TRAFFIC PLANNING CONSULTANTS LTD

PROPOSED PLAN CHANGE
AUCKLAND UNITARY PLAN

41-43 BRIGHAM CREEK ROAD
WHENUAPAI

INTEGRATED TRANSPORT ASSESSMENT

Prepared By:
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1.0 INTRODUCTION

This report provides an Integrated Transport Assessment for a proposal to rezone 41-43 Brigham Creek Road, Whenuapai from Future Urban zone to Mixed House Urban. The site is located immediately south of Brigham Creek Road and provides road frontage onto both Brigham Creek Road and Mamari Road. The area is generally rural in use to the south of Brigham Creek Road, with recently developed residential areas provided to the north.

The proposal intends to provide a zone that will enable the establishment of approximately 260 residential dwellings. The proposal is consistent with Auckland Council's Draft Structure Plan for Whenuapai.

The assessment will consider the proposed changes to the future road environment identified in the north-west Auckland region, and within Whenuapai. It will also refer to the Whenuapai Structure Plan.

The key transportation consideration for this proposal is the accessibility of the plan change area to the various modes of transport, and the ability of the surrounding road network to support the proposed development safely and efficiently.

Figure 1: General Site Location
Source: Geomaps, Auckland Council

2.0 EXISTING TRANSPORT ENVIRONMENT

2.1 Existing Site Traffic Conditions

The site is currently occupied by a rural residential use, associated parking and pastural land. There are two vehicle crossings currently serving the site one on Brigham Creek Road and one on Mamari Road.

2.2 The Surrounding Road Network and Activities

The site is bounded by Brigham Creek Road to the north, Mamari Road to the east and rural properties to the south and west. Opposite the site on both road is residential activity with commercial and retail activities further east. Whenuapai School is located approximately 800 metres to the east of the site on Brigham Creek Road.

Figure 2: Surrounding Land Use

2.3 Road Network

The access opportunities for the site are from Brigham Creek Road and Mamari Road adjacent to the site's northern and eastern site boundaries respectively. In the wider context, the site connects to State Highway 16 and State Highway 18 at each end of Brigham Creek Road.

2.3.1 Brigham Creek Road

Brigham Creek Road is classified as an arterial road under the AUP. To the east it provides a connection to State Highway 18 and into Hobsonville, and to the west it provides a connection to both State Highway 16 and State Highway 23, Fred Taylor Drive. Approximately 400 metres east of the site Brigham Creek Road forms part of a signalised crossroads intersection with Mamari Road and Totara Road.

Within the vicinity of the site Brigham Creek Road has a carriageway width of approximately 9.0 metres, providing one traffic lane in each direction and a central painted median. Right turn lanes are provided within the median where required for access to residential areas. The painted median is removed to the west and the road continues with one lane in each direction only.

The most recent traffic counts on Brigham Creek Road (between SH16 and Joseph McDonald Drive approximately 500 metres west of the site) were carried out Auckland Transport August 2019. Details of the traffic count are summarised in **Table 1**.

Table 1: Traffic Counts on Brigham Creek Road

Direction	Weekday	Saturday	Sunday	Weekday		
				AM Peak	Midday Peak	PM Peak
Both	14,413	12,702	11,083	1,297	1,124	1,235

As of June 2020, traffic flows were estimated to be about 9,990 vehicles per day along Brigham Creek Road on Mobilroad[1]. Development is currently occurring in the local area with vehicle access points being provided onto Brigham Creek Road, and as such traffic flows are expected to increase as development occurs.

2.3.2 Mamari Road

Mamari Road is a local road providing access to residential properties along its length. Mamari Road meets Brigham Creek Road at its northern end and terminates at a farmhouse at its southern end. At its northern end and where it intersects with Brigham Creek Road, it is controlled by traffic signals. Two lanes are provided at the intersection before it narrows to one lane, with road markings provided for approximately 80 metres. For its southern-most 150 metres it forms a gravel road. The road continues with a rural nature with no road markings provided, but with a general carriageway width of approximately 6.5 metres. As of June 2020, Mobilroad estimated 110 vehicle movements per day along Mamari Road.

2.3.3 State Highway 16

State Highway 16 (SH16) is a motorway that provides a link between Auckland City Centre to the south-east and continues north to Westgate. SH 16 continues north as an arterial through rural areas, providing an alternative route between Auckland and parts of Northland. SH16 currently carries an estimated 21,800 vehicles per day near the subject site.

2.3.4 State Highway 18

State Highway 18 (SH18) is also motorway that provides a link between Westgate at its western end and to SH1 near Rosedale at its eastern end. SH18 currently carries an estimated 23,700 vehicles per day near the subject site.

2.4 Road Safety History

Information from the New Zealand Transport Agency's "Crash Analysis System" for the latest available five-year period, January 2016 to December 2020, indicates that six crashes have been reported along Brigham Creek Road approximately 300 metres west of the site inclusive of the signalised intersection with Mamari Road and Totara Road. Four non-injury crashes were reported, with one minor injury crash, and one fatal injury crash.

The fatal injury crash occurred approximately 300 metres west of the site along Brigham Creek Road and occurred because of a head on collision between a car travelling westbound and a truck travelling eastbound. It is understood the road conditions were wet, the driver of the car was too far to the right and under the influence of drugs. This crash is not related to the operation of

[1] Mobilroad - https://mobileroad.org/desktop.html

Brigham Creek Road, nor would it suggest an inherent road safety issue concerning property access near the subject site.

The minor injury crash occurred at the Brigham Creek Road/Mamari Road/Totara Road signalised intersection to the north-east of the site and resulted from a vehicle travelling along Brigham Creek Road colliding with a vehicle merging from the left. It is understood the vehicle travelling along Brigham Creek Road failed to give-way to the merging vehicle.

Based on the above information, there is no trend that would suggest that a change in land use from urban to residential would have a detrimental impact on the safety or functionality of the surrounding road environment.

2.5 The Whenuapai Structure Plan

In September 2016, Auckland Council developed a Structure Plan for the Whenuapai area. The structure plan area is anticipated to provide somewhere between 8,100 to 10,700 dwellings (depending on the density of development), 8,600 jobs and over 300 hectares of new business land over the next 10 to 20 years. Development will be built out in stages as the provision of infrastructure allows for, in line with the growth identified in the whole of the northwest Auckland region.

Stage 1 of the Structure Plan area is split into six phases. These include areas of residential and business land that can be development ready within the next 2-10 years. Some land is being developed already and it has been identified that up to 1,800 dwellings can be built during the Stage 1 period from 2017-2021. Stage 2 comprises the remainder of the land that requires further investment for new infrastructure and is expected to be built out from 2021 onwards.

The Structure Plan was supported by an Integrated Transport Assessment (ITA) prepared by Flow Transportation[2]. The purpose of the ITA was to identify the proposed arterial and collector road network at a high level, along with the public transport network and active mode network to support the future growth in line with the Whenuapai Structure Plan.

The ITA also identified the anticipated trip generation and mode share for the various zoning and land uses set out in the structure plan. It also provided high level traffic modelling outputs, and recommended intersection treatments and road cross sections for the key roads.

The proposal is located within Stage 2 of the Future Urban Land Supply Strategy (FULSS) that includes the bulk of the Structure Plan area. ***Figure 3*** below illustrates the proposed zoning and under the Whenuapai Structure Plan. For the proposal site it is anticipated that the site would be zoned medium density.

[2] Whenuapai Structure Plan – Integrated Transport Assessment Report – July 2016

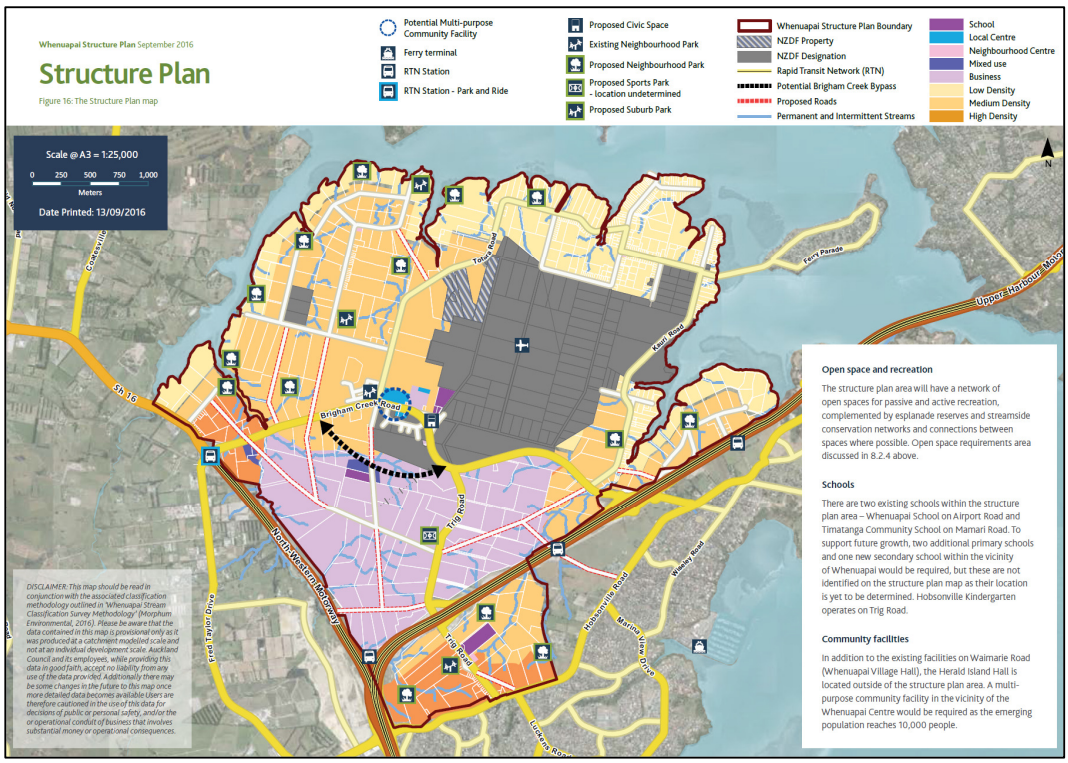


Figure 2 – Whenuapai Structure Plan – Proposed Zoning (September 2016)
Source: Auckland Council

2.6 Future Transport Context

New Zealand Transport Agency (NZTA) and Auckland Transport have proposed several upgrades and proposals to the road environment in the north-west Auckland region to facilitate to expansion of Whenuapai and the surrounding areas, as part of the Whenuapai Structure Plan and the supporting growth programme.

