TPC TRAFFIC PLANNING CONSULTANTS LTD

PROPOSED PLAN CHANGE

80 MCLARIN ROAD

GLENBROOK

AUCKLAND

INTEGRATED TRANSPORT ASSESSMENT

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March 2022
Reference: 21327
Issue B - Final

Project Information:

Client	HD Project 2 Ltd
Job Number	21327
Title	Proposed Plan Change, 80 McLarin Road, Glenbrook
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Date	March 2022

Document History and status

Revision	Date Issued	Reviewed By	Approved by	Date approved	Status
A	09/11/2021	Anatole Sergejew	Bryce Hall	09/11/2021	Draft
B	10/03/2022	Bryce Hall	Bryce Hall	11/03/2021	Final

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1.0   INTRODUCTION

This report examines and describes the traffic effects of a proposal to rezone 8 hectares of land at 80 McLarin Road in Glenbrook from Future Urban Zone to Residential – Mixed Housing Suburban Zone under the Auckland Unitary Plan – Operative in Part (AUP-OIP). The rezoning will enable the development of 100 residential dwellings on the land, as described in more detail in Section 4.0 of this report.

The site adjoins a partially completed Special Housing Area (SHA) at Kahawai Point on the opposite side of McLarin Road, the development of which included a number of roading improvements on the adjoining network.

The report specifically describes the existing traffic environment, the proposal, Unitary Plan provisions, an assessment of traffic related effects and an assessment against the relevant Unitary Plan criteria.

The location of the development site is shown in Figure 1.

Source: https://unitaryplanmaps.aucklandcouncil.govt.nz/upviewer/

Figure 1 – Site Location

By way of a summary of the detail contained within this report, it can be stated that the potential transportation effects of the land use activities resulting from the new Residential – Mixed Housing Suburban Zoning can be accommodated on the road network without compromise to its function, capacity or safety.

2.0 PLANNING CONTEXT

2.1 Future Growth within South Auckland Sub-Region

The Auckland Unitary Plan – Operative in Part (AUP-OIP) identifies approximately 15,000 hectares of new rural land within the Auckland region to accommodate future urban growth, with strategic growth sub-regions identified to the north, northwest and south of Auckland. Of the planned new growth outside the existing urban boundary, the majority, some 45%, is planned to take place in South Auckland, making this the largest of the strategic growth areas.

Whilst most residential growth in rural Auckland is to be focussed towards the larger towns, such as Pukekohe, the Auckland Plan 2050 Development Strategy for Rural Areas identifies Glenbrook Beach as a 'Rural Settlement', at which some urban growth is to take place.

The Proposed Plan Change at 80 McLarin Road thus aligns with the strategic growth of Auckland to the south, which will be accompanied by transport improvements within the wider sub-region. These include improvements to the state highway network to the east and north of Pukekohe and safety improvements to local roads between Pukekohe and the subject site, including Glenbrook Road.

2.1.1 Auckland Future Urban Land Supply Strategy (FULSS)

The Auckland Future Urban Land Supply Strategy (FULSS) sets out a sequential approach towards the development of future urban land within the Auckland Region over the 30-year period of 2017 to 2047.

FULSS recognises Glenbrook Beach as a rural settlement for future urban growth, identifiying some 89 hectares of land for future urban growth of approximately 1,050 dwellings. The land at Glenbrook Beach is subdivided into two areas as follows:

- **Glenbrook Beach 1** – Identified as a 'Special Housing Area' (SHA) in FULSS and referred to as the 'Glenbrook 3' Precinct in the AUP-OIP, approximately 843 dwellings are proposed on land located to the north of McLarin Road, including 80 retirements apartments and around 2,000 sqm GFA of mixed use retail. As noted earlier, Glenbrook Beach 1 has been partially developed as the Kahawai Point SHA, with 115 of the proposed dwellings completed at the time of writing.

- **Glenbrook Beach 2** – Approximately 207 future dwellings divided between three properties to the south and west of McLarin Road, south of Glenbrook Beach 1, including the subject site of 80 McLarin Road with a future anticipated dwelling yield of 100 new dwellings.

While Glenbrook Beach 1 was identified for development during the time period 2012 to 2017, Glenbrook Beach 2 is identified for development during the period 2023 to 2027, which thus aligns with the timing of the proposed plan change at 80 McLarin Road.

2.2   AUP-OIP Glenbrook 3 Special Housing Area (SHA) Precinct

The AUP-OIP Glenbrook 3 Precinct Chapter provides guidance and principles for the partially completed Kahawai Point SHA development to the north of McLarin Road, also known as 'Glenbrook Beach 1' and shown in Figure 2. As noted earlier this site is being developed as a SHA, to enable fast track development for housing, including affordable housing.

Figure 2 – AUP-OIP Glenbrook 3 Precinct Plan.

2.2.1   Glenbrook 3 Zoning

The underlying Unitary Plan zoning for the Glenbrook 3 Precinct is a mix of Residential – Single House, Neighbourhood Centre and Open Space: Informal Recreation Zones.

The Residential – Single House serves a primary purpose to maintain and enhance amenity values of established residential neighbourhoods, which in the case of Glenbrook 3 take account of the coastal setting. The intensity of residential development within the zone is generally expected to be characterised by one to two storey dwellings, representing a lesser density than that planned for 80 McLarin Road, which is proposed to be developed under Residential – Mixed Housing Suburban Zoning.

