scheduled to be live zoned from 2025+.

Investment works offered as part of the WBPPC include roading infrastructure improvements to provide accessibility for a range of transport modes. As a result, private vehicles will be well catered for having convenient links to the State Highway network and supporting infrastructure. Local services and retail are within walking and cycling distance of the WBPPC. A new transportation network within the WBPPC will provide for vehicle, cycle, and pedestrian connections throughout and to the existing network. Allowance has been made for the future internal network to integrate with existing roads connecting to the WBPPC. The roads adjacent to the WBPPC consist of Brigham Creek Road and Trig Road and these will be upgraded to an urban standard, providing for private vehicles and active transport modes in alignment with Te Tupu Ngatāhi Supporting Growth's Northwest Indicative Strategic Transport Network plan (April 2022) that can accommodate future traffic growth including for freight and public transport. Consultation with Council, Auckland Transport and Te Tupu Ngatāhi Supporting Growth indicates general support for the conceptual roading investment works being offered.

The light industrial development enabled by the WBPPC can be achieved in a manner that is consistent with, and encourages, key national, regional and district transportation objectives and policies.

The extent of development enabled by the WBPPC including recent Plan Changes in Whenuapai can be accommodated by the surrounding road network while maintaining acceptable levels of safety and performance including at State Highway 16 and State Highway 18 interchanges. Accordingly, it is concluded that there are no traffic engineering or transportation planning reasons to preclude acceptance of this proposal, since the full extent of development enabled by the WBPPC will be appropriately supported by and integrated with upgrades to existing roading to provide appropriate levels of accessibility, safety, and efficiency for all travel modes.

It is recognised that the traffic generated at final completion of development will depend on a range of factors that cannot necessarily be predicted in advance, such as the type of business activities and development density. We are satisfied that the wider roading network can accommodate 725 peak hour trips generated by the development of the PPC area. To ensure the precinct is not developed

beyond its capacity the proposed precinct provisions limit the cumulative extent of buildings to 115,000m$^2$ GFA, unless a traffic monitoring report prepared by a suitably qualified expert has demonstrated that peak hour trip generation does not exceed 725 vehicles per hour.

# 1 Introduction

Neil Construction Ltd (NCL) owns land or has agreements with landowners for approximately 36 hectares of developable land in central Whenuapai (47.6 hectares total area). This area is currently identified in Auckland Council's Unitary Plan maps as Future Urban Zone (FUZ).

This Integrated Transport Assessment (ITA) was prepared for NCL by Team Traffic to assess the traffic engineering and transportation planning aspects of the Whenuapai Business Park Plan Change (WBPPC).

The transportation issues central to this proposal include:

- the existing and future land use and transport networks in the area.
- accessibility of the site to various modes of transport.
- the ability of the WBPPC to meet key national and regional strategies relating to site accessibility and sustainability; and,
- the mitigation required to the surrounding road network to safely and efficiently support the development potential of the WBPPC and other likely developments in the area, including the now Operative Plan Change 69, Spedding Road.

# 2 Existing Transport Context

**Figure 1** is a March 2022 aerial photograph with road network overlay, which identifies the approximate area of the WBPPC land in relation to the surrounding transport network.

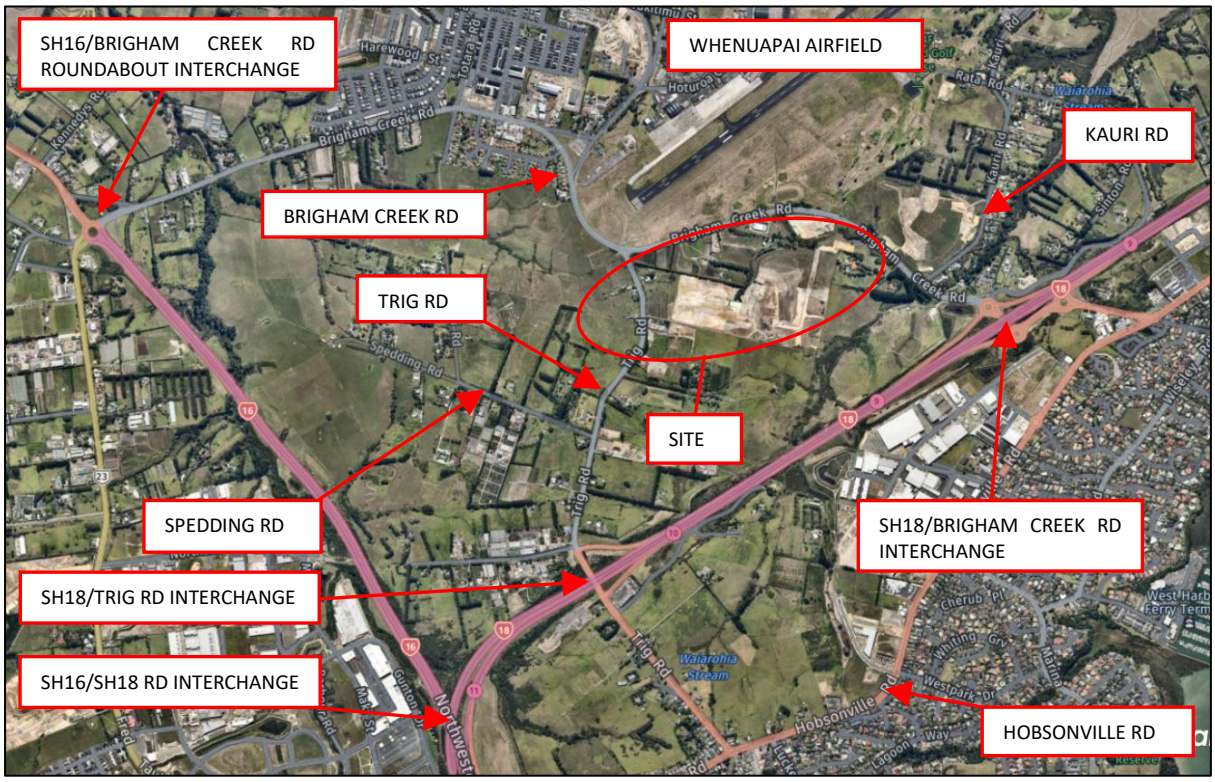



***Figure 1: Site Location***

## 2.1 Surrounding Residential Catchments & Commuter Travel Patterns

As identified in Figure 1, the WBPPC is in Whenuapai 800 metres from State Highway 18's vertically separated interchange with Brigham Creek Road, and 1km from State Highway 18's east facing vertically separated interchange with Trig Road. On the southern side of State Highway 18 is Hobsonville Road where there is a large residential catchment consisting of Hobsonville Point, West Harbour and Massey East. Other established residential catchments within 10km include:

- Whenuapai, along Kauri Road and Totara Road
- Massey,
- Henderson,
- Te Atatu,
- Huapai/Kumeu/Waimauku/Riverhead,
- Greenhithe/North Harbour/Albany.

The Brigham Creek Road / SH18 interchange is approximately 20km (driving distance) from Auckland City when travelling along State Highway 16, or State Highway 1, and then links to State Highway 18.

Existing commuter travel patterns through Whenuapai are comprised of two main routes along Brigham Creek Road and Trig Road. Both of these routes pass through, or adjacent to, the WBPPC and

it is possible to quantify this existing commuter traffic volume using the Commuter Waka App, which applies 2018 census data to map work travel between geographical boundaries throughout Auckland.

A significant travel pattern identified is commuter trips for people residing in Auckland's North-West (Kumeu-Huapai, Riverhead and Waimauku) that work at North Harbour, refer to the Commuter Waka App diagrams in **Figure 2** and **Figure 3** that illustrates this where green is the place of residence and red is place of work. The darker shade of red at North Harbour identifies the main work destination. As there is no direct connection between State Highway 16 (North) and State Highway 18 this traffic predominantly travels via Brigham Creek Road past the WBPPC.

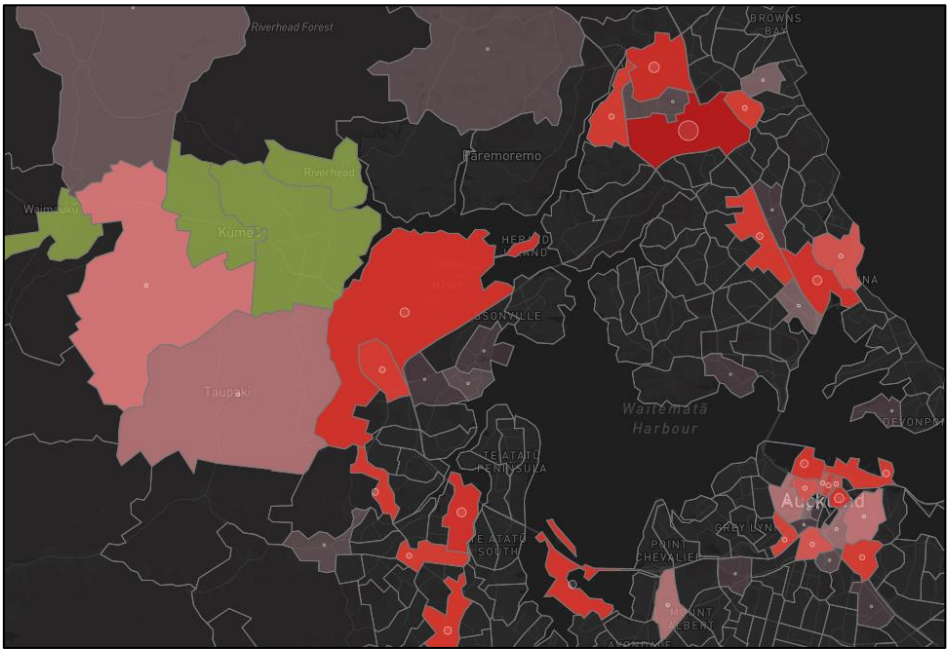



***Figure 2: Commuter Waka App Mapbox (green is residence & red is work)***

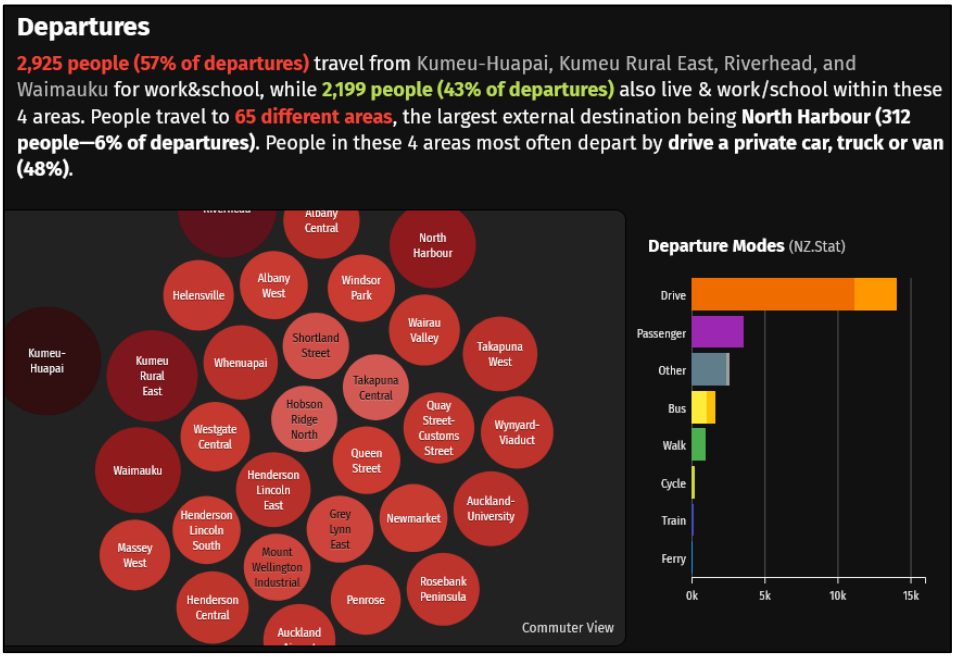



***Figure 3: Comuter Waka App Bubble Visualisation***

As illustrated by the Commuter Waka App map and bubble visualisation in **Figure 2** and **Figure 3** there is a significant amount of work travel between Auckland's North-West region and Auckland's Northshore region via Brigham Creek Road, as much as 56% according to the following calculation.

The Commuter Waka App's 2018 census data quantifies the total number of work trips between Auckland's North-West and Auckland's Northshore as 876 one-way trips, which compared to the Auckland Forecasting Centre's 1,542 traffic volume for Brigham Creek Road (peak two hours and one way), is 56%.

On this basis, the scarcity of light industrial employment in Auckland's North-West is a contributing factor for this travel pattern occurring and is therefore a significant factor to consider when assessing traffic effects of the WBPPC - namely that the provision of new employment in the North-West will reduce the work travel demand to the Northshore.

These effects can be expressed in Vehicle Kilometres Travelled (Vkt) where the provision of work opportunities afforded by the WBPPC has the potential to reduce Vkt by three to nine million Vkt, as illustrated by **Figure 4** below. **Figure 4** utilises 2018 census data to calculate the potential reduction in Vkt for a 15-45% increase in commuters working locally.

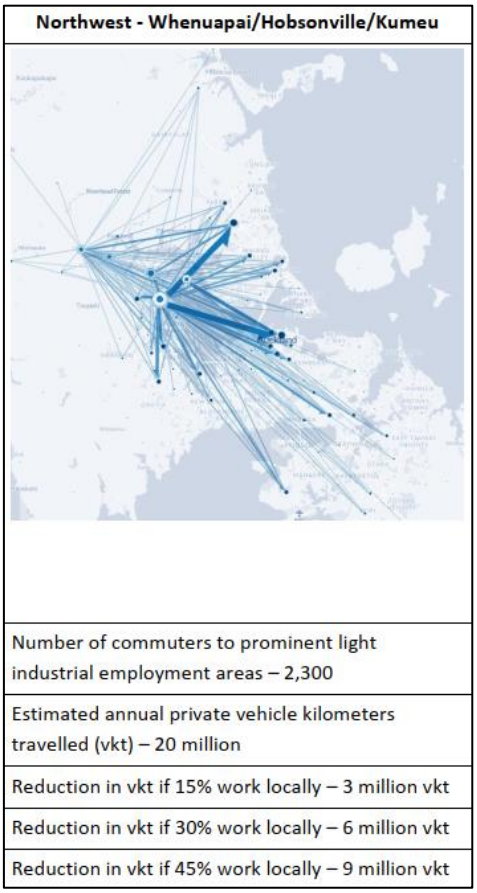



***Figure 4: Vehicle Kilometers Travelled for Auckland's North-West 2018 Census Data***

The existing commuter travel patterns identified by the Commuter Waka App together with the travel demand forecasts provided by the Auckland Forecasting Centre have been considered when assessing traffic effects of the WBPPC, and these effects are assessed in **Section 4.**

## 2.2 Brigham Creek Road

Brigham Creek Road is classified as an arterial in the Auckland Unitary Plan (AUP), and as such caters for traffic between major nodes or suburbs of the city. The layout of State Highway 16 and State Highway 18 does not provide a direct north to east connection; therefore, Brigham Creek Road provides a key strategic route for this connection between the two State Highways. Additionally, Brigham Creek Road is identified as being on the strategic freight network and over dimension vehicle route.

Brigham Creek Road is a two-way, two-lane road with the lanes separated by a centreline. The carriageway has sealed shoulders of varying width and grassed berms. There is a footpath on the northern side of Brigham Creek Road for most of the WBPPC frontage. There is no footpath on the WBPPC side of Brigham Creek Road. The footpath on the northern side connects to shared foot/cycle paths to the east and west along Brigham Creek Road.

The speed limit on Brigham Creek Road in the vicinity of the WBPPC is 60km/h.

**Figure 5 and Figure 6** are views of Brigham Creek Road in both directions taken from a proposed signalised intersection to connect to an internal roading network within the WBPPC. The existing roading environment shown in **Figure 5 and Figure 6** are typical for Brigham Creek Road adjacent to the WBPPC, which is two traffic lanes formed to a rural standard.

***Figure 5: Brigham Creek Road Looking East from the Proposed WBPPC's New Signalised Intersection (eastern intersection)***

***Figure 6: Brigham Creek Road looking West from the Proposed WBPPC's New Signalised Intersection (eastern intersection)***

Auckland Transport's 23rd February 2022 traffic count for the section of Brigham Creek Road adjacent to the WBPPC recorded a daily traffic count of 11,822 vehicles with 10% heavy vehicles. The morning peak hour had 1,002 vehicles, the mid peak hour had 936 vehicles and the evening peak hour had 1,106 vehicles.

In anticipation of traffic volumes along Brigham Creek Road increasing in future years Te Tupu Ngatāhi Supporting Growth have progressed a Notice of Requirement (NoR), referred to as NOR W3, to allow Brigham Creek Road to be widened and upgraded with two traffic lanes in each direction together with separated footpaths and cycleways. The Te Tupu Ngatāhi Supporting Growth's indicative upgrade cross-section is detailed in **Figure 7.**

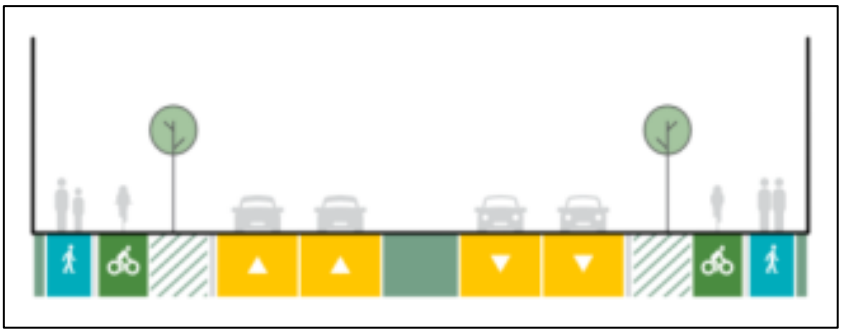


***Figure 7: Te Tupu Ngatāhi Supporting Growth Indicative Brigham Creek Road Upgrade Cross-section***

The Brigham Creek Road widening and upgrade project is included in Te Tupu Ngatāhi's North-West Indicative Strategic Transport Network plan, **Figure 8**, however, while this project is included in the recently published Draft Development Contributions Policy 2025, the Brigham Creek Road widening and upgrade project has not been allocated funding for detailed design or construction under Auckland Transport's Regional Land Transport Plan 2024-2034.

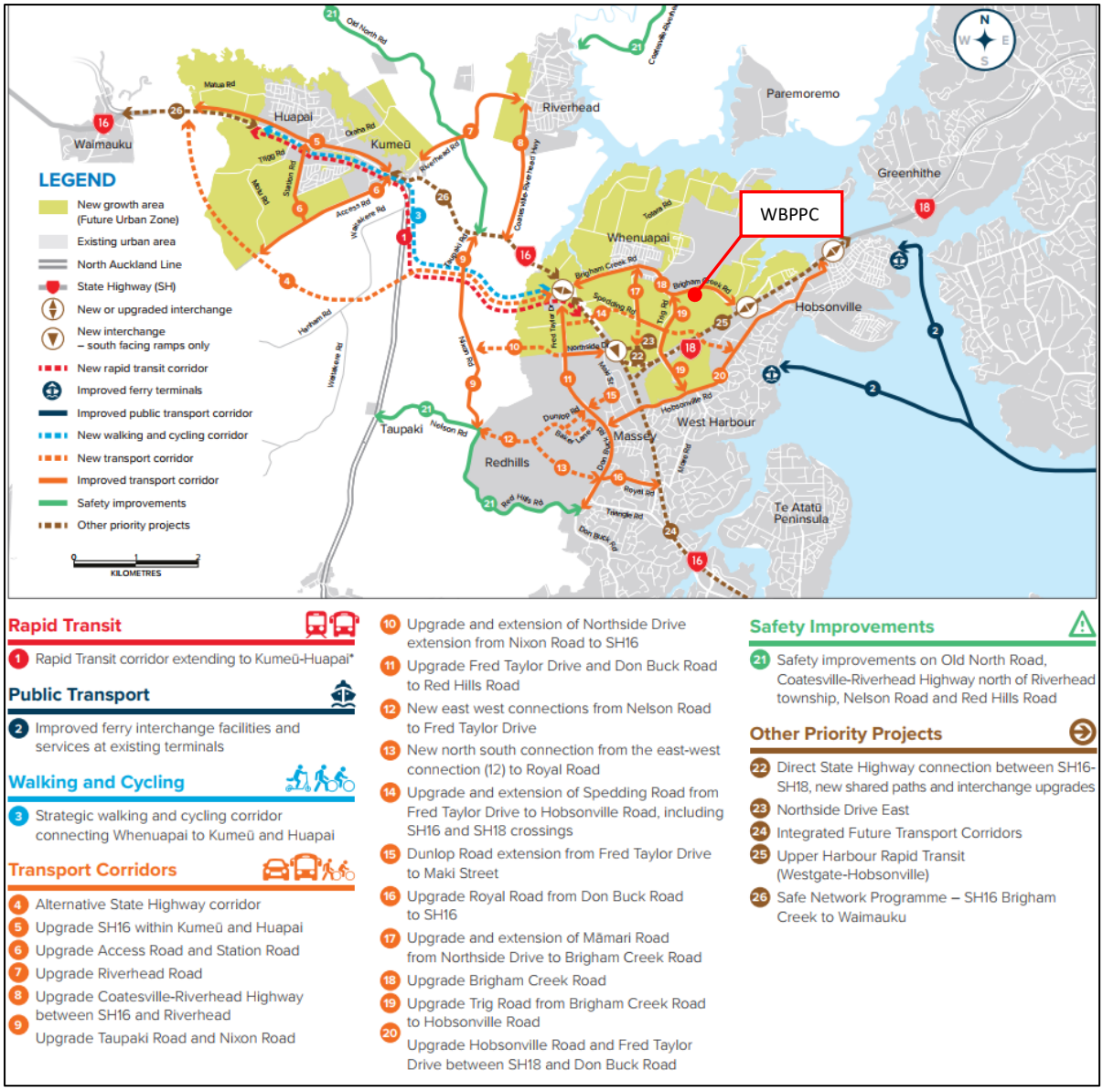



***Figure 8: Te Tupu Ngatāhi Supporting Growth Northwest Indicative Strategic Transport Network***

In order for Te Tupu Ngatāhi to deliver the ultimate design for this proposed future corridor detailed in **Figure 7,** land within WBPPC is required to be vested as road reserve together with additional neighbouring private land associated with the New Zealand Defence Force's Whenuapai airbase and a Spark property containing critical telecommunication infrastructure for New Zealand.

Proposed as part of the WBPPC are significant roading infrastructure upgrades to Brigham Creek Road that will result in a major advancement towards the full upgrade detailed in **Figure 7**.

The Brigham Creek Road upgrade proposed as part of the WBPPC urbanises Brigham Creek Road so that it is able to safely accommodate future traffic growth, and together with provision of separated footpaths and cycleways have significant benefits for active travel modes. Further details and assessment of the proposed Brigham Creek Road upgrade is provided in **Section 4.**

## 2.3 Trig Road

Trig Road is a two-way, two-lane road with the lanes separated by no passing lines. The carriageway has sealed shoulders of varying width and grassed berms. There is a footpath on the western side of Trig Road and nothing on the eastern side. The speed limit on Trig Road is 60km/h.

**Figure 9 and Figure 10** are views of Trig Road in both directions taken from a proposed roundabout intersection that is to provide access to an internal roading network within the WBPPC.

The existing roading environment shown in **Figure 9 and Figure 10** are typical for Trig Road in the WBPPC, which is two traffic lanes formed to a rural standard.

***Figure 9: Trig Road Looking North from the Proposed WBPPC's Roundabout Intersection***

***Figure 10: Trig Road looking South from the Proposed WBPPC's Roundabout Intersection***

A July 2023 traffic count on Trig Road recorded a daily traffic count of 2,912 vehicles with a peak hour of 300 vehicles and 15% heavy vehicles. The mid peak hour was recorded to be 166 vehicles.

In anticipation of traffic volumes along Trig Road increasing in future years, Te Tupu Ngatāhi Supporting Growth have progressed a Notice of Requirement (NoR) to allow Trig Road, referred to as NoR W1, to be widened and upgraded with a single traffic lane in each direction together with separated footpaths and cycleways. The Te Tupu Ngatāhi Supporting Growth indicative upgrade cross-section is detailed in **Figure 11.**

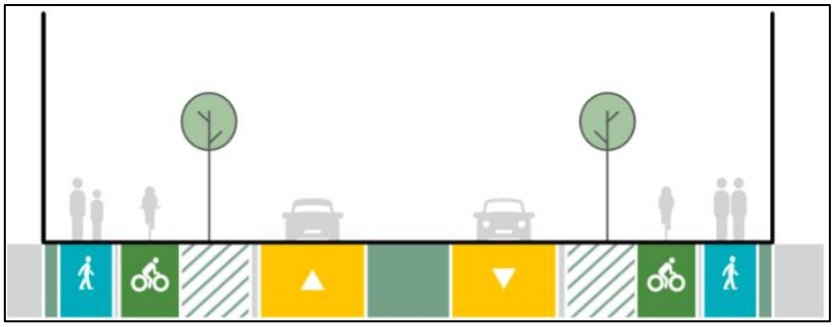


*Figure 11: Te Tupu Ngatāhi Supporting Growth Indicative Trig Road Upgrade Cross-section*

The Trig Road widening and upgrade project is included in Te Tupu Ngatāhi's North-West Indicative Strategic Transport Network plan, **Figure 8**, however this project has not been allocated funding for detailed design or construction under Auckland Transport's Regional Land Transport Plan. The indicated timeframe for construction of the Trig Road widening and upgrade project is in the next 10 to 30 years. Trig Road - Brigham Creek Road to SH18 upgrade is a listed project in the Draft Development Contributions Policy 2025 for the Inner Northwest Investment Priority Area. In that document the upgrade is shown for completion by 2038.

Proposed as part of the WBPPC is an upgrade of Trig Road in accordance with Te Tupu Ngatāhi's design in **Figure 11**.

The upgrade will result in Trig Road being able to safely accommodate future traffic growth, and together with provision of separated footpaths and cycleways have significant benefits for active travel modes. Further details and assessment of the proposed Trig Road upgrade is provided in **Section 4.**

## 2.4 Accessibility

### 2.4.1 Private Vehicles

Private vehicle access from the immediate roading network to the WBPPC is proposed from Brigham Creek Road and Trig Road. These roads have efficient roading connections to the wider Auckland region via the Brigham Creek Road / State Highway 18 interchange and the Trig Road / State Highway 18 interchange. These connections provide a linkage to central, east, west, and southern regions of Auckland.

Secondarily, there is a roading connection to the Brigham Creek Road / State Highway 16 interchange which provides a link to Auckland's North-West.

As the Te Tupu Ngatāhi's North-West Indicative Strategic Transport Network plan, as shown in **Figure 8**, is implemented as indicated in the next 10 to 30 years, these roading connections are anticipated to improve and in the interim the performance of these roading connections to accommodate the WBPPC traffic and other approved developments in Whenuapai have been modelled and assessed, (refer to **Section 4**).

### 2.4.2 Public Transport

The nearest bus route to the site is Route 114, as identified in **Figure 12**. The bus route travels between Westgate and the Hobsonville Ferry via Trig Road, Brigham Creek Road and Kauri Road.


***Figure 12: 114 Bus Route***

A new frequent bus service called the western express started in November 2023, which has buses travelling between Westgate and the city every ten to fifteen minutes.

New bus stops on Trig Road are proposed as part of the WBPPC's Trig Road upgrade works, and together with additional bus routes and increased frequency expected in the future as part of Te Tupu Ngatāhi's North West Indicative Strategic Transport Network (**Figure 8**), bus travel is a viable travel mode choice for the WBPPC.

Facilitating improved public transport services occurring earlier than anticipated is the Fast-track Approvals Bill which is currently before the Environment Select Committee that is expected to go before Parliament for its second reading in November 2024 and includes a North West Rapid Transit infrastructure project undertaken by the New Zealand Transport Agency. This project is '*To develop a rapid transit link between Brigham Creek and Auckland City Centre, including local road links and connections to other existing rapid transit infrastructure and a bi-directional offline busway. This will provide public transport choices to safely and efficiently meet demands for moving people, freight and services along SH16, the main corridor between the NW and Auckland CBD.*'

### 2.4.3 Walking, Cycling & Micro-Mobility

Footpath connections to the WBPPC currently consist of a footpath on the northern side of Brigham Creek Road and western side of Trig Road.

The existing Brigham Creek Road footpath extends to the east where it merges into a shared foot/cycle path at the State Highway 18 interchange. On the eastern side of the State Highway 18 interchange the shared foot/cycle path terminates 300 metres from the footpath network along Hobsonville Road. To the west of WBPPC the existing Brigham Creek Road footpath merges with a shared foot/cycle path, which extends 1.5km to the Whenuapai Village shops.

The existing Trig Road footpath extends south to the footpath network on Hobsonville Road and extends north via an unsealed path to the Whenuapai Village shops.

**Figure 13** shows the Auckland Cycleway Map and identifies the current cycleway facilities in the vicinity of the WBPPC. These consist of shared foot/cycle paths on Brigham Creek Road, with on-street connections available to the wider cycleway network.

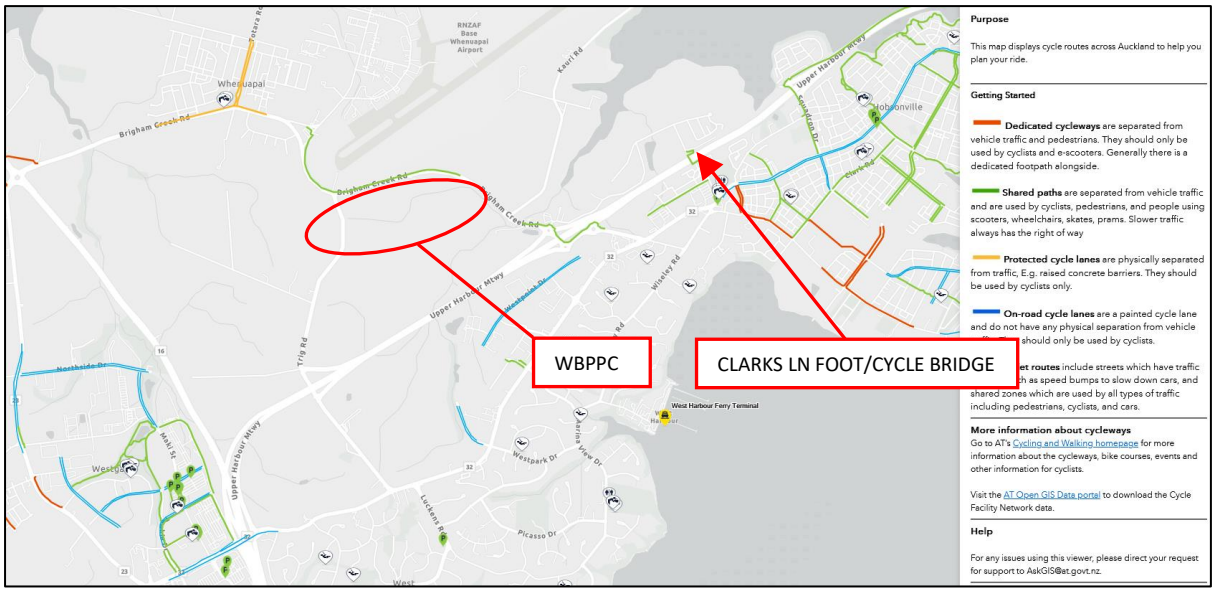



*Figure 13: Auckland Cycleway Map*

As part of Te Tupu Ngatāhi's North-West Indicative Strategic Transport Network plan (**Figure 8**) over the next 10 to 30 years, a connected network of separated footpaths and cycleways is to be provided. The WBPPC brings forward these works on Brigham Creek Road and Trig Road with the provision of separated footpaths and cycleways on both sides of Trig Road, and on the southern side of Brigham Creek Road (west of a proposed WBPPC signalised intersection). On the northern side of Brigham Creek Road an upgraded continuous shared foot/cycle path is proposed due to the constraints discussed in **Section 4.1**

# 3 The Proposal

The proposed Whenuapai Business Park Plan Change (WBPPC) has a developable land area of 36 hectares (47.6 hectares total area). **Figure 14** is the WBPPC's proposed Precinct and Infrastructure Staging Plan The upgrade works include three new internal collector roads with new intersections on Brigham Creek Road and Trig Road. The new collector roads allow for these roads to be extended into adjacent land to the south in the future.

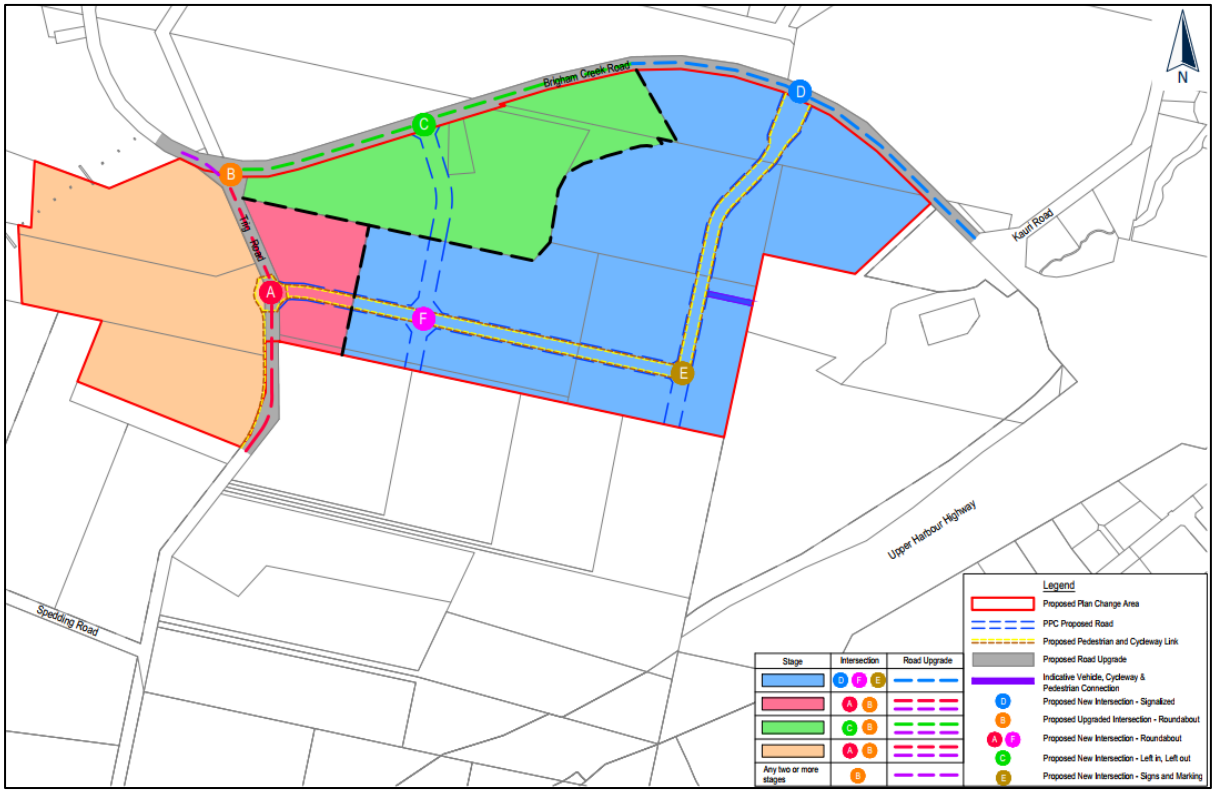



***Figure 14: Proposed Precinct & Infrastructure Staging Plan***

As identified in **Figure 14**, the intersections proposed on Brigham Creek Road and Trig Road as part of the WBPPC roading infrastructure upgrades include:

A. a new Trig Road roundabout (red),
B. a roundabout upgrade of the priority controlled Brigham Creek Road / Trig Road intersection (orange),
C. a new Brigham Creek Road left in/left out only intersection (green),
D. a new Brigham Creek Road signalised intersection (blue),
E. priority controlled intersection between 2 new collector roads (brown),
F. roundabout intersection between 2 new collector roads (pink).

The intersections are indicatively proposed with raised pedestrian crossings or tables to align with Auckland Transport's current expectations in accordance with their Transport Design Manual (TDM) standards to reduce traffic speeds, improve safety, and improve pedestrian/cycling amenity.

Consultation with Te Tupu Ngatāhi and Auckland Transport has indicated general support for the proposed roading upgrade plan and indicative internal roading layout. Consultation records are provided in **Appendix E**.

The operation and capacity of the proposed new and upgraded intersections identified in **Figure 14** together with the existing intersections listed below have been analysed using SIDRA intersection simulation software:

- Brigham Creek Road / Kauri Road priority controlled T-intersection,
- Brigham Creek Road / State Highway 18 roundabout interchange (Sinton Road roundabout),
- Trig Road / State Highway 18 east facing on and off ramps.

The analysis confirms the intersections have capacity to accommodate traffic generated by the WBPPC in a 2030 future year scenario that is based on recent traffic counts with 2.6% annual growth rate added plus traffic generated by Plan Change 69.

Plan Change 69 is an approved light industrial precinct located less than 1km to the west of WBPPC as identified in **Figure 16**. Plan change 69 is similar in size to WBPPC and it is currently under development. Plan Change 69's traffic generation and trip distribution has been analysed in respect of WBPPC by applying its traffic data sourced from its Plan Change traffic reporting and added into WBPPC's trip distribution diagrams that are discussed in detail in **Section 3.5**.