While the programme has been based on specific forecast years from the traffic modelling undertaken in the ITA, there is no certainty around the scale or location of land use and development within the structure plan area or elsewhere, or on the timing of the construction of uncommitted transport projects. Some land can be development ready between 2017 and 2021 where existing infrastructure can be utilised, or limited improvements are required.

Whilst the subject site is expected to operate efficiently within the surrounding road environment, and the proposed residential development on the site is not expected to adversely impact upon that, the planned upgrades will assist with future developments in the local area including the subject site. Several conceptual networks have been evaluated and the following preferred and indicative projects have been identified. ***Figure 4*** illustrates the location of these projects in relation to the site.

Most critical to the accessibility of the site are the Brigham Creek Road and Mamari Road improvements, as both these roads have frontage onto the site and are expected to provide access to the site now and in the future. Further discussion of these improvements and the access options are discussed below.

The site's improved connectively to other modes such as public transport, walking, and cycling will provide a choice of travel modes and a higher level of accessibility to the wider network as this infrastructure is developed. This in turn will reduce the private car demand for the site.

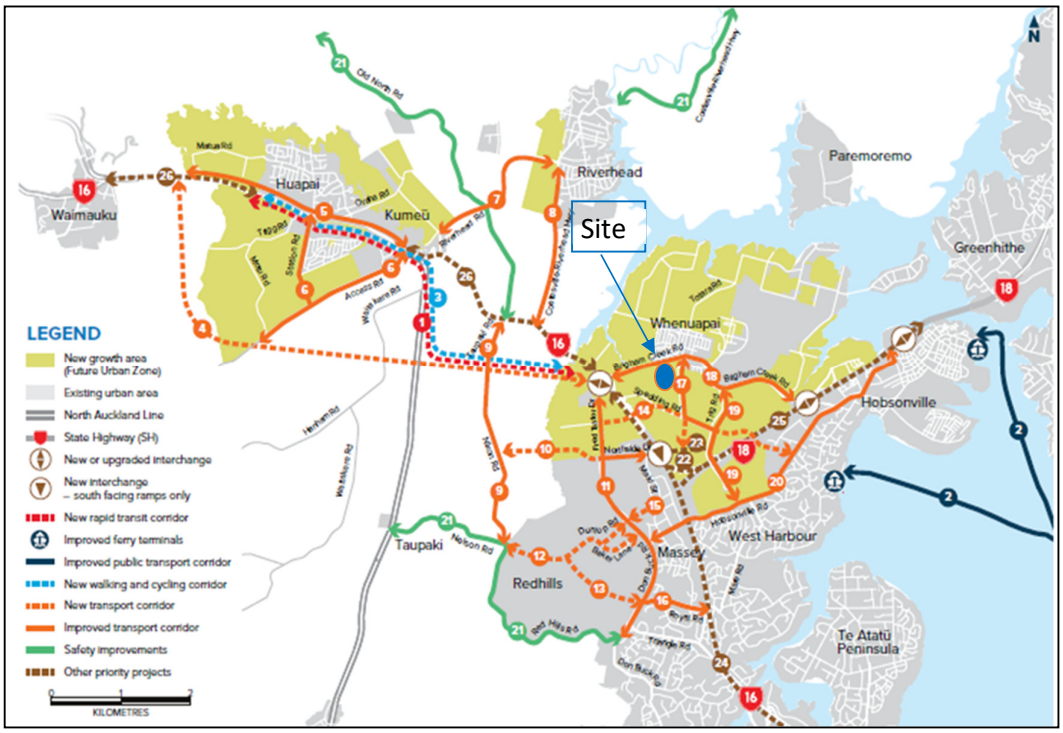


Figure 4: North-West Indicative Strategic Transport Network
Source: New Zealand Transport Agency/Auckland Transport

The following other projects are anticipated to be progressed through an alliance with Auckland Transport and NZTA to address the transport network issues in the north-west region:

- Direct State Highway connection between SH16-SH18, new shared paths and interchange upgrades. This will redirect users from existing local roads to the state highway and support arterial roads to better serve local communities;
- Upgrades to Northside Drive east. This will allow for provision of the SH16 south facing ramps, improving the connection between Westgate and Whenuapai; and
- Upper harbour rapid transit between Westgate and Hobsonville.

2.7 Existing Public Transport Accessibility

Bus route 114 is available on Totara Road approximately 400 metres from the site providing a link between Hobsonville and Westgate, via Whenuapai. Approximately 1.7 kilometres west of the site bus route 122 (Westgate – Huapai – Kumeu) and 125 (Helensville – Waimuka – Huapai – Kumeu – Westgate) and 125x (Helensville – Waimuka – Huapai – Kumeu – Westgate – Northwestern Motorway – Auckland City Centre).

The exiting public transport provision therefore provides a link to Auckland City Centre, as well as nearby areas such as Westgate. Within Westgate, a range of facilities are provided as well as a number of bus routes to other areas as shown in **Figure 5**. Overall, the existing public transport provision is considered suitable to serve the proposed development.

Figure 5: West Auckland Existing Public Transport Routes
Source: New Zealand Transport Agency/Auckland Transport

2.8 Future Public Transport Accessibility

Future public transport is planned for Whenuapai to support the planned population growth in the area. With improvements along both Brigham Creek Road and Mamari Road, bus services are expected to provide a direct link to surrounding areas for future residents. Bus services are expected to be provided every seven minutes along Brigham Creek Road into Whenuapai Road during peak hours, and every 3-4 minutes along Mamari Road.

Upgrades are proposed to the ferry interchanges in Hobsonville which will also provide options for future residents to travel by public transport. Bus services every 3-6 minutes are expected to be provided along Hobsonville Road.

The Rapid Transit Network extension to Kumeu and Huapai will help provide further options to travel by modes other than the private car.

2.9 Existing Pedestrian Accessibility

There is currently no footpath on the southern side of Brigham Creek Road or the western side of Mamari Road. Footpaths are provided on the northern side of Brigham Creek Road and eastern side of Mamari Road within the immediate vicinity of the site. To the east of Mamari Road footpaths are available on both sides of the road for approximately 450 metres, before a zebra crossing is provided over Brigham Creek Road and a shared footway/cycleway continues out of Whenuapai along the northern side of the road. A footpath continues along the southern side of Brigham Creek Road for approximately 220 metres providing pedestrian access for residential areas.

Figure 6 shows the 800 metres walking distance from the middle of the site. It shows the site lies within a convenient walking distance of public transport, residential and commercial activity, and the nearby Whenuapai School.

Figure 5: 400 metre Walking Contour from the Site
Source: New Zealand Transport Agency/Auckland Transport

2.10 Existing Cyclist Accessibility

Within the immediate vicinity of the site, separated cycleways are provided along the north side of Brigham Creek Road past the site and on both sides of the road to the east of the Whenuapai Town Centre.

Figure 6 shows the three-kilometre cycling contour from the site, which encompasses a significant portion of Whenuapai and Whenuapai West area, as well as the northern portion of Westgate commercial area.

Figure 6: Three-kilometre Cycling Contour from the Site
Source: New Zealand Transport Agency/Auckland Transport

2.11 Future Pedestrian and Cyclist Accessibility

The future proposals in the area to the surrounding road environment look to provide walking and cycling routes on both sides of Brigham Creek Road and Mamari Road, which will provide direct links for future residents. These are intended to be provide in the form of segregated footways and cycleways.

In the wider area a strategic walking and cycling corridor is proposed between Whenuapai and Kumeu/Huapai. Along the route walking and cycling facilities will be provided along both Riverhead Road and the Coatesville-Riverhead Highway.

2.12 Future Road Network Upgrade

2.12.1 Brigham Creek Road

Brigham Creek Road is a key east-west connection through Whenuapai, providing access to SH16 to the west and SH18 to the east. The existing roundabout at its western end will be upgraded to an interchange providing access for the rapid transit network. A new direct motorway connection is planned between SH16 in the north and SH18 in the east reducing some of the east-west traffic along Brigham Creek Road, allowing the road to better serve the local community.

The upgrade of Brigham Creek Road to an urban arterial road is expected to allow for four traffic lanes, the provision of a bus every seven minutes to and from Whenuapai town centre in peak times, opportunities for pedestrians and cyclists on both sides of the road and a 50 kph speed limit along the full length of the road to enhance support a safe speed environment. A typical cross section for a four-lane urban arterial road is indicated in ***Figure 7*** below.

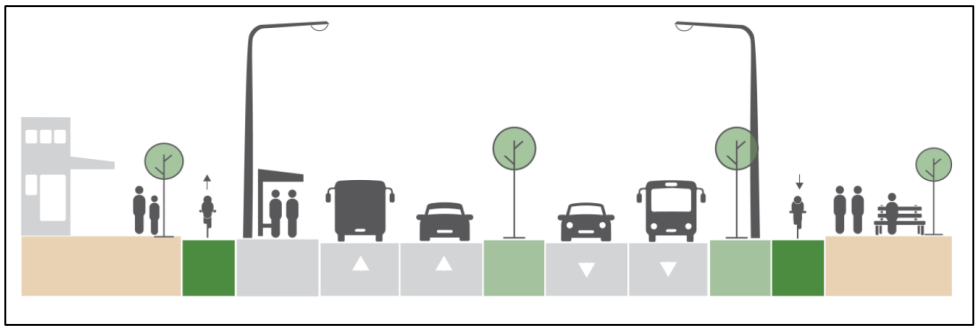


Figure 7: Urban Arterial (32m) – Indicative Cross Section
Source: New Zealand Transport Agency/Auckland Transport

2.12.2 Mamari Road Improvements

It also proposed that Mamari is upgraded to an urban arterial road accommodating walking, cycling and high frequency public transport. The Mamari Road proposals would connect to Northside Drive in the south and interlink with the proposed south facing ramps onto SH16.

The Mamari Road improvements include the provision of four traffic lanes in a similar cross section as shown in ***Figure 7*** inclusive of dedicated bus lanes, which will allow for bus services every 3-4 minutes during peak times. Walking and cycling facilities will also be provided on both sides of the road, and a 50 kph speed limit will allow for a safe road environment.

3.0 THE PROPOSAL

3.1 General Description

The plan change proposal seeks rezoning land from Future Urban to a Mixed Housing Urban zone. The proposal intends to provide a zone that will enable the establishment of approximately 260 medium density dwellings and associated local roads to provide access. An indicative masterplan of the potential site layout is shown in ***Figure 5***. This concept is an example of the type of development the plan change will enable. It is not necessarily the final detailed form of development but represents the likely development for the site.

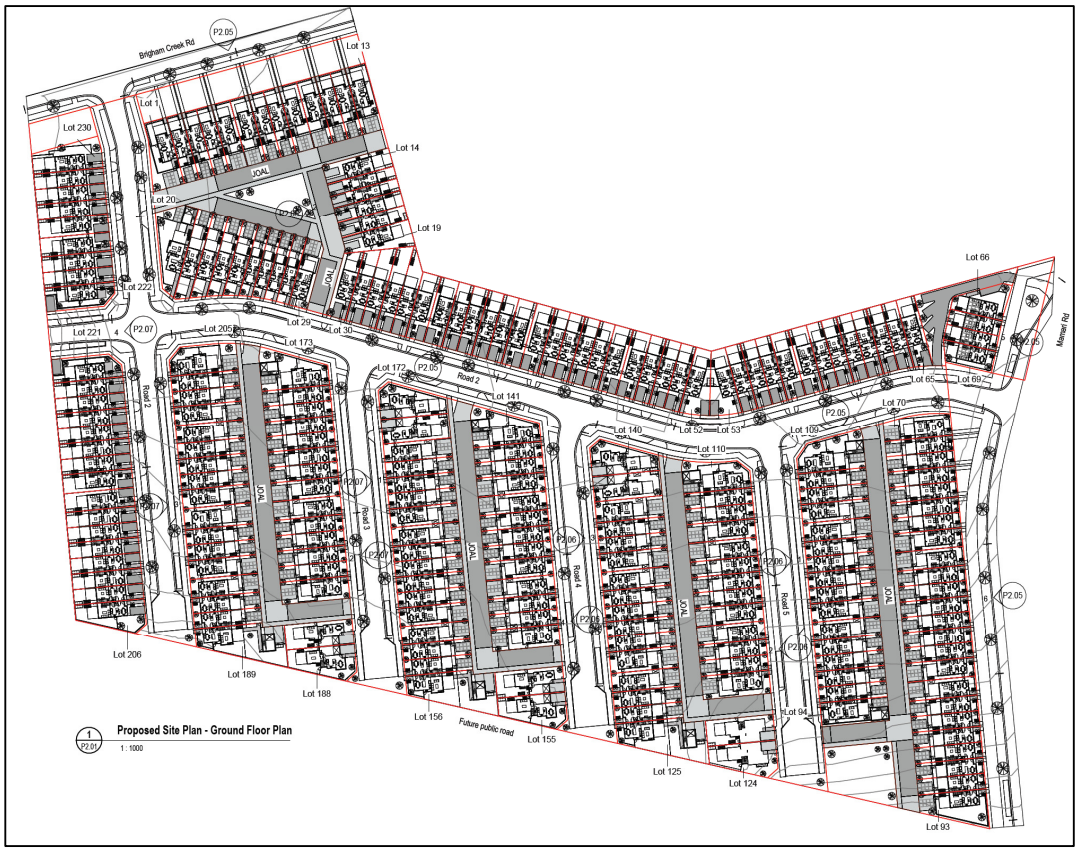


Figure 5: Proposed Concept Plan Layout
Source: Team Architects

The key transport outcomes of the proposal are:

- Supporting the Brigham Creek Road and Mamari Road upgrades including their alignment, as they will provide vital links in the transport network for the site and Whenuapai;
- Providing quality connected residential neighbourhoods to support the growth of Whenuapai;
- Creating a network of walkways through the plan change area with a series of roads and pedestrian access routes; and

- Identifying key intersections on the site boundaries to provide access to adjacent land for development.

Brigham Creek Road and Mamari Road provide the best opportunity for most of the plan change area to access the wider road network. Their function is to provide access to the Future Urban Zone (including the site) and to create a section of an arterial road network, which will enable access to the wider road network. These roads will provide certainty for developers on land accessibility.

It is anticipated that there will be two intersections connecting the site to these roads as well as opportunities to providing connections to neighbouring land (subject to Geotechnical, Ecology, and Civil requirements) as illustrated in ***Figure 5***. Their location and spacing will need to be agreed through discussions between Auckland Transport and landowners, however they will be expected to be consistent with Auckland Transport standards. Further traffic modelling and assessment will be necessary to verify the intended layout of the intersections and their suitability to accommodate the anticipated traffic flows as land use occurs both within the site and beyond.

Within the site a network of local roads that will provide access to most lots will be developed. These roads are anticipated to carry no more than 500 vehicle movements per day in line with local road functions.

3.2 Accessibility Design Principles

Best-practice residential area design aims to produce liveable residential neighbourhoods that contribute to safety, good health, efficiency, and sustainability while having good levels of amenity.

Street patterns that allow good access through and around the area and to local services by walking and cycling are beneficial, and guidelines generally talk about connectivity and permeability as being desirable attributes. Legibility is another desirable attribute and the creation of self-explanatory roads.

It is desirable for residents to be within easy walking distance of public transport services and local service centres to assist in reducing demand for private vehicle travel. Pedestrian walkability catchments are generally based on good access being provided within 400 metres or about 5-minutes' walk, with lesser access being provided within 800 metres or a 10-minute walk. Although with the increase in micro-ability, there will be opportunities for greater distances to be covered.

In terms of intersection design, crossroads on streets where traffic volumes are higher have been shown to have poorer crash records. In general, where traffic volumes are higher than 1,000 vehicles per day consideration should be given to controlling conflict at cross-roads. Roundabouts can be effective at controlling conflict and moderating speeds, although busy roundabouts can be difficult for pedestrians and cyclists to negotiate. Many guidelines refer to the desirability of avoiding crossroads by shifting roads to produce a series of "T" intersections instead.

Any land development will need to provide high quality walking and cycling infrastructure to minimise the need to use private vehicles and for trips within the site. By providing a high standard of pedestrian and cycle facilities, pedestrians and cyclists of all ages can move safely within the area with minimal risk. This will be an important function of any future development of the site.

New facilities outside of the site boundaries are also needed to provide improved safety and connectivity to key destinations. Some of this infrastructure will rely upon other landowners to develop and with the future upgrade of nearby roads, dedicated and safe facilities will be provided. As a minimum, the upgrade of roads alongside the site frontage to including walking and cycling movement will connect any future development to the wider network.

The proposed zoning will not preclude making the most of opportunities to promote walking and cycling.

3.3 Mode Trip Generation

The Structure Plan ITA provides an indication of the anticipated long term mode shares across the Whenuapai Structure Plan area as follows:

- 5% bicycle;
- 15% walking;
- 20% public transport; and
- 60% private car.

The ITA has also stated the following with regards to the anticipated mode share:

> *"It is noted however that the public transport mode share within the structure plan area is dependent on the provision of quality public transport through the area, and more so, on the provision of a connected RTN network from Whenuapai to the city and the North Shore. During initial stages of development, this infrastructure and services are unlikely to be in place, and lower public transport mode shares would be expected.*
>
> *Similarly, while most of the active travel trips will be catered for by the provision of infrastructure from the onset of the development, uptake of this mode will depend on the delivery of new schools, retail areas and employment. These developments may lag behind the initial residential development and as a result, active travel mode shares will initially be lower than the long-term expectations above. The following mode shares have been estimated across a timeline from 2016 to 2046."*

Mode	2016[29]	2026	2036	2046
Bicycle	1%	2%	3%	5%
Walk	3%	8%	11%	15%
Public transport	4%	13%	16%	20%
Private Car	91%	77%	70%	60%

It must however be noted that the long-term private car share of 60% is the equivalent to that currently observed in central Auckland suburbs and is significantly lower than the Auckland average. This assessment has therefore assumed an initial mode share equivalent to 2016 as a baseline for assessment. This is expected to be the worst-case scenario and any reduction in private car travel because of the improved active mode and public transport network will have a positive effect on the surrounding road network.

The ITA also sets out the trip generation rates assumed for each mode per dwelling for the Structure Plan area in 2016, as follows. The peak hour rates for walking and cycling are estimates as they were not provided within the ITA.

Trips per Dwelling	Walking	Cycling	Public Transport	Private Car
Peak Hour	*0.08*	*0.03*	0.05	0.65
Daily	0.33	0.11	0.44	6.5

Based on a development potential of 260 medium density dwellings the following number of trips can be expected for each mode:

Number of Trips	Walking	Cycling	Public Transport	Private Car
Peak Hour	21	8	13	170
Daily	86	29	114	1,690

3.4 Trip Distribution

As the proposal site has no employment or school zoning proposed, it is anticipated that all the associated trips would be external to the site. With a fully developed transport network surrounding the site, it would be expected the trip distribution along road surrounding the site and nearby intersections to be evenly distributed in each direction, on the basis that each arterial road past the site will provide the same level of service across all modes.

As is typical with most residential activities, flow to and from the site is tidal with most vehicle movements in the AM peak leaving the site and then returning in the PM peak, thus reducing the potential of any two-way conflicts when vehicles are entering or leaving the site. For this assessment, it is assumed that 80% vehicles exiting the site and 20% vehicles entering the site in the AM peak hours and vice versa in the PM peak.

The predicted origins and destination of the vehicle trips generated by the proposal have been based on the existing directional flows on Brigham Creek Road. Furthermore, most trips would use Brigham Creek Road towards the west to enter and leave the Whenuapai area as this is the quickest route to the motorway and wider road network.

The assignment of turning movements at each of the key intersections on Brigham Creek Road is shown in ***Figure 6***. Only these intersections have been assessed as part of this proposal given the arterial road status of Brigham Creek Road as it is currently the only road available for external trips to and from the site.

Furthermore, it is anticipated that most walking and cycling trips, would gravitate towards Mamari Road this being the most direct route to the school, local centre and bus stops where a footpath network is already created, and footpaths cannot be provided along the full extent of the south side of Brigham Creek Road without acquiring further land to construction a footpath.