**Figure 16** also identifies Plan Change 86, which is an approved residential precinct that is not currently under development. From reviewing Plan Change 86's traffic reporting its level of traffic generation is sufficiently low level for it to be accounted for in the 2.6% annual growth rate that has been applied.

## 3.1 Background Traffic Growth & Establishment Date

Background traffic growth rate has been determined from the New Zealand Transport Agency's traffic monitoring sites on SH18 and SH16 that has data available pre Covid starting in 2018 and post Covid ending in 2023/2024.

The average growth rate (linear) for these sites is 2.6% and while this growth rate is based on traffic counts, there is still an element of prediction that is required to estimate a realistic traffic growth rate through to the anticipated date of establishment.

The establishment date is expected to be 2030 as reflected by the timeline to achieve full buildout in the following **Figure 1**5 project timeline Gantt chart.

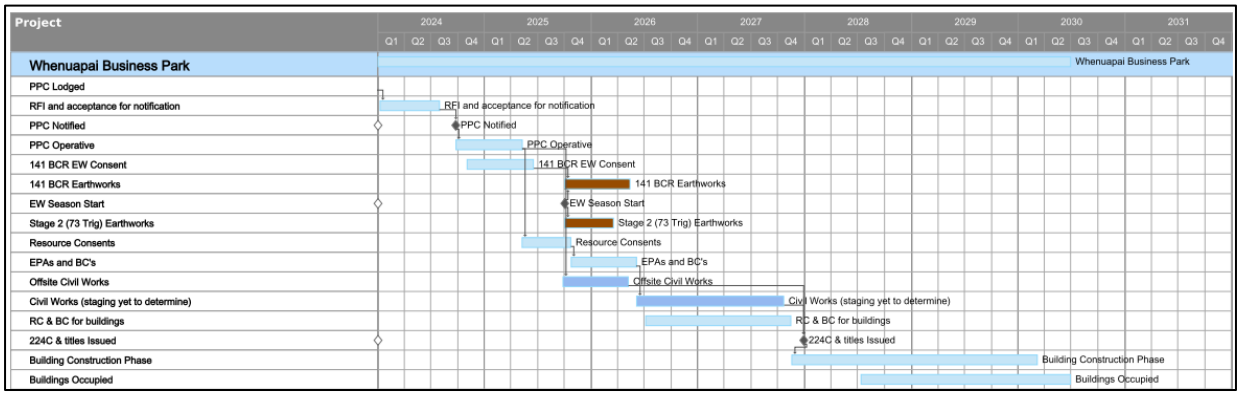



***Figure 15: Establishment Gantt Chart***

For this 2030 timeline the background traffic growth will be closely linked to development occurring in the Whenuapai catchment up to 2030.

Although most of Whenuapai is identified in the Auckland Unitary Plan as Future Urban Zone, there has been minimal urban growth in the area and anticipated future development will take some time to be realised. The only urban development that has been delivered in Whenuapai in the recent past is that arising from the Special Housing Area located to the north and west of Whenuapai village. That development has resulted in around 900 houses being built since 2016.

Other than the Special Housing Area, there have been only two private plan changes advanced to the point where they are operative – Plan Change 69 and Plan Change 86. Neither of these have been implemented to the point where building development has occurred.

Future development in Whenuapai is directed by the Council's Future Development Strategy (FDS). The FDS sets out the anticipated timing of Auckland's urban growth and, in the case of Whenuapai, states that most of the growth will not be enabled before 2035 with some scheduled after 2050.

Similar circumstances exist in Kumeu and Huapai, which contribute to traffic volumes in Brigham Creek Road. Like Whenuapai, Kumeu and Huapai have substantial tracts of land that are identified in the Auckland Unitary Plan as Future Urban Zone. While those areas were originally tagged for urban development, the FDS has now identified the land as being 'red flagged'. That notation means that development on the land is uncertain and may not occur at all, and no timeframe has been identified to revisit the growth potential in this location.

For these reasons, only limited development is anticipated in the north-west before 2030, comprised either in the Whenuapai future business area or utilising existing infrastructure capacity in that location. In this context, the traffic growth rate of 2.6% is considered to be sufficiently conservative for traffic modelling and assessment purposes.

## 3.2 Expected Gross Floor Area (GFA), Employee & Parking Numbers

Based on extensive subdivision work and concept designs NCL undertook for a smaller Whenuapai Business Park proposal, it is possible to accurately calculate an expected ratio of GFA/developable area of 42%. A spreadsheet detailing the calculations to arrive at this ratio is provided in **Appendix A**.

With a developable area of 36 hectares, the maximum expected WBPPC's GFA is 151,200m$^2$. Using this GFA Insight Economics Ltd estimated WBPPC having 1,100 employees, and this balances well with concept designs indicating WBPPC having 800 onsite parking spaces and 60 street parking spaces.

## 3.3 Peak Hour Trip Rate

Comparison is made to the peak hour trip rate used to assess a recently approved Business – Light Industry Zone within Whenuapai known as Plan Change 69 (Spedding Block). Plan Change 69 is identified in **Figure 16** and as can be seen from **Figure 16,** Plan Change 69 and the WBPPC have a similar size, 37.4 hectares developable area compared to 36 hectares, and they are anticipated to have a similar makeup of industrial and warehousing type activities established.

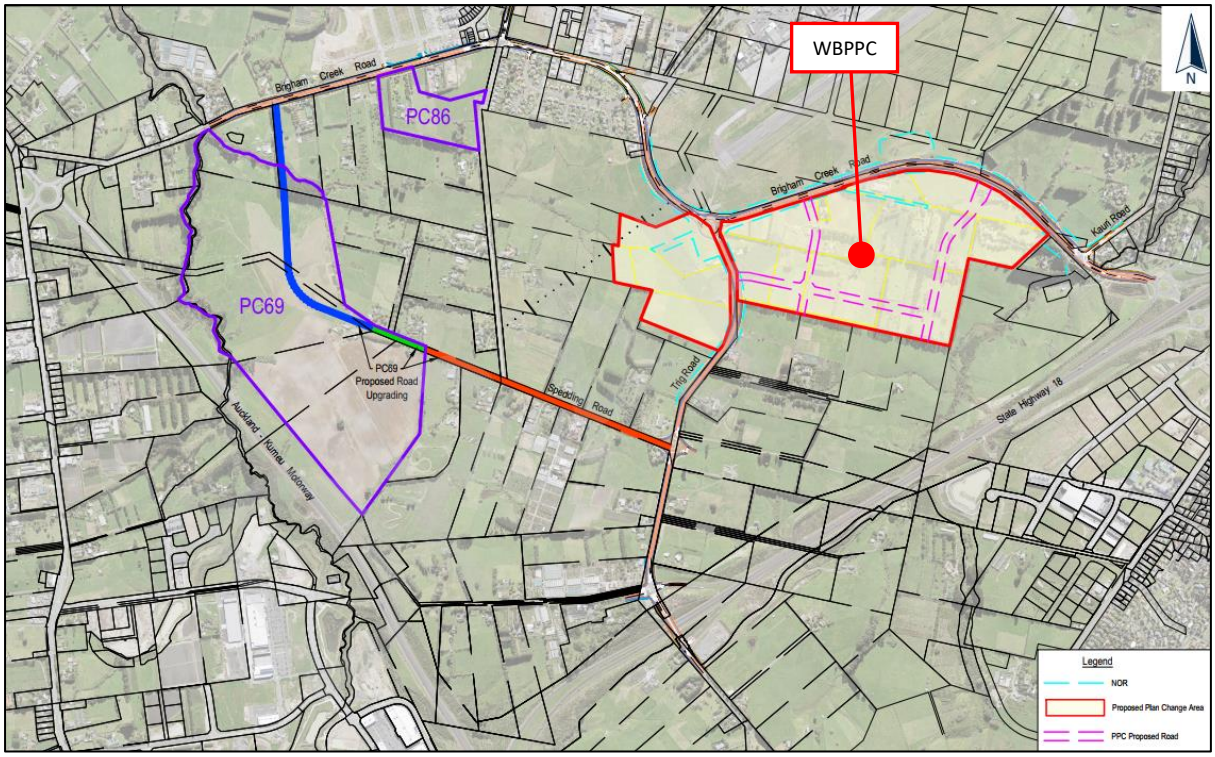



***Figure 16: WBPPC Aerial Photo & Property Boundary Map Overlay***

The traffic reporting for Plan Change 69, as prepared by Stantec for Oyster Capital dated July 2020, is based on an expected 131,000m$^2$ light industry Gross Floor Area (GFA) and 1,021 peak hour vehicle trips. From this a trip rate for the mix of activities expected to be established is calculated to be 0.78 trips per 100m$^2$ of GFA.

The mix of activities expected to be established is:

- 50% industrial manufacturing,
- 50% distribution centre or warehousing.

Another widely recognised generic trip rate for industrial developments has been considered, and this trip rate is 20 trips per hectare of total land area. This trip rate was recommended by Auckland Transport's consultant (Commute) during a Ministry of Environment fast track consent application that NCL made for a smaller Whenuapai Business Park proposal that was declined for non-transport related matters.

The technical memo that Commute provided to Auckland Transport for the fast track application dated 13 March 2023 stated "*from their involvement in the preparation of the Warkworth Structure Plan ITA for Auckland Council, and as part of that work, we surveyed an industrial catchment in Silverdale to understand peak hour and daily trip rates for light industrial activity. Those surveys revealed a peak hour trip rate of approximately 20 trips per ha (developable area).*"

Using the Gross Floor Area (GFA) calculated for the WBPPC as detailed in **Section 3.2**, a midpoint between the above trip rates is calculated to be 0.63 trips per 100m$^2$ GFA and this has been used as a starting point to assess WBPPC traffic effects.

## 3.4 Traffic Generation

The WBPPC has a developable area of 36 hectares, (total area of 47.6 hectares) and expected maximum GFA of 151,200m$^2$.

The peak hour traffic generation of the WBPPC when applying a trip rate of 0.63 trips/100m$^2$ GFA, equates to a peak hour traffic generation of 950 trips. Subsequent SIDRA modelling analysis identified sensitivities on the transport network with 950 trips and this is detailed in the **Appendix D** correspondence that has previously been had with Auckland Council, Auckland Transport, and a subconsultant (Abley Ltd) commissioned to assist with SATURN traffic data and SIDRA network analysis.

Subsequent SIDRA modelling analysis of the identified 20 trips per hectare rate with a peak hour of 725 trips identified spare capacity on the traffic network and this is detailed in **Section 4**.

Overall, the 725 trips analysed indicates that a developed GFA of 115,000m$^2$ can be accommodated with the roading infrastructure upgrades proposed. A WBPPC GFA of 115,000m$^2$ is therefore recommended as a WBPPC development threshold.

## 3.5 Trip Distribution

Trip distribution to/from the wider Whenuapai area is based on the WBPPC's accessibility via Brigham Creek Road and Trig Road. The closest State Highway interchanges to the site are located on State Highway 18 at Brigham Creek Road and Trig Road. These interchanges are vertically separated allowing traffic to arrive from and depart to State Highway 18 without impeding traffic flow on the State Highway.
With the Brigham Creek Road interchange having on/off ramps in both directions and the Trig Road interchange having eastbound facing on/off ramps, 3/5$^{th}$ of the traffic generated is expected to travel via the Brigham Creek Road interchange and 2/5$^{th}$ is expected to travel via the Trig Road interchange. This distribution also aligns with other recent Plan Change applications in the area, and with Te Tupu Ngatāhi's Whenuapai SATURN 2028 traffic model.

Traffic travelling on the section of Brigham Creek Road to the northwest of the site that travels via the State Highway 16 roundabout interchange does not increase significantly as evidenced by the commuter travel pattern identified in **Section 2.1**. Further confidence that travel will be focused via State Highway 18 and Hobsonville Road to the south and east is provided by Te Tupu Ngatāhi's Whenuapai SATURN 2028 traffic model, which has been reviewed separately by Abley Ltd and Don McKenzie Consulting Ltd, refer to **Appendix E**. From these reviews it is appropriate to assign all WBPPC traffic to travel via SH18 and Hobsonville Road as this results in a conservative method to test key routes.

The inbound outbound split for the morning and evening peak hour is expected to be a standard 70/30 split for commuting traffic i.e., dominant direction biased to inbound trips in the morning peak hour and biased to outbound trips in the evening peak hour.

**Figure 17** and **Figure 18** details the WBPPC's morning and evening peak hour trip distribution for the identified key routes. Included are the base traffic volumes collected from recent traffic counts, refer to **Appendix B** for the spreadsheets of these counts.

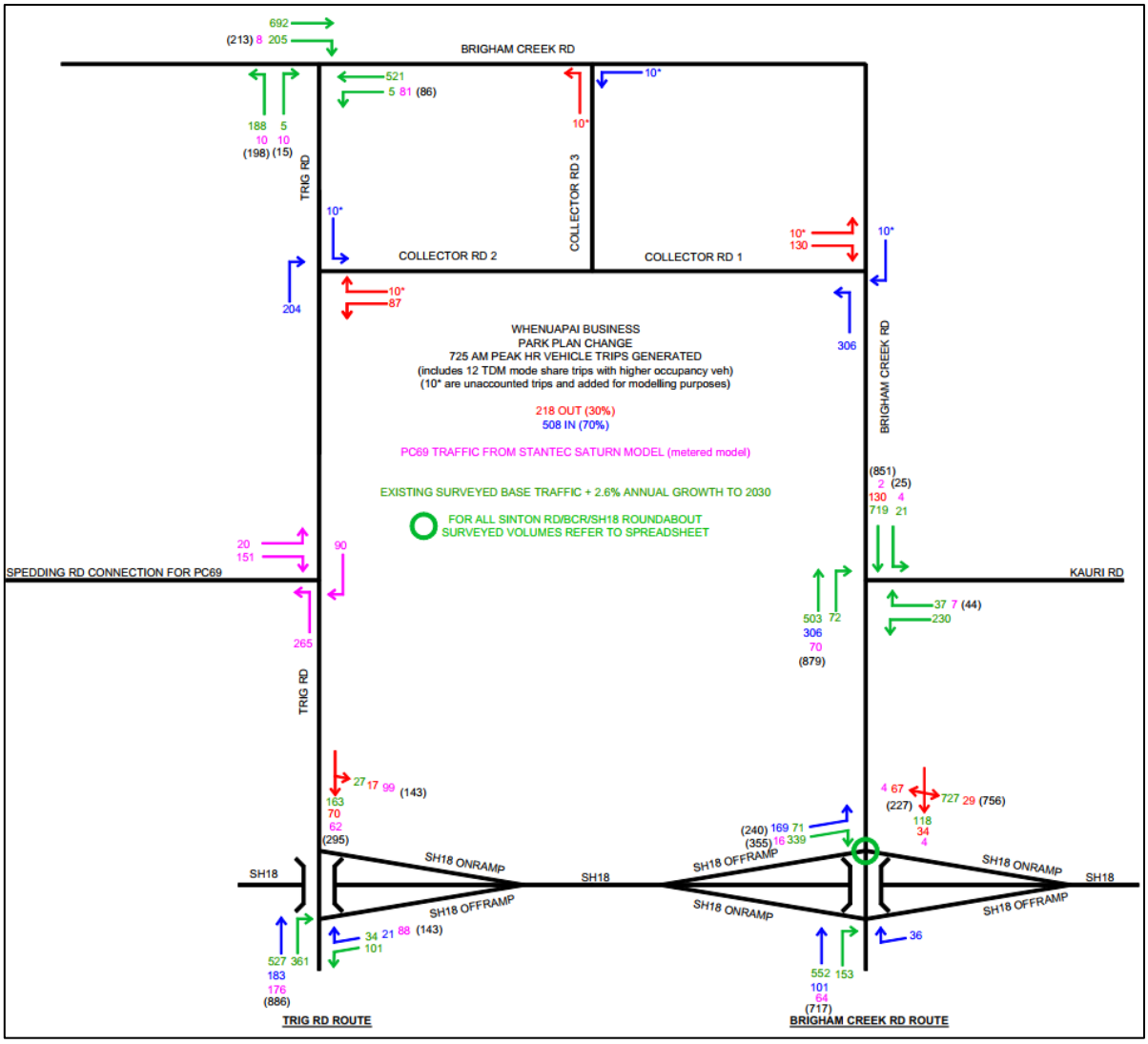



*Figure 17: Morning Peak Hour Trip Distribution 725 vph*

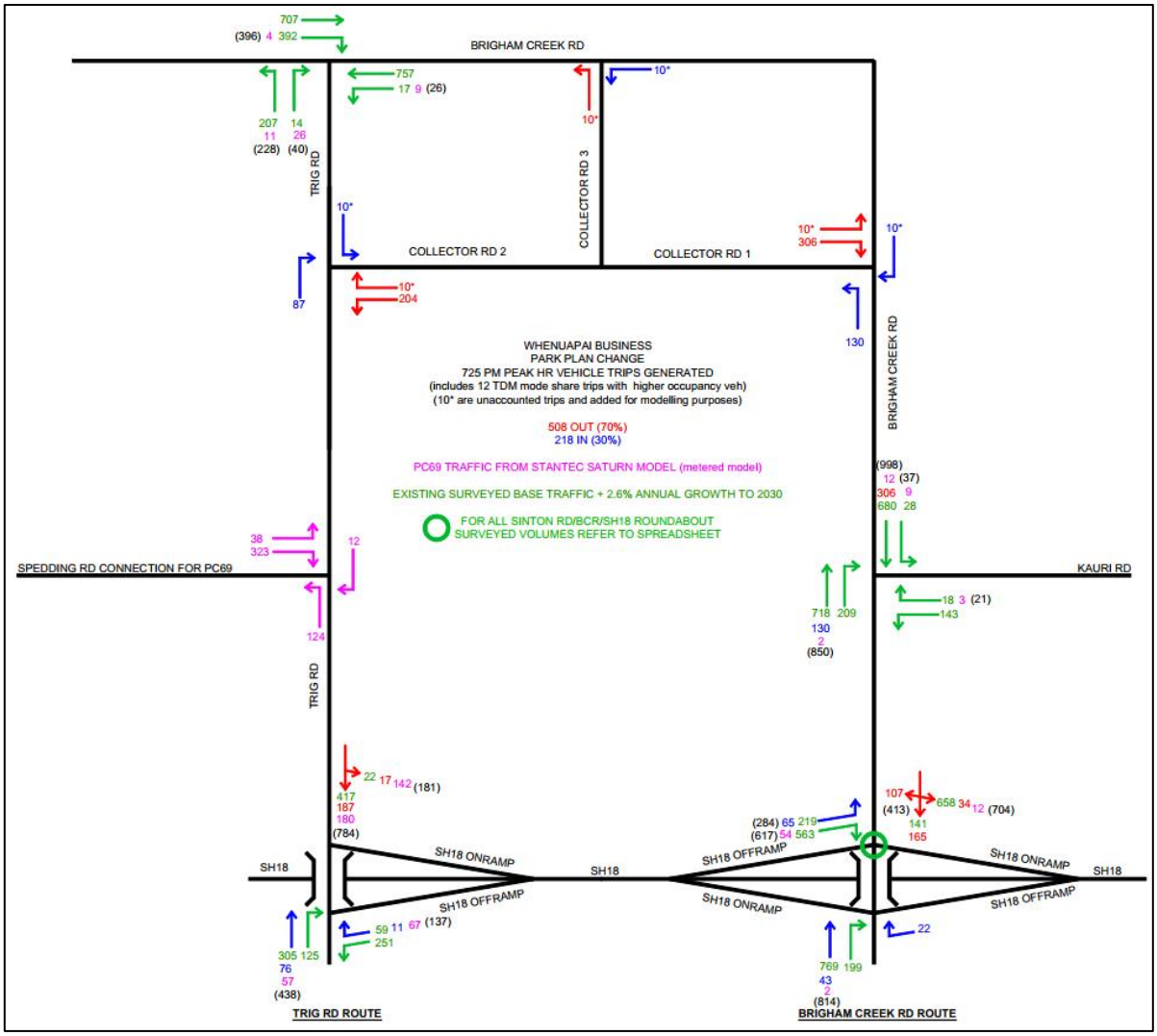



*Figure 18: Evening Peak Hour Trip Distribution 725 vph*

# 4 Effects of the Proposal & Mitigations

## 4.1 Brigham Creek Road

The WBPPC proposes to upgrade the section of Brigham Creek Road that has property boundary constraints with a single traffic lane in each direction together with a shared foot/cycle path on the northern side and separated footpath and cycleway on the southern side, refer to this cross-section in **Figure 19**.

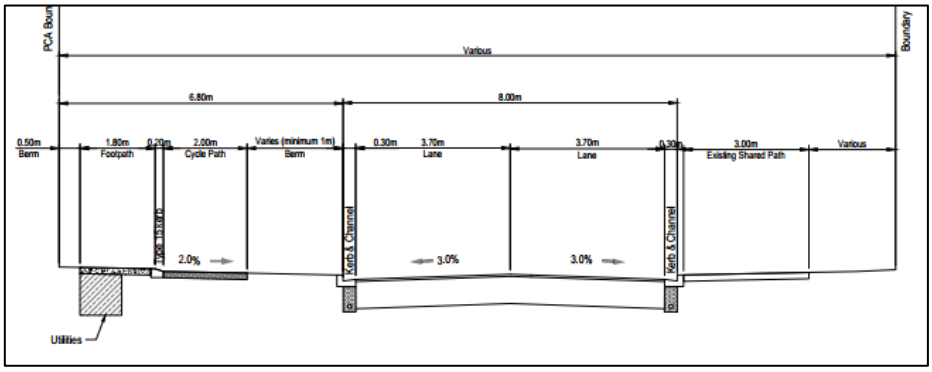



***Figure 19: Proposed Brigham Creek Road – Constrained Boundary Cross-section***

Where it is possible, the remaining sections of Brigham Creek Road adjacent to the WBPPC are to be upgraded to align with Te Tupu Ngātahi's indicative upgraded cross-section (**Figure 7**). The **Figure 20** plan details where the 'pinch points' are on Brigham Creek Road require a departure from **Figure 7** to **Figure 19**.

**Table 1** details the Road Function and Required Design Elements of Brigham Creek Road and the other roads to be upgraded for the WBPPC.

***Table 1: Road Function & Required Design Elements***

| Road name | Proposed role and function of road in precinct area | Minimum road reserve width[1] | Total number of lanes | Design speed | Median[2] | Cycle Provision | Pedestrian provision | Freight or heavy vehicle route | Access restriction | Bus provision[3] |
|---|---|---|---|---|---|---|---|---|---|---|
| Brigham Creek Road upgrade (Between Kauri Road and Intersection D)* | Arterial | 30m | 4 | 60km/hr | No | Yes-one side[4] | Yes-two sides[5] | Yes | Yes | Yes |
| Brigham Creek Road upgrade (West of Intersection D)* | Arterial | Various | 2 | 60km/hr | No | Yes-two sides[6] | Yes-two sides[6] | Yes | Yes | Yes |
| Trig Road | Future Arterial | 24m | 2 | 60km/hr | Yes | Yes-two sides | Yes-two sides | Yes | No | Yes |
| Roads 1, 2, 3 | Collector | 24m | 2 | 50km/hr | No | Yes-two sides | Yes-two sides | Yes | No | Yes |

* Denotes interim upgrades to Brigham Creek Road (i.e. not the ultimate width provided for by AT's NOR W3)

[1] Typical minimum width which may be varied in specific locations where required to accommodate network utilities, batters, structures stormwater treatment, intersection design, significant constraints or other localised design requirements.

[2] Flush, solid or raised medians subject to Auckland Transport approval at EPA stage.

[3] Carriageway lanes and geometry of intersections capable of accommodating buses. Bus stop form and locations and bus routes shall be determined with Auckland transport at resource consent and engineering plan approval stage.

[4] Two-way cycleway on northern side only.

[5] Southern side footpath extending to the eastern extremity of Lot 1 DP 167537 (159 Brigham Creek Road)

[6] Shared path on northern side of Brigham Creek Road remains

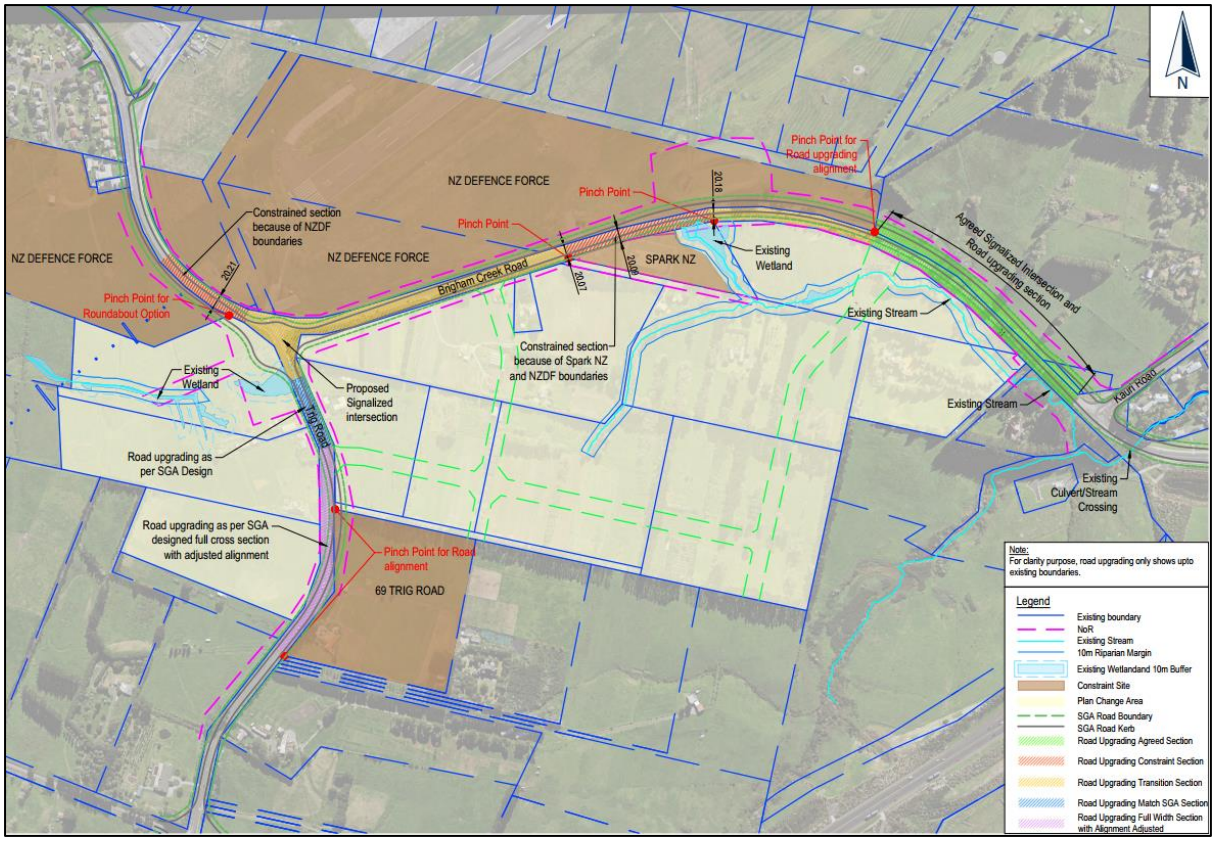



***Figure 20: Road Upgrading Constraints Plan***

The proposed upgrade aligns with Auckland Transport's Roads and Streets Framework (RASF) typology for a road with a low place function and high movement function, refer to this identified in the RASF matrix in **Figure 21**.

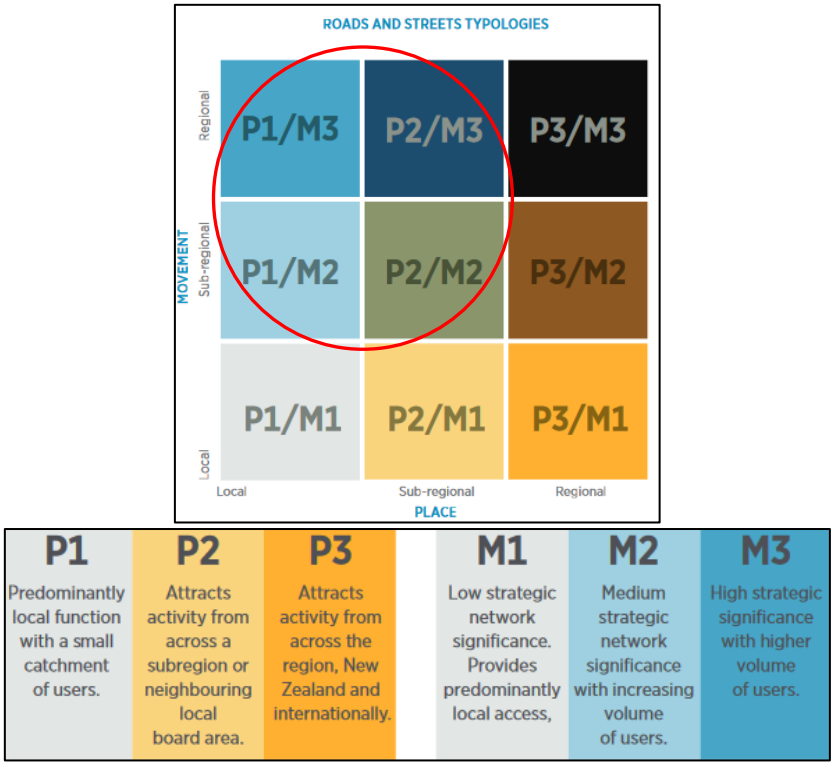



***Figure 21: Roads & Streets Framework Typology Matrix***

## 4.2 Trig Road

The WBPPC proposes to upgrade the adjacent section of Trig Road so that it aligns with Te Tupu Ngātahi's (**Figure 11**) cross-section, which also aligns with Auckland Transport's Roads and Streets Framework (RASF) typology for a road with a low place function and high movement function, refer to this identified in the RASF matrix in **Figure 21**. The previous **Table 1** details the Road Function and Required Design Elements of Trig Road to be upgraded for the WBPPC.

## 4.3 Pedestrian, Cycling & Passenger Transport

The existing shared footpath and cycleway on the northern side of Brigham Creek Road adjacent to the WBPPC is to be retained or upgraded where required, as part of the roading upgrade package.

Additionally, a new separated footpath and cycleway is to be installed on the southern side of Brigham Creek Road. The exception is to the east of the proposed Brigham Creek Road signalised intersection where on the southern side a footpath is proposed. Topographical constraints and the close proximity of the main stream preclude the construction of a fully separated footpath and cycleway in this location.

The internal roading network of the WBPPC has been designed with separated footpath and cycleway on both sides of all roads. This achieves a high level of connectivity and amenity across the plan change area that is greater than traditionally provided for industrial streets.

Bus stops and bus shelters have been designed on the internal roads and on Trig Road, which allows the WBPPC to be directly accessible to an existing bus route on Trig Road, and the future frequent transport network in accordance with the Northwest Indicative Strategic Network goals over the next 10 to 30 year period. Connectivity to two proposed future Council sports parks adjacent to the WBPPC have also been considered and allowed for in the proposed Precinct Plan (**Figure 14**).

The walking and cycling infrastructure proposed as part of the WBPPC roading upgrades improves the safety and accessibility for pedestrians and cyclists in the vicinity of the site. Additionally, the proposed Brigham Creek Road intersections provide safe connections into the WBPPC for all transport modes. A footbridge across State Highway 18, the Clarks Lane foot/cycle bridge, is expected to be favoured by cyclists that cycle between Hobsonville Road and the WBPPC with a distance of 2.5km for this route.

Overall, the walking and cycling infrastructure works proposed allow for active travel modes to access the WBPPC in accordance with the expectations of Te Tupu Ngatāhi's North West Indicative Strategic Transport Network (**Figure 8**). These provisions assist in reducing private vehicle trips, which is a key consideration of Auckland Transport for their future transport network.

## 4.4 Internal Road Design

The WBPPC's proposed collector roads have been designed to be suitable for industrial use and provide separated footpaths and cycleways that connect directly to Brigham Creek Road and Trig Road.

**Figure 22** details the proposed 24 metre road corridor cross-sections that consist of one traffic lane in each direction, recessed parking bays, footpath, cycleway, and berms.

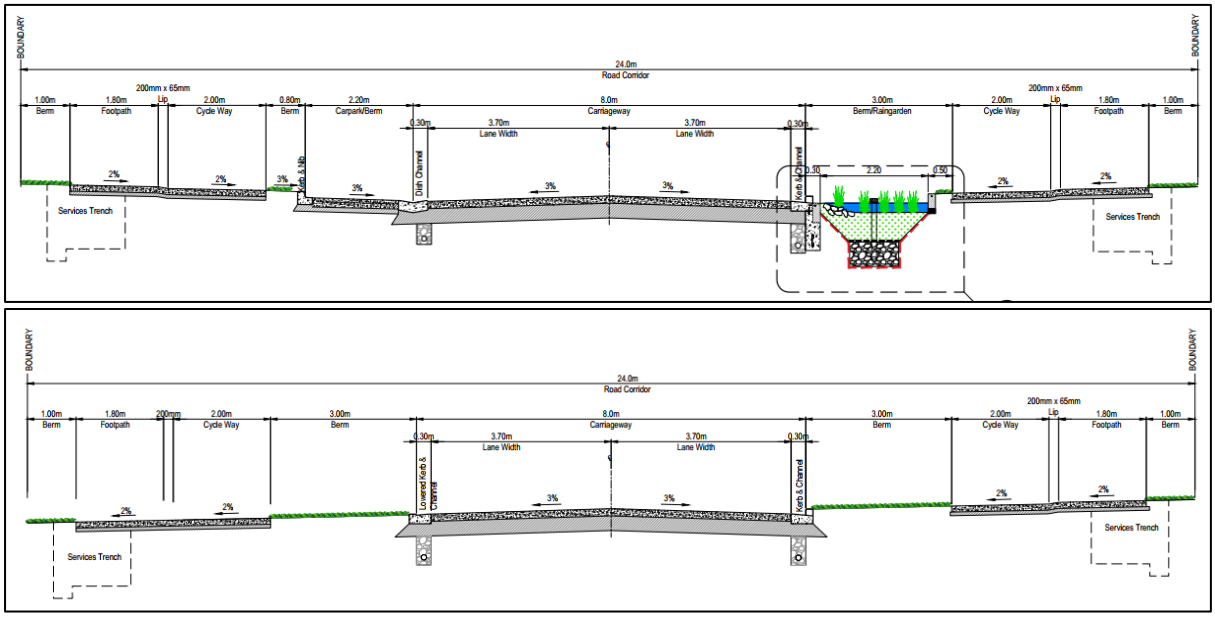



***Figure 22: Internal Road Cross-sections***

The proposed cross-section aligns with recognised roading guidelines and standards including Auckland Transport's Transport Design Manual and Waka Kotahi's Manual of Traffic Signs and Markings (MOTSAM). The indicative eight metre wide carriageway provides two traffic lanes that are comfortable for slow speed heavy vehicle traffic (30-50km/hr speed zone) and allow for a potential future retrofit to provide flush median or bus stops.

Eight metres is also consistent with the freight traffic lanes prescribed by Auckland Transport's Transport Design Manual TDM, plus include extra shoulder width in accordance with MOTSAM. No Stopping At All Times (NSAAT) markings are recommended on both sides for efficient traffic flow.

Theses traffic lane widths and separated footpath and cycleway are continued over a bridge that is required to cross a tributary to the Waiarohia Stream. Refer to **Figure 23** for this bridge cross-section, which includes an additional right turning lane for the proposed Brigham Creek Road signalised intersection.

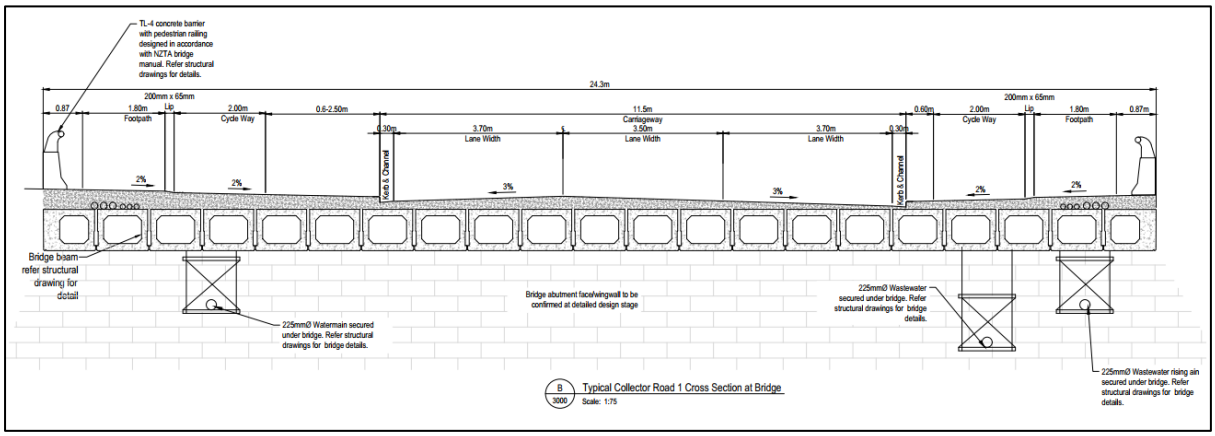



***Figure 23: Bridge Cross-section***

The previous **Table 1** details the Road Function and Required Design Elements of the WBPPC's internal roads.

The internal road intersections consist of a T-intersection and a roundabout. The areas identified for the intersections have been checked to ensure they have kerb lines that can accommodate high productivity semi-trailer trucks without crossing the road centreline. Refer to tracking curves demonstrating this in **Appendix C**.

Street parking has been designed in the form of recessed parking bays that can accommodate circa sixty parking spaces.

Bulk earthworks within the WBPPC are 90% complete and provide gentle road gradients with the maximum gradient expected to be a suitable 8% (1 vertical by 12.5 horizontal) for the proposed Business – Light Industry zoning.

Overall, the internal roading design is appropriate for a Business – Light Industry Zone and allows for the roading network to be extended in general accordance with the most recently published indicative roading network designs for Whenuapai. These include the now withdrawn Plan Change 5 and an August 2024 report by BECA Limited 8 August 2024, supporting the proposed draft Development Contributions Policy.

## 4.5 Traffic Generation Effects (Intersection & Interchange Performance)

The key intersections that have been assessed for traffic generation effects of the WBPPC are:

- new Brigham Creek Road / Collector Road 1 signalised intersection,
- new Trig Road / Collector Road 2 roundabout intersection,
- roundabout intersection upgrade of existing Brigham Creek Road / Trig Road intersection,
- existing Kauri Road /Brigham Creek Road T-intersection,
- existing State Highway 18 / Brigham Creek Road roundabout interchange (Sinton Road),
- existing State Highway 18 / Trig Road interchange.

**Table 2** details the Road Function and Required Design Elements of the WBPPC's new and upgraded intersections.

***Table 2: Road Function & Required Design Elements***

| | | | |
|---|---|---|---|
| A - Trig Road | New Intersection - Roundabout | 47712-DR-C-8510 | Single Lane roundabout. A future fourth leg could provide access to part of the PCA west of Trig Road |
| B - Trig / Brigham Creek Road | Upgraded Intersection - Roundabout | 47712-DR-C-8511 | Single lane roundabout with an additional circulating lane on the northern side. Two approach lanes on Brigham Creek Road, eastbound. |
| C - Brigham Creek Road | New Intersection - Left in, left out | 47712-DR-C-8512 | |
| D - Brigham Creek Road | New Intersection - Signalized | 47712-DR-C-513 | |

To assess the effects of the generated traffic from the WBPPC, SIDRA traffic models have been analysed for the above intersections and interchanges. The detailed SIDRA outputs for the modelled intersections and interchanges are included in **Appendix D**. These were prepared with modelling assistance from Abley, refer Appendix E.

The modelling methodology uses a 2030 future year scenario where the WBPPC is fully established. The base traffic flows utilise recent traffic counts forecast adjusted using a 2.6% arithmetic (linear) annual growth rate. Telemetry traffic counts on the adjacent State Highway 18 support this growth rate. Consideration of Plan Change 69 traffic has also been included as detailed in the **Figure 17** and **Figure 18** trip distribution diagrams.

### 4.5.1 Brigham Creek Road Signalised Intersection

A signalised intersection is proposed on Brigham Creek Road as part of the roading upgrade works to provide access to the WBPPC. It also has been designed to potentially provide future access to land on the northern side of Brigham Creek Road. The works required include significant widening of Brigham Creek Road to accommodate additional traffic lanes as detailed in **Figure 24**. For this design all private land that is required to be vested as road reserve is owned by NCL.

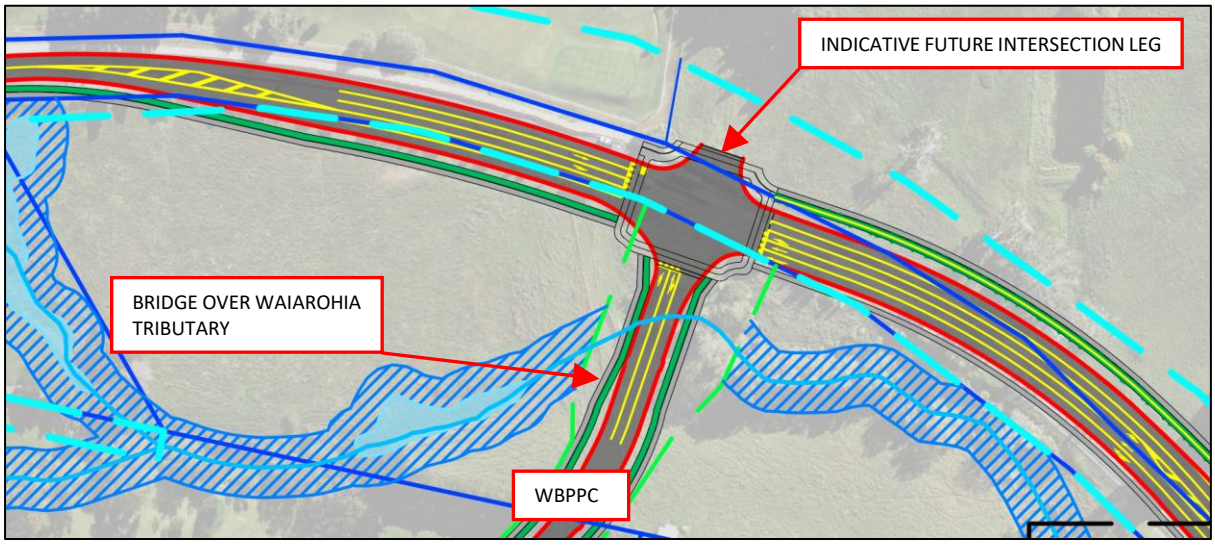



***Figure 24: Proposed Brigham Creek Road Signalised Intersection***

A raised table treatment is indicatively proposed for the signalised intersection together with pedestrian/cycle crossing phases on each leg. The raised table can easily be included in the detailed engineering/construction plans, or removed, depending on Auckland Transport's policy at the time. The raised table provides an appropriate speed environment for Auckland Transport's Vision Zero programme.

The intersection's sight distances can comply with the AUSTROADS Safe Intersection Sight Distance (SISD) criteria of 151 metres for a conservatively high speed of 70km/hr, refer to these sightlines detailed in the WBPPC's civil engineering plans prepared by Cato Bolam Consultants Ltd.

All traffic lane widths are a minimum of 3.2 metres wide and intersection kerb lines have been designed to accommodate High Productivity Motor Vehicles (HPMV) such as Auckland Transport's 19.45 metre semi-trailer and 23 metre truck and trailer design vehicles. The extra turning lanes proposed on Brigham Creek Road have queue storage lengths of 100 metres, and 60 metres on the internal Collector 1 road.

As there is no certainty of future development on the fourth leg of the intersection to the north the SIDRA model is a T-intersection.

**Figure 25** provides the SIDRA movement summary tables for the analysed 2030 morning peak hour period, and **Figure 26** provides the movement summary for the analysed 2030 evening peak hour period.

Two movement summaries are provided for each peak period. This is because there is a second model without a pedestrian crossing movement on the BCR east approach to the intersection. This is

provided for comparison purposes because it is not expected that a pedestrian crossing will be called on all intersection legs on every cycle.

It is noted that the benefit of signals is that phase times can be preset, or actuators installed, to favour critical movements. The critical movement in this case being the eastern approach that is 600 metres from SH18's offramp. The longest queue on this approach occurs in the morning with the peak hour 95 percentile queue without a pedestrian crossing phase for the eastern approach being 173 metres, and with a pedestrian crossing called on all approaches is 525 metres.

It can therefore be expected that with moderate numbers of pedestrians present that call pedestrian crossing phases on all legs of the intersection for half of the phase cycles in a peak hour, the 95 percentile peak hour queue will be midway between 173-525 metres (349 metres), which does not compromise SH18.

**MOVEMENT SUMMARY**

**Site: 101 [AM - Tintersection - surveyed base traffic + 2.6% to 2030 alt phasing (Site Folder: Whenuapai Business Park Plan Change)]**

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

100 sec cycle time
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

**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: Road 1 | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 10 | 10.0 | 10 | 10.0 | 0.027 | 39.0 | LOS D | 0.4 | 2.9 | 0.82 | 0.66 | 0.82 | 32.2 |
| 12 | R2 | All MCs | 130 | 10.0 | 130 | 10.0 | * 0.625 | 52.4 | LOS D | 6.4 | 48.5 | 1.00 | 0.82 | 1.04 | 28.6 |
| Approach | | | 140 | 10.0 | 140 | 10.0 | 0.625 | 51.4 | LOS D | 6.4 | 48.5 | 0.99 | 0.81 | 1.02 | 28.9 |
| East: BCR E | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 306 | 10.0 | 306 | 10.0 | 0.351 | 8.8 | LOS A | 8.1 | 61.4 | 0.43 | 0.60 | 0.43 | 43.1 |
| 2 | T1 | All MCs | 879 | 10.0 | 879 | 10.0 | * 0.651 | 12.0 | LOS B | 22.7 | 172.5 | 0.64 | 0.61 | 0.64 | 43.2 |
| Approach | | | 1185 | 10.0 | 1185 | 10.0 | 0.651 | 11.2 | LOS B | 22.7 | 172.5 | 0.58 | 0.61 | 0.58 | 43.2 |
| West: BCR W | | | | | | | | | | | | | | | |
| 8 | T1 | All MCs | 692 | 10.0 | 692 | 10.0 | 0.323 | 4.0 | LOS A | 6.8 | 52.0 | 0.33 | 0.29 | 0.33 | 47.5 |
| 9 | R2 | All MCs | 10 | 10.0 | 10 | 10.0 | * 0.096 | 55.3 | LOS E | 0.5 | 3.7 | 0.97 | 0.67 | 0.97 | 28.0 |
| Approach | | | 702 | 10.0 | 702 | 10.0 | 0.323 | 4.7 | LOS A | 6.8 | 52.0 | 0.34 | 0.29 | 0.34 | 47.0 |
| All Vehicles | | | 2027 | 10.0 | 2027 | 10.0 | 0.651 | 11.7 | LOS B | 22.7 | 172.5 | 0.52 | 0.51 | 0.53 | 42.9 |

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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 Green.
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.

* Critical Movement (Signal Timing)

**MOVEMENT SUMMARY**

**Site: 101 [AM - Tintersection - surveyed base traffic + 2.6% to 2030 (Site Folder: Whenuapai Business Park Plan Change)]**

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

100 sec cycle time
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

**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: Road 1 | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 10 | 10.0 | 10 | 10.0 | 0.013 | 22.3 | LOS C | 0.3 | 2.1 | 0.59 | 0.63 | 0.59 | 37.7 |
| 12 | R2 | All MCs | 130 | 10.0 | 130 | 10.0 | * 0.625 | 52.4 | LOS D | 6.4 | 48.5 | 1.00 | 0.82 | 1.04 | 28.6 |
| Approach | | | 140 | 10.0 | 140 | 10.0 | 0.625 | 50.2 | LOS D | 6.4 | 48.5 | 0.97 | 0.80 | 1.01 | 29.1 |
| East: BCR E | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 306 | 10.0 | 306 | 10.0 | 0.552 | 24.8 | LOS C | 16.1 | 122.5 | 0.74 | 0.75 | 0.74 | 37.8 |
| 2 | T1 | All MCs | 879 | 10.0 | 879 | 10.0 | * 1.023 | 113.6 | LOS F | 69.2 | 525.9 | 0.95 | 1.60 | 1.78 | 20.4 |
| Approach | | | 1185 | 10.0 | 1185 | 10.0 | 1.023 | 90.7 | LOS F | 69.2 | 525.9 | 0.90 | 1.38 | 1.52 | 23.1 |
| West: BCR W | | | | | | | | | | | | | | | |
| 8 | T1 | All MCs | 692 | 10.0 | 692 | 10.0 | * 0.402 | 5.8 | LOS A | 7.3 | 55.5 | 0.53 | 0.45 | 0.53 | 46.4 |
| 9 | R2 | All MCs | 10 | 10.0 | 10 | 10.0 | 0.021 | 32.4 | LOS C | 0.3 | 2.7 | 0.75 | 0.65 | 0.75 | 34.0 |
| Approach | | | 702 | 10.0 | 702 | 10.0 | 0.402 | 6.2 | LOS A | 7.3 | 55.5 | 0.53 | 0.45 | 0.53 | 46.2 |
| All Vehicles | | | 2027 | 10.0 | 2027 | 10.0 | 1.023 | 58.6 | LOS E | 69.2 | 525.9 | 0.77 | 1.02 | 1.14 | 28.5 |

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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 Green.
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.

* Critical Movement (Signal Timing)

***Figure 25: 2030 Morning Peak Hour SIDRA Movement Summary (New Brigham Creek Rd Signalised Intersection)***

**MOVEMENT SUMMARY**

**Site: 101 [PM - Tintersection - surveyed base traffic + 2.6% to 2030 alt phasing (Site Folder: Whenuapai Business Park Plan Change)]**

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

100sec cycle time
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

**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: Road 1 | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 10 | 10.0 | 10 | 10.0 | 0.007 | 5.7 | LOS A | 0.0 | 0.3 | 0.16 | 0.55 | 0.16 | 45.4 |
| 12 | R2 | All MCs | 306 | 10.0 | 306 | 10.0 | * 0.679 | 41.4 | LOS D | 13.7 | 104.3 | 0.96 | 0.84 | 0.97 | 31.3 |
| Approach | | | 316 | 10.0 | 316 | 10.0 | 0.679 | 40.3 | LOS D | 13.7 | 104.3 | 0.93 | 0.83 | 0.94 | 31.6 |
| East: BCR E | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 130 | 10.0 | 130 | 10.0 | 0.378 | 8.9 | LOS A | 10.1 | 76.4 | 0.64 | 0.63 | 0.64 | 39.6 |
| 2 | T1 | All MCs | 850 | 10.0 | 850 | 10.0 | * 0.702 | 21.5 | LOS C | 23.6 | 179.6 | 0.78 | 0.72 | 0.78 | 39.4 |
| Approach | | | 980 | 10.0 | 980 | 10.0 | 0.702 | 19.8 | LOS B | 23.6 | 179.6 | 0.76 | 0.71 | 0.76 | 39.4 |
| West: BCR W | | | | | | | | | | | | | | | |
| 8 | T1 | All MCs | 707 | 10.0 | 707 | 10.0 | 0.405 | 10.1 | LOS B | 11.2 | 85.2 | 0.52 | 0.45 | 0.52 | 44.1 |
| 9 | R2 | All MCs | 10 | 10.0 | 10 | 10.0 | * 0.096 | 55.3 | LOS E | 0.5 | 3.7 | 0.97 | 0.67 | 0.97 | 28.0 |
| Approach | | | 717 | 10.0 | 717 | 10.0 | 0.405 | 10.7 | LOS B | 11.2 | 85.2 | 0.52 | 0.46 | 0.52 | 43.8 |
| All Vehicles | | | 2013 | 10.0 | 2013 | 10.0 | 0.702 | 19.8 | LOS B | 23.6 | 179.6 | 0.70 | 0.64 | 0.71 | 39.3 |

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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 Green.
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.

* Critical Movement (Signal Timing)

**MOVEMENT SUMMARY**

**Site: 101 [PM - Tintersection - surveyed base traffic + 2.6% to 2030 (Site Folder: Whenuapai Business Park Plan Change)]**

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

100sec cycle time
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

**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: Road 1 | | | | | | | | | | | | | | | |
| 10 | L2 | All MCs | 10 | 10.0 | 10 | 10.0 | 0.011 | 17.7 | LOS B | 0.2 | 1.8 | 0.51 | 0.62 | 0.51 | 39.6 |
| 12 | R2 | All MCs | 306 | 10.0 | 306 | 10.0 | * 0.981 | 94.2 | LOS F | 22.9 | 174.4 | 1.00 | 1.28 | 1.87 | 21.6 |
| Approach | | | 316 | 10.0 | 316 | 10.0 | 0.981 | 91.8 | LOS F | 22.9 | 174.4 | 0.98 | 1.26 | 1.82 | 21.9 |
| East: BCR E | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 130 | 10.0 | 130 | 10.0 | 0.535 | 22.8 | LOS C | 14.0 | 106.4 | 0.82 | 0.74 | 0.82 | 36.0 |
| 2 | T1 | All MCs | 850 | 10.0 | 850 | 10.0 | * 0.991 | 80.5 | LOS F | 50.3 | 382.1 | 0.95 | 1.33 | 1.49 | 24.8 |
| Approach | | | 980 | 10.0 | 980 | 10.0 | 0.991 | 72.9 | LOS E | 50.3 | 382.1 | 0.93 | 1.25 | 1.40 | 25.8 |
| West: BCR W | | | | | | | | | | | | | | | |
| 8 | T1 | All MCs | 707 | 10.0 | 707 | 10.0 | * 0.456 | 8.3 | LOS A | 9.3 | 70.9 | 0.61 | 0.52 | 0.61 | 45.1 |
| 9 | R2 | All MCs | 10 | 10.0 | 10 | 10.0 | 0.019 | 30.8 | LOS C | 0.3 | 2.6 | 0.73 | 0.65 | 0.73 | 34.5 |
| Approach | | | 717 | 10.0 | 717 | 10.0 | 0.456 | 8.6 | LOS A | 9.3 | 70.9 | 0.61 | 0.53 | 0.61 | 44.9 |
| All Vehicles | | | 2013 | 10.0 | 2013 | 10.0 | 0.991 | 52.9 | LOS D | 50.3 | 382.1 | 0.82 | 0.99 | 1.19 | 29.4 |

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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 Green.
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.

* Critical Movement (Signal Timing)

***Figure 26: 2030 Evening Peak Hour SIDRA Performance Output Graphs (New Brigham Creek Rd Signalised Intersection)***

Overall, the SIDRA analysis confirms that the proposed Brigham Creek Road signalised intersection can accommodate traffic generated by a fully developed WBPPC without compromise to Brigham Creek Road's strategic arterial function in the roading hierarchy.

### 4.5.2 Trig Rd Roundabout Intersection

A roundabout intersection is proposed on Trig Road as part of the roading upgrade works to provide access to the WBPPC. The works include significant widening of Trig Road to accommodate a median and separated footpath and cycleways as detailed in **Figure 27**.

For this design, all private land that is required to be vested as road reserve is owned by NCL or other land owners who are participating in and supportive of the Private Plan Change. There is potential for the proposed Trig Road roundabout to also provide access to the WBPPC land on the western side of

Trig Road, alternatively this land can be accessed directly by utilising the median that is to be provided as part of the Trig Road upgrade.

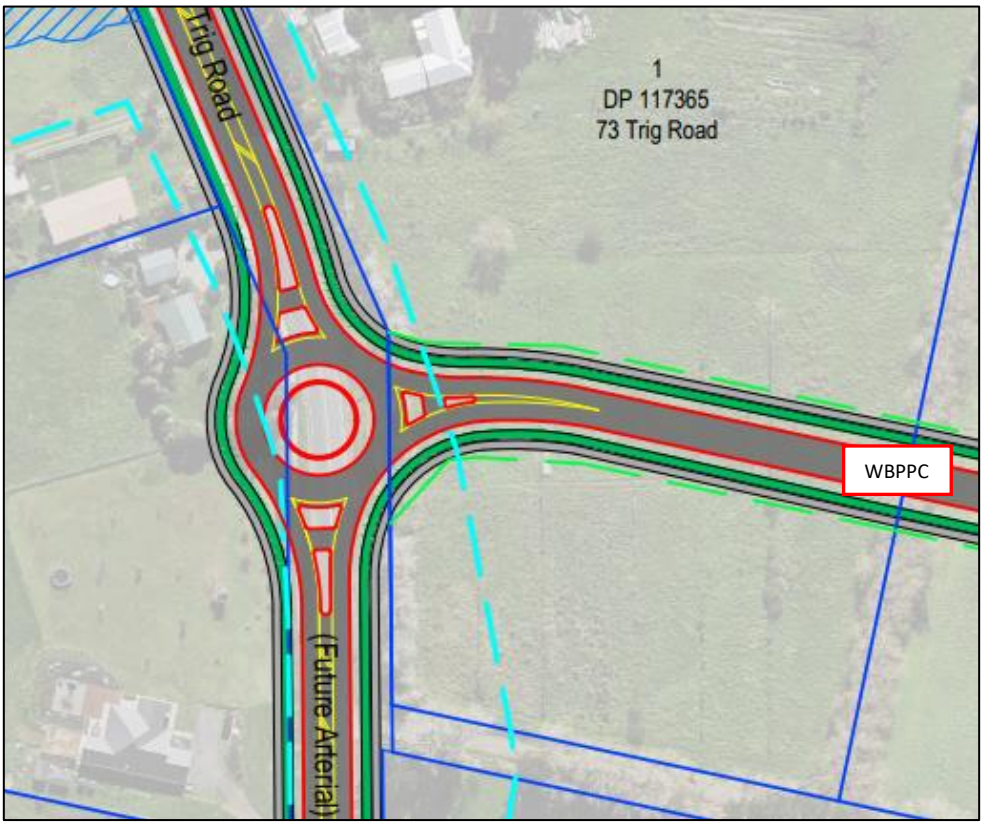



***Figure 27: Proposed Trig Rd Roundabout Intersection***

Raised pedestrian crossings or tables are indicatively proposed for the roundabout to provide an appropriate speed environment and low exposure to conflicts to align with Auckland Transport's Vision Zero programme, refer to Auckland Transport's Transport Design Manual diagram in **Figure 28** below that illustrates this.

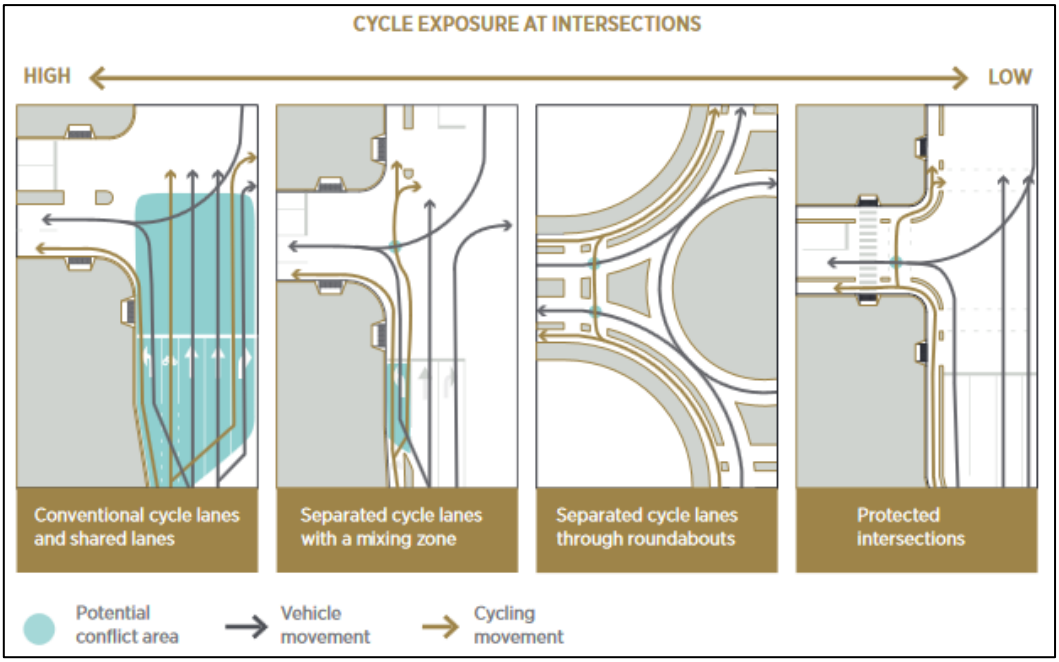



***Figure 28: Transport Design Manual's Cycle Exposure at Intersections***

The intersection's sight distances can comply with the AUSTROADS Safe Intersection Sight Distance (SISD) criteria for roundabouts, refer to these sightlines detailed in the WBPPC's civil engineering plans prepared by Cato Bolam Consultants Ltd.

All traffic lane widths are acceptable for freight movement with the circulating lane being six metres wide with a 20 metre radius central island having a mountable apron to accommodate High Productivity Motor Vehicles (HPMV) such as Auckland Transport's 19.45 metre semi-trailer and 23 metre truck and trailer design vehicles. Refer to **Appendix C** for vehicle tracking plans demonstrating this.

**Figure 29** provides the key SIDRA performance output graphs for the analysed 2030 morning peak hour period, and **Figure 30** provides these graphs for the analysed 2030 evening peak hour period.

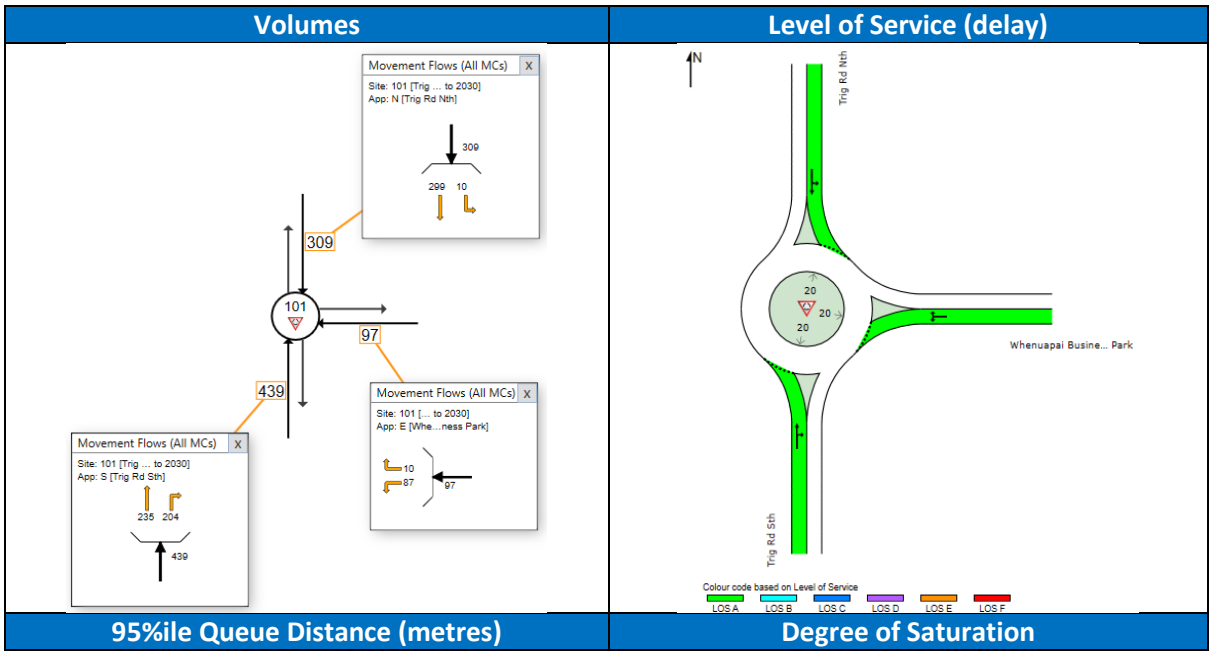



*Figure 29: 2030 Morning Peak Hour SIDRA Performance Output Graphs*

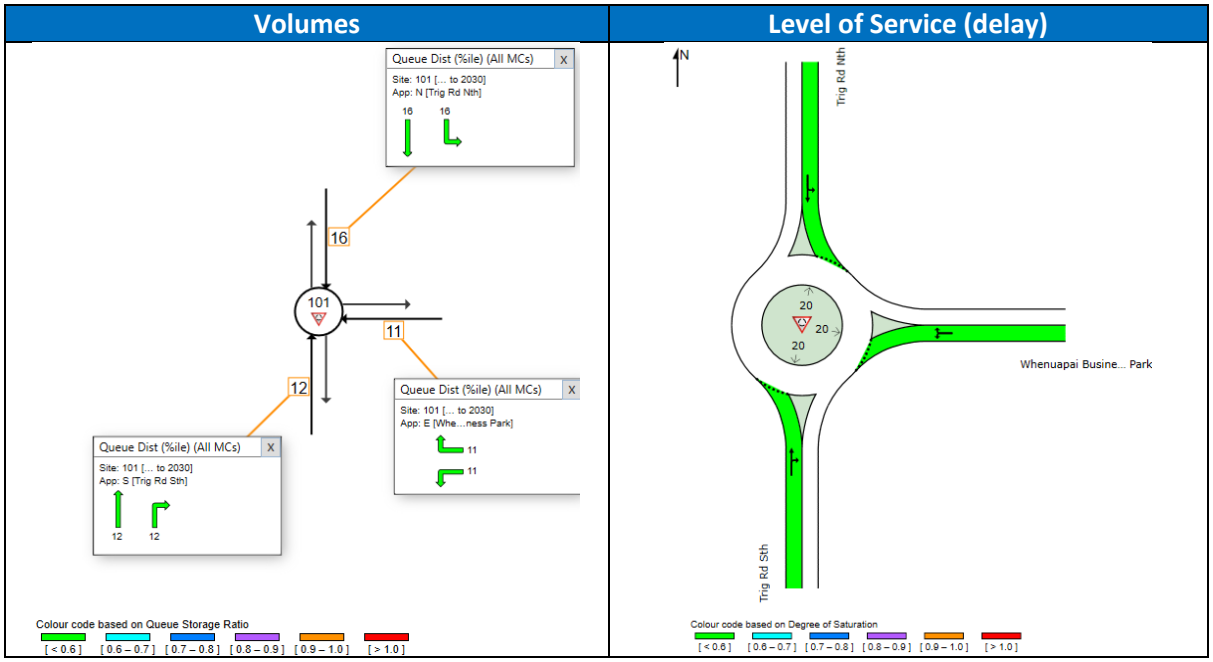



*Figure 30: 2030 Evening Peak Hour SIDRA Performance Output Graphs*

As detailed in the **Figure 29** and **Figure 30** SIDRA output graphs the performance of the proposed roundabout operates at a Level of Service (LoS) of A. The LoS measure is based on traffic delay and with all traffic movements expected to operate at LoS A, there are no delay concerns, and the roundabout will function well for an arterial route and provide access for the WBPPC. There are no concerns with the operation of the roundabout for the future 2030 year. Refer to **Appendix D** for detailed SIDRA output.

Overall, the SIDRA model confirms the proposed Trig Road roundabout can accommodate traffic generated by a fully developed WBPPC without compromise to Trig Road's arterial function in the roading hierarchy. Additionally, the proposal is consistent with Te Tupu Ngatāhi's NoR design.

### 4.5.3 Upgraded Brigham Creek Rd / Trig Rd Roundabout Intersection

The existing priority controlled Brigham Creek Road / Trig Road T-intersection is proposed to be upgraded as a roundabout as part of the roading upgrade works for the WBPPC. The roundabout replicates Te Tupu Ngatāhi's Notice of Requirement design but to avoid property boundary constraints the centre of the roundabout is shifted to the east circa 10 metres, as detailed in **Figure 31.** The works include significant widening of Trig Road and Brigham Creek Road to accommodate separated footpath and cycleways. For this design all land that is required to be vested as road reserve is owned by NCL or other land owners who are participating in and supportive of the Private Plan Change or within Te Tupu Ngatāhi's designation.

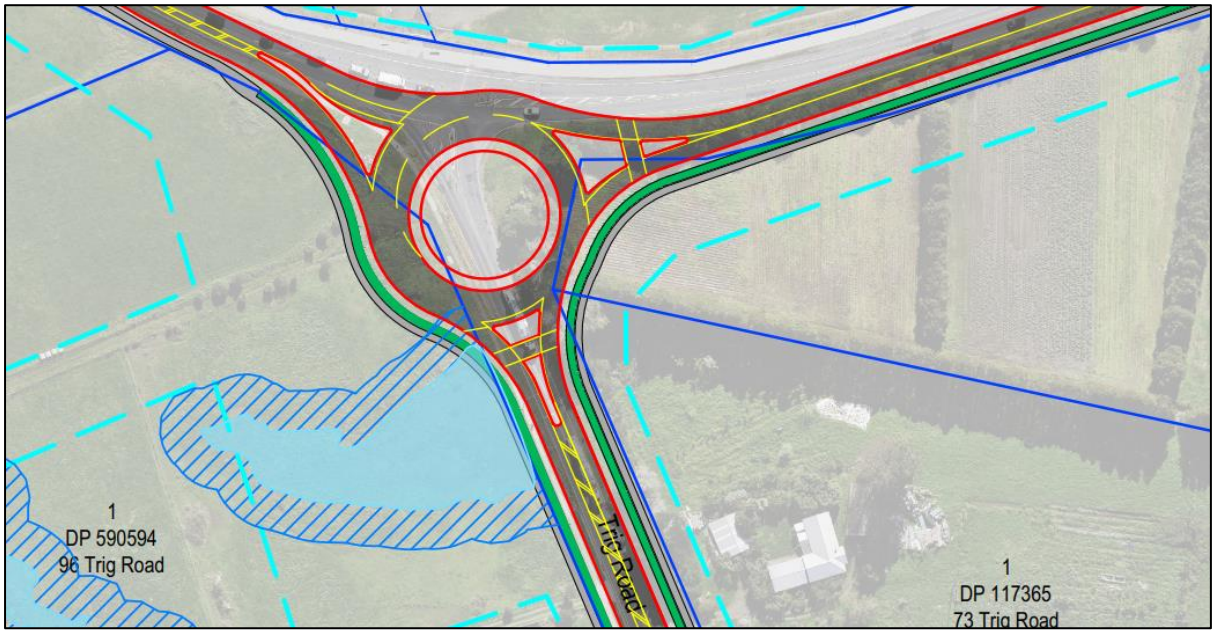



***Figure 31: Upgraded Brigham Creek Road / Trig Rd Roundabout Intersection***

All traffic lane widths are acceptable for freight movement with the circulating lane being six metres wide with a 21 metre radius central island having a mountable apron to accommodate High Productivity Motor Vehicles (HPMV) such as Auckland Transport's 19.45 metre semi-trailer and 23 metre truck and trailer design vehicles. Refer to **Appendix C** for vehicle tracking plans demonstrating this.

Raised pedestrian crossings or tables are indicatively proposed for the roundabout to provide a speed environment that aligns with Auckland Transport's Vision Zero programme, refer to Auckland Transport's Transport Design Manual diagram in **Figure 28** that illustrates this.

The roundabouts sight distances comply with AUSTROADS Safe Intersection Sight Distance (SISD) roundabout criteria, refer to these sightlines detailed in the WBPPC's civil engineering plans prepared by Cato Bolam Consultants Ltd.

There are 'stop on red' signals on the approaches to the existing T-intersection to hold traffic from crossing the New Zealand Defence Force's 03 runway approach when military fixed wing aircraft with medium wake turbulence are landing. The existing signals can be incorporated into the proposed roundabout so that they can be activated by the New Zealand Defence Force when required.

**Figure 32** provides the key SIDRA performance output graphs for the analysed 2030 morning peak hour period, and **Figure 33** provides these graphs for the analysed 2030 evening peak hour period.