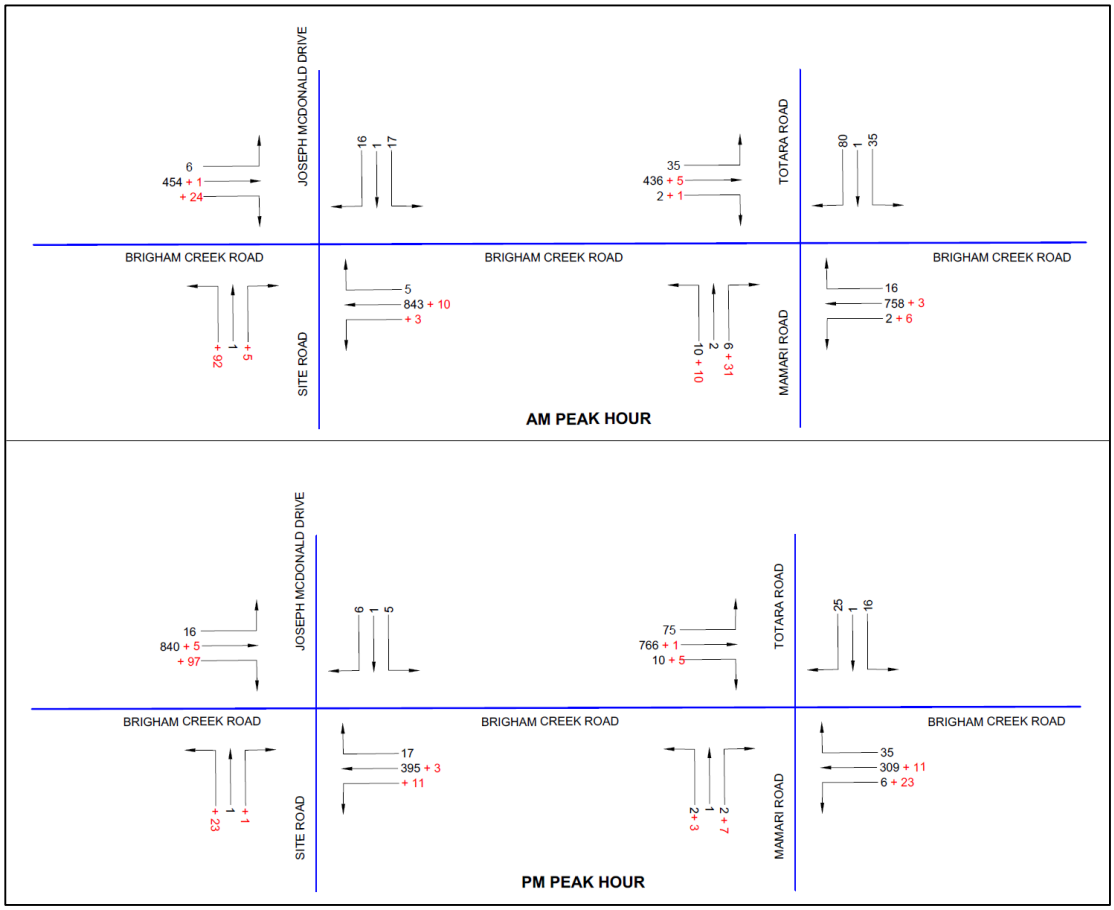


Figure 6: AM & PM Peak Hour – Predicted Turning Movements

4.0 TRANSPORT ASSESSMENT & MITIGATIONS

4.1 Walking and Cycling Trips

Although the predicted walking and cycling numbers are expected to be initially low, any redevelopment on the subject site will need to manage pedestrian and cycling amenity and safety. As the surrounding area develops with other activities such as employment and schools, it is anticipated that the volume of pedestrians and cyclists will increase.

To cater for these new trips and to ensure a safe environment for active modes, any development of the subject site will need to include the following:

- Creation of footpaths along both sides of the new street alignments that meet Auckland Transports standards;
- Connection of new footpaths with the existing public footpath network immediately outside the site, with upgraded pedestrian infrastructure along the frontages on both Brigham Creek Road and an extended Mamari Road;
- Pedestrian crossing facilities incorporated into the intersection layouts;
- Regular and safe crossing opportunities on the arterial roads where pedestrian desire lines are evident;
- Separated, protected, or off-street cycle facilities on busier roads; and
- Provision of a low-speed local street network that allows cyclists and vehicles to share the same carriageway on an equal basis.

The implementation of such measures will ensure that pedestrian and cycling activity in the area will not be adversely affected and will promote an increase in active travel.

4.2 Public Transport Trips

The new public transport network in west Auckland will be significantly enhanced to help accommodate the anticipated demands associated with growth in Whenuapai and other key areas. With the upgrades of Brigham Creek Road and Mamari Road to accommodate the Rapid Transit Network (RTN) and connections to other centres and transport hubs, the anticipated future public transport network will cater well for the Whenuapai area and including the subject site.

The exact nature, timing, and routes of future bus services through the Whenuapai area will be finalised and decided upon by Auckland Transport. When this occurs, accessibility will be significantly improved.

As set out in the ITA for the Structure Plan, during the very early stages of development in Whenuapai, the public transport system will likely be unchanged from the existing until such time as the RTN is established and further development occurs and potential patronage increases.

The key outcome of the rezoning will therefore be to ensure that high quality walking connections are provided to nearby bus stops to promote a greater use of public transport and reduce private car travel.

4.3 Traffic Generation Effect (Intersection Performance)

The ability for roads to accommodate two-way flow and the performance of the intersections are both key considerations when assessing traffic generation effects. As set out above, the two key intersections that will need to be modelled are a priority-controlled intersection with Brigham Creek Road and the Mamari Road / Brigham Creek Road signalised intersection.

To assess the likely effects of the generated traffic from the development of the site, a SIDRA-9 traffic model has been run for these two intersections. The SIDRA outputs for the modelled intersections are included in **Attachment 1**.

For the purposes of this assessment, it has been assumed that 50% of site related vehicle trips will be to and from the west and 50% of traffic will be to and from the east. As set out above, Brigham Creek Road provides direct motorway connections and therefore vehicle trips are expected to be evenly distributed.

4.3.1 Brigham Creek Road – Priority Controlled Intersection

The SIDRA results for the potential Brigham Creek Road in the AM and PM peak hours are summarised in **Figure 7** and **Figure 8.** There is a likelihood that the intersection could be located directly opposite Joseph McDonald Drive. The model has therefore been modelled as a crossroad intersection, however there is not anticipated to be any cross-movement traffic between the two roads given they are both serving residential land uses.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m
South: Site Road South										
1	L2	92	0.0	97	0.0	0.332	20.9	LOS C	1.2	8.4
2	T1	1	0.0	1	0.0	0.163	75.3	LOS F	0.4	3.1
3	R2	5	0.0	5	0.0	0.163	103.1	LOS F	0.4	3.1
Approach		98	0.0	103	0.0	0.332	25.7	LOS D	1.2	8.4
East: Brigham Creek Road East										
4	L2	3	0.0	3	0.0	0.471	4.8	LOS A	0.0	0.0
5	T1	853	3.0	898	3.0	0.471	0.2	LOS A	0.0	0.0
6	R2	5	0.0	5	0.0	0.005	6.3	LOS A	0.0	0.1
Approach		861	3.0	906	3.0	0.471	0.3	NA	0.0	0.1
North: Joseph McDonald Drive North										
7	L2	17	0.0	18	0.0	0.027	10.5	LOS B	0.1	0.6
8	T1	1	0.0	1	0.0	0.569	135.5	LOS F	1.7	11.9
9	R2	16	0.0	17	0.0	0.569	182.7	LOS F	1.7	11.9
Approach		34	0.0	36	0.0	0.569	95.2	LOS F	1.7	11.9
West: Brigham Creek Road West										
10	L2	6	0.0	6	0.0	0.254	4.6	LOS A	0.0	0.0
11	T1	455	3.0	479	3.0	0.254	0.1	LOS A	0.0	0.0
12	R2	24	0.0	25	0.0	0.045	10.1	LOS B	0.2	1.1
Approach		485	2.8	511	2.8	0.254	0.6	NA	0.2	1.1
All Vehicles		1478	2.7	1556	2.7	0.569	4.3	NA	1.7	11.9

Figure 7: SIDRA Results – Brigham Creek Road – Priority Control – AM Peak Hour

In the weekday AM peak hour, the intersection will operate well within its capacity, with a maximum degree of saturation of 0.569. The worst performing movement is for the right-turn movement on Joseph McDonald Drive having a Level of Service (LOS) of F and an average delay of 182.7 seconds. This level of delay is expected for a crossroad intersection during peak times. Of interest with this approach is the vehicle queues are no more than two vehicles, given that this is during peak times the perception of delay is not going to be significant.

The same LOS is also expected for the new road from the Plan Change area with an average delay of 103 .1 seconds and a queue length no greater than one vehicle. It is not expected that this level of congestion and delay will occur for any long period of time.

Given that the right turning vehicles from both side roads will also have the option of using the Mamari Road signals should they consider this level of delays are not acceptable or feel unsafe with the manoeuvre. Therefore, no further mitigation for the intersection is consider necessary.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m
South: Site Road South										
1	L2	23	0.0	24	0.0	0.033	9.9	LOS A	0.1	0.8
2	T1	1	0.0	1	0.0	0.049	74.8	LOS F	0.1	0.9
3	R2	1	0.0	1	0.0	0.049	96.3	LOS F	0.1	0.9
Approach		25	0.0	26	0.0	0.049	16.0	LOS C	0.1	0.9
East: Brigham Creek Road East										
4	L2	11	0.0	12	0.0	0.225	4.6	LOS A	0.0	0.0
5	T1	398	3.0	419	3.0	0.225	0.1	LOS A	0.0	0.0
6	R2	17	0.0	18	0.0	0.032	10.1	LOS B	0.1	0.8
Approach		426	2.8	448	2.8	0.225	0.6	NA	0.1	0.8
North: Joseph McDonald Drive North										
7	L2	5	0.0	5	0.0	0.018	17.4	LOS C	0.1	0.4
8	T1	1	0.0	1	0.0	0.203	83.4	LOS F	0.6	3.9
9	R2	6	0.0	6	0.0	0.203	113.6	LOS F	0.6	3.9
Approach		12	0.0	13	0.0	0.203	71.0	LOS F	0.6	3.9
West: Brigham Creek Road West										
10	L2	16	0.0	17	0.0	0.474	4.8	LOS A	0.0	0.0
11	T1	845	3.0	889	3.0	0.474	0.2	LOS A	0.0	0.0
12	R2	97	0.0	102	0.0	0.087	6.2	LOS A	0.4	2.6
Approach		958	2.6	1008	2.6	0.474	0.9	NA	0.4	2.6
All Vehicles		1421	2.6	1496	2.6	0.474	1.7	NA	0.6	3.9

Figure 8: SIDRA Results – Brigham Creek Road – Priority Control – PM Peak Hour

In the Weekday PM peak hour, the intersection will also operate within its capacity, with a maximum degree of saturation of 0.474. The same LOS will remain for the right-turn movement from the side roads, which has a LOS of F and average delay of between 96 and 113 seconds. As above, queue lengths are low with no more than one vehicle expected to queue when turning right. As with the AM peak, it is not expected that this level of congestion and delay will occur for any long period of time.