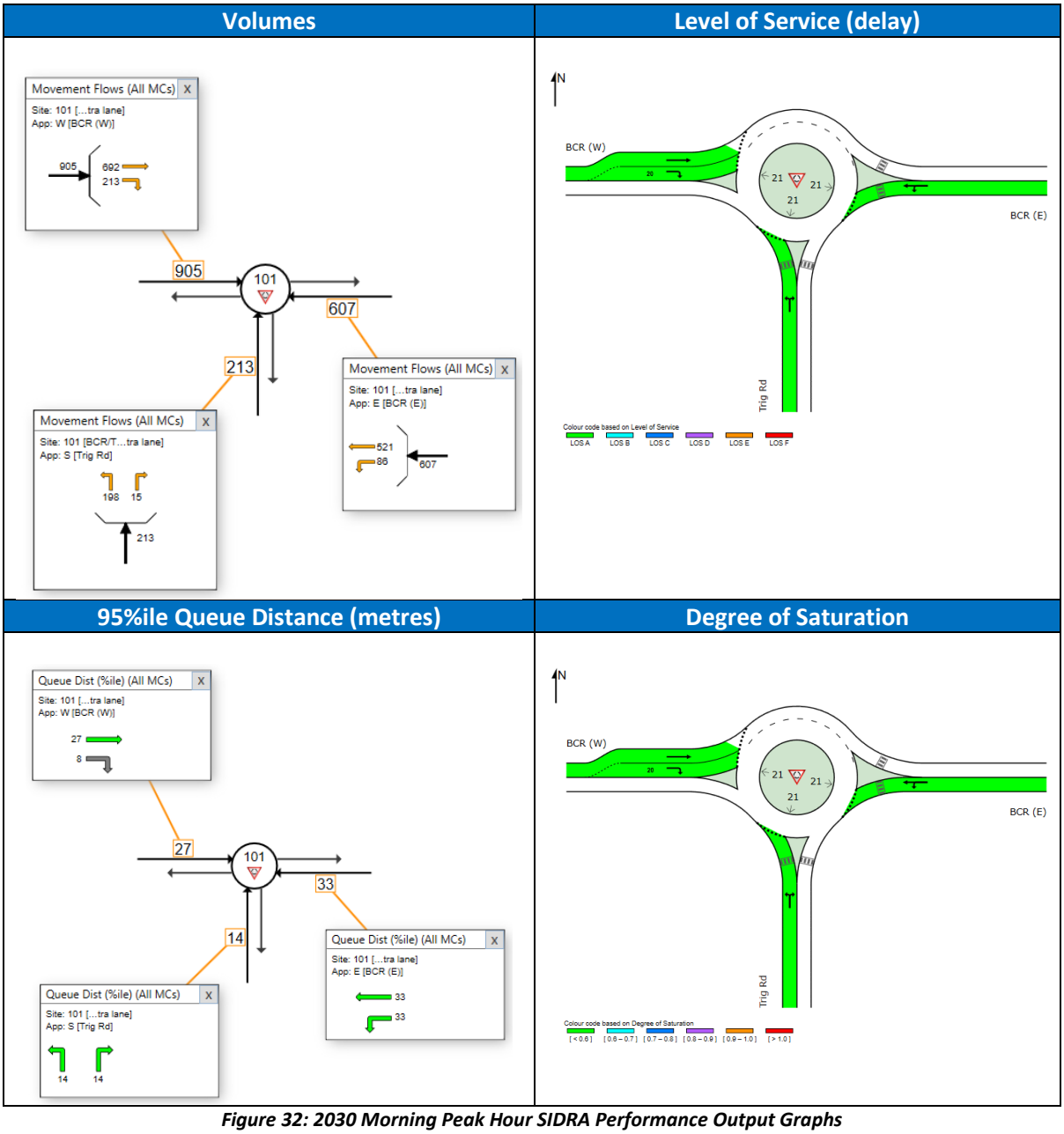



***Figure 32: 2030 Morning Peak Hour SIDRA Performance Output Graphs***

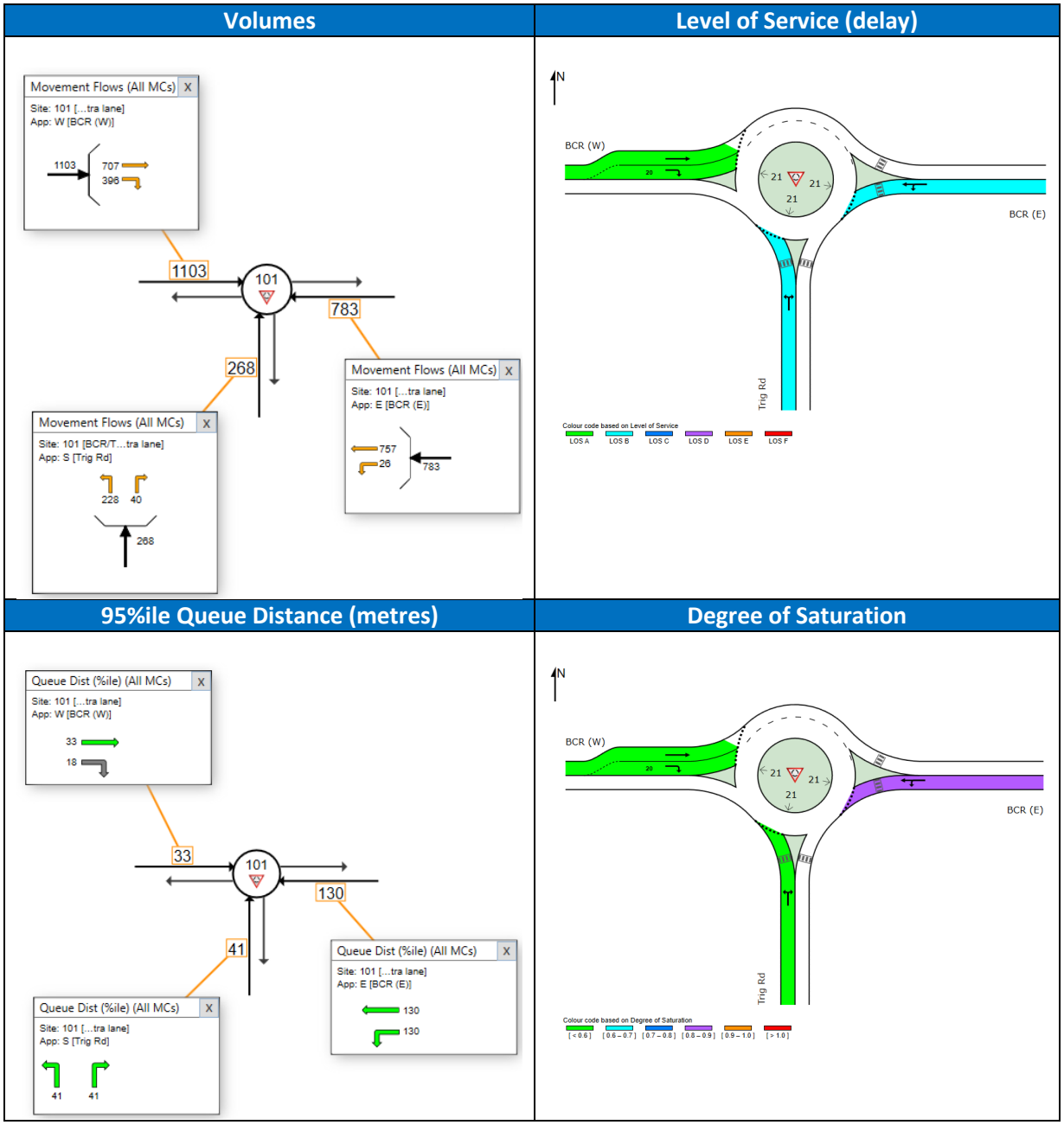



***Figure 33: 2030 Evening Peak Hour SIDRA Performance Output Graphs***

As detailed in the **Figure 32** and **Figure 33** SIDRA output graphs the performance of the proposed roundabout operates at a Level of Service (LoS) ranging between A and B. The LoS measure is based on traffic delay and with all traffic movements expected to operate above LoS F, the roundabout can satisfy Trig Road's arterial function in 2030. Refer to **Appendix D** for detailed SIDRA output.

Overall, the SIDRA model confirms that the upgraded Brigham Creek Road / Trig Road roundabout intersection can accommodate traffic generated by a fully developed WBPPC without compromise to Brigham Creek Road and Trig Roads' arterial function in the roading hierarchy. Additionally, the proposed roundabout design is preferred by Auckland Transport over that of a signalised design that was also investigated.

### 4.5.4 State Highway 18 / Brigham Creek Rd Roundabout Interchange (Sinton Rd) Including Kauri Rd

The Brigham Creek Road / State Highway 18 interchange consists of three roundabouts that connect all four state highway on / off ramps. The critical roundabout relevant to the proposal is the closest one to WBPPC, which has eastbound on / off ramps. **Figure 34** provides the key SIDRA degree of saturation performance output graph for the analysed 2030 morning peak hour period, and **Figure 35** provides this graph for the analysed 2030 evening peak hour period. Given the proximity of the Brigham Creek Road / Kauri Road intersection to the roundabout a SIDRA network model has been prepared with the assistance of Abley Ltd that includes Kauri Road.

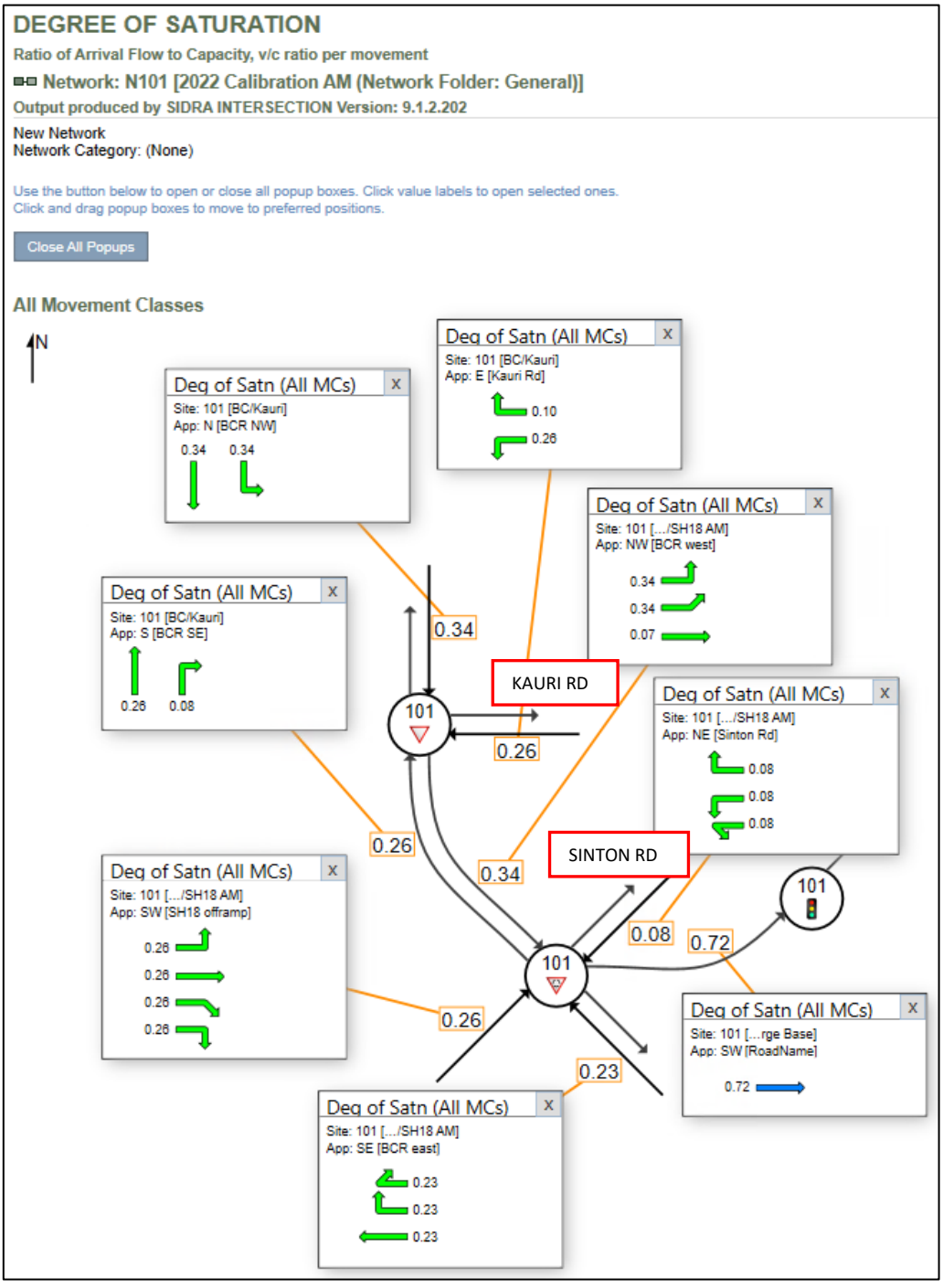



*Figure 34: 2030 Morning Peak Hour SIDRA Performance Output Graph*

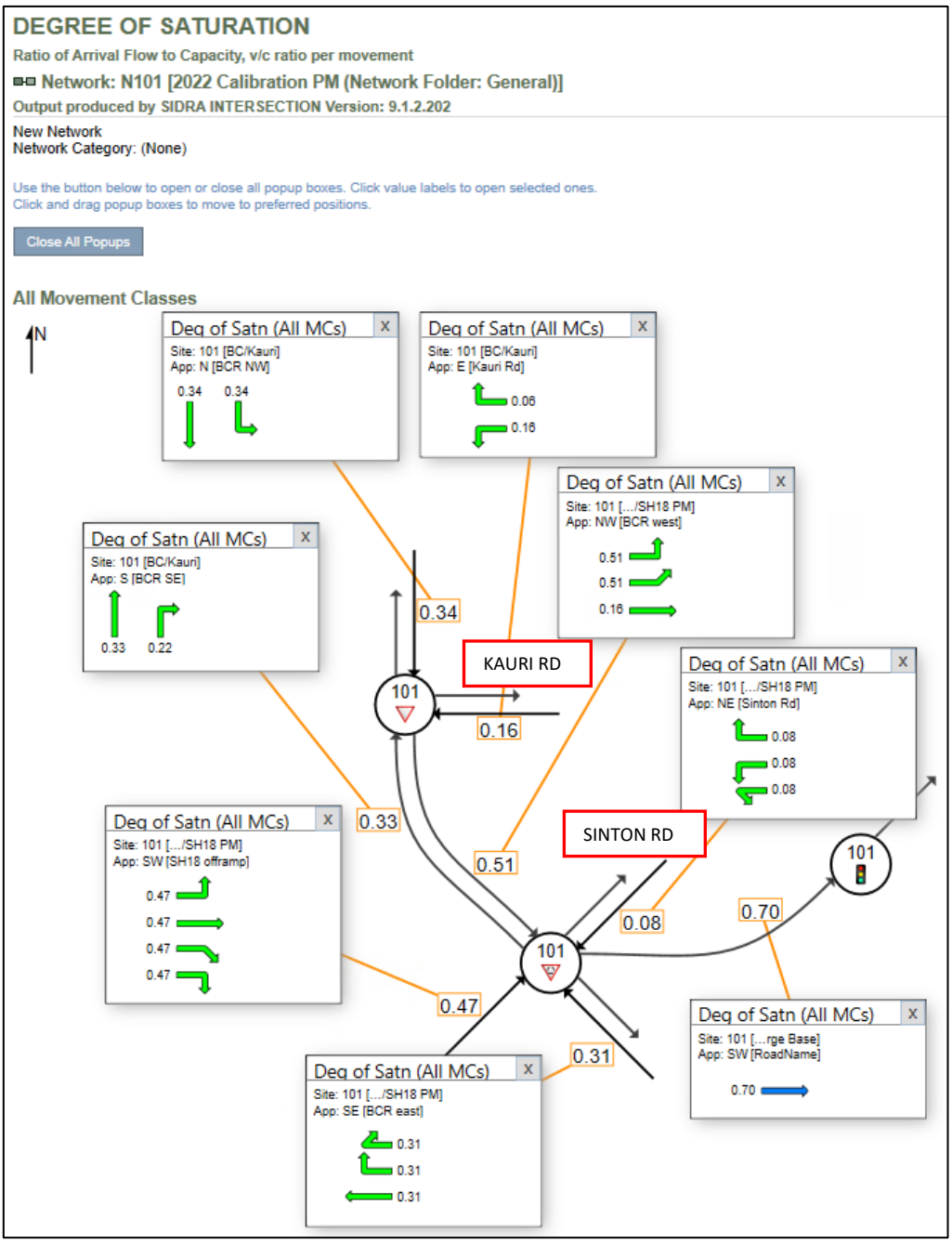



***Figure 35: 2030 Evening Peak Hour SIDRA Performance Output Graph***

As detailed in the **Figure 34** and **Figure 35** SIDRA output graphs the performance of the State Highway 18 (Sinton Road roundabout) interchange operates at a degree of saturation less than 0.72, which avoids queues and delays that could adversely impact the operation of the state highway network. Refer to **Appendix D** for further SIDRA output.

Overall, the SIDRA network model confirms that the State Highway 18 interchange can accommodate the traffic generated by a fully developed WBPPC without compromise to Brigham Creek Road or the State Highway's strategic arterial function in the roading hierarchy.

### 4.5.5 State Highway 18 / Trig Rd Interchange

Trig Road has a generously wide 3.3 metre median in the vicinity of State Highway 18's east facing on and off ramps. From extensive reviewing of video traffic count files there is evidence of a large percentage of off-ramp right turning motorists undertaking a 2-stage right turn manoeuvre. The traffic survey video files have been reviewed to calibrate a SIDRA model based on observed queues, delays and driver behaviour.

The SIDRA movement summaries for a calibrated networked base model with the onramp and 2030 model is provided in Appendix D (for the more sensitive offramp in the PM). The evening period with higher offramp volumes is the critical period to analyse and the base model in this period has insignificant queuing and delays with a Level of Service LoSB, as was observed in the traffic survey video. The 2030 model results in the Level of Service decreasing to LoSE for the right turn movement with the average delay increasing from 11 seconds to 45 seconds and the 95 percentile queue increasing from effectively zero to a queue of 31 metres. The reduction in level of service is primarily due to the increased delays and not the queue length and there is no impact on SH18 given that the offramp lane is 370 metres long.

From observing the video it is clear that right turning motorists on the offramp are required to pull up to, and even slightly beyond, the Stop Priority Control limit line to observe motorists approaching from the north on Trig Road. This is both a potential safety concern and limits capacity by increasing the gap acceptance required for motorists to initiate their right turn. Improving this visibility situation can be achieved by sight benching and removal of vegetation (mature Harekeke) on the corner of the right turn lane. With improved visibility motorists approaching the limit line have significantly longer opportunity to observe traffic approaching from the north (Trig Road north), which can significantly mitigate safety concerns with the existing restricted visibility.

Overall, the State Highway 18 Trig Road interchange has been assessed to accommodate a fully established WBPPC in 2030 without capacity issues, however a potential safety concern is raised with restricted visibility for motorists turning right from the offramp and measures such as those described above, to mitigate this concern, are recommended.

## 4.6 Road Safety

The New Zealand Police traffic accident records have been searched to identify pre-existing roading or traffic issues along Brigham Creek Road and Trig Road adjacent to the proposed WBPPC. In the most recent five year period three accidents have been recorded. These accidents consisted of one resulting in minor injuries and the remaining two with non-injuries, refer to **Figure 36** identifying the search area and location of recorded accidents.

The traffic accidents consisted of one head on, one loss of control and one rear end. The number and type of accidents is not excessive given the existing rural roading standard with moderate traffic volume and historically high speed environment.

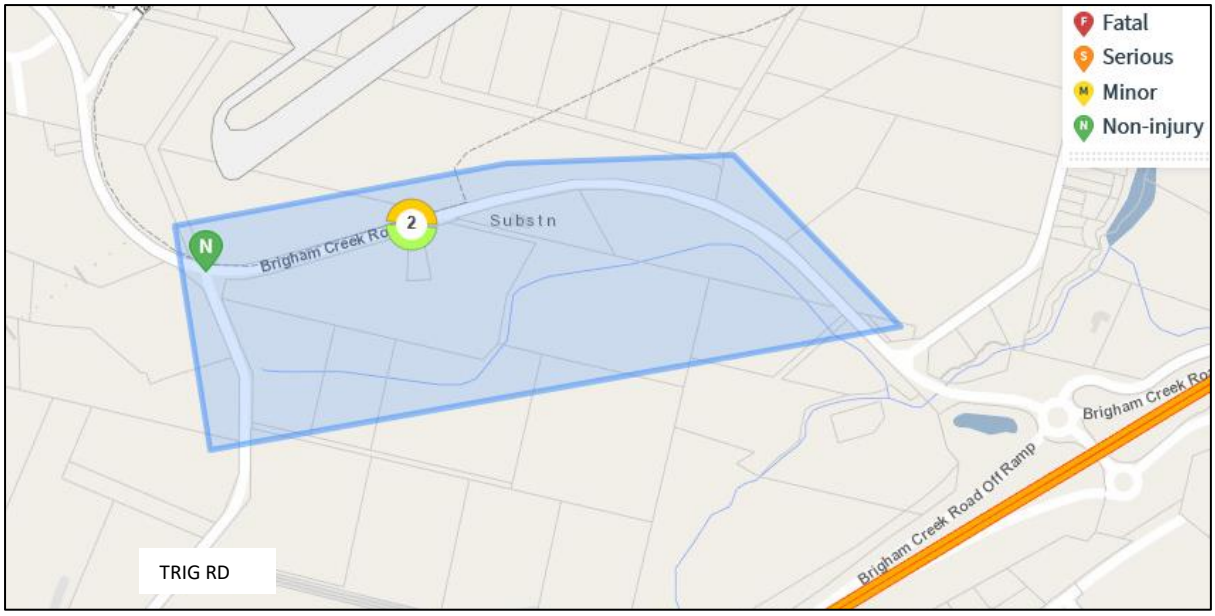



***Figure 36: Brigham Creek Rd & Trig Road Traffic Accident Search Area (2018-2023)***

The proposed upgrade of Brigham Creek Road and Trig Road to an urban standard with a signalised intersection and roundabout upgrades will improve road safety through the provision of high standard intersection designs and with the roading upgrades proposed between these intersections the WBPPC will contribute significantly to achieving safer lower overall speeds on the adjoining sections of Brigham Creek Road and Trig Road.

Together with the introduction of separated footpaths and cycleways the WBPPC will improve safety for active travel by providing facilities that can become a significant travel mode share of all travel for the WBPPC in the future, as is envisaged by Auckland Transport and Te Tupu Ngatāhi for the Whenuapai area.

A wider accident history search has been undertaken that extends to the State Highway 18 interchanges at Brigham Creek Road and Trig Road, refer to **Figure 37**. From this search there are no serious crash trends identified that are expected to be worsened by the WBPPC traffic. Two notable trends that potentially warrant further investigation by the road controlling authorities are at the State Highway 18/ Brigham Creek Road off ramp where 7 non-injury and minor injury rear-end type accidents have been recorded, and at the State Highway / Trig Road onramp where 8 right-turn-against type accidents have been recorded. While these trends can potentially be mitigated with simple treatments such as rumble strips and slower speeds they are typically trends for these locations and outside of being quantifiably an adverse impact of WBPPC traffic.


*Figure 37: State Highway 18 Interchanges at Brigham Creek Rd & Trig Traffic Accident Search Area (2018-2023)*

## 4.7 Infrastructure Staging

**Figure 14** details the proposed infrastructure staging for the roading and intersection upgrades to occur along Brigham Creek Road and Trig Road. There are a total of four stages and flexibility is required to progress each stage separately.

For each colour coded stage the corresponding intersections and road upgrades are required.

The proposed infrastructure staging plan has been developed to manage construction and development traffic in a manner that preserves and enhances the arterial functioning of Brigham Creek Road and Trig Road.

We have been directly involved in the determination of which transport infrastructure should be completed at each stage and are satisfied that the pre-requisites as set out in the Infrastructure Staging Plan are appropriate.

## 4.8 Strategic Planning Framework – Regional Land Transport Plan (RLTP) & Future Development Strategy

The Regional Land Transport Plan (2024-2034) lists Auckland's directions and focus areas to support the growth of Auckland over 10 years.

The primary directions are as follows:

- Focus on climate.
- Better connected people, places, goods, and services.
- Increase genuine travel choices for a healthy, vibrant and equitable Auckland.
- Maximise safety and environmental protection.

The primary focus areas are as follows:

- Make better use of existing transport networks.
- Target new transport investment to the most significant challenges.
- Maximise the benefits from transport technology.
- Better integrate land use and transport decisions.
- Move to a safe transport network, free from death and serious injury.
- Develop a sustainable and resilient transport system.
- Make walking, cycling and public transport preferred choices for many more Aucklanders.

To achieve the above directions Auckland Transport's online mapping portal 'Future Connect' identifies the Whenuapai area as having a multi modal focus for its 2024-2034 projects. Included in these projects are rapid transit bus routes on State Highway 1 (City-Westgate) and frequent transit bus routes along Hobsonville Road (Westgate-Northshore).

The WBPPC is proposing an upgrade of Brigham Creek Road and Trig Road together with a new signalised intersection, new roundabout, new left in/out intersection and a roundabout intersection upgrade to access the WBPPC, which will bring these sections of Brigham Creek Road and Trig Road to a standard that will be safer for road users and also bring it closer in line with Auckland Transport's and Te Tupu Ngatāhi's vision for the corridors in the future. Separated footpaths and cycleways are also proposed which will support multi modal travel choice. Therefore, the Plan Change is consistent with the direction and focus of the RLTP.

The Future Development Strategy (FDS) identifies that 'some business' can take advantage of existing capacity in Whenuapai prior to infrastructure prerequisites being in place from 2025, which the traffic modelling of the WBPPC proposal demonstrates can be accommodated.

The roading upgrades delivered as part of the WBPPC improve the Whenuapai roading network to a level that can accommodate WBPPC traffic, and the background traffic growth, avoiding the need for the FDS prerequisites being in place, as evidenced by the traffic modelling undertaken.

## 4.9 Consultation Summary

The WBPPC project team have carried out extensive consultation with Auckland Council, Auckland Transport (AT) and Te Tupu Ngatāhi Supporting Growth on transport matters. Refer to **Appendix E** for key documentation of this consultation. Through this consultation general agreement has been reached that the proposed roading infrastructure works achieves an acceptable interim outcome that aligns with the future vision for Whenuapai. A key focus being that the proposed WBPPC roading infrastructure works achieves an outcome requiring the minimum amount of additional works to achieve the future vision that can be realised when the NoR W3 designation road to vest has been given effect to.

The key consultation documents included in **Appendix E** are:

- Don Mckenzie Consulting Ltd, Transport Peer Review, 7th December 2023.
- Don Mckenzie Consulting Ltd, Strategic Assessment and Modelling Overview, 29th April 2024.
- Abley Ltd, SATURN Extracts Memo, 17th April 2024.
- Team Traffic Ltd, further information for Council and Auckland Transport, 24th July 2024.
- Team Traffic Ltd, further information for Council and Auckland Transport, 29th August 2024.
- Abley Ltd, further information for Council and Auckland Transport, 27th August 2024.

# 5 Conclusions

The descriptions, analyses and assessments provided in this report have shown that:

- the proposed road cross sections and network allows the WBPPC to be accessible by all transport modes: walking, cycling, bus and private vehicles.
- the development enabled by the WBPPC is consistent with, and will give effect to, regional and district transport policies.
- the proposed transport network to support the plan change supports the Te Tupu Ngatāhi Supporting Growth's Northwest Indicative Transport Network goals.
- the extent of development facilitated by the WBPPC can be accommodated by the surrounding road network while maintaining acceptable levels of safety and performance, given the proposed upgrades to Brigham Creek Road and Trig Road.
- The infrastructure staging plan appropriately deals with staged development

Accordingly, it is concluded that there is no traffic engineering or transportation planning reason to preclude approval of this WBPPC, since the full extent of development enabled by the plan change will be appropriately supported by a new road network and upgrades to existing roading to maintain and enhance appropriate levels of safety and efficiency on the surrounding road network.

The provision of a 725 peak vehicle trip cap adds robustness to the proposal by requiring any development above that level to be assessed on its merits at the appropriate time.

# Appendix A: Developable/Area Calculations

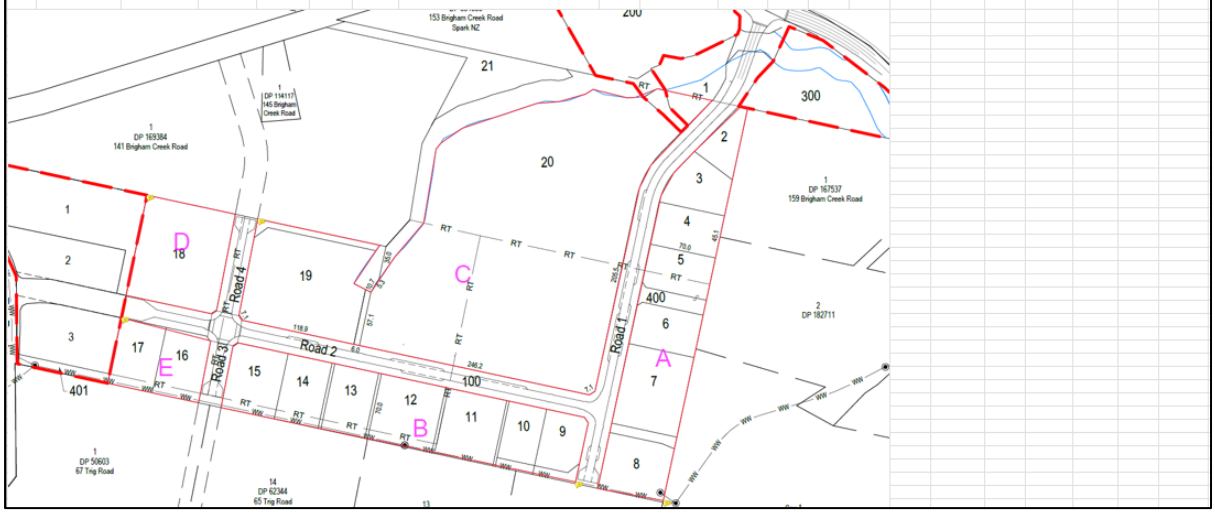
| LOT | SITE AREA (m²) | WAREHOUSE (r | CANOPY (r | OFFICE (m | CARPA | YARD (m | NOTES |
|---|---|---|---|---|---|---|---|
| 2 | 2,000 | - | 65 | 250 | 20 | - | Café Building |
| 3 | 3,159 | 1,204 | 503 | 282 | 13 | 529 | Part Breezeway for canopy (327m²) |
| 4 | 3,161 | 1,511 | 216 | 324 | 14 | 380 | |
| 5 | 3,160 | 1,512 | 135 | 250 | 12 | 420 | |
| 6 | 3,161 | 1,575 | 120 | 400 | 17 | 412 | |
| 7 | 5,369 | 2,228 | 216 | 360 | 22 | 1,393 | |
| 8 | 4,895 | 1,560 | 240 | 334 | 20 | 335 | 3 multi-unit |
| 9 | 3,184 | 1,020 | 90 | 180 | 18 | - | 3 multi-unit |
| 10 | 2,801 | 1,174 | 100 | 105 | 8 | 438 | |
| 11 | 4,551 | 2,000 | 220 | 370 | 23 | 678 | |
| 12 | 5,025 | 2,537 | 220 | 168 | 17 | 521 | |
| 13 | 3,502 | 1,680 | 190 | 264 | 13 | 525 | |
| 14 | 3,502 | 1,740 | 210 | 240 | 11 | 340 | |
| 15 | 3,974 | 1,677 | 132 | 240 | 18 | - | 2 multi-unit |
| 16 | 3,354 | 1,452 | 156 | 240 | 16 | 301 | |
| 17 | 3,358 | 1,655 | 90 | 390 | 18 | - | 3 multi-unit |
| 18 | 10,163 | 5,700 | 710 | 440 | 28 | 1,795 | |
| 19 | 14,202 | 6,956 | 805 | 502 | 25 | 2,175 | |
| 20 | 66,098* (NET ARE | 26,439 | - | 800 | 50 | - | WAREHOUSE m² CALC.@ 40% OF NET SITE AREA |
| **TOT** | **149,219** | **63620** | **4428** | **6139** | **363** | **10242** | |

| Study Areas: | A | B | C | D | E | Total (ha) | |
|---|---|---|---|---|---|---|---|
| Developable Are | 2.93 | 2.92 | 9.05 | 1.02 | 0.67 | 16.59 | Measured from Map Below |

| | |
|---|---|
| **GFA from Tplus Architects Schedule** | |
| Warehouse | 63,620 |
| Office | 6,139 |
| Canopies (excluded) | - |
| TOTAL GFA | 69,759 |
| | |
| Percentage of Developable Land Area in WBP Fast Track | 42% |
| | |
| Developable Land (ha) as shown on Dwg 47712-DR-C-8200 | 36.0 |

| | | Share of | 42% GFA | Trip Rate/100m2 GFA AM | Trip Rate/100m2 GFA PM | Total Trips General AM | Total Trips General PM |
|---|---|---|---|---|---|---|---|
| 20%/30% | Warehousing/Distribution | 18 | 7.57 | 1.09 | 1.08 | 825 | 817 |
| 50% | Manufacturing and Industrial | 18 | 7.57 | 0.48 | 0.48 | 363 | 363 |
| | | 36 | 15.1 | | | 1188 | 1181 |

| | | |
|---|---|---|
| Generation Based on PC69 Methodology | | **1188** |
| Generic 20 trips per hectare of gross land Area (as recommended by AT) | | **720** |
| | | |
| Mid range | | **954** |



# Appendix B: Intersection Traffic Counts

| Peak Hour Table | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Peak Marker | 1 | | | | | | | | | | | | | | | |
| BRIGHAM CREEK RD / SH18 / SINTON RD ROUNDABOUT, TUE 31/05/2022 | | | | | | | | | | | | | | | | |
| | AM | | | | | | | | PM | | | | | | | |
| | Cars | Trucks | Buses | Cyclists | HV% | Total veh | 2.6% growth to 2030 | | Cars | Trucks | Buses | Cyclists | HV% | Total veh | 2.6% growth to 2030 | |
| Sinton Road (North) | 40 | 2 | 0 | 1 | 4.8 | 42 | 51 | | 31 | 4 | 0 | 0 | 11.4 | 35 | 42 | |
| Left into State Highway 18 (On Ramp) | 15 | 0 | 0 | 0 | 0.0 | 15 | 18 | | 12 | 0 | 0 | 0 | 0.0 | 12 | 14 | |
| Thru to Brigham Creek Road (Southeast) | 21 | 0 | 0 | 0 | 0.0 | 21 | 25 | | 14 | 4 | 0 | 0 | 22.2 | 18 | 22 | |
| Left into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Right into Brigham Creek Road (West) | 4 | 2 | 0 | 1 | 33.3 | 6 | 7 | | 5 | 0 | 0 | 0 | 0.0 | 5 | 6 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| State Highway 18 (On Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Left into State Highway 18 (Southeast) | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Thru into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Left into Brigham Creek Road (West) | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Right into Sinton Road | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Brigham Creek Road (Southeast) | 554 | 38 | 3 | 1 | 6.9 | 595 | 719 | | 794 | 38 | 3 | 2 | 4.9 | 835 | 1009 | |
| Left into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Thru to Brigham Creek Road (West) | 421 | 33 | 3 | 1 | 7.9 | 457 | 552 | | 602 | 33 | 2 | 2 | 5.5 | 637 | 769 | |
| Left into Sinton Road | 9 | 2 | 0 | 0 | 18.2 | 11 | 13 | | 31 | 2 | 0 | 0 | 6.1 | 33 | 40 | |
| Right into State Highway 18 (On Ramp) | 124 | 3 | 0 | 0 | 2.4 | 127 | 153 | | 161 | 3 | 1 | 0 | 2.4 | 165 | 199 | |
| State Highway 18 (Off Ramp) | 310 | 36 | 0 | 0 | 10.4 | 346 | 418 | | 643 | 15 | 2 | 0 | 2.6 | 660 | 797 | |
| Left into State Highway 18 (On Ramp) | 1 | 0 | 0 | 0 | 0.0 | 1 | 1 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Left into Brigham Creek Road (West) | 54 | 5 | 0 | 0 | 8.5 | 59 | 71 | | 170 | 9 | 2 | 0 | 6.1 | 181 | 219 | |
| Thru to Sinton Road | 5 | 0 | 0 | 0 | 0.0 | 5 | 6 | | 12 | 1 | 0 | 0 | 7.7 | 13 | 16 | |
| Right into Brigham Creek Road (Southeast) | 250 | 31 | 0 | 0 | 11.0 | 281 | 339 | | 461 | 5 | 0 | 0 | 1.1 | 466 | 563 | |
| Brigham Creek Road (West) | 643 | 54 | 7 | 4 | 8.7 | 704 | 850 | | 636 | 27 | 8 | 4 | 5.2 | 671 | 811 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Left into Sinton Road | 4 | 0 | 0 | 0 | 0.0 | 4 | 5 | | 9 | 0 | 0 | 2 | 0.0 | 9 | 11 | |
| Thru to State Highway 18 (On Ramp) | 560 | 40 | 2 | 0 | 7.0 | 602 | 727 | | 520 | 21 | 4 | 0 | 4.6 | 545 | 658 | |
| Left into Brigham Creek Road (Southeast) | 79 | 14 | 5 | 4 | 19.4 | 98 | 118 | | 107 | 6 | 4 | 2 | 8.5 | 117 | 141 | |
| Right into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Total | 1547 | 130 | 10 | 6 | 8.3 | 1687 | 2038 | | 2104 | 84 | 13 | 6 | 4.4 | 2201 | 2659 | |
| | | | | | | | 1481 | | | | | | | | 1805 | |

| **Kauri Rd - Brigham Creek Rd** **Weather Fine** **Thurs 08/02/2024** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | | | | | PM | | | | | | | |
| | Cars | Trucks | Buses | HV% | Cyclists | Total Veh | 2.6% growth to 2030 | Cars | Trucks | Buses | HV% | Cyclists | Total veh | 2.6% growth to 2030 | |
| Kauri Rd | 213 | 12 | 6 | 7.8 | 2 | 231 | 267 | 128 | 8 | 4 | 8.6 | 4 | 140 | 162 | |
| Left into Brigham Creek Rd (S/E) | 185 | 8 | 6 | 7.0 | 2 | 199 | 230 | 112 | 8 | 4 | 9.7 | 4 | 124 | 143 | |
| Right into Brigham Creek Rd (N/W) | 28 | 4 | 0 | 12.5 | 0 | 32 | 37 | 16 | 0 | 0 | 0.0 | 0 | 16 | 18 | |
| Brigham Creek Rd (S/E) | 451 | 40 | 6 | 9.3 | 6 | 497 | 575 | 773 | 26 | 3 | 3.6 | 3 | 802 | 927 | |
| Thru to Brigham Creek Rd (N/W) | 394 | 36 | 5 | 9.4 | 1 | 435 | 503 | 598 | 22 | 1 | 3.7 | 1 | 621 | 718 | |
| Right into Kauri Rd | 57 | 4 | 1 | 8.1 | 5 | 62 | 72 | 175 | 4 | 2 | 3.3 | 2 | 181 | 209 | |
| Brigham Creek Rd (N/W) | 596 | 43 | 1 | 6.9 | 0 | 640 | 740 | 583 | 27 | 2 | 4.7 | 2 | 612 | 707 | |
| Left into Kauri Rd | 17 | 1 | 0 | 5.6 | 0 | 18 | 21 | 21 | 3 | 0 | 12.5 | 0 | 24 | 28 | |
| Thru to Brigham Creek Rd (S/E) | 579 | 42 | 1 | 6.9 | 0 | 622 | 719 | 562 | 24 | 2 | 4.4 | 2 | 588 | 680 | |
| Total | 1260 | 95 | 13 | 7.9 | 8 | 1368 | 1581 | 1484 | 61 | 9 | 4.5 | 9 | 1554 | 1796 | |
| | | | | | | | 1524 | | | | | | | 1750 | |

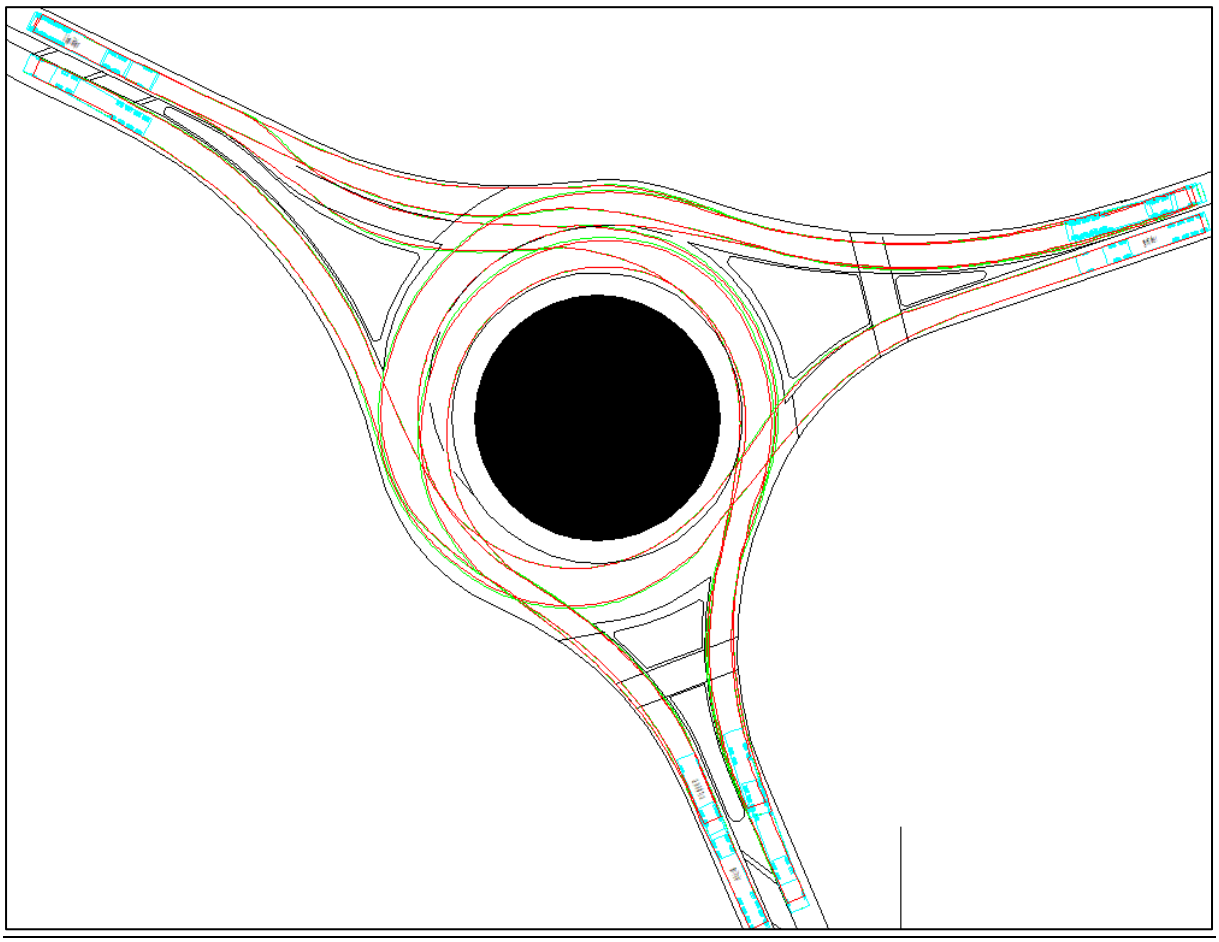
| **Trig Rd - Brigham Creek Rd** **Weather Fine** **Tue 30/04/2024** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | | | | | PM | | | | | | |
| | Cars | Trucks | Buses | HV % | Cyclists | AM Total | 2.6% growth to 2030 | Cars | Trucks | Buses | HV% | Cyclists | PM Total | 2.6% growth to 2030 |
| Brigham Creek Rd (East) | 417 | 33 | 5 | 8.4 | 0 | 455 | 526 | 629 | 41 | 0 | 6.1 | 0 | 670 | 775 |
| Left into Trig Rd | 2 | 2 | 0 | 50.0 | 0 | 4 | 5 | 12 | 3 | 0 | 20.0 | 0 | 15 | 17 |
| Thru to Brigham Creek Rd (West) | 415 | 31 | 5 | 8.0 | 0 | 451 | 521 | 617 | 38 | 0 | 5.8 | 0 | 655 | 757 |
| Trig Rd | 154 | 10 | 3 | 7.8 | 2 | 167 | 193 | 173 | 16 | 2 | 9.4 | 1 | 191 | 221 |
| Left into Brigham Creek Rd (West) | 151 | 9 | 3 | 7.4 | 2 | 163 | 188 | 164 | 13 | 2 | 8.4 | 0 | 179 | 207 |
| Right into Brigham Creek Rd (East) | 3 | 1 | 0 | 25.0 | 0 | 4 | 5 | 9 | 3 | 0 | 25.0 | 1 | 12 | 14 |
| Brigham Creek Rd (West) | 711 | 61 | 4 | 8.4 | 0 | 776 | 897 | 911 | 35 | 5 | 4.2 | 0 | 951 | 1099 |
| Thru to Brigham Creek Rd (East) | 559 | 39 | 1 | 6.7 | 0 | 599 | 692 | 590 | 19 | 3 | 3.6 | 0 | 612 | 707 |
| Right into Trig Rd | 152 | 22 | 3 | 14.1 | 0 | 177 | 205 | 321 | 16 | 2 | 5.3 | 0 | 339 | 392 |
| Grand Total | 1282 | 104 | 12 | 8.3 | 2 | 1398 | 1616 | 1713 | 92 | 7 | 5.5 | 1 | 1812 | 2095 |

| Trig Rd - SH18 - On Ramp | Weather Fine | | | Tue 30/04/2024 | | | | PM | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | | | | | | | | | | | |
| | Cars | Trucks | Buses | HV% | Cyclists | AM Total | 2.6% growth to 2030 | Cars | Trucks | Buses | HV% | Cyclists | PM Total | 2.6% growth to 2030 |
| Trig Rd (North) | 142 | 24 | 2 | 15.5 | 0 | 168 | 194 | 364 | 15 | 2 | 4.5 | 1 | 381 | 440 |
| Left into SH 18 - On Ramp | 18 | 5 | 0 | 21.7 | 0 | 23 | 27 | 15 | 4 | 0 | 21.1 | 0 | 19 | 22 |
| Thru to Trig Rd (South) | 121 | 18 | 2 | 14.2 | 0 | 141 | 163 | 348 | 11 | 2 | 3.6 | 1 | 361 | 417 |
| Right into Driveway | 3 | 1 | 0 | 25.0 | 0 | 4 | 5 | 1 | 0 | 0 | 0.0 | 0 | 1 | 1 |
| Trig Rd (South) | 485 | 21 | 3 | 4.7 | 3 | 509 | 588 | 274 | 37 | 3 | 12.7 | 1 | 314 | 363 |
| Left into Driveway | 8 | 3 | 0 | 27.3 | 0 | 11 | 13 | 4 | 6 | 0 | 60.0 | 0 | 10 | 12 |
| Thru to Trig Rd (North) | 170 | 13 | 3 | 8.6 | 3 | 186 | 215 | 171 | 23 | 2 | 12.8 | 1 | 196 | 227 |
| Right into SH 18 - On Ramp | 307 | 5 | 0 | 1.6 | 0 | 312 | 361 | 99 | 8 | 1 | 8.3 | 0 | 108 | 125 |
| Driveway | 5 | 6 | 0 | 54.5 | 0 | 11 | 13 | 7 | 5 | 0 | 41.7 | 0 | 12 | 14 |
| Left into Trig Rd (North) | 1 | 0 | 0 | 0.0 | 0 | 1 | 1 | 4 | 0 | 0 | 0.0 | 0 | 4 | 5 |
| Thru to SH 18 - On Ramp | 2 | 0 | 0 | 0.0 | 0 | 2 | 2 | 0 | 1 | 0 | 100.0 | 0 | 1 | 1 |
| Right into Trig Rd (South) | 2 | 6 | 0 | 75.0 | 0 | 8 | 9 | 3 | 4 | 0 | 57.1 | 0 | 7 | 8 |
| Grand Total | 632 | 51 | 5 | 8.1 | 3 | 688 | 795 | 645 | 57 | 5 | 8.8 | 2 | 707 | 817 |

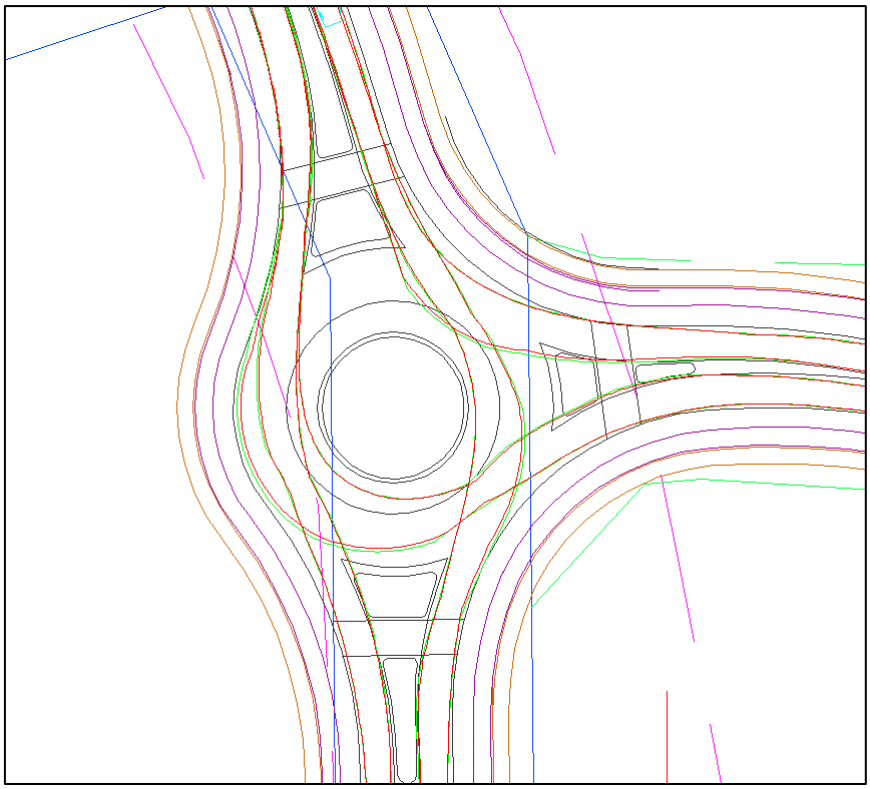
| Trig Rd - SH18 - Off Ramp | Weather Fine | | | Tue 30/04/2024 | | | | PM | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AM | | | | | | | | | | | | | |
| | Cars | Trucks | Buses | HV% | Cyclists | AM Total | 2.6% growth to 2030 | Cars | Trucks | Buses | HV% | Cyclists | PM Total | 2.6% growth to 2030 |
| Trig Rd (North) | 138 | 29 | 3 | 18.8 | 0 | 170 | 197 | 332 | 6 | 2 | 2.4 | 1 | 340 | 393 |
| Thru to Trig Rd (South) | 138 | 29 | 3 | 18.8 | 0 | 170 | 197 | 332 | 6 | 2 | 2.4 | 1 | 340 | 393 |
| SH 18 - Off Ramp | 110 | 6 | 0 | 5.2 | 0 | 116 | 134 | 257 | 11 | 0 | 4.1 | 0 | 268 | 310 |
| Left into Trig Rd (South) | 85 | 2 | 0 | 2.3 | 0 | 87 | 101 | 212 | 5 | 0 | 2.3 | 0 | 217 | 251 |
| Right into Trig Rd (North) | 25 | 4 | 0 | 13.8 | 0 | 29 | 34 | 45 | 6 | 0 | 11.8 | 0 | 51 | 59 |
| Trig Rd (South) | 437 | 17 | 2 | 4.2 | 3 | 456 | 527 | 239 | 23 | 2 | 9.5 | 1 | 264 | 305 |
| Thru to Trig Rd (North) | 437 | 17 | 2 | 4.2 | 3 | 456 | 527 | 239 | 23 | 2 | 9.5 | 1 | 264 | 305 |
| Grand Total | 685 | 52 | 5 | 7.7 | 3 | 742 | 858 | 828 | 40 | 4 | 5.0 | 2 | 872 | 1008 |

# APPENDIX C: High Productivity Semi-Trailer Tracking

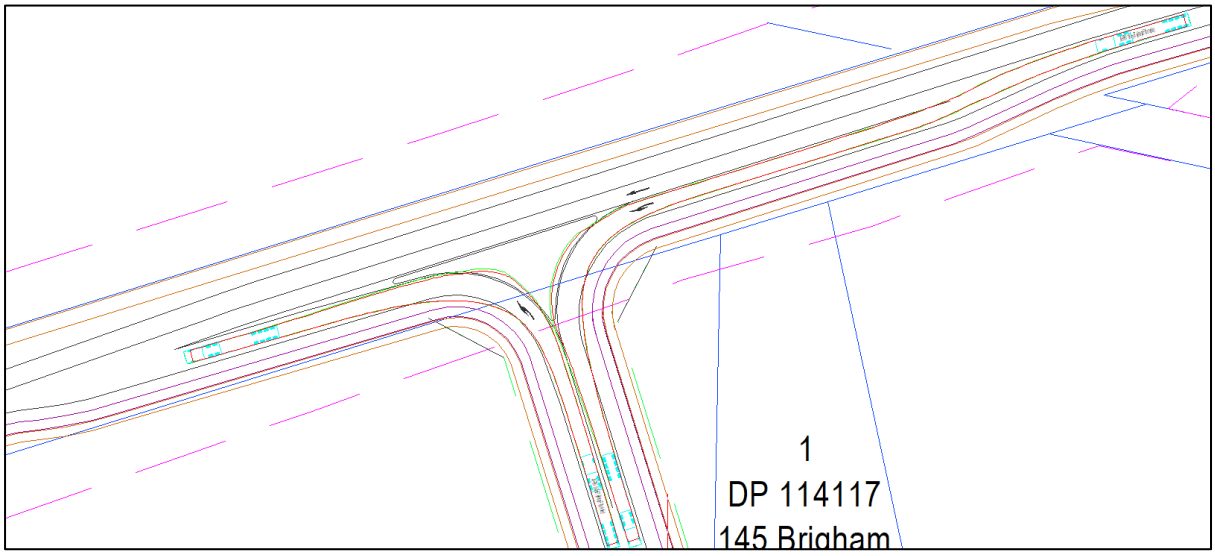
Brigham Creek Rd / Trig Rd Roundabout



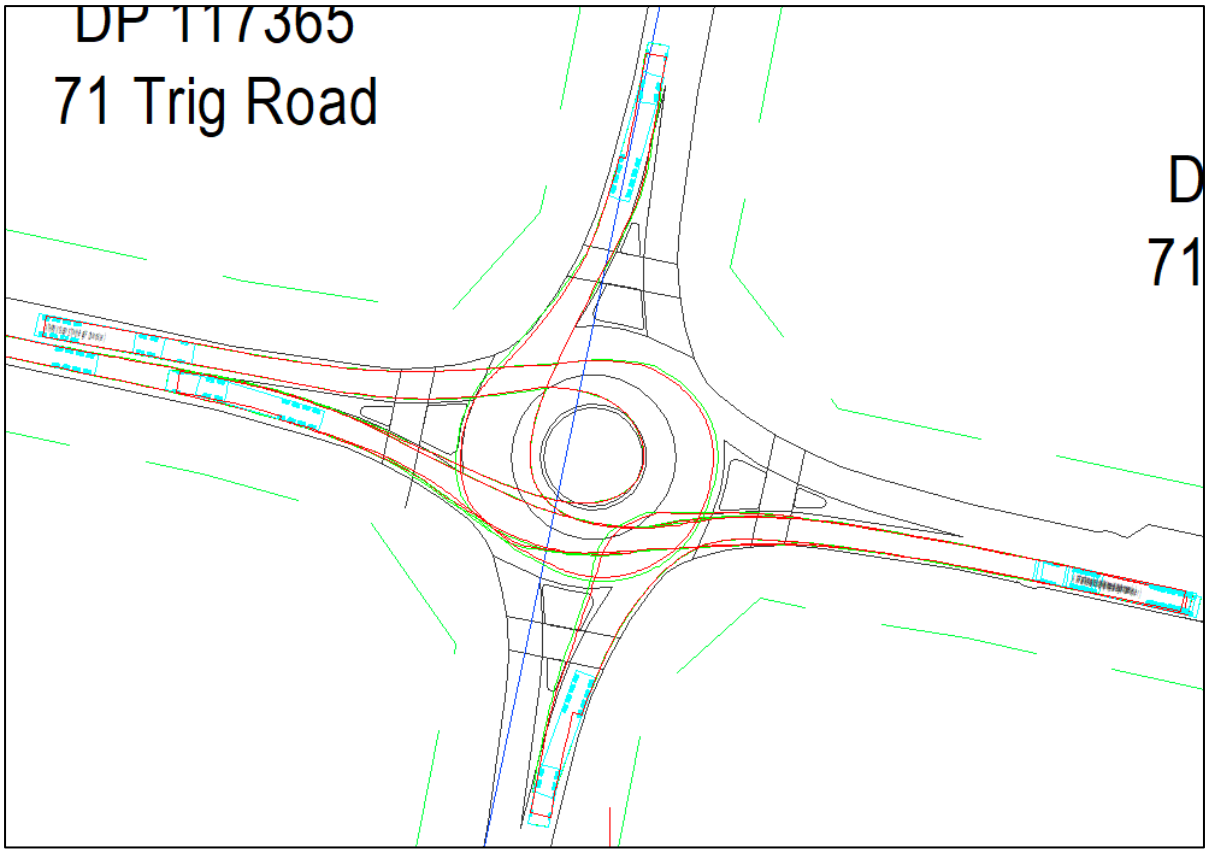
Trig Rd Roundabout



Brigham Creek Rd Left in/Left out Only Intersection

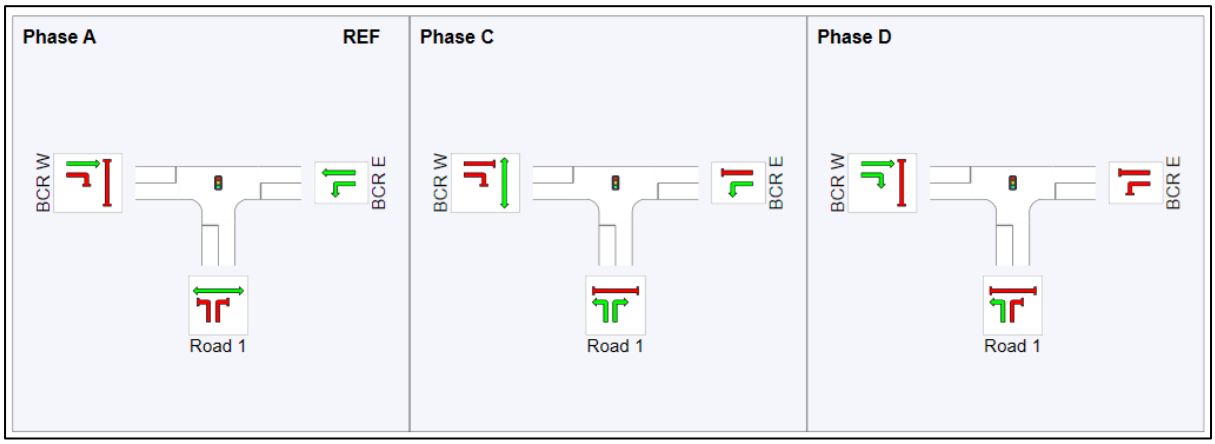


Road 2 & Road 3 Internal Road Roundabout

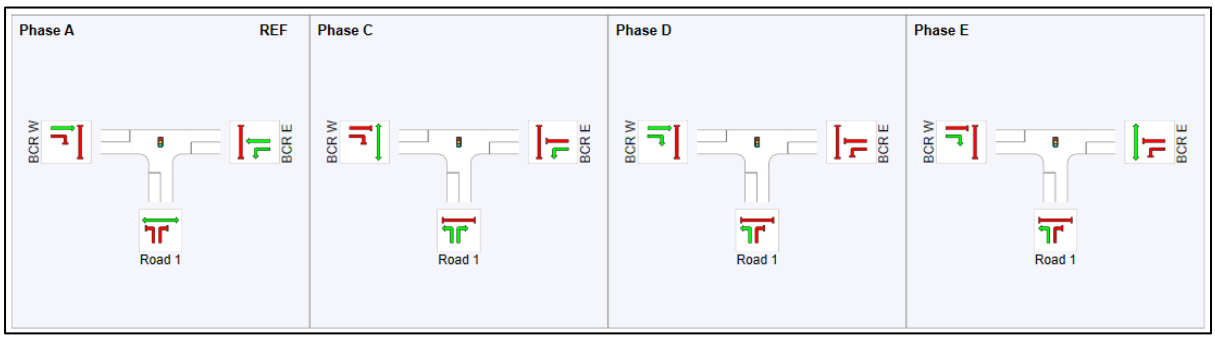


# Appendix D: Sidra Performance Output

## Proposed Brigham Creek Rd Signalised Intersection Phasing Summary – 2 Ped Crossings




## Proposed Brigham Creek Road Signalised Intersection Phasing Summary – 3 Ped Crossings




## Trig Rd Roundabout AM Peak Period

**MOVEMENT SUMMARY**

**Site: 101 [Trig Rd/WBP roundabout access - AM 2.6% growth to 2030 (Site Folder: General)]**

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

traffic count Tue 30/04/24 + 5% growth to 2028 + PC69 + WBPPC
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: Trig Rd Sth | | | | | | | | | | | | | | | |
| 2 | T1 | All MCs | 247 | 5.0 | 247 | 5.0 | 0.287 | 2.8 | LOS A | 2.0 | 14.6 | 0.09 | 0.47 | 0.09 | 46.3 |
| 3 | R2 | All MCs | 215 | 5.0 | 215 | 5.0 | 0.287 | 7.3 | LOS A | 2.0 | 14.6 | 0.09 | 0.47 | 0.09 | 45.7 |
| Approach | | | 462 | 5.0 | 462 | 5.0 | 0.287 | 4.9 | LOS A | 2.0 | 14.6 | 0.09 | 0.47 | 0.09 | 46.1 |
| East: Whenuapai Business Park | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 92 | 5.0 | 92 | 5.0 | 0.101 | 4.5 | LOS A | 0.5 | 4.0 | 0.49 | 0.54 | 0.49 | 46.0 |
| 6 | R2 | All MCs | 11 | 5.0 | 11 | 5.0 | 0.101 | 9.0 | LOS A | 0.5 | 4.0 | 0.49 | 0.54 | 0.49 | 45.6 |
| Approach | | | 102 | 5.0 | 102 | 5.0 | 0.101 | 5.0 | LOS A | 0.5 | 4.0 | 0.49 | 0.54 | 0.49 | 46.0 |
| North: Trig Rd Nth | | | | | | | | | | | | | | | |
| 7 | L2 | All MCs | 11 | 5.0 | 11 | 5.0 | 0.287 | 4.2 | LOS A | 1.7 | 12.1 | 0.44 | 0.44 | 0.44 | 46.0 |
| 8 | T1 | All MCs | 315 | 5.0 | 315 | 5.0 | 0.287 | 4.1 | LOS A | 1.7 | 12.1 | 0.44 | 0.44 | 0.44 | 46.3 |
| Approach | | | 325 | 5.0 | 325 | 5.0 | 0.287 | 4.1 | LOS A | 1.7 | 12.1 | 0.44 | 0.44 | 0.44 | 46.3 |
| All Vehicles | | | 889 | 5.0 | 889 | 5.0 | 0.287 | 4.6 | LOS A | 2.0 | 14.6 | 0.26 | 0.46 | 0.26 | 46.1 |

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.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Project: C:\TEAM Projects\2020\20350 - Whenuapai land holdings\Proposed Plan Change\SIDRA\Trig Rd RA - WBP PC.sip9

## Trig Rd Roundabout PM Peak Period

### MOVEMENT SUMMARY

**Site: 101 [Trig Rd/WBP roundabout access - PM 2.6% growth to 2030 (Site Folder: General)]**

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

New Site
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: Trig Rd Sth | | | | | | | | | | | | | | | |
| 2 | T1 | All MCs | 279 | 5.0 | 279 | 5.0 | 0.232 | 2.8 | LOS A | 1.6 | 11.6 | 0.09 | 0.40 | 0.09 | 46.9 |
| 3 | R2 | All MCs | 92 | 5.0 | 92 | 5.0 | 0.232 | 7.3 | LOS A | 1.6 | 11.6 | 0.09 | 0.40 | 0.09 | 46.2 |
| Approach | | | 371 | 5.0 | 371 | 5.0 | 0.232 | 3.9 | LOS A | 1.6 | 11.6 | 0.09 | 0.40 | 0.09 | 46.7 |
| East: Whenuapai Business Park | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 215 | 5.0 | 215 | 5.0 | 0.244 | 5.6 | LOS A | 1.4 | 10.5 | 0.61 | 0.60 | 0.61 | 45.7 |
| 6 | R2 | All MCs | 11 | 5.0 | 11 | 5.0 | 0.244 | 10.1 | LOS B | 1.4 | 10.5 | 0.61 | 0.60 | 0.61 | 45.3 |
| Approach | | | 225 | 5.0 | 225 | 5.0 | 0.244 | 5.8 | LOS A | 1.4 | 10.5 | 0.61 | 0.60 | 0.61 | 45.7 |
| North: Trig Rd Nth | | | | | | | | | | | | | | | |
| 7 | L2 | All MCs | 11 | 5.0 | 11 | 5.0 | 0.339 | 3.4 | LOS A | 2.1 | 15.5 | 0.29 | 0.35 | 0.29 | 46.5 |
| 8 | T1 | All MCs | 444 | 5.0 | 444 | 5.0 | 0.339 | 3.3 | LOS A | 2.1 | 15.5 | 0.29 | 0.35 | 0.29 | 46.8 |
| Approach | | | 455 | 5.0 | 455 | 5.0 | 0.339 | 3.3 | LOS A | 2.1 | 15.5 | 0.29 | 0.35 | 0.29 | 46.8 |
| All Vehicles | | | 1051 | 5.0 | 1051 | 5.0 | 0.339 | 4.1 | LOS A | 2.1 | 15.5 | 0.29 | 0.42 | 0.29 | 46.5 |

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.


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Project: C:\TEAM Projects\2020\20350 - Whenuapai land holdings\Proposed Plan Change\SIDRA\Trig Rd RA - WBP PC.sip9

## Brigham Creek Rd / Trig Rd Roundabout Intersection AM Peak Period

### MOVEMENT SUMMARY

**Site: 101 [BCR/Trig Roundabout Single Lane AM - 2.6% to 2030 - extra lane (Site Folder: General)]**

Output produced by SIDRA INTERSECTION Version: 9.1.1.200

Intersection count Tue 30/04/24 + 2.6% to 2030 + PC69
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: Trig Rd | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 208 | 8.0 | 208 | 8.0 | 0.295 | 6.6 | LOS A | 1.9 | 14.2 | 0.73 | 0.67 | 0.73 | 45.1 |
| 3 | R2 | All MCs | 16 | 23.0 | 16 | 23.0 | 0.295 | 11.8 | LOS B | 1.9 | 14.2 | 0.73 | 0.67 | 0.73 | 44.5 |
| Approach | | | 224 | 9.1 | 224 | 9.1 | 0.295 | 7.0 | LOS A | 1.9 | 14.2 | 0.73 | 0.67 | 0.73 | 45.0 |
| East: BCR (E) | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 91 | 20.0 | 91 | 20.0 | 0.567 | 5.2 | LOS A | 4.4 | 33.2 | 0.60 | 0.50 | 0.60 | 45.6 |
| 5 | T1 | All MCs | 548 | 6.0 | 548 | 6.0 | 0.567 | 4.6 | LOS A | 4.4 | 33.2 | 0.60 | 0.50 | 0.60 | 45.9 |
| Approach | | | 639 | 8.0 | 639 | 8.0 | 0.567 | 4.7 | LOS A | 4.4 | 33.2 | 0.60 | 0.50 | 0.60 | 45.9 |
| West: BCR (W) | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 728 | 4.0 | 728 | 4.0 | 0.420 | 2.7 | LOS A | 3.8 | 27.4 | 0.14 | 0.30 | 0.14 | 47.4 |
| 12 | R2 | All MCs | 224 | 5.0 | 224 | 5.0 | 0.180 | 7.4 | LOS A | 1.2 | 8.4 | 0.13 | 0.57 | 0.13 | 44.4 |
| Approach | | | 953 | 4.2 | 953 | 4.2 | 0.420 | 3.8 | LOS A | 3.8 | 27.4 | 0.14 | 0.36 | 0.14 | 46.7 |
| All Vehicles | | | 1816 | 6.1 | 1816 | 6.1 | 0.567 | 4.5 | LOS A | 4.4 | 33.2 | 0.37 | 0.45 | 0.37 | 46.2 |

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.


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Project: C:\TEAM Projects\2020\20350 - Whenuapai land holdings\Proposed Plan Change\SIDRA\BCR-Trig Rd RA single lane.sip9

## Brigham Creek Rd / Trig Rd Roundabout Intersection PM Peak Period

### MOVEMENT SUMMARY

**Site: 101 [BCR/Trig Roundabout Single Lane PM - 2.6% to 2030 - extra lane (Site Folder: General)]**

**Output produced by SIDRA INTERSECTION Version: 9.1.1.200**

Intersection count Tue 30/04/24 + 2.6% to 2030 + PC69
Site Category: (None)
Roundabout

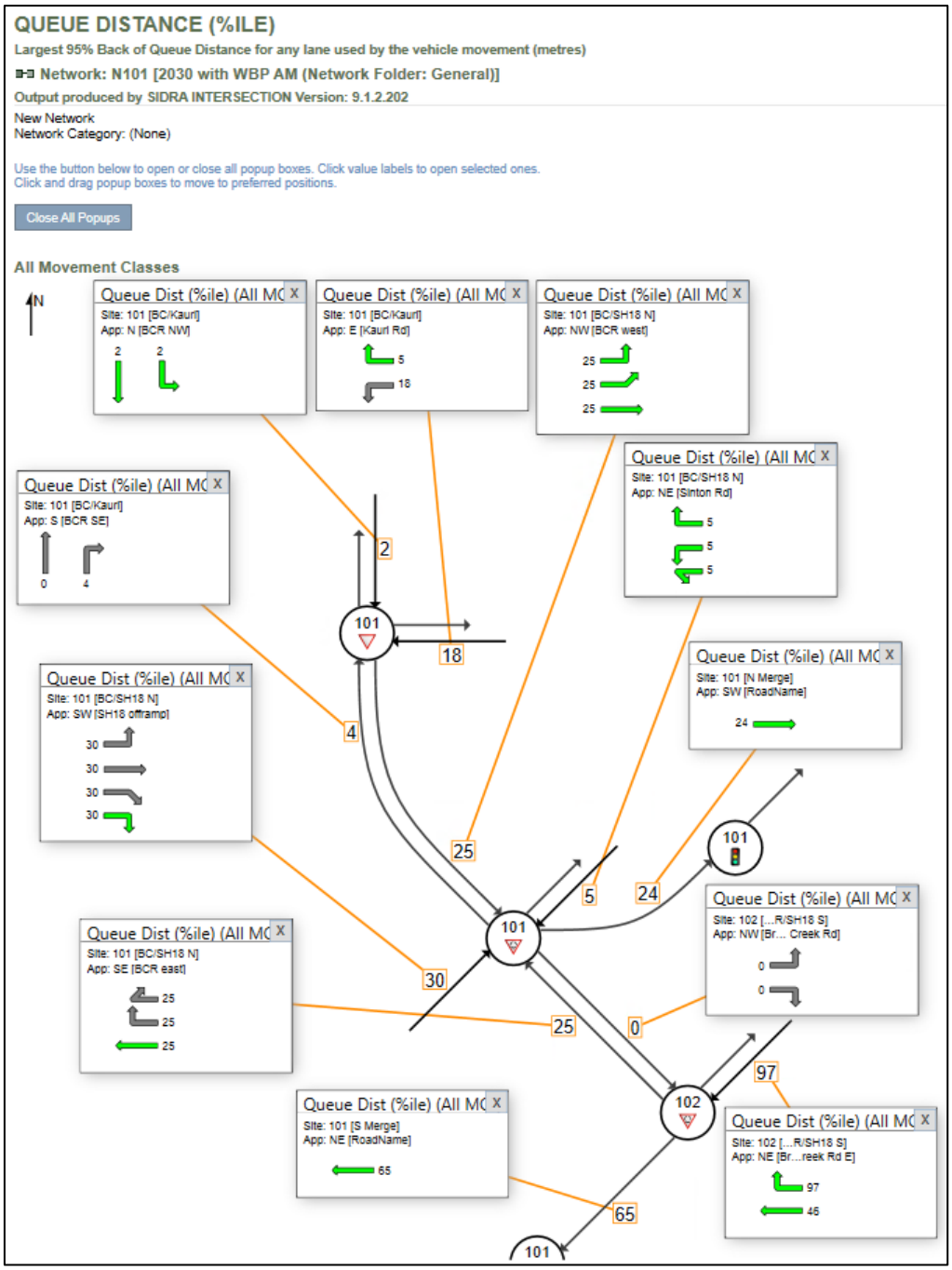
**Vehicle Movement Performance**

| 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: Trig Rd | | | | | | | | | | | | | | | |
| 1 | L2 | All MCs | 240 | 8.0 | 240 | 8.0 | 0.580 | 13.9 | LOS B | 5.4 | 41.0 | 1.00 | 0.94 | 1.25 | 41.2 |
| 3 | R2 | All MCs | 42 | 23.0 | 42 | 23.0 | 0.580 | 19.3 | LOS B | 5.4 | 41.0 | 1.00 | 0.94 | 1.25 | 40.7 |
| Approach | | | 282 | 10.2 | 282 | 10.2 | 0.580 | 14.7 | LOS B | 5.4 | 41.0 | 1.00 | 0.94 | 1.25 | 41.1 |
| East: BCR (E) | | | | | | | | | | | | | | | |
| 4 | L2 | All MCs | 27 | 20.0 | 27 | 20.0 | 0.876 | 17.9 | LOS B | 17.6 | 129.9 | 1.00 | 1.18 | 1.69 | 40.2 |
| 5 | T1 | All MCs | 797 | 6.0 | 797 | 6.0 | 0.876 | 16.9 | LOS B | 17.6 | 129.9 | 1.00 | 1.18 | 1.69 | 40.4 |
| Approach | | | 824 | 6.5 | 824 | 6.5 | 0.876 | 17.0 | LOS B | 17.6 | 129.9 | 1.00 | 1.18 | 1.69 | 40.4 |
| West: BCR (W) | | | | | | | | | | | | | | | |
| 11 | T1 | All MCs | 744 | 4.0 | 744 | 4.0 | 0.456 | 2.9 | LOS A | 4.5 | 32.6 | 0.28 | 0.32 | 0.28 | 46.9 |
| 12 | R2 | All MCs | 417 | 5.0 | 417 | 5.0 | 0.316 | 7.6 | LOS A | 2.5 | 18.2 | 0.26 | 0.55 | 0.26 | 44.1 |
| Approach | | | 1161 | 4.4 | 1161 | 4.4 | 0.456 | 4.6 | LOS A | 4.5 | 32.6 | 0.27 | 0.40 | 0.27 | 45.9 |
| All Vehicles | | | 2267 | 5.9 | 2267 | 5.9 | 0.876 | 10.3 | LOS B | 17.6 | 129.9 | 0.63 | 0.75 | 0.91 | 43.1 |

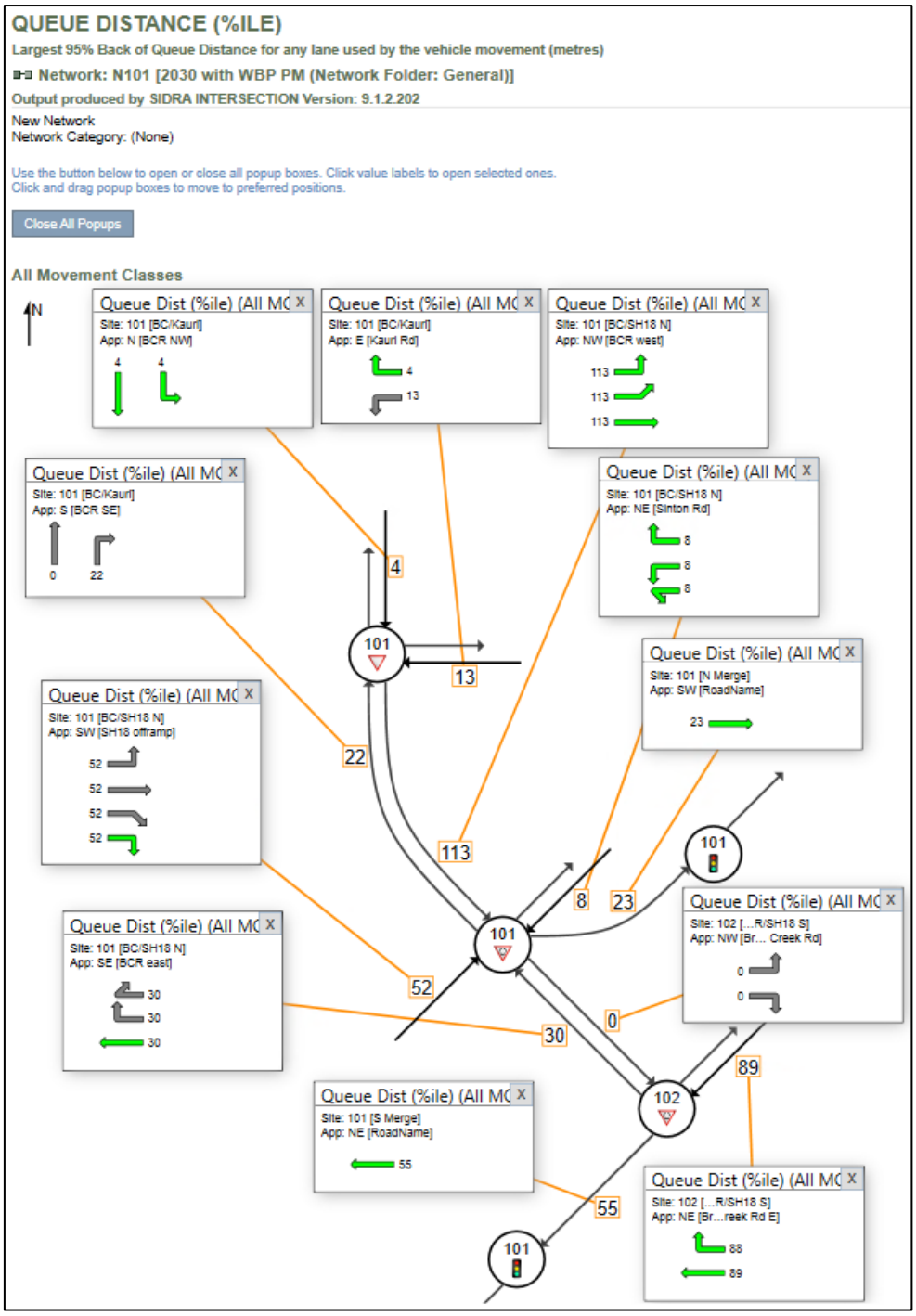
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay 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: TRAFFIC ENGINEERING & MANAGEMENT LTD | Licence: PLUS / 1PC | Processed: Friday, 23 August 2024 1:32:05 pm
Project: C:\TEAM Projects\2020\20350 - Whenuapai land holdings\Proposed Plan Change\SIDRA\BCR-Trig Rd RA single lane.sip9

## Brigham Creek Rd / SH18 Interchange Roundabout (Sinton Rd) AM Peak Period Including Kauri Rd



## Brigham Creek Rd / SH18 Interchange Roundabout (Sinton Rd) PM Peak Period



# Appendix E: Correspondence

DON McKENZIE CONSULTING
Traffic Engineering & Transportation Planning
don@dmconsulting.co.nz
Mob: 021 656 191

Ref: 23043
7 December 2023

The Neil Group
PO Box 8751
Newmarket
**Auckland 1149**

**Attention:** Matt Ashworth

**Issued via email:** **mashworth@neilgroup.co.nz**

Dear Matt

**Transportation Peer Review Neil Group Private Plan Change**

Following the recent commissioning by The Neil Group, Don McKenzie Consulting Ltd is pleased to provide the following summary and confirmation of a peer review of the transportation matters associated with a Private Plan Change at Whenuapai.