4.3.2 Brigham Creek Road / Mamari Road – Signalised Intersection

The SIDRA results for the potential Brigham Creek Road / Mamari Road intersection in the AM and PM peak hours are summarised in **Figure 9** and **Figure 10.**

In the weekday AM peak hour, the intersection will operate within its capacity, with a maximum degree of saturation of 0.749 and average delay of 27.9 seconds. The overall level of service (LOS) for the intersection will be C, with the worst LOS on the northern approach on Totara Road where there is a LOS D.

Level of service and average delays provide a robust measure of an intersection's performance and resilience to accommodate added traffic demand and when it may need upgrading. Once and intersection moves beyond a LOS D, it is considered close to reaching its capacity and unreasonable delays can be expected. As the overall LOS is measured as C during the busiest time

of the day, the intersection will operate within its capacity even with the added plan change trips traffic and for the most part will operate at a higher level in the off-peak times.

Vehicle Movement Performance										
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m
South: Mamari Road South										
1	L2	20	0.0	21	0.0	0.038	26.0	LOS C	0.6	4.1
2	T1	2	0.0	2	0.0	*0.147	32.8	LOS C	1.4	10.1
3	R2	37	0.0	39	0.0	0.147	37.4	LOS D	1.4	10.1
Approach		59	0.0	62	0.0	0.147	33.3	LOS C	1.4	10.1
East: Brigham Creek Road East										
4	L2	8	0.0	8	0.0	0.275	26.3	LOS C	5.0	35.7
5	T1	520	3.0	547	3.0	0.619	24.0	LOS C	12.9	92.5
6	R2	16	0.0	17	0.0	*0.121	44.0	LOS D	0.7	4.6
Approach		544	2.9	573	2.9	0.619	24.7	LOS C	12.9	92.5
North: Totara Road North										
7	L2	35	0.0	37	0.0	0.088	19.0	LOS B	0.7	5.0
8	T1	1	0.0	1	0.0	*0.552	35.5	LOS D	5.8	40.7
9	R2	145	0.0	153	0.0	0.552	40.1	LOS D	5.8	40.7
Approach		181	0.0	191	0.0	0.552	36.0	LOS D	5.8	40.7
West: Brigham Creek Road West										
10	L2	35	0.0	37	0.0	0.061	24.5	LOS C	1.0	6.9
11	T1	441	3.0	464	3.0	*0.749	27.9	LOS C	17.1	122.6
12	R2	3	0.0	3	0.0	0.023	43.0	LOS D	0.1	0.8
Approach		479	2.8	504	2.8	0.749	27.8	LOS C	17.1	122.6
All Vehicles		1263	2.3	1329	2.3	0.749	27.9	LOS C	17.1	122.6

Figure 9: SIDRA Results – Brigham Creek Road / Mamari Road – Signals – AM Peak Hour

Vehicle Movement Performance										
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m
South: Mamari Road South										
1	L2	5	0.0	5	0.0	0.010	32.9	LOS C	0.2	1.3
2	T1	1	0.0	1	0.0	*0.038	39.4	LOS D	0.4	3.1
3	R2	9	0.0	9	0.0	0.038	44.0	LOS D	0.4	3.1
Approach		15	0.0	16	0.0	0.038	40.0	LOS D	0.4	3.1
East: Brigham Creek Road East										
4	L2	29	0.0	31	0.0	0.148	25.0	LOS C	3.5	24.7
5	T1	320	3.0	337	3.0	0.333	21.8	LOS C	8.6	61.5
6	R2	35	0.0	37	0.0	*0.331	56.6	LOS E	1.8	12.9
Approach		384	2.5	404	2.5	0.333	25.2	LOS C	8.6	61.5
North: Totara Road North										
7	L2	11	0.0	12	0.0	0.030	23.5	LOS C	0.3	2.1
8	T1	1	0.0	1	0.0	*0.249	41.4	LOS D	3.1	21.5
9	R2	65	0.0	68	0.0	0.249	46.0	LOS D	3.1	21.5
Approach		77	0.0	81	0.0	0.249	42.7	LOS D	3.1	21.5
West: Brigham Creek Road West										
10	L2	155	0.0	163	0.0	0.220	25.7	LOS C	5.2	36.4
11	T1	621	3.0	654	3.0	*0.867	37.8	LOS D	33.4	240.1
12	R2	15	0.0	16	0.0	0.142	55.4	LOS E	0.8	5.4
Approach		791	2.4	833	2.4	0.867	35.7	LOS D	33.4	240.1
All Vehicles		1267	2.2	1334	2.2	0.867	33.0	LOS C	33.4	240.1

Figure 10: SIDRA Results – Brigham Creek Road / Mamari Road – Signals PM Peak Hour

In the weekday PM peak hour, the intersection will operate within its capacity, with a maximum degree of saturation of 0.867 and average delay of 33 seconds. The overall level of service (LOS) for the intersection will also be C, with the worst LOS on the northern approach on Brigham Creek Road West where there is a LOS D.

4.4 Road Safety

Development of the subject site, completion of any new roads and the creation of the new intersections should have no detrimental impact on general road safety. The following key points are noted about the proposal:

- The adoption of the road design principles above will promote the safe use of the new roads and intersections;
- The introduction of pedestrian facilities and safe provision for cycling to will promote greater awareness and a safer environment; and
- Adoption of the Council's underlying development controls for access and parking provisions.

It is thus expected that any crashes will be addressed in the future with any future development, both by the road changes that can be expected under the Auckland Transport Roads and Streets Framework, and by the AUP controls relating to development on arterial roads. This will apply regardless of the proposed Plan Change. In view of the above, any road safety effects of the proposal are expected to be negligible.

5.0 AUCKLAND UNITARY PLAN CONSIDERATIONS

While the Section 32 documentation within the application considers the proposed Plan Change against all relevant policies and objectives of the AUP, we have focused our assessment on the objectives and policies most relevant to transport, especially those in Sections B3 (Infrastructure, transport and energy) and E27 (Transport).

5.1 B3 (Infrastructure, Transport and Energy)

The relevant Auckland-wide transport objectives and policies in the AUP are set out below and comments are provided as to how the proposal aligns with each:

The key issue for this plan change is B3.1(2) integrating the provision of infrastructure with urban growth. As explained in more detail below in section 6.2, the site is well served with transport infrastructure and integrates well with local road, pedestrian and cycle connections and is within a walkable catchment of a school, a local centre and bus stops.

The transport aspects of the plan change are consistent with the objectives and policies of Section B3.3 Transport, in that:

- There is good supporting infrastructure for people and the goods they need;
- A suitably high density of zoning has been chosen which is appropriate for the convenient links to public transport;
- The proposed transport linkages do not create amenity or safety issues of concern and a range of transport choices are enabled; and
- No major off-site transport upgrades are required as part of this plan change, though small localised upgrades may be appropriate as part of the design and assessment at a resource consent stage.

5.2 Section E27 – Transport

The relevant Auckland-wide transport objectives and policies in the AUP are set out below and comments are provided as to how the proposal aligns with each:

E27.2 Objectives

(1) Land use and all modes of transport are integrated in a manner that enables:
(a) the benefits of an integrated transport network to be realised; and
(b) the adverse effects of traffic generation on the transport network to be managed.

As demonstrated in this report, the subject area is well served by roading, bus, and cycling infrastructure in the future, and thus the proposal is integrated with all modes of transport and enables the benefits of the integrated transport network at this location to be further utilised.

On this basis the motor vehicle traffic effects of the proposal are expected to be accommodated within the existing transport network. The impacts of the proposal on the public transport, walking and cycling network is also expected to be minimal.

(2) An integrated transport network including public transport, walking, cycling, private vehicles and freight, is provided for.

As demonstrated in this report, the subject area is well served by an integrated transport network of roading, bus, walking and cycling infrastructure.

> ***E27.3 Policies***
> *(1) Require subdivision, use and development which:*
> *(a) generate trips resulting in potentially more than minor adverse effects on the safe, efficient and effective operation of the transport network;*
> *to manage adverse effects on and integrate with the transport network by measures such as travel planning, providing alternatives to private vehicle trips, staging development or undertaking improvements to the local transport network.*

The proposed could be expected to generate some 170 vehicle movements in peak hours. This increase in vehicle movements, which would be shared between intersections surrounding the site, is minimal in the context of the flows already catered for in peak periods, and the operation of any intersections are expected to have an acceptable level of service.

Furthermore, under the Mixed Housing Urban zone, resource consent is required for any land use or subdivision that accommodates more than 100 lots, or if there is a change in land use greater than 3 dwellings. Assessment of any effects on the road network, including the effects of the location and design of any intersections on the safe and efficient operation of the adjacent transport network, will be required.

Thus, the AUP requires the effects on the efficient operation of the transport network to be considered for any redevelopment on the subject site. It is thus expected that the effects of motor vehicle traffic generated by any future development on the road network, will be assessed and addressed at the resource consent stage by the AUP controls relating to development.

On this basis the effects of the proposal on the efficient and effective operation of the road transport network are expected to be negligible. As discussed above, the impacts of the proposal on the efficient and effective operation of the public transport and cycling network is also expected to be negligible, and the impact on the pedestrian network is expected to be minimal.

There are no changes to the controls or standards that relate to the effects of development on the safe, efficient and effective operation of the transport network, and the proposed development would only apply as redevelopment occurs.

5.3 Section E27 – Transport Standards

Section E27.6 Standards sets out the transport related standards for development. These standards are considered suitable to be applied to activities and any future development of the site.

Compliance with these standards would be assessed as part of any future resource consent application.

5.4 Section E27 – Assessment Criteria

These assessment criteria will need to be considered at the time of a future resource consent application. Notwithstanding that, this report demonstrates that access to the site can be provided safely and efficiently from the wider road network.

5.5 Section E38 – Transport Standards

Section E38 Standards sets out the subdivision related standards for development. These standards are considered suitable to be applied to activities and any future development of the site.

Compliance with these standards would be assessed as part of any future resource consent application.

5.6 Section E38 – Assessment Criteria

These assessment criteria will need to be considered at the time of a future resource consent application. Notwithstanding that, this report demonstrates that access to the site can be provided safely and efficiently from the wider road network.

6.0 INTERGRATION WITH FUTURE TRANSPORT NETWORK

The following section considers the various regional plans and considers that the proposal is consistent with what has been anticipated. The following is noted in this regard:

6.1 Auckland Plan 2050

The Auckland Plan 2050 is the Council's long-term spatial plan to ensure Auckland grows in a way that will meet the opportunities and challenges of the future. It was originally released in 2012 and has subsequently updated in 2018. The Auckland Plan 2050 describes Auckland in general terms, outlines the major challenges that we face, and sets the direction for tackling these challenges.

The proposed subject site is identified as a location where new dwellings can be provided in a future urban zone and can be supported by new transport infrastructure.

- The site's improved connectively to other modes such as public transport, walking, and cycling are identified and will provide choice of travel mode and a higher level of accessibility for the subject site;

- Short term strategies for managing network demands and improving safety, such as introducing smart technologies or improving efficiency of intersections, will continue to be implemented while new roading infrastructure is developed in the medium to long term; and

- A new road network will also be investigated in the wider Pukekohe area when the area begins to develop, providing more local road options for travel.

6.2 Auckland Regional Land Transport Plan 2021-2031

The Auckland Regional Land Transport Plan 2021-2031 sets out the land transport objectives, policies, and measures for the Auckland region over the next 10 years. It includes the land transport activities of Auckland Transport, Auckland Council, Waka Kotahi NZ Transport Agency, KiwiRail, and other agencies.

The Plan sets out the direction for the region's transport systems. It identifies what is needed to achieve an affordable, integrated, safe, responsive, and sustainable land transport system that can cope with population growth and the changing economic environment. The provision of intensified residential housing in Pukekohe will promote walking and cycling to nearby activities, thus removing some vehicles making short trips from the network.

6.3 Auckland Regional Public Transport Plan 2018

The Auckland Regional Public Transport Plan 2018 seeks to deliver an improved public transport network in Auckland by increasing public transport frequency along key transport corridors. Future public transport services are anticipated, and the site is considered well located to support further growth in public transport use.

7.0 CONCLUSIONS

The following conclusions can be made in respect of the proposal to rezone 41-43 Brigham Creek Road in Whenuapai:

- The potential residential development for the site is feasible in terms of a transportation perspective, and this has been anticipated for in the future planning for the Whenuapai Structure Plan.
- The estimated traffic generation of the proposal is likely to be about 1,690 traffic movements per day with peak hour traffic generation of about 170 traffic movements per hour based on 260 residential dwellings within the subject site.
- The estimated traffic generated by the proposal can be accommodated on the nearby road network with minimal upgrades to existing infrastructure.
- The infrastructure upgrades identified in this ITA on Brigham Creek Road and Mamari Road are considered critical to ensure the transport demands of the proposed zoning can be met. These are set out as follows:
  - Developers will be required to vest additional land to create new intersections on Brigham Creek Road and Mamari Road and provide the necessary turning lanes and supporting infrastructure to connect to the site;
  - Extension of Mamari Road as a local road to connect with the site frontage; and
  - Upgrade of the Brigham Creek Road frontage to include walking facilities across the site frontage and connect to the existing public footpath network.
- Following the completion of the upgrades of Brigham Creek Road and Mamari Road, the site is considered to have a high level of accessibility to public transportation, walking, and cycling and the effects of private car travel from the development area will likely be reduced.

Attachment 1

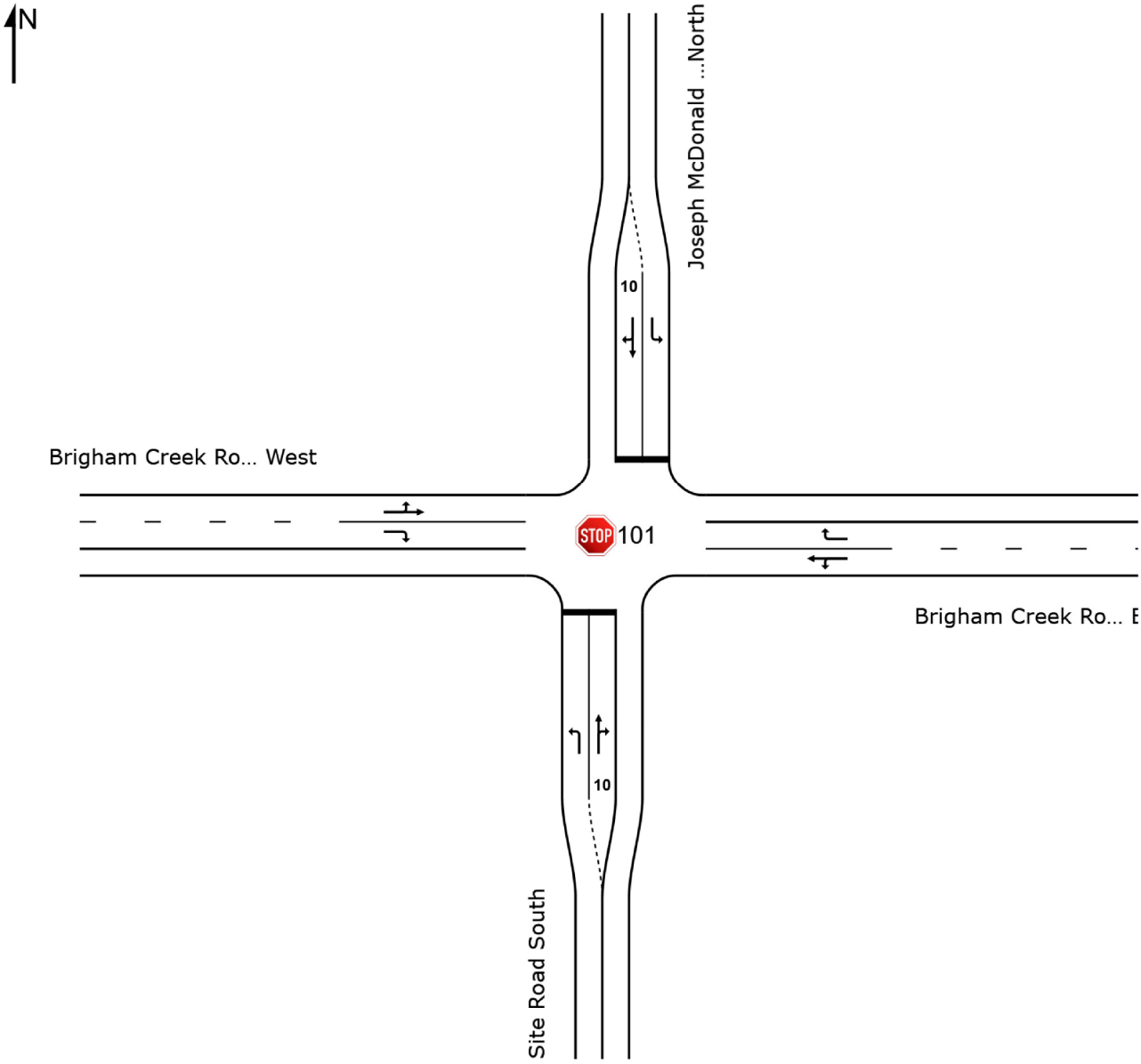
SIDRA MODELLING RESULTS

SITE LAYOUT

Site: 101 [Brigham Creek - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Brigham Creek - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND 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	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Road South														
1	L2	92	0.0	97	0.0	0.332	20.9	LOS C	1.2	8.4	0.82	1.05	1.00	39.3
2	T1	1	0.0	1	0.0	0.163	75.3	LOS F	0.4	3.1	0.96	1.00	0.98	21.4
3	R2	5	0.0	5	0.0	0.163	103.1	LOS F	0.4	3.1	0.96	1.00	0.98	21.4
Approach		98	0.0	103	0.0	0.332	25.7	LOS D	1.2	8.4	0.83	1.05	1.00	37.4
East: Brigham Creek Road East														
4	L2	3	0.0	3	0.0	0.471	4.8	LOS A	0.0	0.0	0.00	0.00	0.00	49.2
5	T1	853	3.0	898	3.0	0.471	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	49.7
6	R2	5	0.0	5	0.0	0.005	6.3	LOS A	0.0	0.1	0.48	0.57	0.48	45.3
Approach		861	3.0	906	3.0	0.471	0.3	NA	0.0	0.1	0.00	0.01	0.00	49.7
North: Joseph McDonald Drive North														
7	L2	17	0.0	18	0.0	0.027	10.5	LOS B	0.1	0.6	0.49	0.90	0.49	43.9
8	T1	1	0.0	1	0.0	0.569	135.5	LOS F	1.7	11.9	0.98	1.06	1.21	14.5
9	R2	16	0.0	17	0.0	0.569	182.7	LOS F	1.7	11.9	0.98	1.06	1.21	14.5
Approach		34	0.0	36	0.0	0.569	95.2	LOS F	1.7	11.9	0.74	0.98	0.85	21.8
West: Brigham Creek Road West														
10	L2	6	0.0	6	0.0	0.254	4.6	LOS A	0.0	0.0	0.00	0.01	0.00	49.4
11	T1	455	3.0	479	3.0	0.254	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	49.8
12	R2	24	0.0	25	0.0	0.045	10.1	LOS B	0.2	1.1	0.69	0.84	0.69	43.4
Approach		485	2.8	511	2.8	0.254	0.6	NA	0.2	1.1	0.03	0.05	0.03	49.5
All Vehicles		1478	2.7	1556	2.7	0.569	4.3	NA	1.7	11.9	0.09	0.11	0.10	47.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Brigham Creek - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND 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	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Site Road South														
1	L2	23	0.0	24	0.0	0.033	9.9	LOS A	0.1	0.8	0.46	0.90	0.46	44.1
2	T1	1	0.0	1	0.0	0.049	74.8	LOS F	0.1	0.9	0.96	1.00	0.96	23.2
3	R2	1	0.0	1	0.0	0.049	96.3	LOS F	0.1	0.9	0.96	1.00	0.96	23.1
Approach		25	0.0	26	0.0	0.049	16.0	LOS C	0.1	0.9	0.50	0.90	0.50	41.2
East: Brigham Creek Road East														
4	L2	11	0.0	12	0.0	0.225	4.6	LOS A	0.0	0.0	0.00	0.01	0.00	49.3
5	T1	398	3.0	419	3.0	0.225	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	49.8
6	R2	17	0.0	18	0.0	0.032	10.1	LOS B	0.1	0.8	0.70	0.82	0.70	43.4
Approach		426	2.8	448	2.8	0.225	0.6	NA	0.1	0.8	0.03	0.05	0.03	49.5
North: Joseph McDonald Drive North														
7	L2	5	0.0	5	0.0	0.018	17.4	LOS C	0.1	0.4	0.76	0.98	0.76	40.8
8	T1	1	0.0	1	0.0	0.203	83.4	LOS F	0.6	3.9	0.97	1.01	1.00	20.1
9	R2	6	0.0	6	0.0	0.203	113.6	LOS F	0.6	3.9	0.97	1.01	1.00	20.1
Approach		12	0.0	13	0.0	0.203	71.0	LOS F	0.6	3.9	0.88	1.00	0.90	25.5
West: Brigham Creek Road West														
10	L2	16	0.0	17	0.0	0.474	4.8	LOS A	0.0	0.0	0.00	0.01	0.00	49.2
11	T1	845	3.0	889	3.0	0.474	0.2	LOS A	0.0	0.0	0.00	0.01	0.00	49.6
12	R2	97	0.0	102	0.0	0.087	6.2	LOS A	0.4	2.6	0.48	0.64	0.48	45.4
Approach		958	2.6	1008	2.6	0.474	0.9	NA	0.4	2.6	0.05	0.07	0.05	49.2
All Vehicles		1421	2.6	1496	2.6	0.474	1.7	NA	0.6	3.9	0.06	0.09	0.06	48.7