## 1. Background

I was commissioned by The Neil Group in August 2023 to provide a transportation peer review of the Integrated Transportation Assessment (**"ITA"**) accompanying the Proposed Whenuapai Business Park Private Plan Change (**"WBPPPC"**) and associated transportation design and assessment work to be undertake by Mr Eric Hebner of Traffic Engineering and Management Ltd (**"TEAM"**).

## 2. Qualifications and Experience

My full name is Donald (Don) John McKenzie. I am the Director and co-owner of Don McKenzie Consulting Ltd – a sole-practise traffic engineering and transport planning firm established in March 2023. Prior to that I held various senior technical and leadership roles with Stantec New Zealand between 2018 and 2023. Between 1992 and 2018 I was employed by Traffic Design Group Ltd (TDG) including periods as a Director, shareholder and Auckland Branch manager prior to the purchase of TDG by Stantec New Zealand in 2018.

I hold a Bachelor's degree with honours in Civil Engineering awarded in 1991. I am a Chartered Professional Engineer, a Fellow and Chartered Member of Engineering of New Zealand, an International Professional Engineer, and a Fellow of the Institute of Transportation Engineers (ITE America).

I have over 30 years of professional experience in the field of traffic engineering and transportation planning throughout New Zealand. As a transportation consultant, I have been engaged by numerous local authorities, and private concerns to advise on traffic and transport matters covering safety, management and planning matters of many kinds. I have and continue to be engaged by clients to provide expert transportation evidence to Council and Environment Court hearings.

## 3. Involvement in the Project

Following my instruction by The Neil Group in August I have provided/undertaken the following:

- I worked with Mr Hebner in the framing of the content and structure of the ITA;
- provided advice in relation to various transportation matters related to the WBPPPC and proposed transport mitigation surrounding the WBPPPC site;
- I attended and participated in meetings with Auckland Transport and Supporting Growth Alliance, and
- In November 2023 I reviewed the TEAM ITA and provided commentary to the project team including Mr Hebner.

## 4. Key Transportation Issues

On the basis of my involvement in the peer review of the TEAM ITA, I consider that the key transportation issues relevant to the WBPPPC site and surrounding transport network are:

- The ability of the adjoining road network (especially the Trig Road and Brigham Creek Road frontages and proposed intersections connecting with the WBPPPC) to safely and effectively support the planned development potential of the WBPPPC site;
- Identification of the necessary mitigation projects including proposed upgraded and new intersections, and road widening especially along Brigham Creek Road;
- Functional and design alignment of the transport solution associated with the WBPPPC, and its integration with the planned upgrading of Trig Road and Brigham Creek Road as part of the Supporting Growth Alliance programme of Notices of Requirement in the Whenuapai area;

The above points and other matters are in my opinion appropriately addressed in the TEAM ITA.

I would be happy to further discuss any of the details of this report as required. Please don't hesitate to contact via the below.

Yours sincerely
**Don McKenzie Consulting Ltd**

Don McKenzie
**Director**
E: don@dmconsulting.co.nz
M: 021 656 191

# Memorandum

**To:** Matt Ashworth, Trevor Canty (Neil Group)

**cc:** Eric Heber (TEAM Traffic)

**From:** Don McKenzie

**Date:** 29 April 2024

**Re:** **Whenuapai Business Park Plan Change**
**Strategic Assessment and Modelling Overview**

## Introduction

At the request of Neil Construction Ltd (**"NCL"**) as proponents of the Whenuapai Business Park Plan Change (**"WBPPC"** or **"Plan Change"**), I have provided a transportation peer review of the Integrated Transportation Assessment (**"ITA"**) prepared by Traffic Engineering and Management Ltd (**"TEAM Traffic"**) conveyed by way of a letter dated 7 December 2023. I have also provided strategic input to the preparation of responses to a series of Requests for Further Information issued by Auckland Transport (**"AT"**) and Auckland Council (**"Council"**).

The following commentary has been prepared alongside the detailed responses prepared by TEAM Traffic. It is intended to provide an over-arching, strategic context for the nature of responses to the RFI's and some broader, strategic context with respect to the applicability (or otherwise) of regional and wider-area transport models in relation to the Plan Change.

## Application of Strategic Modelling and Land Use Scenarios

Background

I have been involved in the preparation of transportation assessments for various types and natures of land-use development reporting across the Auckland region and have applied a number of different transport and traffic models including the MSM macro strategic (regional) transportation demand model, Supporting Growth Alliance (**"SGA"**) Whenuapai SATURN wider area models, through micro-simulation and intersection or corridor specific models in SIDRA.

In relation to the WBPPC, I have been requested by NCL (as the Plan Change proponents) to provide the following as a strategic transport context in support of TEAM Traffic in preparing responses to the Requests for Further Information (**"RFI"**) issued by Auckland Council and Auckland Transport (and their transport advisers). A number of issues have been raised by the agencies and their advisers that refer to queries around the appropriate land use scenarios and modelling platform application to be used in support of the Plan Change request.

Overall Approach to Modelling

The suite of transportation models available to support these sorts of land-use applications derive from a family of models not only within the realm of transport but also across population, dwelling and employment, and then extend through four stage (travel demand models such as the MSM) and into vehicle specific, public transport and walking and cycling models (e.g. SIDRA). Each with its own set of possible applications but also many able to do the same or similar job.

Further there are project specific models that do not necessarily fall into the suite of public-agency transport models (e.g. MSN or SATURN). For example, the PC69 Spedding Block Plan Change transport modellers developed a project-specific, micro-simulation VISSIM model in order to test the specific dynamics and required detail associated with the SH16 / Brigham Creek Road roundabout and its relationship to the PC69 land. It understood that this approach was due to some particular site-specific complexities and interactions that were not able to handled by the "higher level" SGA Whenuapai SATURN model provided by AT.

In a similar manner to that adopted and accepted in respect of PC69 Spedding Block, intersection-specific SIDRA models have been developed by TEAM Traffic in support of WBPPC. They provide the necessary details of intersection and turning lanes to test the operational performance of key intersections supporting the Plan Change area. As reported by TEAM Traffic in both the ITA and in RFI responses, these SIDRA models and the performance outputs have been used to identify required interventions to ensure an acceptable level of delay and queueing is maintained following the establishment of thee Plan Change zoning and future activity.

A common theme in the requirement for and application of these various transport models is to both test the external effects of a land-use or infrastructure change, as well as to provide input to both the timing and form of infrastructure proposed (or required to support) the planning process.

In the context of the WBPPC application and the application of the SGA Whenuapai SATURN model to complement and provide input to the SIDRA modelling, the primary purpose of the modelling approach adopted is to test the effects of the Plan Change development within the context of current and planned infrastructure. The challenge faced both by NCL, as well as Council and AT, is that the rate and nature of development within and adjacent to Whenuapai is somewhat ahead of the ability of these publicly available transport models and their input land-use scenarios. As I will discuss shortly, the 2023 Auckland Future Development Strategy (**"FDS"**) has yet to be fully and properly incorporated into the relevant SGA Whenuapai SATURN model – and even if the FDS forecasts of development were to be included and captured, there are many elements of the FDS which fall under the category of "expectations" or proposals with uncertain timing – and equally if not more uncertain – funding paths.

The use of – or requirement to use – any transport or traffic model should be considered within the context with which it has been prepared, the application it is being put to and the nature of inputs going into the model. At best the model is a tool or assistant to making professional judgements.

In this regard and on the basis of the notable limitations that I will discuss shortly, the key purpose that the SGA Whenuapai SATURN 2028 model has been put within the context of the WBPPC is to provide wider area travel demands and directional distributions associated with the Plan Change future activity especially between the subject land and the SH16/Brigham Creek Road intersection/roundabout.

2028 vs 2038

In the current context of Whenuapai with its rapidly changing environment (and impacts from surrounding areas including the wider North-west), the prediction of a distant future year is often unhelpful especially in the case of predicting the effects of land-use. I understand that there has been some discussion between the WBPPC proponent team and Council/AT with respect to the appropriate future assessment year to adopt for testing the Plan Change. For the purposes of testing "big picture", regional infrastructure such as SGA's route protection works, adoption of a somewhat distant future year (e.g. 2038 or beyond) may be of assistance. However, at a local effects assessment level, a 20-year horizon modelled year projection is entirely inappropriate and unhelpful due to the greater number uncertainties and assumptions having to be made.

I understand from TEAM and the discussions that the WBPPC team have had with Council/AT/Auckland Forecasting Centre that the SGA Whenuapai SATURN 2038 model has not been updated to account for the now-adopted FDS. Further, I understand that the current iteration of the 2038 model assumes that a number (if not all) of SGA schemes and the SH16/SH18 Connection Project are in place. For the reasons I have already noted above in terms of certainty of funding and delivery, assumptions such as this are inappropriate and unhelpful in the context of the Plan Change being sought (and as related to the zoning of the land under the AUP).

I consider that the adoption of the 2028 model (for the limited purpose of quantifying the wider-area traffic distribution of Plan Change traffic) is most appropriate given these more distant assumptions needing to be made as well as reflecting the nature of the process being followed by the Plan Change – a rezoning sought within the Unitary Plan. In my experience, the assessment of effects of a rezoning or Plan Change application is generally focused within the time horizon applying to the Unitary Plan – generally no more than 10 years over which time the Unitary Plan is required to undergo review and the surrounding zoning reconsidered.

Modelling Assumptions

As the model is a representation of the distribution of transport demands generated by land-use, there are necessarily a wide range of assumption that are required as inputs within the model – some within the model representation, other from outside derived from say the regional land-use models. Among the many assumptions feeding into the modelling undertaken for WBPPC are as well as within the SGA Whenuapai SATURN model, are:

- Modelling software, scope of area modelled and assessment method;
- Land-use scale including floor areas;
- Development typology including the nature of development and potential internalization of interaction within the WBPPC area;
- Development and delivery timing based on the relevant development strategies in place (e.g. FULSS, FDS);
- Trip generation/distribution of employees and other generated movements within and external to WBPPC; and
- External and internal infrastructure and land uses beyond the site.

I consider that the SGA Whenuapai SATURN model includes numerous inappropriate and unhelpful assumptions on the transport infrastructure within Whenuapai, as well as the land-use assumptions. Strict adoption of these SGA Whenuapai SATURN demands at a local level (e.g. at the local intersection level and network surrounding the Plan Change site) is in my opinion and experience inappropriate when there are such significant limitations, omissions and inclusions as set out below:


- A (Sinton Road bridge): it is considered that this alignment and form of bridge would never get built in the form represented in the SATURN model.
- B (Kauri Road south): this link forming a fourth leg to the Kauri / Brigham Creek Road would need to pass through what is now reserve land. This in combination with C below, forms what was initially proposed by Council in its Plan Change 5 proposal (but in Variation 1 of PC5 removed). This has now been superseded by both the SGA proposals for this North-west area and the SH16/SH18 Connections strategy being advanced by NZTA.
- C (western section of Kauri Road extension): this part of the Kauri Road extension (PC5 link) has been set aside and will not be delivered given the withdrawal of the PC5 rezoning and the subsequent SGA and NZTA proposals for the area. The effect of this link (alongside "B" above) included within the SATURN model is to greatly reduce (under-estimate) the volumes carried by Brigham Creek Road.
- D (Mamari Road Extension - south): this link also formed part of the PC5 strategy and was previously anticipated to create further network connections. It is no longer part of the current planning for the North-west area.
- E (Mamari Road Upgrade north): this upgrading of an existing local access road connecting with Brigham Creek Road is the subject of one of SGA's Northwest NOR's and while the designation for the upgrade has yet to be confirmed, it is understood that there are no funding commitments for either land purchase to facilitate the works or capital funding for the works themselves. There is little certainty that this will be delivered, certainly not within the timeframes being considered for the WBPPC.
- F (Spedding Road Link and PC69 development): the approved PC69 (Spedding Block) established the basis for the development of primarily industrial landuses and

accompanying infrastructure upgrade requirements. Both infrastructure and the land-use should be considered contemporaneously – there will be no land-use (and traffic generation) without the infrastructure in place. The scenario of PC69 traffic generation without the supporting infrastructure is purely hypothetical and is not supported by the upgrading requirements (especially in relation to the Speeding Road link from Brigham Creek Road to Trig Road) of PC69.

The detail of roading infrastructure included within the SGA Whenuapai SATURN model for the area is in my view inappropriate to assess the operation of the intersections along both Brigham Creek and Trig Roads (including with SH18). Any manual redistribution of the SGA SATURN model flows as might be adopted to replicate actual roading network surrounding the WBPPC area, is in my opinion, subject to another layer of assumption and estimation. The approach adopted by TEAM Traffic in applying relevant growth factors to surveyed intersection counts is an appropriate method to represent the future year travel patterns within the network as currently exists and as might exist within the future year horizon appropriate for the Plan Change request.

Employment Assumptions

In addition to the above unrealistic and inappropriate transport infrastructure assumptions, the SGA Whenuapai SATURN model (for 2028) also includes (via the MSM regional model and land-use scenario i11.5 as shown below) a range of primarily employment assumptions for the Whenuapai area that are in my opinion equally unhelpful and unrealistic.

| MSM Zone | 2016 | 2028 | 2038 | 2048 |
|---|---|---|---|---|
| 165 | 108 | 41 | 1,725 | 3,612 |
| 166 | 10 | 1,657 | 2,333 | 2,325 |
| 168 | 40 | 391 | 520 | 626 |
| 169 | 171 | 174 | 443 | 855 |
| 172 | 225 | 258 | 274 | 280 |

- Zones 166 and 165 in the MSM model includes the PC69 Spedding Block and proposed WBPPC, respectively.
- The model includes a total of 1698 employees within Zone 165 by 2028. This is a significant over-estimate especially within WBPPC. The economic assessment accompanying the WBPPC prepared by Insight considered a total employment figure of only 1100 (approximately 65% of the modelled employment figure).
- Meanwhile, the model vastly underestimates the level of employment within the PC69 land (within the model's Zone 166). By 2028 the model expects an employment figure of just 41. With properties within PC69 already on the market and likely to be occupied and operational within the next couple of years, this figure appears unrealistically low However, the practical level of increased employment within the PC69 land will be supported by the required transport improvements attached to the PC69 approval (including the triggers requiring such infrastructure to be in place before buildings are occupied and traffic movements generated).

In summary, it is clear from this list of issues (both infrastructure and land-use/employment) that the SGA Whenuapai SATURN model for the 2028 year includes a number of key elements

that limit its value in providing an appropriate tool for the evaluation of the WBPPC. These include:

- inconsistent employment levels (both under-estimates and unrealistic over-estimates);
- unmatched land-use trip generation and infrastructure where existing planning controls (e.g. PC69 triggers and thresholds) limit the traffic generation able to be generated until the appropriate infrastructure is delivered, and
- infrastructure that is not physically possible or not enabled by current planning zoning or other restrictions (e.g. Kauri Road extension through Council reserve).

SATURN Model Distribution

I have been provided with the outputs from a "Select link analysis" of vehicle movements to and from the WBPPC zone as predicted by the SGA Whenuapai SATURN model intended top ascertain whether the SATURN model could form a helpful basis to inform the modelling of trip distribution at the site being undertaken by TEAM Traffic. Plots of the weekday AM peak results are shown in the following two figures for trips to and from the WBPPC zone, respectively.

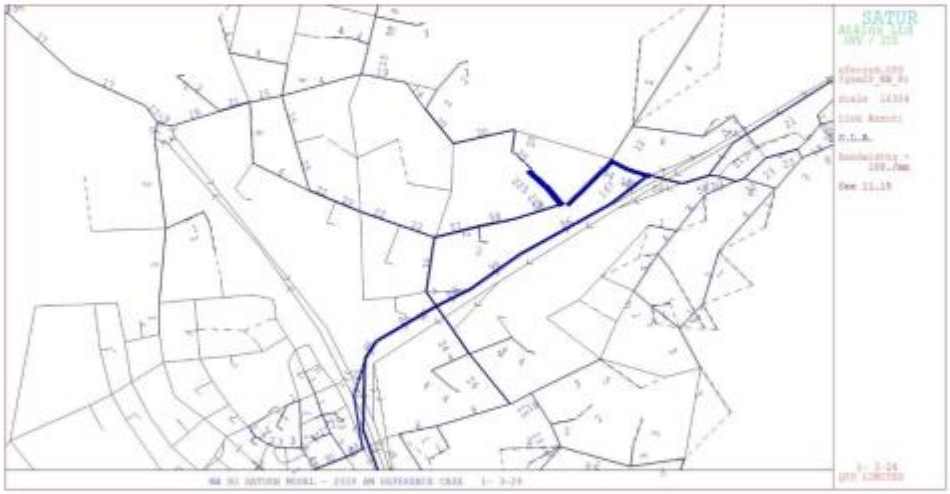


*Figure 1: Select Link Analysis – Trips to WPBPPC Zone (2028, AM Peak)*

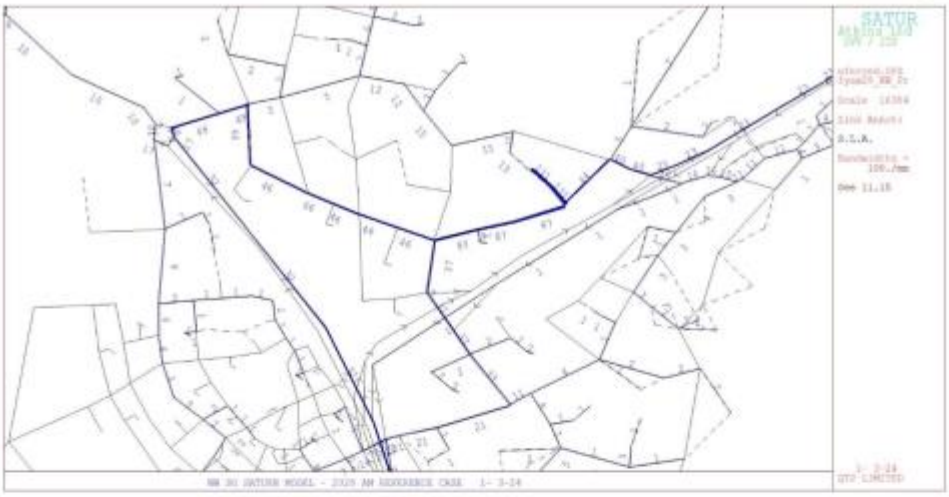


***Figure 2: Select Link Analysis – Trips from WPBPPC Zone (2028, AM Peak)***

As can be appreciated from both the numbers and proportional widths of the network links (in proportion to the volumes predicted to be carried by these links), the majority of movement to and from the WBPPC Zone in the morning peak derives from the eastbound direction on SH18 Upper Harbour Motorway and from both the Westgate and SH16 links leading into this eastbound flow. A relatively small component of activity is drawn from the northwest via SH16/Brigham Creek Road, while a similarly small component of generated trips (generated from the WBPPC Zone) is provided with a link broadly representing the Spedding Link connection from Trig Road through to Brigham Creek Road via the PC69 land. As previously discussed, this link is not currently provided and nor does it connect directly into the WBPPC land. The prediction of this level and nature of traffic movement (the majority of which is predicted by the SATURN model to turn left onto SH16 southbound) would be logically catered for by Brigham Creek Interchange on SH18.

The following figures have been extracted from the SATURN model representing the generated trips to and from the WBPPC Zone during the 2028 weekday PM peak hour.

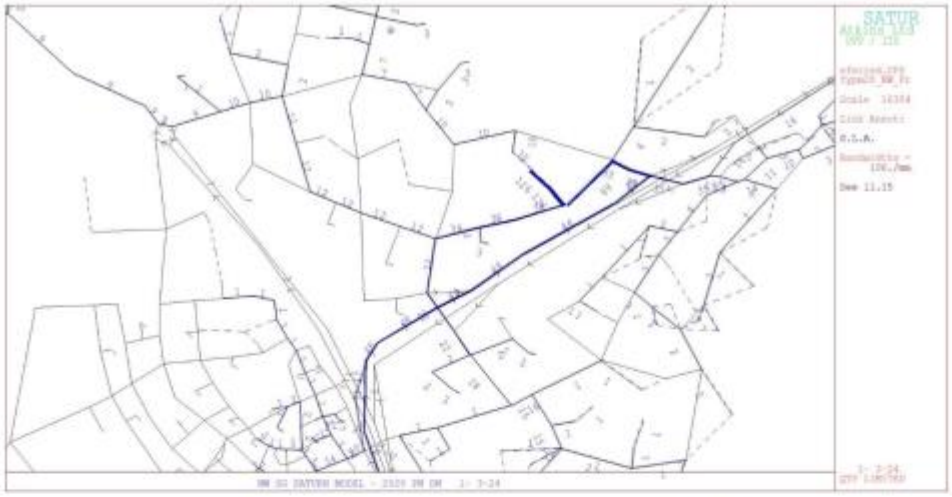


*Figure 3: Select Link Analysis – Trips to WPBPPC Zone (2028, PM Peak)*

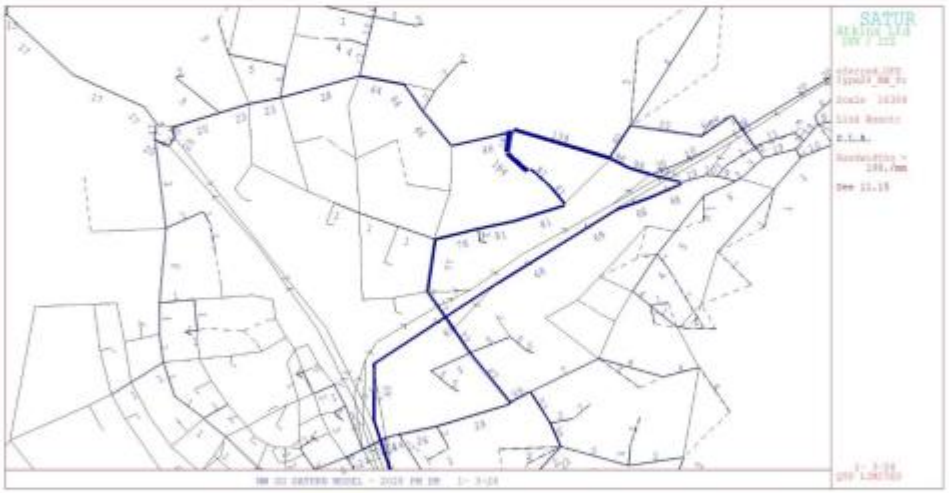


*Figure 4: Select Link Analysis – Trips from WPBPPC Zone (2028, PM Peak)*

As with the AM peak, the existence of the Spedding Link unrealistically creates added demand towards the northwest via the connection to Trig Road and then via the link towards the SH16/Brigham Creek roundabout. Without the Spedding Link in place this demand will be catered for by the current form and alignment of the Brigham Creek Road corridor as assessed in the TEAM Traffic ITA (and RFI responses) – therefore in my opinion providing a conservative upper estimate of flows along Brigham Creek Road.

There is also a predicted moderate (89vph) generated towards WBPPC via the "fourth leg" of the Kauri/Brigham Creek intersection – which as previously discussed does not and will not exist. Any generated movements towards the WBPPC area will be catered for via the proposed

intersections between the Plan Change land and Brigham Creek Road along the northern boundary of the site – not via a theoretical Kauri Road (south) link.

Overall, the departure movements away from the WBPPC Zone during the weekday evening peak reflects the broad catchment of employee-related travel across the network including Westgate, West Harbour, the north-west towards Kumeu/Huapai, and via the SH16/SH18 routes to more distant parts of the city.

## Summary

On the basis of the foregoing assessment, I consider that the adoption of either the 2028 or 2038 SGA Whenuapai SATURN models (and their local-area distribution of traffic within the network surrounding the WBPPC land) for the detailed evaluation of the transport effects of WBPPC is generally inappropriate. The limited use of the SGA Whenuapai SATURN model by TEAM Traffic to test the proportional distribution of Plan Change traffic through the SH16 Brigham Creek Road intersection (setting aside the travel demands within the Whenuapai network), is more appropriate.

The approach adopted by TEAM Traffic within the ITA and as further discussed in the RFI to incorporate specific growth assumptions (referencing recent traffic counts and annual growth rates) applied to existing traffic counts around the perimeter of the WBPPC land and other potentially affected intersections such as those at the SH18/Brigham Creek Interchange), is in my professional opinion appropriate and a better approach than adoption of the SATURN model.

***Don McKenzie Consulting Ltd.***

# Whenuapai Business Park SATURN Model Extracts

| | |
|---|---|
| **Prepared for** | Neil Construction Ltd |
| **Job Number** | TNEGL-J004 |
| **Revision** | 3 |
| **Issue Date** | 17 April 2024 |
| **Prepared by** | Chris Blackmore, Principal Transportation Planner |
| **Reviewed by** | Mat Collins, Associate Transportation Engineer |

## 1. Introduction

Abley was commissioned by Neil Construction Ltd to supply intersection turning movements at key intersections around Whenuapai to support the modelling undertaken by TEAM Traffic as part of the Whenuapai Business Park private plan change.

Note that our commission is limited to data sourcing and extract, further modelling and analysis of outputs is undertaken by TEAM Traffic and out of scope for this technical note.

## 2. Data received from AFC

A request was lodged with the Auckland Forecasting Centre (AFC) for the supply of information from the Supporting Growth Alliance North West Area (SGA NW) 2028-year model. The data supplied by AFC included network and vehicle trip matrices to allow turning movements at key intersections and select link analysis to isolate trips to and from the Whenuapai Business Park model zone.

AFC have advised that the current version of the SGA NW model is built using landuse forecast i11.5. It is understood that this is based on the 2017 Future Urban Land Supply Strategy (FULSS) and a newer landuse forecast, i11.6, has been developed on the Future Development Strategy (FDS) growth forecast. The updated strategy is expected to result in a change in the timing of activity uptake around Whenuapai, however a detailed analysis of the differences between i11.5 and i11.6 is not included in this technical note.

Files received from AFC for use in extracting and analysing intersection turning movements were:

- 2028 preferred scenario *.UFC files by period
- 2028 preferred scenario *.UFS files by period
- 2028 preferred scenario *.UFM files by period.

## 3. SATURN land use assumptions

As mentioned above, the 2028 SGA model uses landuse forecast i11.5, which is based on the Future Urban Land Supply Strategy (which has since been superseded by the Future Development Strategy).

The i11.5 population, household, and employment assumptions for model zones in Whenuapai (refer to Figure 3.1) are shown in Table 3.1 to Table 3.3.

We note that these forecasts are based on future landuse zoning changes. The forecasts likely exceed what could reasonably be developed under the operative landuse zoning in the area, which is predominately Future Urban Zone as shown in Figure 3.2. Currently, urban zoning is only enabled within part of Zone 165 (which includes Spedding Block), and part of Zone 168/172 (which include Whenuapai 1 and Whenuapai 2).

Further, the Future Development Strategy anticipates business land in Zones 165 and 166 will be available from 2025 onwards. The other Future Urban Zone land is anticipated to be available from 2035 and from 2050, as shown in Figure 3.3.

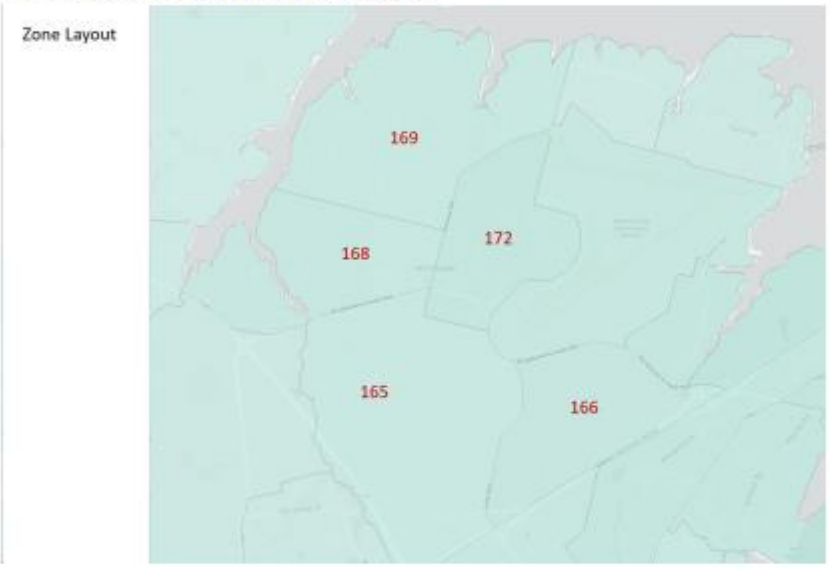



**Figure 3.1 Model zones**

**Table 3.1 i11.5 household forecasts**

| MSM Zone | 2016 | 2028 | 2038 | 2048 |
|---|---|---|---|---|
| 165 | 62 | 102 | 384 | 1,005 |
| 166 | 16 | 261 | 252 | 251 |
| 168 | 47 | 1,663 | 2,388 | 3,031 |
| 169 | 127 | 318 | 1,483 | 3,637 |
| 172 | 153 | 604 | 750 | 1,023 |

Table 3.2 I11.5 population forecasts

| MSM Zone | 2016 | 2028 | 2038 | 2048 |
|---|---|---|---|---|
| 165 | 177 | 281 | 984 | 2,492 |
| 166 | 54 | 683 | 624 | 598 |
| 168 | 153 | 4,545 | 6,210 | 7,569 |
| 169 | 346 | 844 | 3,790 | 9,014 |
| 172 | 470 | 1,699 | 1,995 | 2,599 |

Table 3.3 I11.5 employment forecasts

| MSM Zone | 2016 | 2028 | 2038 | 2048 |
|---|---|---|---|---|
| 165 | 108 | 41 | 1,725 | 3,612 |
| 166 | 10 | 1,657 | 2,333 | 2,325 |
| 168 | 40 | 391 | 520 | 626 |
| 169 | 171 | 174 | 443 | 855 |
| 172 | 225 | 258 | 274 | 280 |

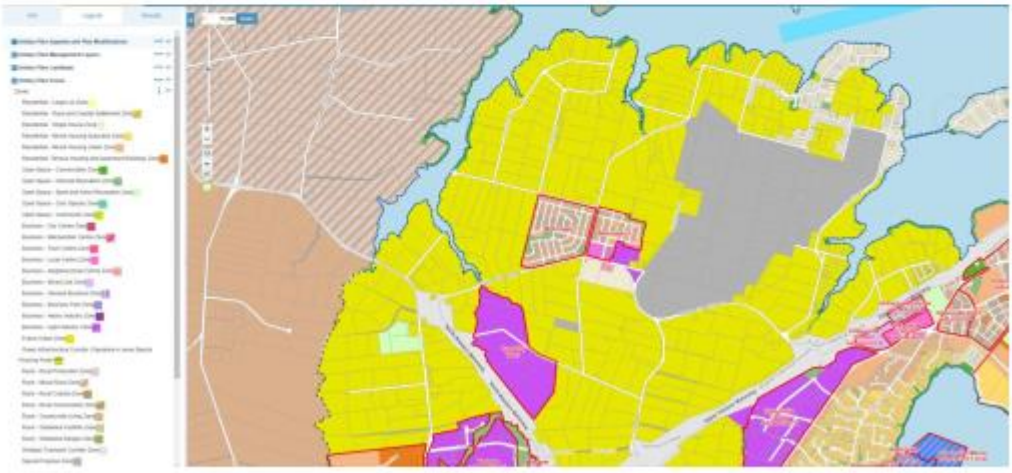


Figure 3.2 Operative landuse zoning

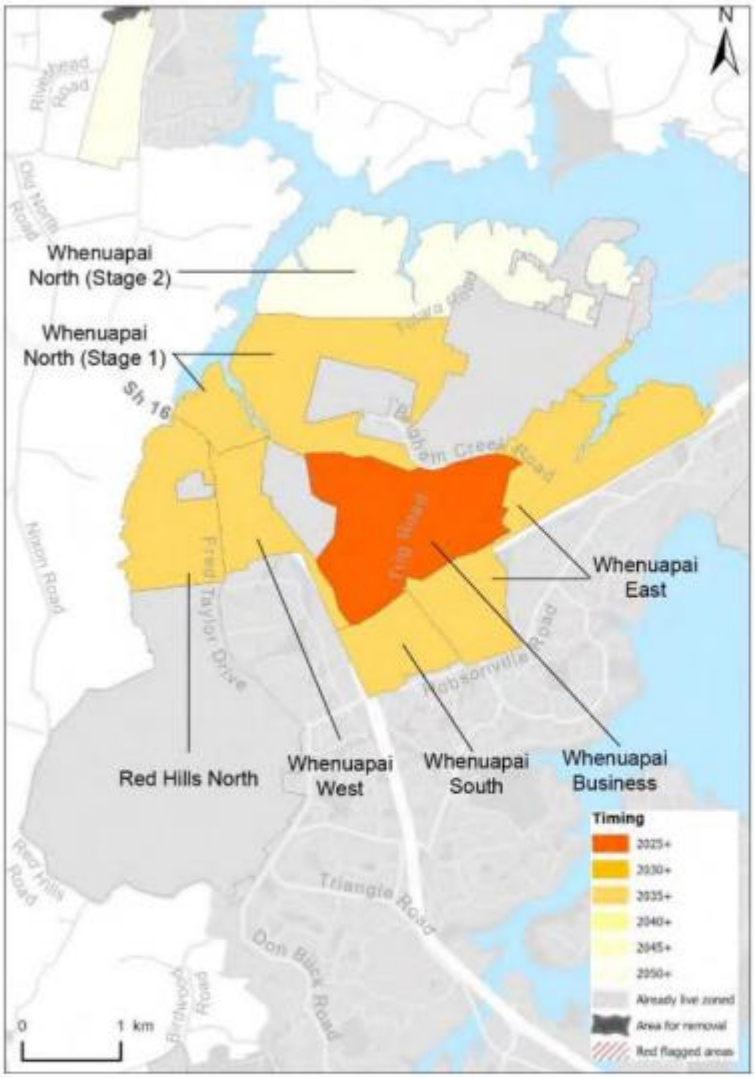



Figure 3.3: Future Development Strategy release sequence for Whenuapai-Red Hills cluster

# 4. SATURN model infrastructure assumptions

The Future Development Strategy (FDS) indicates transport infrastructure that supports development within the Whenuapai Business Area, as shown in Figure 4.1.

| | | |
|---|---|---|
| Whenuapai Business | Not before 2025+<br><br>* some business can take advantage of existing capacity, these are the projects required to | Spedding Road/ Northside Drive connection over SH16<br>SH16 to SH18 Connections<br>Spedding Road Upgrade and Extension<br>Mamari Road Upgrade and Extension<br>Trig Road Upgrade<br>North Western Bus Improvements (not rapid transit)<br>Northwest Rapid Transit |

**Figure 4.1 FDS transport infrastructure for Whenuapai Business Area**

In terms of the SGA 2028 model:

- The Spedding Road/Northside Drive connection is not included
- The SH16 to SH18 Connections are not included
- The Spedding Road Upgrade and Extension is included
- The Maramari Road Upgrade and Extension is included
- The Trig Road Upgrade is assumed to be included, we understand that this relates to a realignment of Trig Road and upgrade of the intersection with Hobsonville Road, and that Auckland Transport are currently seeking consent for these works
- The model does not directly include public transport, thus the inclusion or otherwise of North Western Bus improvements and Rapid Transit should be inferred by trip generation rates assumed for Whenuapai Business Park.