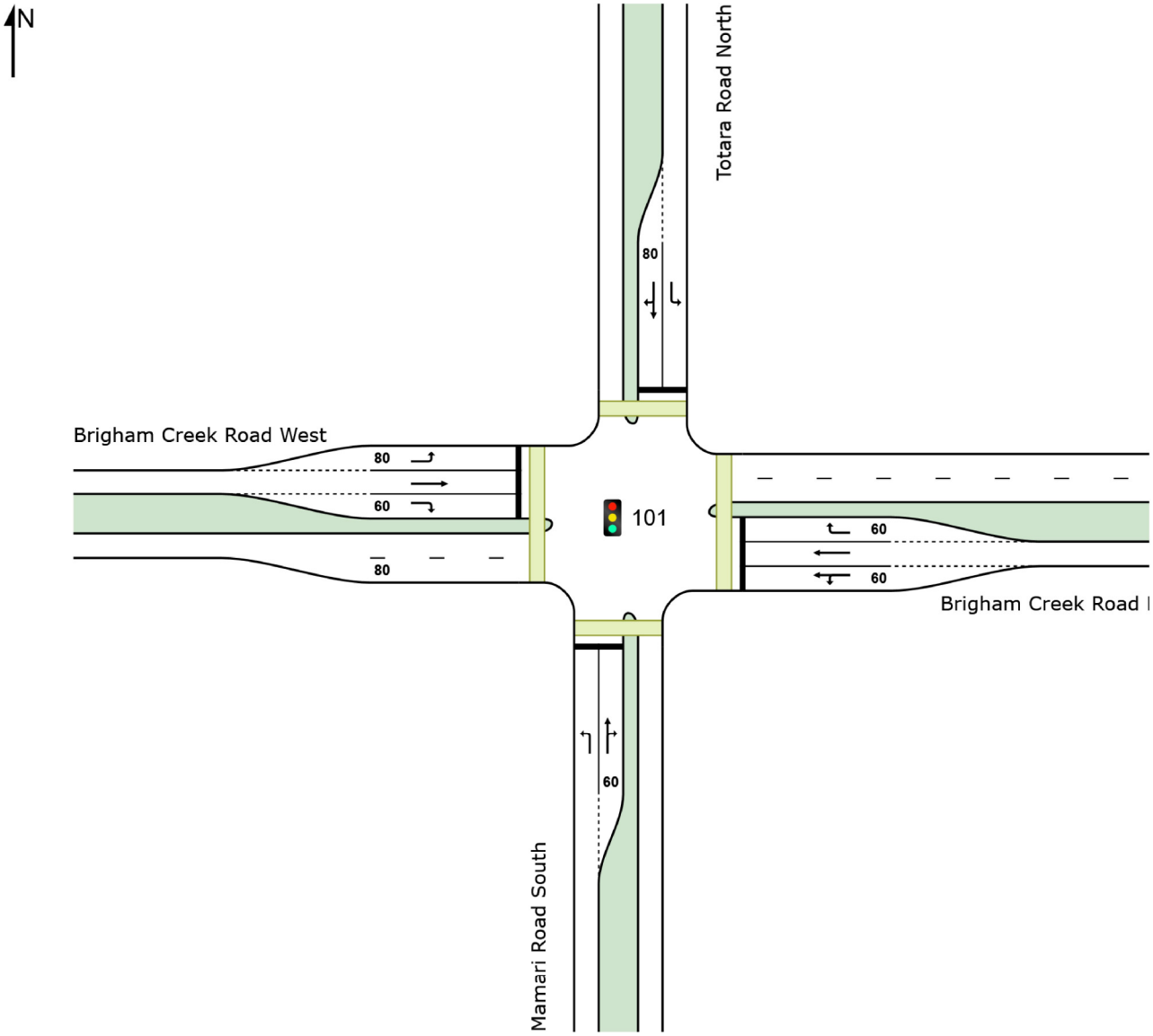
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Mamari Road - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



PHASING SUMMARY

Site: 101 [Mamari Road - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

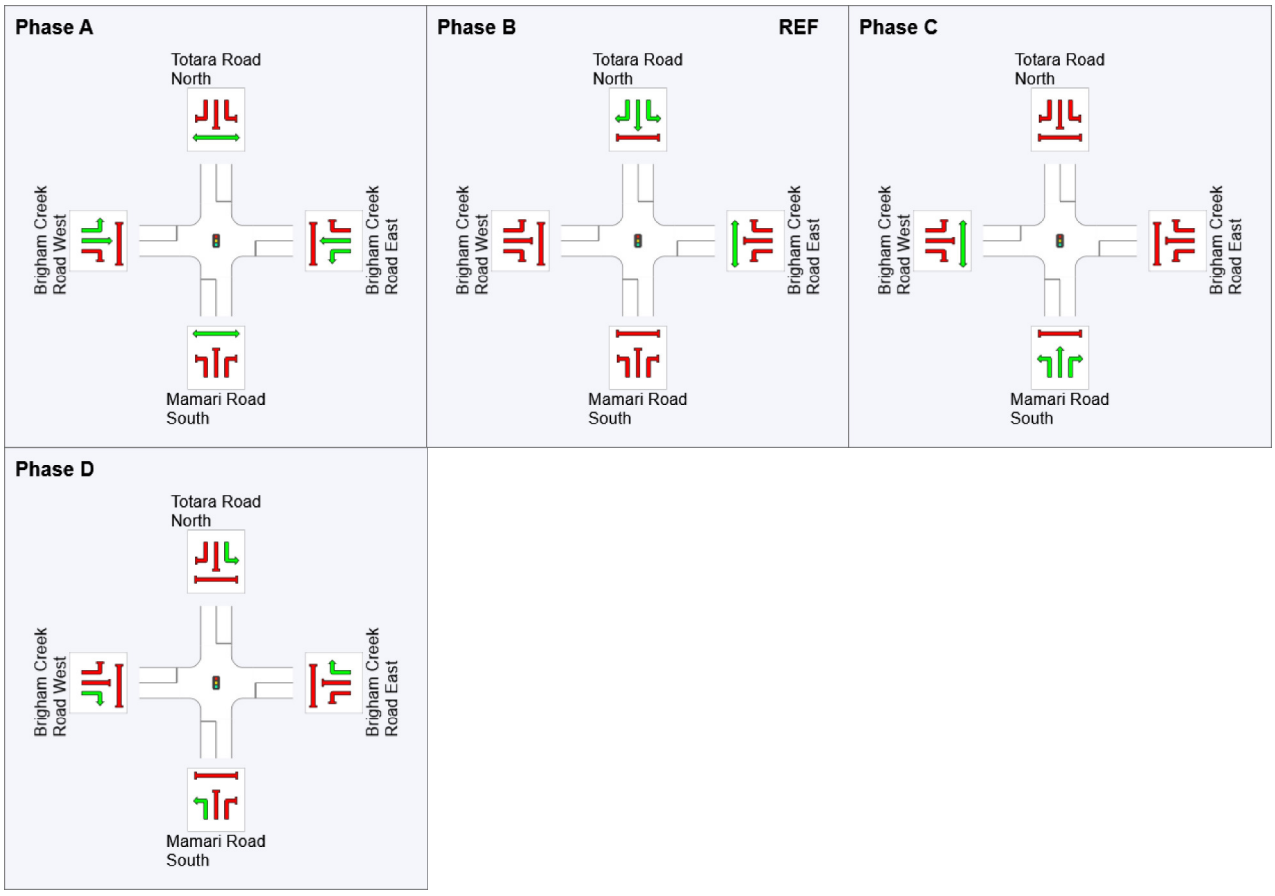
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Summary

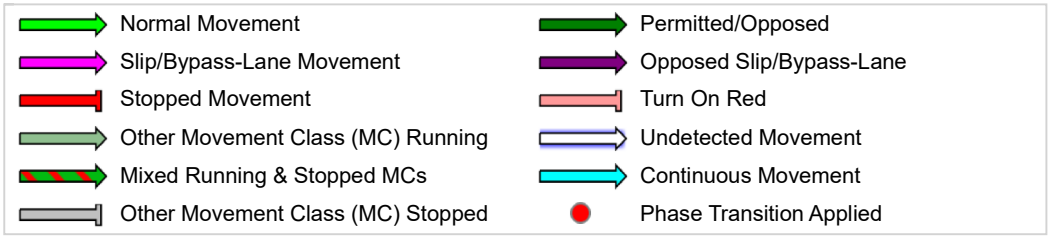
Phase	A	B	C	D
Phase Change Time (sec)	48	0	18	36
Green Time (sec)	26	12	12	6
Phase Time (sec)	32	18	18	12
Phase Split	40%	23%	23%	15%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