# 5. SATURN outputs produced

The following outputs were extracted from the 2028 SGA model data supplied by AFC for use on this project:

- Turning movements at intersections specified by TEAM Traffic, summarised in Figure 5.1, also included is assumed 2028 infrastructure as included in the SGA model.
  - 1 – Southern Site Access (to future Spedding-Kauri link road)
  - 2 – Northern Site Access (to Brigham Creek Rd)
  - 3 – Brigham Creek Rd / Trig Rd
  - 4 – Brigham Creek Rd / Kauri Rd
  - 5 – Brigham Creek Rd / SH18 North RAB
  - 6 – SH18 EB Onramp merge
  - 7 – Trig Rd / Spedding Rd
  - 8 – Brigham Creek Rd / SH18 South RAB
  - 9 – Trig Rd / SH18 Offramp
  - 10 – Trig Rd / SH18 Onramp
- Select link analysis of vehicle movements to and from the Whenuapai Business Park zone to form a basis to inform modelling of trip distribution at the site. Morning peak results are shown in

Figure 5.2 and Figure 5.3 for trips to and from the Whenuapai Business Park Zone, respectively. Figure 5.4 and Figure 5.5 show the same for the evening peak results.

- Turning movement outputs are included as Appendix A.


**Figure 5.1 Key intersection locations (blue) and additional included infrastructure (red)**

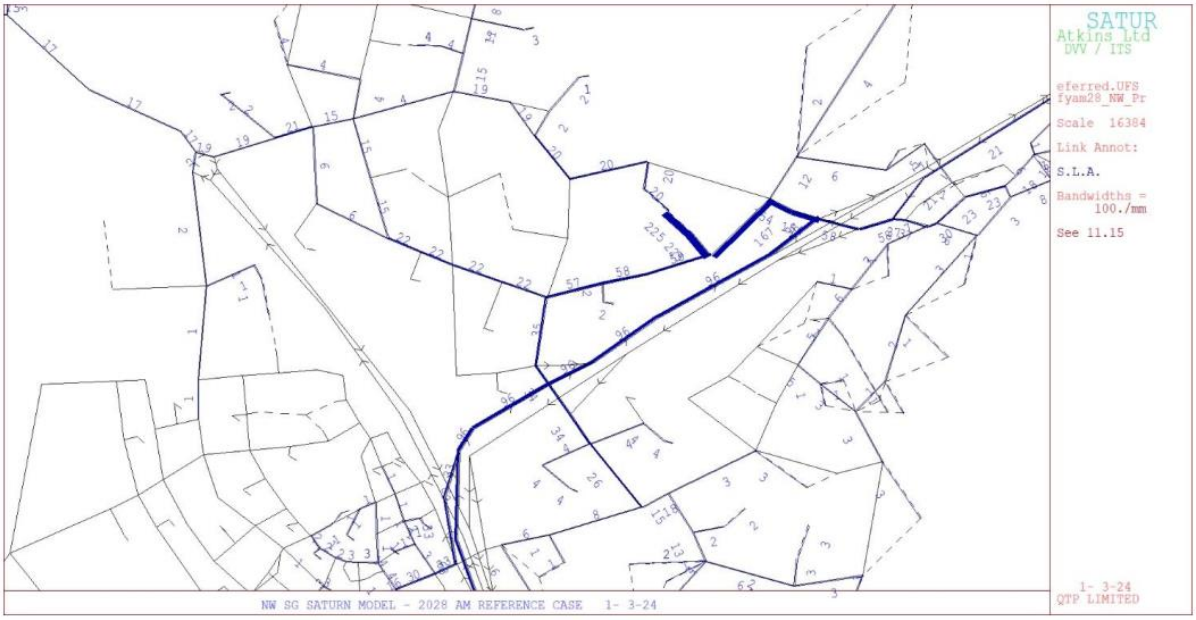



**Figure 5.2 Select Link Analysis to Whenuapai Business Park model zone morning peak**



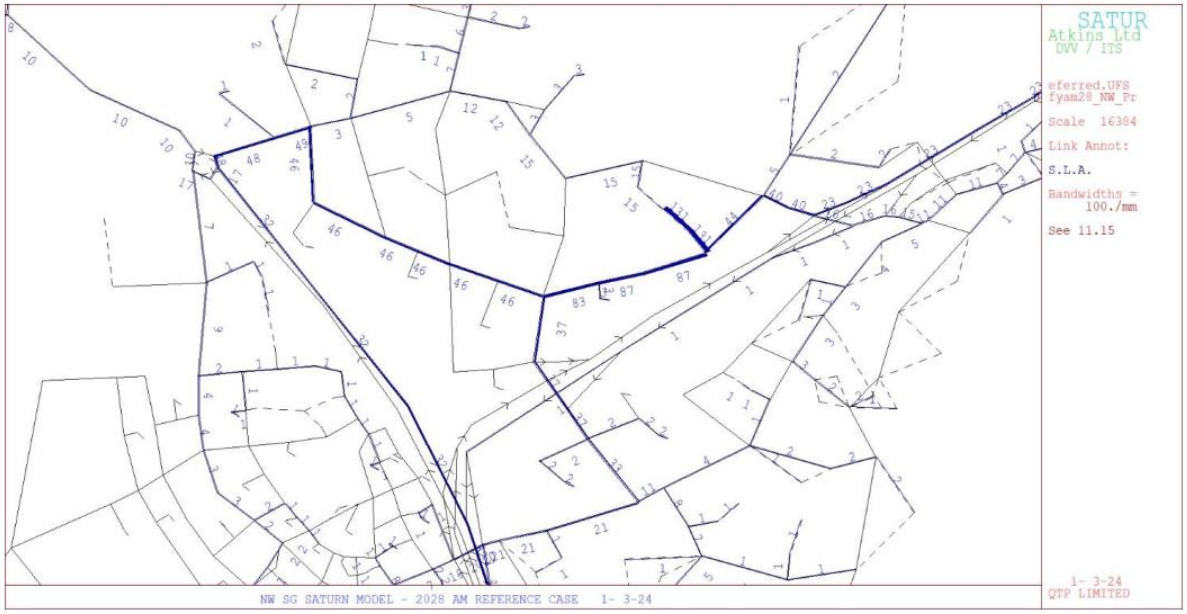



**Figure 5.3 Select Link Analysis from Whenuapai Business Park model zone morning peak**

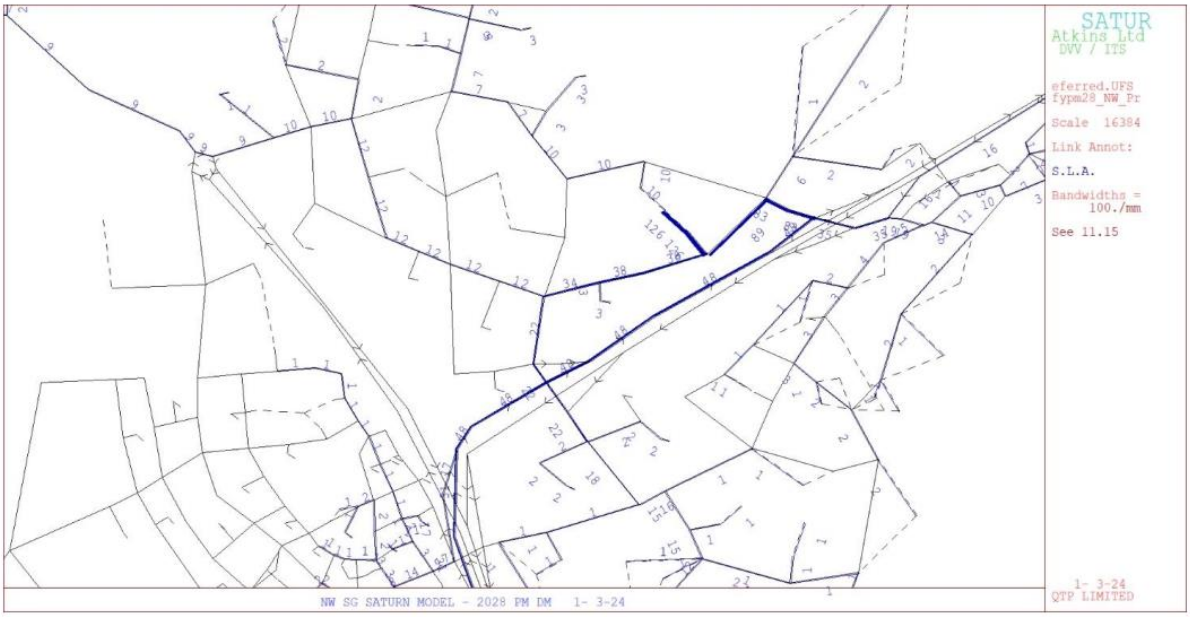



**Figure 5.4 Select Link Analysis to Whenuapai Business Park model zone evening peak**



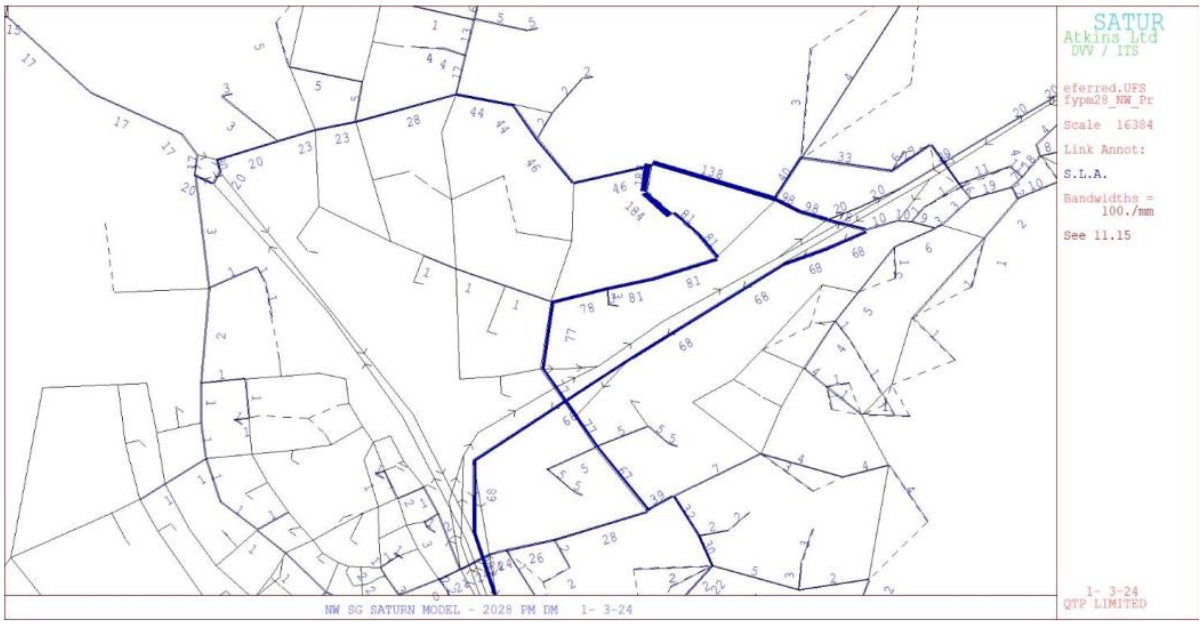



**Figure 5.5 Select Link Analysis from Whenuapai Business Park model zone evening peak**

## 6. Adjustments to match planned site activity

The current planned site activity was advised by TEAM Traffic at 950 total (origin and destination) vehicle movements in each peak hour. The turning movements at each key intersection resulting from activity at the Whenuapai Business Park site, as identified using the select link analysis, have been factored using the planned site activity to produce expected movements when the site is fully operational.

Note that as vehicle movements have been adjusted by factoring, other transport affects such as rerouting, trip retiming or combination, or destination choice change have not been considered. This means that the resulting analysis may be conservative compared to a bespoke SATURN model scenario where these effects could be quantified.

Baseline (SGA model development) and scenario (planned site development) turning counts for each intersection in Figure 5.1 are included as Appendix B.

# Appendix A.
# Traffic Volumes by Intersection and Vehicle Type

Traffic Engineering & Management Ltd
Level 2, 1b Buscomb Avenue,
Henderson, Auckland
PO Box 21-803, Henderson, Auckland 0650

# Technical Note

| | |
|---|---|
| PROJECT | WHENUAPAI BUSINESS PARK PLAN CHANGE |
| SUBJECT | COUNCIL & AUCKLAND TRANSPORT FURTHER INFO REQUESTS |
| TO | NCL & CAMPBELL BROWN PLANNING |
| FROM | ERIC HEBNER (SENIOR ASSOCIATE), eric@teamtraffic.co.nz |
| DATE | 24 JULY 2024 |

Team Traffic Ltd has reviewed the second round of further information requests Auckland Council (represented by Flow) and Auckland Transport (represented by Commute) have provided on the Whenuapai Business Park Plan Change (WBPPC) application (request dated 12th June 2024).

The attached table lists the transport related items together with our responses.

In addition, a mode share assessment is provided together with refined traffic growth, trip distribution and SIDRA modelling .

## MODE SHARE ASSESSMENT

Mode shift is a significant factor to consider, and it is appropriate to apply mode shift to the WBPPC assessment. The former Auckland Regional Council's 2016 Northern Strategic Growth Area modelling, stated the following mode share (rounded values)[1]:

- Walk and cycle 10%
- Public transport 10%
- Travel Demand Management (ride share, car share etc.) 5%
- Private vehicle 75%

These figures are supported by a more recent study of Auckland's 2018 census data, refer to the following mode share chart taken from this study[2].

[1] Pg 35 of the Whenuapai Structure Plan Integrated Transport Assessment Report
[2] Pg 9 of the Analysis of the 2018 Census Results, Travel to work and Travel to Education in Auckland, October 2020

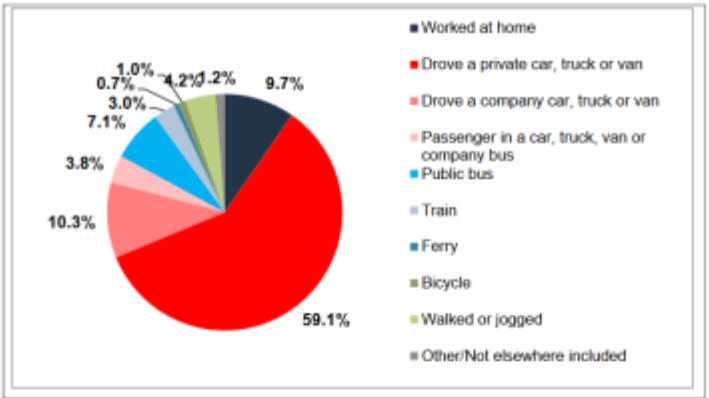



**Figure 2.1**
**2018 Modal shares - Travel to work**
***Analysis of the Auckland 2018 Census Results***

Applying the Northern Strategic Growth Area mode share to the WBPPC's predicted 950 total peak hour trips provides the following breakdown of mode share trips in a peak hour:

- Walk and cycle 95 trips,
- Public transport 95 person trips,
- Travel Demand Management 48 person trips (or 12 vehicle trips with an average vehicle occupancy of 4),
- Private vehicle 713 trips.

This level of walk and cycle trips can be accommodated by the existing shared path and footpath infrastructure on Brigham Creek Road and Trig Road.

Similarly, this level of public transport trips can be accommodated by the existing bus route between Westgate and Hobsonville Ferry that routes via Brigham Creek Road and Trig Road.

Combined with the robustness that has been built into the previous WBPPC traffic modelling consisting of:

- conservatively assigning all trip generation through SH18 interchanges,
- conservatively applying a high background traffic growth rate, irrespective of a trending down in wider development growth in Auckland's northwest,
- conservatively compounding background traffic growth with PC69 traffic, and
- conservatively assigning no internal trips;

applying a mode share factor to the WBPPC modelling is considered reasonable and appropriate.

When quality RTN public transport infrastructure and integrated active travel facilities are established in Whenuapai a further reduction in motor vehicle mode share trips can be expected.

The previous WBPPC trip generation has therefore been adjusted to reflect the Northern Strategic Growth Area mode share, which results in 725 peak hour motor vehicle trips.

It is noted that the calculated Whenuapai Business Park's total gross floor area and parking yield supports this mode shift by not oversupplying parking, with the development concept having 800 onsite parking spaces.

Projects listed in the draft Regional Land Transport Plan 2024-2034 that would contribute to higher percentages of active and public transport mode share trips being achieved include:

- Northwest bus improvements,
- SH16 Brigham Creek to Waimauku safety works,
- Northwest rapid transit,
- SH16 Westgate and Brigham Creek Road rapid transit stations, which is also identified in National's Budget 2024 'Transport for the Future' and the Transport Minister's 'Next steps for Northwest Rapid Transit underway' released on 4th July 2024, refer below map.


- SH18 Upper Harbour rapid transit,
- SH16/18 staging assessment refresh,
- SH18 squadron Drive west facing ramps and shared path.

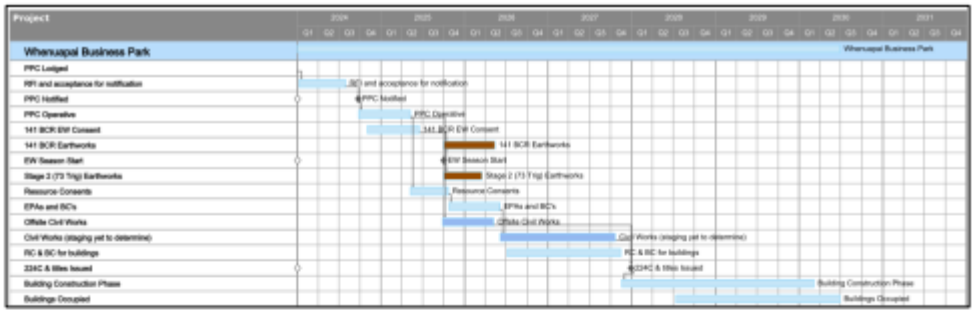
## BACKGROUND TRAFFIC GROWTH & ESTABLISHMENT DATE

A conservatively high 5% background traffic growth has previously been applied for the WBPPC traffic modelling (SIDRA), and this identified sensitivities for the western approaches of both the proposed Brigham Creek Road / Trig Road single lane roundabout, and the existing SH18 / Brigham Creek Road / Sinton Road interchange.

A refined background traffic growth rate has been determined from the New Zealand Transport Agency's traffic monitoring sites on SH18 and SH16 that has data available pre Covid starting in 2018 and post Covid ending in 2023/2024, refer to **Appendix D** for the GIS screen shot identifying these sites.

The average growth rate (linear) for these sites is 2.6% and while this growth rate is based on traffic counts, there is still an element of prediction that is required to estimate a realistic traffic growth rate through to the anticipated date of establishment.

The establishment date has been extended from 2028 to 2030 to better reflect the timeline to achieve full build out of Whenuapai Business Park, refer to the following project timeline Gantt chart detailing the anticipated project timeline.




***WBPPC Development Gantt Chart***

For this 2030 timeline the background traffic growth will be closely linked to development occurring in the Whenuapai catchment up to 2030.

Although most of Whenuapai is identified in the Auckland Unitary Plan as Future Urban Zone, there has been minimal urban growth in the area and anticipated future development will take some time to be realised. The only urban development that has been delivered in Whenuapai in the recent past is that arising from the Special Housing Area located to the north and west of Whenuapai village. That development has resulted in around 900 houses being built since 2016.

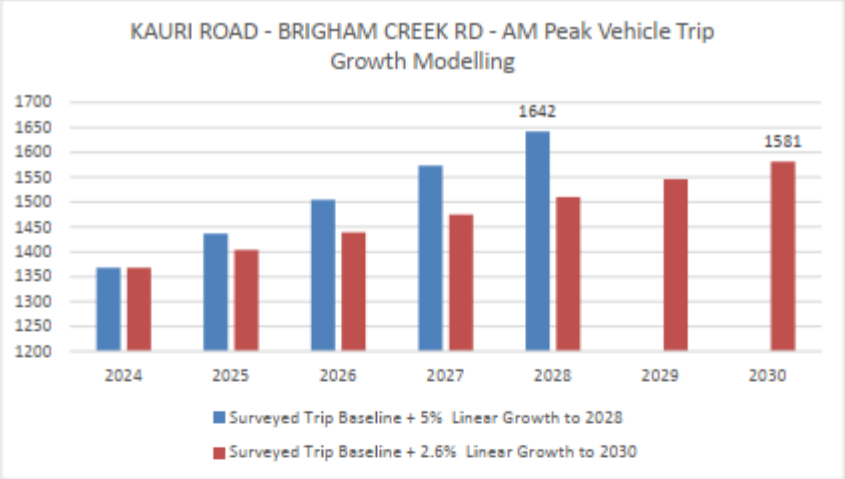
Other than the Special Housing Area, there have been only two private plan changes advanced to the point where they are operative – Plan Change 69 and Plan Change 86. Neither of these have been implemented to the point where development has occurred.

Future development in Whenuapai is directed by the Council's Future Development Strategy (FDS). The FDS sets out the anticipated timing of Auckland's urban growth and, in the case of Whenuapai, states that most of the growth will not be enabled before 2035 with some scheduled after 2050.

Similar circumstances exist in Kumeu and Huapai, which contribute to traffic volumes in Brigham Creek Road. Like Whenuapai, Kumeu and Huapai have substantial tracts of land that are identified in the Auckland Unitary Plan as Future Urban Zone. While those areas were originally tagged for urban development, the FDS has now identified the land as being 'red flagged'. That notation means that development on the land is uncertain and may not occur at all, and no timeframe has been identified to revisit the growth potential in this location.

For these reasons, only limited development is anticipated in the north-west before 2030, comprised either in the Whenuapai future business area or utilising existing infrastructure capacity in that location. In this context, the traffic growth rate of 2.6% is considered to be sufficiently conservative for traffic modelling and assessment purposes.

A comparison with the previous 5% growth rate is illustrated by the following graph that shows the difference in overall growth for each scenario, which is 20% growth (4 x 5%) compared to 16% (6 x 2.6%).




**TRIP DISTRIBUTION & SIDRA MODELLING**

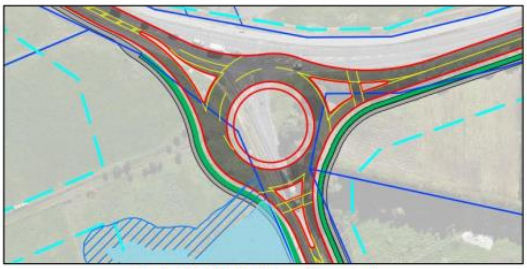
As requested by Auckland Transport, trip distribution has been revised to incorporate the PC69 development traffic distribution contained in Appendix G of Stantec's PC69 Traffic Modelling Repor (July 2020).

Additionally, a higher percentage of WBPPC trips has been applied to the Trig Road interchange, ar increase from 1/3rd to 2/5th of all trips. This has been done to better align with other recent Plan Change applications in the area, and with Supporting Growth's northwest SATURN model that Abley Ltd have been engaged to assist with. Refer to the following morning and evening peak hour trip distributior plans that detail these refined trip distributions.

Abley Ltd have also been engaged to undertake Sidra Network modelling of the Trig Road and Brighan Creek Road SH18 interchanges, inclusive of Kauri Road. The Sidra Network performance outputs are provided in **Appendix B**.

| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|
| **Item 1 – Crash History**<br>Please provide further assessment of the safety impact of the additional trips travelling on Trig Road between the Site and SH18, and any mitigation that may be required. | Further crash history assessment is provided in **Appendix A**. The further assessment includes a summary of each accident record. The Trig Road speed limit was reduced from 80km/hr to 60km/hr in 2023 and this is expected to address the 2 recorded loss of control accidents that did not have contributing factors (identified in accident summary by an *). With a 60km/hr speed limit the existing rural roading environment can accommodate the peak hour traffic. There are no identified accident trends at the SH18 on and off ramps. Although the safety of Trig Road can accommodate the proposed traffic, road pavement deterioration will become a factor for the section not upgraded. This should be scheduled into Auckland Transport's road maintenance programme of works. A significant 450 metre section of Trig Road will be upgraded to an urban standard by WBPPC. |
| **Item 2 – Modelling years of assessment**<br>Please comment on whether it is realistic for the full buildout of the development enabled by the Plan Change to occur by 2028, when the modelling has been undertaken. Consider modelling in an alternative year if adjustments need to be provided. | Given delays with consenting, full buildout has been revised to 2030 and the traffic modelling has been revised to reflect this. Refer to **Appendix B** for updated SIDRA model outputs.<br><br>Refer to pages 5 & 6 for revised trip generation and distribution plans. |
| **Item 5 – Mode share assessment**<br>Please provide anticipated mode share data of the Site for the same periods as the vehicle modelling assessment. | Refer to the mode share assessment on pages 1-3. |
| **Item 8 – Modelling of SH18 Interchanges**<br>A. Please provide data of the ramp signal phasing at both SH18 interchanges.<br>B. Please include ramp signals to the SIDRA models to fully assess potential queuing.<br>C. Please provide an assessment of a base SIDRA model of the SH18 / Brigham Creek Road roundabout and calibrate this to existing conditions. If any changes to the roundabout settings are required as part of calibration, please use this to reassess the development scenarios | A. The phasing of the SH18 east facing onramps has been requested from ATOC and this information will be provided when received, however we understand the phasing is variable depending on SH flows with 5.5 seconds being the default and this is incorporated into the SIDRA network model prepared by Abley Ltd.<br>B. A SIDRA network model prepared by Abley Ltd of the SH18 roundabout that includes ramp metering signals, and the Kauri Road intersection, has been prepared, refer to the SIDRA model outputs on pages 14-21 in **Appendix B**.<br>C. A base SIDRA model has been prepared by Abley Ltd. This model was calibrated by stop line delay and capacity to match the behaviour observed in the video survey. Refer to pages 14-17 in **Appendix B** for the SIDRA model outputs.<br>It is noted that momentary queues of 200m extending to Kauri Road were observed on the video files of the Kauri Road intersection count. These queues occurred over a half hour period between 7:30-8:00am and courtesy priority was observed without issue for Kauri Road traffic to cross through the queue. |
| **Item 9 – Staging plan**<br>A. Please assess whether the intersection upgrade for 'B' should be provided as a prerequisite for the green stage, to facilitate U-turns to support the left-in / left-out access on Brigham Creek Road<br>B. Please assess how active mode crossing facilities can be provided across Brigham Creek Road can be provided, should the green or red stages be developed first. | A. The staging plan has been revised so that Intersection B is required as a prerequisite to the green stage, and also for any two or more stages, refer to Cato Bolam drawing number 47712-DR-C-8400 Rev D which is attached in **Appendix C**.<br>B. The BCR/Trig Rd roundabout design includes pram crossings and pedestrian refuges on BCR east and Trig Road, see Item 12 response below for the roundabout design. Should the red stage progress first, the existing footpath network and existing BCR pedestrian crossing (Zebra crossing) located 500m to the west of Trig Road can accommodate active mode crossing of BCR for this relatively small development area, refer to a photo of this existing pedestrian crossing below. |



| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|
| |  <br>*Existing Brigham Creek Rd Pedestrian Crossing* |
| **Unnumbered Item (12) – Brigham Creek Rd/ Trig Rd roundabout**<br>Please undertake a sensitivity assessment of the Brigham Creek Road / Trig Road roundabout to determine when two lane approaches may be required. | An additional circulating lane has been added to the roundabout design, refer to the revised design below and the full trig Road upgade design in **Appendix E** on page 53. The SIDRA model output of this roundabout design is provided on pages 30-35 in **Appendix B.** This roundabout design has acceptable spare capacity in 2030 with the Whenuapai Business Park traffic. The peak 85$^{th}$ percentile queue length modelled is 32 metres for BCR west and 57 metres for BCR east, with the degree of saturation less than 0.7, which provides confidence that extended two lane approaches is not required.<br>  <br>*Revised BCR/Trig Rd Roundabout Design* |

| AUCKLAND TRANSPORT FEEDBACK ITEMS | | RESPONSE |
|---|---|---|
| 9 | **ITA - Brigham Creek Road/ Road 1 Signals**<br>The traffic volumes for assessment are considered acceptable however generally most signals in Auckland operate on a 100 second cycle time. Can the model please be updated for a 100 second cycle time to understand queuing effects? | Refer to page 22-29 of **Appendix B** for the SIDRA output with 100 second cycle time. It must be noted that the model reflects the peak hour of the day when queues are to be expected. Also, the original intersection design for the fast track application had a left turn slip lane to increase capacity, but Auckland Transport rejected slip lanes over concerns with pedestrian crossing amenity and safety. |
| 11 | **ITA - Brigham Creek Road / Trig Road Roundabout**<br>Commute acknowledges that PC69 volumes have been included. Commute notes that the queue distances are very long on the Brigham Creek Road approaches (300m approx.) suggesting dual-laning of the roundabout should be undertaken sooner rather than later. Can the applicant please review the SIDRA results and confirm whether they consider the queueing acceptable (particularly as SIDRA generally models roundabouts as operating better than they do in reality)? | An extra west to east lane has been added to the proposed roundabout design. Refer to page 30-35 of **Appendix B** for the SIDRA model output for this revised design that confirms significantly less 85$^{th}$ percentile queuing of circa 30 metres. |
| 12 | **ITA - Brigham Creek Road / SH18 Interchange**<br>Can the applicant please show the comparison between the base intersection performance i.e. existing surveys + 5% + PC69 volumes, and proposed 'with development' intersection performance? Can the applicant also provide the SIDRA files for this roundabout. | The revised SIDRA network model output including calibrated base model output is provided on pages 22-29 of **Appendix B**. The SIDRA files will be sent by email from Abley Ltd to Mike Nixon of Commute Ltd. |
| 13 | **ITA - Trig Road / SH18 Interchange**<br>Commute considers the volumes at this interchange have likely been underestimated. Can the applicant please combine the existing surveyed volumes + 5%, the WBP volumes, plus the PC69 volumes within the modelling report prepared by Stantec[1] to support PC69 (Appendix G SATURN traffic flow plots, of the Stantec report). | The Stantec PC69 Appendix G SATURN flows have been applied directly to the WBPPC trip distribution plans, refer to the revised trip distribution plans on pages 5 & 6. Two SIDRA network models have been prepared to assess the performance of the offramp's right turn onto Trig Road, one with a one stage right turn and the other with a two stage right turn. The actual performance is expected to lie between these two models, which has an acceptable level of service. Refer to the SIDRA models on pages 42-49 in **Appendix B**. |



| AUCKLAND TRANSPORT FEEDBACK ITEMS | | RESPONSE |
|---|---|---|
| 14 | **ITA - Other intersections**<br>Commute has reviewed the modelling in the updated ITA but consider that the modelling shows very little queuing for the right turn into Kauri Road (with a high opposing flow). Can the applicant provide the SIDRA files for this intersection (Brigham Creek Road / Kauri Road)? | Refer to the SIDRA output on pages 22-29 of **Appendix B** for the revised networked model of the Brigham Creek Road / SH18 roundabout that includes Kauri Road. The SIDRA files from Abley Ltd will be sent via email to Mike Nixon of Commute Ltd. |

Traffic Engineering & Management Ltd
Level 2, 1b Buscomb Avenue,
Henderson, Auckland
PO Box 21-803, Henderson, Auckland 0650

# Technical Note

| | |
|---|---|
| PROJECT | WHENUAPAI BUSINESS PARK PLAN CHANGE |
| SUBJECT | COUNCIL & AUCKLAND TRANSPORT FURTHER INFO REQUESTS |
| TO | NCL & CAMPBELL BROWN PLANNING |
| FROM | ERIC HEBNER (SENIOR ASSOCIATE), eric@teamtraffic.co.nz |
| DATE | 29 AUGUST 2024 |

Team Traffic Ltd has reviewed the third round of further information requests Auckland Council (represented by Flow) and Auckland Transport (represented by Commute) have provided on the Whenuapai Business Park Plan Change (WBPPC) application (request dated 12th June 2024).

The attached table lists the transport related items together with our responses.

| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|

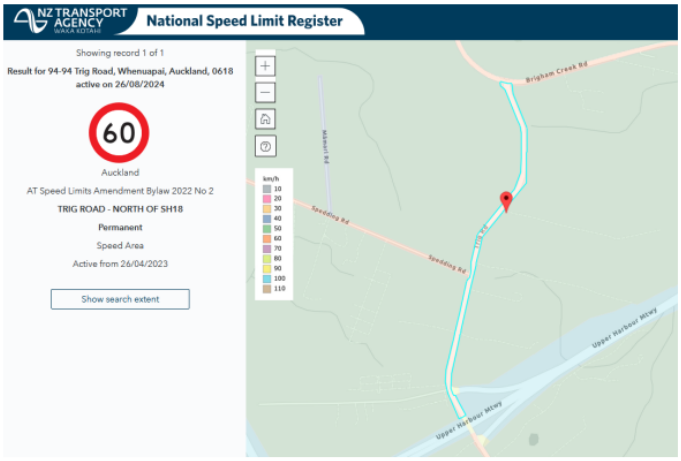
**Ref # 1 Crash History**

Please provide a more detailed safety assessment of Trig Road /Spedding Road intersection and the impacts of the additional trips generated by the plan change.

The Trig Road / Spedding Road intersection is required to be upgraded to a signalised intersection, as prescribed in Spedding Block Precinct Plan 3. The Engineering Approval for the design of this intersection has been lodged by Spedding Land Company Limited under ENG60424841. It is standard practice for the design and construction of the intersection to be safety audited to ensure it functions at an acceptable level of safety.

All Police traffic accident reports in the immediate vicinity of the intersection over the last ten years have been researched. One serious injury pedestrian accident occurred at night in 2019 involving a pedestrian standing on Spedding Road and was struck by a car inbound from Trig Road. A second minor injury accident occurred during the day in 2017 involving an outbound motorist entering Trig Road without giving way.

These accidents occurred prior to a speed limit reduction to 60km/hr that was active from 26/04/2023.



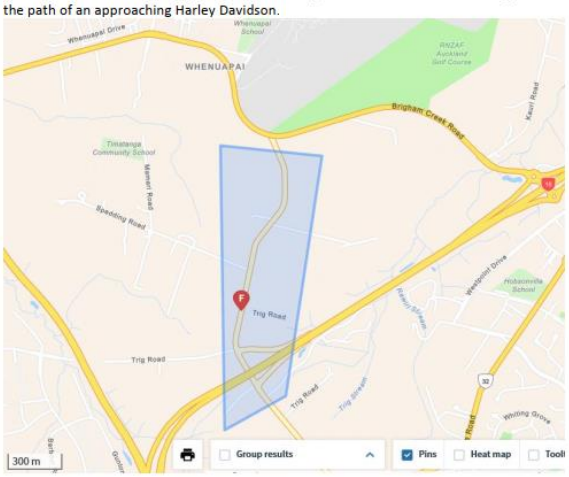

There are clear sightlines at the intersection and the ten year accident record does not indicate any significant operational issues with the intersection. The predicted 291 WBPPC peak hour trips travelling through the intersection is not expected to exacerbate the accident record given the minimal number, type and nature of the accidents recorded. With the impending upgrade to a signalised intersection, the resulting



| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|

urbanisation of the roading environment in the vicinity is beneficial for delineation and lighting of the intersection and an overall general improvement for existing traffic and for future traffic growth.

The reported fatal accident occurred 300 metres south of Spedding Road on Sunday February 2021. As detailed in our previous reply this accident occurred when the speed limit was 80km/hr and involved a Hilux turning into a driveway located on a straight section of Trig Road into the path of an approaching Harley Davidson.




**Ref # 3 Traffic Demands**

For the Trip Distribution Plan diagrams, we note that there appears to be some missing traffic volumes between intersections. For example in the AM peak, there appears to be 100 vehicles per hour missing between Kauri Road and the SH18 interchange for the southbound traffic (green text). This should be checked in case it affects the SIDRA modelling, and updated as required.

The 'missing' 100 vehicles per hour has been checked, and the difference occurs because the Kauri Road and SH18 traffic surveys have been undertaken on different days (Kauri on Thur 8/02/2024 and SH18 on Tue 31/05/2022). The peak hour for both Kauri and SH18 in the AM is 7:15-8:15, which confirms the peak is consistent between the two periods surveyed. Refer to the traffic survey graphs and spreadsheets provided for reference again below with the relevant comparisons highlighted in green. The difference between the two surveys in the extrapolated 2030 year is 43 in the morning peak and 55 in the evening peak, which is within normal daily and hourly variations.

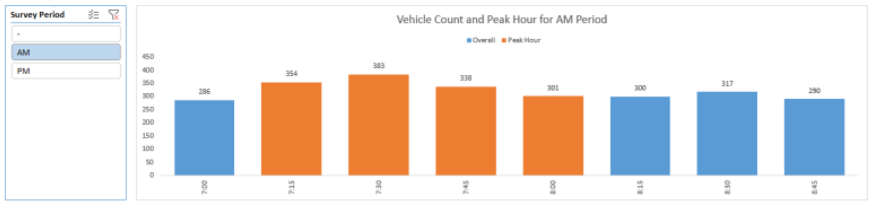
| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|

**Peak Hour**

The peak hour for AM is 1376 vehicles between 07:15 and 08:15
The peak hour for PM is 1563 vehicles between 16:30 and 17:30

team www.teamtraffic.co.nz

Select Survey Period to view




**Kauri Rd - Brigham Creek Rd** **Weather Fine** **Thurs 08/02/2024**

| | AM | | | | | | | | PM | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | Trucks | Buses | HV% | Cyclists | Total Veh | 5% growth to 2028 | 2.6% growth to 2030 | Cars | Trucks | Buses | HV% | Cyclists | Total veh | 5% growth to 2028 | 2.6% growth to 2030 |
| Kauri Rd | 213 | 12 | 6 | 7.8 | 2 | 231 | 277 | 267 | 128 | 8 | 4 | 8.6 | 4 | 140 | 168 | 162 |
| Left into Brigham Creek Rd (S/E) | 185 | 8 | 6 | 7.0 | 2 | 199 | 239 | 230 | 112 | 8 | 4 | 9.7 | 4 | 124 | 149 | 143 |
| Right into Brigham Creek Rd (N/W) | 28 | 4 | 0 | 12.5 | 0 | 32 | 38 | 37 | 16 | 0 | 0 | 0.0 | 0 | 16 | 19 | 18 |
| Brigham Creek Rd (S/E) | 401 | 40 | 6 | 9.3 | 6 | 497 | 596 | 575 | 773 | 26 | 3 | 3.6 | 3 | 802 | 962 | 927 |
| Thru to Brigham Creek Rd (N/W) | 394 | 36 | 5 | 9.4 | 1 | 435 | 522 | 503 | 598 | 22 | 1 | 3.7 | 1 | 621 | 745 | 718 |
| Right into Kauri Rd | 57 | 4 | 1 | 8.1 | 5 | 62 | 74 | 72 | 175 | 4 | 2 | 3.3 | 2 | 181 | 217 | 209 |
| Brigham Creek Rd (N/W) | 596 | 43 | 1 | 6.9 | 0 | 640 | 768 | 740 | 583 | 27 | 2 | 4.7 | 2 | 612 | 734 | 707 |
| Left into Kauri Rd | 17 | 1 | 0 | 5.6 | 0 | 18 | 22 | 21 | 21 | 3 | 0 | 12.5 | 0 | 24 | 29 | 28 |
| Thru to Brigham Creek Rd (S/E) | 579 | 42 | 1 | 6.9 | 0 | 622 | 746 | 719 | 562 | 24 | 2 | 4.4 | 2 | 588 | 706 | 680 |
| Total | 1260 | 95 | 13 | 7.9 | 8 | 1368 | 1642 | 1581 | 1484 | 61 | 9 | 4.5 | 9 | 1554 | 1865 | 1796 |
| | | | | | | | | 1524 | | | | | | | | 1750 |



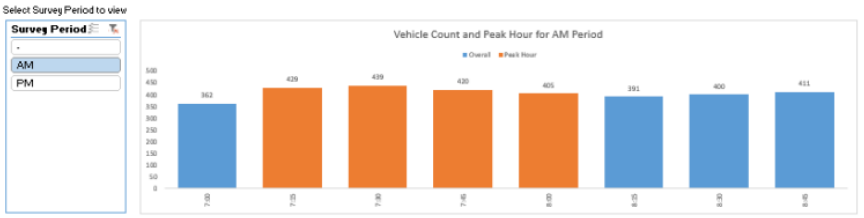
| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|

**Peak Hour**

The peak hour for AM is 1693 vehicles between 07:15 and 08:15
The peak hour for PM is 2207 vehicles between 16:00 and 17:00

team www.teamtraffic.co.nz

Select Survey Period to view




Peak Hour Table
Peak Marker 1
BRIGHAM CREEK RD / SH18 / SINTON RD ROUNDABOUT, TUE 31/05/2022

| | AM | | | | | | | | | PM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cars | Trucks | Buses | Cyclists | HV% | Total veh | 5% growth to 2028 | 2.6% growth to 2030 | | Cars | Trucks | Buses | Cyclists | HV% | Total veh | 5% growth to 2028 | 2.6% growth to 2030 | |
| Sinton Road (North) | 40 | 2 | 0 | 1 | 4.8 | 42 | 55 | 51 | | 31 | 4 | 0 | 0 | 11.4 | 35 | 46 | 42 | |
| Left into State Highway 18 (On Ramp) | 15 | 0 | 0 | 0 | 0.0 | 15 | 20 | 18 | | 12 | 0 | 0 | 0 | 0.0 | 12 | 16 | 14 | |
| Thru to Brigham Creek Road (Southeast) | 21 | 0 | 0 | 0 | 0.0 | 21 | 27 | 25 | | 14 | 4 | 0 | 0 | 22.2 | 18 | 23 | 22 | |
| Left into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Right into Brigham Creek Road (West) | 4 | 2 | 0 | 1 | 33.3 | 6 | 8 | 7 | | 5 | 0 | 0 | 0 | 0.0 | 5 | 7 | 6 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| State Highway 18 (On Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Left into State Highway 18 (Southeast) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Thru into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Left into Brigham Creek Road (West) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Right into Sinton Road | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Brigham Creek Road (Southeast) | 554 | 38 | 3 | 1 | 6.9 | 595 | 774 | 719 | | 794 | 38 | 3 | 2 | 4.9 | 835 | 1086 | 1009 | |
| Left into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Thru to Brigham Creek Road (West) | 421 | 33 | 3 | 1 | 7.9 | 457 | 594 | 553 | | 602 | 33 | 2 | 2 | 5.5 | 637 | 828 | 768 | |
| Left into Sinton Road | 9 | 2 | 0 | 0 | 18.2 | 11 | 14 | 13 | | 31 | 2 | 0 | 0 | 6.1 | 33 | 43 | 40 | |
| Right into State Highway 18 (On Ramp) | 124 | 3 | 0 | 0 | 2.4 | 127 | 165 | 153 | | 161 | 3 | 1 | 0 | 2.4 | 165 | 215 | 199 | |
| State Highway 18 (Off Ramp) | 310 | 36 | 0 | 0 | 10.4 | 346 | 450 | 418 | | 643 | 15 | 2 | 0 | 2.6 | 660 | 858 | 797 | |
| Left into State Highway 18 (On Ramp) | 1 | 0 | 0 | 0 | 0.0 | 1 | 1 | 1 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Left into Brigham Creek Road (West) | 54 | 5 | 0 | 0 | 8.5 | 59 | 77 | 71 | | 170 | 9 | 2 | 0 | 6.1 | 181 | 235 | 219 | |
| Thru to Sinton Road | 5 | 0 | 0 | 0 | 0.0 | 5 | 7 | 6 | | 12 | 1 | 0 | 0 | 7.7 | 13 | 17 | 16 | |
| Right into Brigham Creek Road (Southeast) | 250 | 31 | 0 | 0 | 11.0 | 281 | 365 | 339 | | 461 | 5 | 0 | 0 | 1.1 | 466 | 606 | 563 | |
| Brigham Creek Road (West) | 643 | 54 | 7 | 4 | 8.7 | 704 | 915 | 850 | | 636 | 27 | 8 | 4 | 5.2 | 671 | 872 | 811 | |
| U-Turn | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Left into Sinton Road | 4 | 0 | 0 | 0 | 0.0 | 4 | 5 | 5 | | 9 | 0 | 0 | 2 | 0.0 | 9 | 12 | 11 | |
| Thru to State Highway 18 (On Ramp) | 560 | 40 | 2 | 0 | 7.0 | 602 | 783 | 727 | | 520 | 21 | 4 | 0 | 4.6 | 545 | 709 | 658 | |
| Left into Brigham Creek Road (Southeast) | 79 | 14 | 5 | 4 | 19.4 | 98 | 127 | 118 | | 107 | 6 | 4 | 2 | 8.5 | 117 | 152 | 141 | |
| Right into State Highway 18 (Off Ramp) | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | |
| Total | 1547 | 130 | 10 | 6 | 8.3 | 1687 | 2193 | 2038 | | 2104 | 84 | 13 | 6 | 4.4 | 2201 | 2861 | 2659 | |
| | | | | | | | | 1481 | | | | | | | | | 1805 | |

| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|
| **Ref # 5 Mode Share Assessment**<br>Please provide clarity around the assumptions regarding person trip rates and vehicle trip rates, and update the mode share assessment, and vehicle traffic modelling, as appropriate. | Person trip rates have not previously been calculated. Person trips in the peak hour is calculated to be 550, which is based on 0.5 trips per employee where Insight Economics Ltd has estimated approximately 1,100 WBPPC employees.<br><br>From our previous modelling of 950 vehicle trips that identified sensitivities on the network, subsequent modelling applying a forecast 25% mode shift to walk, cycle, PT and car share trips resulted in 725 vehicle trips being modelled. The SIDRA models with 725 trips evidence spare capacity in the network. On this basis, it is proposed to limit WBPPC development to 725 vehicle trips. The mechanism for this can be through development caps or traffic volume thresholds and will be dealt with in redrafted precinct provisions to be supplied by Campbell Brown Planning.<br><br>It is reminded that a recommended trip generation rate established for an industrial precinct in Silverdale for a Warkworth Structure Plan of 20 trips per hectare results in 720 peak hour trips when applied to the WBPPC's 36 developable hectares. Provided the WBPPC development is not more intensive than the Silverdale precinct i.e. with a higher percentage of smaller format higher traffic generating type light industrial activities, there is a high confidence level that the modelled 725 WBPPC vehicle trips is an accurate reflection of the 2030 outcome. |
| **Ref # 6 Modelling trip Distribution**<br>Please provide further detail and justification for the 40% vehicle trip distribution to Trig Road.<br>Should the trip distribution assessment show trips heading south on Trig Road towards/from Westgate, please assess effects at the Trig Road/Hobsonville Road intersection.<br><br>Flow Comment:<br>We suggest that the Trig Road interchange is unlikely to serve many trips to and from SH18, as it only serves trips travelling to/from the northeast. Trips travelling in this direction would instead be able to use the Brigham Creek Road interchange as a more direct connection point to SH18. | Upgrading of the BCR/Trig roundabout is expected to make the Trig/SH18 route more attractive for the dominant BCR traffic that travels between the northwest and Albany. Also, with travel time being similar and subjectively more direct, these considerations provide confidence that 2/5th of WBPPC traffic instead of the previous 1/3rd is expected to travel via Trig Road.<br><br>Regarding Trig Road/Hobsonville Road intersection, 253 WBPPC peak hour trips are predicted at this intersection which is based on the SGA SATURN model distribution at the SH18/Trig Road interchange. There is a long term plan for this intersection to be signalised by funding under HIF loans from central government and it is expected the signalised design will be future proofed for traffic growth. |
| **Ref # 8 Modelling of Trig Rd/SH18 Offramp**<br>Please calibrate the Trig Road / SH18 assessment to **take account of existing right turn behaviour from the SH18 off-ramp.**<br><br>Should the right turns at the Trig Road off-ramp be predicted to operate at/near full capacity and long delays, please assess if any mitigation may be required.<br><br>Note: we recommend that NZTA Waka Kotahi is provided opportunity to provide comments on the modelling results at the SH18 interchanges at Brigham Creek Road and Trig Road. | Trig Road's generously wide 3.3 metre median provides confidence that a large percentage of right turning motorists undertake a 2-stage right turn manoeuvre. The traffic survey video files have since been reviewed to calibrate the offramp SIDRA model based on observed queues, delays and driver behaviour.<br><br>The SIDRA movement summaries for the calibrated base model and 2030 model is provided in Appendix A (for the more sensitive offramp intersection in the PM). The evening period with higher offramp volumes is the critical period to analyse and the base model in this period has insignificant queuing and delays with a Level of Service LoSB, as was observed in the traffic survey video. The 2030 model results in the Level of Service decreasing to LoSE for the right turn movement with the average delay increasing from 11 seconds to 45 seconds and the 95 percentile queue increasing from effectively zero to a queue of 31 metres. The reduction in level of service is primarily due to the increased delays and not the queue length and there is no impact on SH18 given that the offramp lane is 370 metres long.<br><br>From observing the video it is clear that right turning motorists are required to pull up to, and even slightly beyond, the Stop Priority Control limit line to observe motorists approaching from the north. This is both a potential safety concern and limits capacity by increasing the gap |



| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
|---|---|
| | acceptance required for motorists to initiate their right turn. Improving this visibility situation can be achieved by sight benching and removal of vegetation (mature Harekeke) on the corner of the right turn lane, this is circled in the following image sourced from Google Street View. With improved visibility motorists approaching the limit line have significantly longer opportunity to observe traffic approaching from the north (Trig Road north), which will significantly mitigate safety concerns with restricted visibility and increase capacity.<br><br>  <br><br>Regarding comments from NZTA. We note that NZTA will have the ability to review at the notification stage, once a preliminary position has been agreed with Council and Auckland Transport. |
| **Ref # 9 Staging Plan**<br>Please assess how pedestrians will be able to cross Brigham Creek Road and Trig Road safely should the red stage be developed first in isolation, to provide connectivity to the Whenuapai Centre.<br>Please assess how pedestrian crossing points can be provided safely on Trig Road and Brigham Creek Road for potential bus stops, when considering staging and the full buildout . | For the red stage, intersections A and B have now been revised to enable pedestrian crossing facilities of both Trig Road and BCR as a prerequisite.<br><br>The following pedestrian crossing points are available for each stage and these are identified on Drawing No 47712-DR-C-8100:<br>- Blue stage, intersection D crossing for BCR<br>- Green stage, intersection B for crossing BCR<br>- Orange stage, intersection A for crossing Trig Road and intersection B for crossing BCR<br>- Red stage, intersection A for crossing for Trig Road and intersection B for crossing BCR |
| **Ref # 11 Trig Road Access**<br>Please provide further details of the 'workable compromise' with identified access points and Vehicle Access Restrictions on Trig Road. | A plan identifying an access point is provided on Drawing No 47712-DR-C-8103, which is on a new western leg of the proposed roundabout access to WBPPC. |

| AUCKLAND COUNCIL FEEDBACK ITEMS | RESPONSE |
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| **Ref # 12 Brigham Creek Rd/Trig Rd Roundabout**<br>Please outline if a safe pedestrian crossing can be provided on the west Brigham Creek Road approach of the Brigham Creek Road / Trig Road roundabout. | We do not consider a safe pedestrian crossing can be provided on the west BCR approach at a point where a safe median refuge can be provided between single opposing traffic lanes. The Brigham Creek Road reserve is constrained between two NZDF owned land parcels which prevents widening the median for safe refuge at this location, refer to the below plan that dimensions the road reserve width constraint of 20 metres.<br>  <br> |



| AUCKLAND TRANSPORT FEEDBACK ITEMS | RESPONSE |
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| **Ref # (no number) - Updated Trip Distribution**<br>For clarity, please set out (e.g. in bullet points) which plan changes and other projects have been included in the analysis (e.g. PC69, PC86, Whenuapai Green etc). | PC69 traffic output from the SATURN model has been included as requested. PC86 volumes are minor and make up the 2.6% background growth that has been included. For example, the PC86 traffic volume on BCR west of Trig Road is 45 and 42 in the AM and PM respectively. This traffic will be further split at the BCR / Trig Rd intersection. By comparison, the 2.6% growth for the section of BCR west of Trig Rd equates to 216 in the AM, and 278 in the PM.<br><br>To summarise:<br>- PC69 is included.<br>- PC86 traffic is excluded, but sufficiently low to be included within the background growth assessment. PC86 is capped at a maximum of 120 dwellings after which the provision of a local road connection between Māmari Road and Brigham Creek Road through the precinct is required.<br>- Whenuapai Green traffic is excluded on the basis that WBPPC was lodged first and the Whenuapai Green ITA includes WBPPC trip generation. To include in both applications would be double counting. |
| **Ref # 9 – BCR / Road 1 Signals**<br>The model has been updated to a 100 second cycle time as requested. However, Commute has some concerns about the 'wider' traffic volume distribution (this is discussed in next item but Commute wants to be sure that the volumes used for assessment at this intersection are correct). No movement summaries were provided for review and the SIDRA files provided did not include this intersection. Please check trip distribution and provide SIDRA 'movement summaries' to understand degree of saturation for each movement. | The SIDRA movement summary is attached in Appendix B and trip distribution and traffic volumes have been checked. Two movement summaries are provided for each peak period. This is because there is a second model without a pedestrian crossing movement on the BCR east approach to the intersection. This is provided for comparison purposes because it is not expected that a pedestrian crossing will be called on all intersection legs on every cycle.<br><br>It is noted that the benefit of signals is that phase times can be preset, or actuators installed, to favour critical movements. The critical movement in this case being the eastern approach that is 600 metres from SH18's offramp. The longest queue on this approach occurs in the morning with the peak hour 95 percentile queue without a pedestrian crossing phase for the eastern approach being 173 metres, and with a pedestrian crossing called on all approaches is 525 metres.<br><br>It can therefore be expected that with moderate numbers of pedestrians present that call pedestrian crossing phases on all legs of the intersection for half of the cycles in a peak hour, the 95 percentile peak hour queue will be midway between 173-525 metres (349 metres), which does not compromise SH18. |

| AUCKLAND TRANSPORT FEEDBACK ITEMS | RESPONSE |
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**Ref # 11 - Brigham Creek Rd / Trig Rd Roundabout**

Please check vehicle distribution. For example, at the Trig Road / Collector Road 2 intersection in the AM peak hour, the SIDRA models (as per volume summaries in Appendix B of the TEAM memo) have a northbound through volume on Trig Road of 784 vehicles per hour, however the northbound flow on Trig Road at the Brigham Creek Road / Trig Road intersection is 208 vph. Where have all the vehicles gone? On the trip distribution plans, please show through volumes at all intersections to assist the reviewer.

Also, AT subject matter experts would like to understand the difference between a single lane roundabout at the BCR / Trig Road intersection and the current proposal (single lane roundabout with a second lane on Brigham Creek Road west). We need to compare the options using the same volumes. Please provide movement summaries for quick comparison between options.

This has arisen because there are two traffic surveys of the Trig Road / SH18 interchange, one for the off ramp and the other for the onramp. These are copied below for reference.

The through volume on the distribution plan is from the offramp survey. It is difficult for legibility and balancing to include the through volume for the onramp on the distribution plan. The right turn onto the onramp on the distribution plan is from the onramp survey. The SIDRA model of the Trig Road / Collector Road 2 intersection incorrectly includes the onramp right turn movements which accounts for 'where have all the vehicles gone'. There has been no understating of traffic movements, the Trig Road / Collector Road 2 volumes are significantly overstated (incorrectly includes the onramp right turn volumes) and no sensitivity is identified at this roundabout.

The trip distribution plan originally included only the WBPPC trip generation to avoid this mistake of double counting, but at Council and Auckland Transport's request the base traffic volumes were added and as mentioned not all the traffic survey data can be legibly included on the distribution plans. With multiple traffic surveys the base traffic volumes should be referenced directly from the traffic survey spreadsheet data.

| Trig Rd - SH18 - Off Ramp | Weather Fine | | Tue 30/04/2024 | | | | |
|---|---|---|---|---|---|---|---|
| | AM | | | | | | |
| | Cars | Trucks | Buses | HV% | Cyclists | AM Total | 2.6% growth to 2030 |
| Trig Rd (North) | 138 | 29 | 3 | 18.8 | 0 | 170 | 197 |
| Thru to Trig Rd (South) | 138 | 29 | 3 | 18.8 | 0 | 170 | 197 |
| SH 18 - Off Ramp | 110 | 6 | 0 | 5.2 | 0 | 116 | 134 |
| Left into Trig Rd (South) | 85 | 2 | 0 | 2.3 | 0 | 87 | 101 |
| Right into Trig Rd (North) | 25 | 4 | 0 | 13.8 | 0 | 29 | 34 |
| Trig Rd (South) | 437 | 17 | 2 | 4.2 | 3 | 456 | 527 |
| Thru to Trig Rd (North) | 437 | 17 | 2 | 4.2 | 3 | 456 | 527 |
| Grand Total | 685 | 52 | 5 | 7.7 | 3 | 742 | 858 |
| | PM | | | | | | |
| | Cars | Trucks | Buses | HV% | Cyclists | PM Total | 2.6% growth to 2030 |
| Trig Rd (North) | 332 | 6 | 2 | 2.4 | 1 | 340 | 393 |
| Thru to Trig Rd (South) | 332 | 6 | 2 | 2.4 | 1 | 340 | 393 |
| SH 18 - Off Ramp | 257 | 11 | 0 | 4.1 | 0 | 268 | 310 |
| Left into Trig Rd (South) | 212 | 5 | 0 | 2.3 | 0 | 217 | 251 |
| Right into Trig Rd (North) | 45 | 6 | 0 | 11.8 | 0 | 51 | 59 |
| Trig Rd (South) | 239 | 23 | 2 | 9.5 | 1 | 264 | 305 |
| Thru to Trig Rd (North) | 239 | 23 | 2 | 9.5 | 1 | 264 | 305 |
| Grand Total | 828 | 40 | 4 | 5.0 | 2 | 872 | 1008 |



| AUCKLAND TRANSPORT FEEDBACK ITEMS | RESPONSE |
|---|---|

| Trig Rd - SH18 - On Ramp | Weather Fine | | Tue 30/04/2024 | | | | |
|---|---|---|---|---|---|---|---|
| | AM | | | | | | |
| | Cars | Trucks | Buses | HV% | Cyclists | AM Total | 2.6% growth to 2030 |
| Trig Rd (North) | 142 | 24 | 2 | 15.5 | 0 | 168 | 194 |
| Left into SH 18 - On Ramp | 18 | 5 | 0 | 21.7 | 0 | 23 | 27 |
| Thru to Trig Rd (South) | 121 | 18 | 2 | 14.2 | 0 | 141 | 163 |
| Right into Driveway | 3 | 1 | 0 | 25.0 | 0 | 4 | 5 |
| Trig Rd (South) | 485 | 21 | 3 | 4.7 | 3 | 509 | 588 |
| Left into Driveway | 8 | 3 | 0 | 27.3 | 0 | 11 | 13 |
| Thru to Trig Rd (North) | 170 | 13 | 3 | 8.6 | 3 | 186 | 215 |
| Right into SH 18 - On Ramp | 307 | 5 | 0 | 1.6 | 0 | 312 | 361 |
| Driveway | 5 | 6 | 0 | 54.5 | 0 | 11 | 13 |
| Left into Trig Rd (North) | 1 | 0 | 0 | 0.0 | 0 | 1 | 1 |
| Thru to SH 18 - On Ramp | 2 | 0 | 0 | 0.0 | 0 | 2 | 2 |
| Right into Trig Rd (South) | 2 | 6 | 0 | 75.0 | 0 | 8 | 9 |
| Grand Total | 632 | 51 | 5 | 8.1 | 3 | 688 | 795 |
| | PM | | | | | | |
| | Cars | Trucks | Buses | HV% | Cyclists | PM Total | 2.6% growth to 2030 |
| Trig Rd (North) | 364 | 15 | 2 | 4.5 | 1 | 381 | 440 |
| Left into SH 18 - On Ramp | 15 | 4 | 0 | 21.1 | 0 | 19 | 22 |
| Thru to Trig Rd (South) | 348 | 11 | 2 | 3.6 | 1 | 361 | 417 |
| Right into Driveway | 1 | 0 | 0 | 0.0 | 0 | 1 | 1 |
| Trig Rd (South) | 274 | 37 | 3 | 12.7 | 1 | 314 | 363 |
| Left into Driveway | 4 | 6 | 0 | 60.0 | 0 | 10 | 12 |
| Thru to Trig Rd (North) | 171 | 23 | 2 | 12.8 | 1 | 196 | 227 |
| Right into SH 18 - On Ramp | 99 | 8 | 1 | 8.3 | 0 | 108 | 125 |
| Driveway | 7 | 5 | 0 | 41.7 | 0 | 12 | 14 |
| Left into Trig Rd (North) | 4 | 0 | 0 | 0.0 | 0 | 4 | 5 |
| Thru to SH 18 - On Ramp | 0 | 1 | 0 | 100.0 | 0 | 1 | 1 |
| Right into Trig Rd (South) | 3 | 4 | 0 | 57.1 | 0 | 7 | 8 |
| Grand Total | 645 | 57 | 5 | 8.8 | 2 | 707 | 817 |

Regarding the difference between a single lane roundabout at the BCR / Trig Road intersection and the current roundabout design with a second lane on BCR west, refer to the SIDRA movement summaries in Appendix C. The difference in queue length for the identified sensitive BCR west approach in the PM peak is 130 metres with the extra lane, and 150 metres without it. There is also reduced queue lengths on the Trig Road and BCR west approaches with the extra lane. With the previous trip distribution modelling the west approach has been identified as sensitive and the extra lane now proposed provides beneficial spare capacity.

| AUCKLAND TRANSPORT FEEDBACK ITEMS | RESPONSE |
|---|---|
| **Ref # 12 – Brigham Creek Rd SH18 Interchange**<br>Commute has printed off network site summaries for the 2030 with WBP scenario and note that there is substantial queuing and delays at the SH18 Brigham Creek South roundabout – essentially the plan change results in this roundabout being over capacity in the morning peak hour. This is not considered acceptable. Provide further commentary to justify why this is considered to be an appropriate level of effects.<br><br>Queues on the BCR east approach are also very long (over 1km) and therefore warrant analysis of the SH18 southbound offramp onto Brigham Creek Road – are queues onto the motorway anticipated? | An incorrect SIDRA network model was sent, the correct model has now been sent direct to Commute with clarification.<br>The model also included the Brigham Creek Road / Kauri Road intersection and the queue from the Brigham Creek Road north roundabout on the BCR West approach extends to 235m i.e. not quite up to the Kauri Road. This approach performance is considered acceptable. |
| **Ref # 13 – Trig Rd / SH18 Interchange**<br>Please check volumes as per previous items. Sight distance at the SH18 / Trig Road offramp is considered to be restricted. Given the potential for queuing at the offramp, and the need to undertake at least some two stage right turns to operate acceptably, does the applicant consider this level of performance acceptable, and safe? | Traffic volumes have been checked as detailed in the Ref # 11 Auckland Transport response and Ref # 8 Council response. Refer to the following photos that confirm clear sightlines from the Stop Priority Control limit lines. Note the vegetation on the corner that is discussed together with level of performance and safety in Ref # 8.<br>  |



| AUCKLAND TRANSPORT FEEDBACK ITEMS | RESPONSE |
|---|---|
| **Ref # 14**<br>Commute notes that the gap acceptance parameters for the right turn from Brigham Creek Road into Kauri Road have been reduced. Was there a reason for this? (The right turn out gap acceptance has been changed as well however this is considered to be realistic versus the standard defaults). | Gap Acceptance values at BC/Kauri Road have been lowered compared to SIDRA defaults but line up with Austroads values. Please see the chart below, which is sourced from Table 6.1 in the Austroads Guide to Traffic Management Part 3.<br><br>**Table 6.1: Critical gap and follow-up headway parameters for two-way sign-controlled intersections in SIDRA intersection (template setting for 4-way intersections)** |

| Standard driving on the left model | | | | | | |
|---|---|---|---|---|---|---|
| | 2-lane major road | | | 4-lane major road | | |
| **STOP sign** | $t_c$ | $t_f$ | s | $t_c$ | $t_f$ | s |
| Minor road: left turn | 4.5 | 2.5 | 1440 | 5.0 | 3.0 | 1200 |
| • through | 5.0 | 3.0 | 1200 | 6.5 | 3.5 | 1029 |
| • right turn | 5.5 | 3.5 | 1029 | 7.0 | 4.0 | 900 |
| Right turn from major road | 4.0 | 2.0 | 1800 | 4.5 | 2.5 | 1440 |
| **GIVE-WAY / YIELD sign** | $t_c$ | $t_f$ | s | $t_c$ | $t_f$ | s |
| Minor road: left turn | 4.0 | 2.2 | 1636 | 4.5 | 2.7 | 1333 |
| • through | 4.5 | 2.7 | 1333 | 6.0 | 3.2 | 1125 |
| • right turn | 5.0 | 3.2 | 1125 | 6.5 | 3.7 | 973 |
| Right turn from major road | 4.0 | 2.0 | 1800 | 4.5 | 2.5 | 1440 |

*Source: SIDRA Intersection User Guide (Akçelik & Associates 2011).*

# Whenuapai Business Park

## Clause 23 transport responses

| | |
|---|---|
| **Prepared for** | Neil Construction Ltd |
| **Project Number** | TNEGL-J002 |
| **Revision** | A |
| **Issue Date** | 27 August 2024 |
| **Prepared by** | Regan Toogood, Graduate Transportation Modeller |
| **Reviewed by** | Mat Collins, Associate Transportation Engineer |

Neil Construction Limited (NCL) commissioned Abley Limited (Abley) to assist Team Traffic with responses to Clause 23 information requests with respect to the Whenuapai Business Park (WBP) Plan Change, Whenuapai in Auckland (the site).

This technical note provides Abley's information to support Team Traffic's responses to Auckland Council (Council) and Auckland Transport (AT) Clause 23 requests for information (RFI).

# 1. Council RFIs

For each Council RFI we have paraphrased the request from Council in a separate subsection and provided our response.

### 1.1 RFI 3 Traffic Demands

**Council request**

*For the Trip Distribution Plan diagrams, we note that there appears to be some missing traffic volumes between intersections. For example in the AM peak, there appears to be 100 vehicles per hour missing between Kauri Road and the SH18 interchange for the southbound traffic (green text). This should be checked in case it affects the SIDRA modelling, and updated as required.*

**Abley response**

We confirm that our SIDRA modelling for SH18/Brigham Creek Road/Kauri Road intersections and SH18/Trig Road interchange have used Team Traffic's trip distribution diagrams.

### 1.2 RFI 5 Mode Share Assessment

**Council request**

*Please provide clarity around the assumptions regarding person trip rates and vehicle trip rates, and update the mode share assessment and vehicle traffic modelling as appropriate.*

**Abley response**

We understand that revised precinct provisions will include a development cap with a 725 veh/hour limit. We confirm that our SIDRA modelling supplied to Team Traffic is based on WBP generating 725 veh/hour and therefore support the proposed development cap.

### 1.3 RFI 6 Modelling Trip Distribution

**Council request**

*Please provide further detail and justification for the 40% vehicle trip distribution to Trig Road. Should the trip distribution assessment show trips heading south on Trig Road towards/from Westgate, please assess effects at the Trig Road/Hobsonville Road intersection.*

**Abley response**

This distribution is based on engineering judgement supported by consideration of existing operating conditions. In the evening peak Google Maps indicates that it is time compatible to use the SH18/Trig Road interchange vs the SH18/Brigham Creek interchange, as shown in the Figures below. With the average distance navigating through the WBP site being approximately equal between accessing each interchange, the 40% share to Trig Rd is seen as appropriate.


**Figure 1.1 Departure at 17:00 from Trig Rd access to WBP (source: Google Maps)**

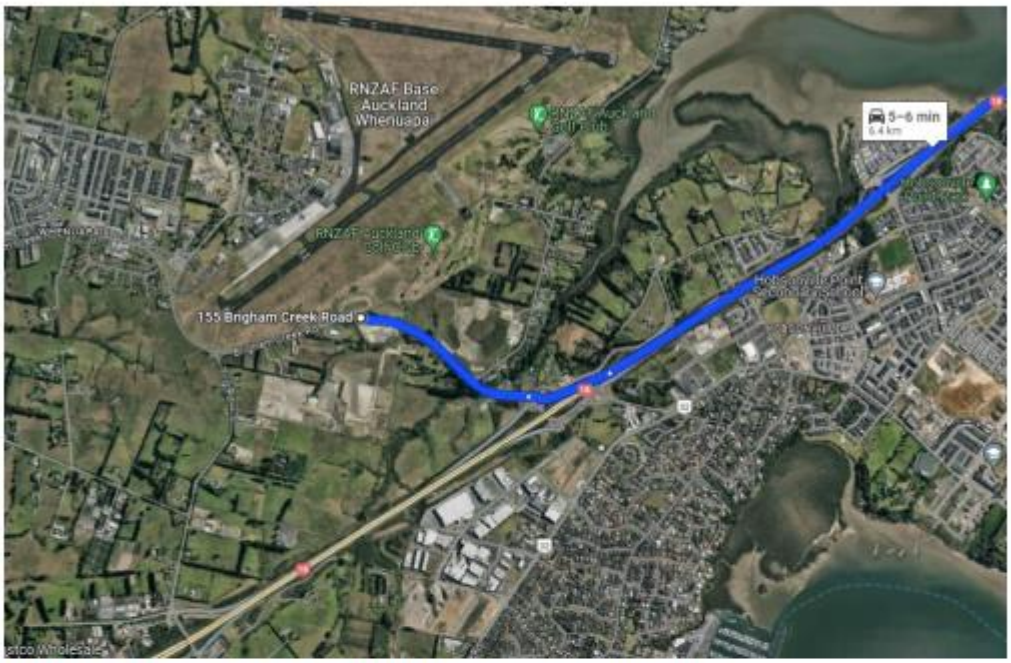


Figure 1.2 Departure at 17:00 from Brigham Creek Rd access to WBP (source: Google Maps)

# 2. Auckland Transport RFIs

For each Auckland Transport RFI we have paraphrased the request from Auckland Transport in a separate subsection and provided our response.

## 2.1 RFI 12 Brigham Creek Road / SH18 interchange

### Auckland Transport request

*Queues on the Brigham Creek Road east approach to the SH18/Brigham Creek Road interchange are over 1km long, are queues onto the motorway anticipated.*

### Abley response

We supplied the wrong SIDRA file to Commute, and we have now supplied the correct file. We explain the the differences between the outdated model and the model used for Clause 23 responses below.

The issue with the ramp signal timings came due to a statistical model that we built that predicted red times based on onramp flow and state highway flow - this gave sensible results that reconciled with the base year for the North roundabout ramps. However, the results from the model based on the south roundabout data produced some non-intuitive results that did not reconcile with the base year, which we tested in the SIDRA models. We opted to keep the ramp signal timings the same as in the base year into the future for the south roundabout on ramp. The model files that were sent through had the statistical model red time predictions in the morning peak only, which was incorrect.

We are happy to meet with Commute to further discuss if this would assist their review.

## 2.2 RFI 14 Other Intersections

### Auckland Transport request

*Commute notes that the gap acceptable parameters for the right turn from Brigham Creek Road into Kauri Road have been reduced. Was there a reason for this?*

### Abley response

Gap Acceptance values at Brigham Creek Road/Kauri Road were lowered compared to SIDRA defaults but comply with Austroads values per Table 6.1 in the Austroads Guide to Traffic Management Part 3. Table 6.1 is reproduced in the Figure below.

**Table 6.1: Critical gap and follow-up headway parameters for two-way sign-controlled intersections in SIDRA intersection (template setting for 4-way intersections)**

| Standard driving on the left model | | | | | | |
|---|---|---|---|---|---|---|
| | 2-lane major road | | | 4-lane major road | | |
| **STOP sign** | $t_c$ | $t_f$ | s | $t_c$ | $t_f$ | s |
| Minor road: left turn | 4.5 | 2.5 | 1440 | 5.0 | 3.0 | 1200 |
| • through | 5.0 | 3.0 | 1200 | 6.5 | 3.5 | 1029 |
| • right turn | 5.5 | 3.5 | 1029 | 7.0 | 4.0 | 900 |
| Right turn from major road | 4.0 | 2.0 | 1800 | 4.5 | 2.5 | 1440 |
| **GIVE-WAY / YIELD sign** | $t_c$ | $t_f$ | s | $t_c$ | $t_f$ | s |
| Minor road: left turn | 4.0 | 2.2 | 1636 | 4.5 | 2.7 | 1333 |
| • through | 4.5 | 2.7 | 1333 | 6.0 | 3.2 | 1125 |
| • right turn | 5.0 | 3.2 | 1125 | 6.5 | 3.7 | 973 |
| Right turn from major road | 4.0 | 2.0 | 1800 | 4.5 | 2.5 | 1440 |

*Source: SIDRA Intersection User Guide (Akçelik & Associates 2011).*

**Figure 2.1 Table 6.1 in the Austroads Guide to Traffic Management Part 3**