PHASING SUMMARY

Site: 101 [Mamari Road - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

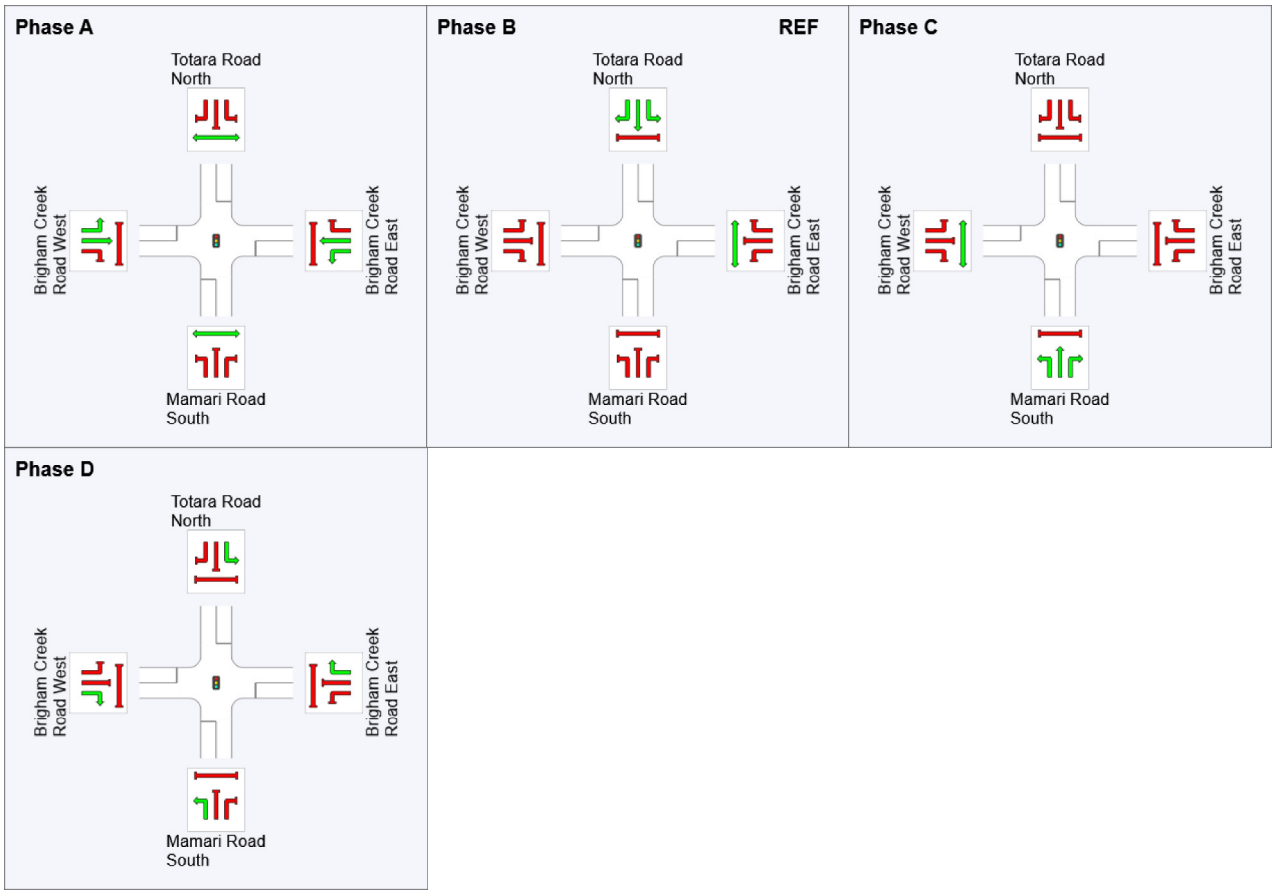
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Leading Right Turn
Reference Phase: Phase B
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Summary

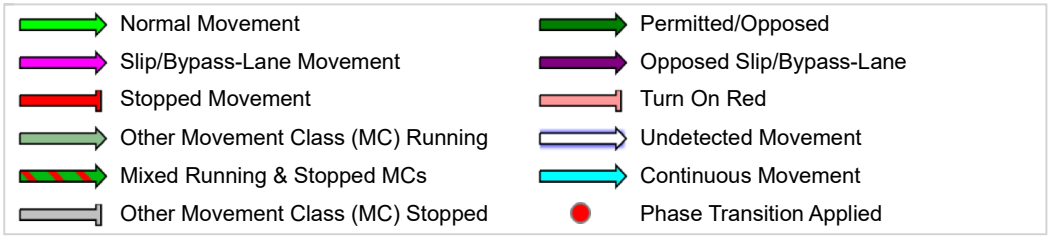
Phase	A	B	C	D
Phase Change Time (sec)	54	0	21	42
Green Time (sec)	40	15	15	6
Phase Time (sec)	46	21	21	12
Phase Split	46%	21%	21%	12%

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



MOVEMENT SUMMARY

Site: 101 [Mamari Road - AM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND 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	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Mamari Road South														
1	L2	20	0.0	21	0.0	0.038	26.0	LOS C	0.6	4.1	0.73	0.67	0.73	36.7
2	T1	2	0.0	2	0.0	*0.147	32.8	LOS C	1.4	10.1	0.90	0.72	0.90	33.2
3	R2	37	0.0	39	0.0	0.147	37.4	LOS D	1.4	10.1	0.90	0.72	0.90	33.0
Approach		59	0.0	62	0.0	0.147	33.3	LOS C	1.4	10.1	0.85	0.70	0.85	34.2
East: Brigham Creek Road East														
4	L2	8	0.0	8	0.0	0.275	26.3	LOS C	5.0	35.7	0.78	0.65	0.78	38.2
5	T1	520	3.0	547	3.0	0.619	24.0	LOS C	12.9	92.5	0.87	0.74	0.87	37.6
6	R2	16	0.0	17	0.0	*0.121	44.0	LOS D	0.7	4.6	0.96	0.69	0.96	31.0
Approach		544	2.9	573	2.9	0.619	24.7	LOS C	12.9	92.5	0.87	0.74	0.87	37.4
North: Totara Road North														
7	L2	35	0.0	37	0.0	0.088	19.0	LOS B	0.7	5.0	0.82	0.70	0.82	39.4
8	T1	1	0.0	1	0.0	*0.552	35.5	LOS D	5.8	40.7	0.97	0.80	0.97	32.3
9	R2	145	0.0	153	0.0	0.552	40.1	LOS D	5.8	40.7	0.97	0.80	0.97	32.2
Approach		181	0.0	191	0.0	0.552	36.0	LOS D	5.8	40.7	0.94	0.78	0.94	33.3
West: Brigham Creek Road West														
10	L2	35	0.0	37	0.0	0.061	24.5	LOS C	1.0	6.9	0.72	0.69	0.72	37.2
11	T1	441	3.0	464	3.0	*0.749	27.9	LOS C	17.1	122.6	0.95	0.88	1.01	36.2
12	R2	3	0.0	3	0.0	0.023	43.0	LOS D	0.1	0.8	0.95	0.62	0.95	31.3
Approach		479	2.8	504	2.8	0.749	27.8	LOS C	17.1	122.6	0.94	0.86	0.99	36.2
All Vehicles		1263	2.3	1329	2.3	0.749	27.9	LOS C	17.1	122.6	0.90	0.79	0.92	36.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Mamari Road South												
P1	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	198.8	213.9	1.08
East: Brigham Creek Road East												
P2	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	203.9	220.5	1.08
North: Totara Road North												
P3	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	198.8	213.9	1.08

West: Brigham Creek Road West											
P4 Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	203.9	220.5	1.08
All Pedestrians	200	211	34.3	LOS D	0.1	0.1	0.93	0.93	201.4	217.2	1.08

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [Mamari Road - PM Peak (Site Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND 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	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Mamari Road South														
1	L2	5	0.0	5	0.0	0.010	32.9	LOS C	0.2	1.3	0.75	0.63	0.75	34.3
2	T1	1	0.0	1	0.0	*0.038	39.4	LOS D	0.4	3.1	0.88	0.66	0.88	31.4
3	R2	9	0.0	9	0.0	0.038	44.0	LOS D	0.4	3.1	0.88	0.66	0.88	31.2
Approach		15	0.0	16	0.0	0.038	40.0	LOS D	0.4	3.1	0.84	0.65	0.84	32.2
East: Brigham Creek Road East														
4	L2	29	0.0	31	0.0	0.148	25.0	LOS C	3.5	24.7	0.67	0.59	0.67	38.3
5	T1	320	3.0	337	3.0	0.333	21.8	LOS C	8.6	61.5	0.72	0.62	0.72	38.4
6	R2	35	0.0	37	0.0	*0.331	56.6	LOS E	1.8	12.9	0.99	0.73	0.99	28.0
Approach		384	2.5	404	2.5	0.333	25.2	LOS C	8.6	61.5	0.74	0.62	0.74	37.1
North: Totara Road North														
7	L2	11	0.0	12	0.0	0.030	23.5	LOS C	0.3	2.1	0.82	0.66	0.82	37.6
8	T1	1	0.0	1	0.0	*0.249	41.4	LOS D	3.1	21.5	0.92	0.75	0.92	30.7
9	R2	65	0.0	68	0.0	0.249	46.0	LOS D	3.1	21.5	0.92	0.75	0.92	30.6
Approach		77	0.0	81	0.0	0.249	42.7	LOS D	3.1	21.5	0.91	0.74	0.91	31.4
West: Brigham Creek Road West														
10	L2	155	0.0	163	0.0	0.220	25.7	LOS C	5.2	36.4	0.70	0.74	0.70	36.7
11	T1	621	3.0	654	3.0	*0.867	37.8	LOS D	33.4	240.1	0.98	1.00	1.13	32.9
12	R2	15	0.0	16	0.0	0.142	55.4	LOS E	0.8	5.4	0.98	0.69	0.98	28.3
Approach		791	2.4	833	2.4	0.867	35.7	LOS D	33.4	240.1	0.93	0.94	1.04	33.5
All Vehicles		1267	2.2	1334	2.2	0.867	33.0	LOS C	33.4	240.1	0.87	0.83	0.94	34.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Mamari Road South												
P1	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	208.8	213.9	1.02
East: Brigham Creek Road East												
P2	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	213.9	220.5	1.03
North: Totara Road North												
P3	Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	208.8	213.9	1.02

West: Brigham Creek Road West											
P4 Full	50	53	44.3	LOS E	0.1	0.1	0.94	0.94	213.9	220.5	1.03
All Pedestrians	200	211	44.3	LOS E	0.1	0.1	0.94	0.94	211.4	217.2	1.03

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.