The precinct also contains a small centrally located service centre, to be located on the eastern side of McLarin Road, opposite the subject site of this report. At the time of writing, this service centre is yet to be developed.

2.2.2 Glenbrook 3 Transportation Provisions

The Glenbrook 3 Precinct Chapter sets the objective for the development to establish *'a safe, efficient and integrated transport system that provides strategic roading connections, a choice of travel modes, encourages walking and cycling and provides strong, legible connections to and through the precinct, whilst minimising crossings through natural features.'*

Accordingly, the Glenbrook 3 Precinct Chapter sets out Roading Standards for the precinct, including standards for road cross-section designs and Transport Infrastructure upgrades.

To achieve consistency and integration with the Glenbrook 3 precinct, it is proposed that development at 80 McLarin Road will adopt the road cross-section designs set out in the Glenbrook 3 Precinct Chapter. These are discussed in more detail in section 4.4 of this report.

The package of transport upgrade works outlined in the Precinct Chapter includes the following:

- Upgrades to sections of McLarin Road adjoining the site

- New Roundabout to be provided at the intersection of McLarin Road / Hill Road

- Whilst not listed in the tables of infrastructure works in the Precinct Chapter, the Precinct Plan includes a new roundabout on McLarin Road adjacent to the proposed local centre.

- Lower speed limits along Glenbrook Beach Road and McLarin Road

- Intersection upgrades at the following locations:
    - Brookside Road / Mission Bush Road
    - Brookside Road / Glenbrook Beach Road
    - Brookside Road / Glenbrook Road / Glenbrook-Waiuku Road

       ○ Mission Bush / Glenbrook-Waiuku Road

- General Road Safety Improvements, including improved signage, sealing, edge delineation treatments, centreline markings and protection from roadside hazards

Engagement with Auckland Transport (AT) and site inspections have confirmed the implementation of roading upgrade works within the last five years following approval for the development of the Glenbrook 3 Precinct, as noted within Chapter 5 of this report.

2.3   AUP-OIP Future Urban Zone Provisions and Objectives

The AUP-OIP provides the following description for land categorised as Future Urban Zone (FUZ), which is the current zoning for the subject site at 80 McLarin Road:

The Future Urban Zone is applied to greenfield land that has been identified as suitable for urbanisation. The Future Urban Zone is a transitional zone. Land may be used for a range of general rural activities but cannot be used for urban activities until the site is rezoned for urban purposes.

The proposed plan change to enable residential development of the subject site is thus considered to be consistent with the over-arching objective of the FUZ. The subject site of 80 McLarin Road was rezoned as FUZ to acknowledge that it could form a logical urban extension to the SHA that has already been developed on the Glenbrook Beach 1 site to the north of McLarin Road, subject to appropriate infrastructure upgrades to service the land.

2.4   AUP-OIP Residential – Mixed Housing Suburban Zone Provisions and Objectives

The AUP-OIP provides the following description for land categorised as Residential – Mixed Housing Suburban Zone, being the proposed future zoning for 80 McLarin Road:

The Residential – Mixed Housing Suburban Zone is the most widespread residential zone covering many established suburbs and some greenfields areas. ... The zone enables intensification, while retaining a suburban built character. Development within the zone will generally be two storey detached and attached housing in a variety of types and sizes to provide housing choice.

While neighbouring land within the SHA to the north of McLarin Road is zoned and developed as Residential – Single House Zone, the Residential – Mixed Housing Suburban Zone allows for higher density dwelling typologies, thus providing opportunity to achieve an increased dwelling yield, of up to 100 dwellings on the subject site.

Due to constraints imposed on the site through wetland classifications, the concentration of higher density residential development towards the northwestern and northeastern parts of the site, closer to MacLarin Road, is considered to offer the best opportunity to maximise the development potential for the site.

3.0   EXISTING TRANSPORT ENVIRONMENT

3.1   Road Network

The site is located at 80 Mclarin Road, as shown in Figure 3.

Source: https://unitaryplanmaps.aucklandcouncil.govt.nz/upviewer/

Figure 3 – Local Traffic Environment

3.1.1   McLarin Road

Mclarin Road is classified as a collector road with the primary function to collect traffic from local streets between Glenbrook Beach Boat Ramp Reserve and Glenbrook Beach Road, to the south of Glenbrook Beach township. McLarin Road travels primarily through residential areas, including parts of the newly developed Glenbrook Precinct SHA, as well as some business and rural areas.

McLarin Road is a two-lane road as shown in Figure 4. It is subject to a speed limit of 60km/hr entering the Glenbrook Beach township from the south, which transitions to a 50 km/hr limit on the northbound approach to the new roundabout with Okoreka Road, opposite the subject site.

Figure 4 – Mclarin Road Traffic Environment

Traffic flows on Mclarin Road in the vicinity of the subject site are in the order of 353 vehicles per day, based on traffic counts obtained from Auckland Transport from February 2020. Corresponding weekday peak hour traffic flows are in the order of 40 to 60 vehicles per hour. Weekday peak hour traffic flows are in the order of 45 vehicles per hour during both midday peak times.

3.1.2   Glenbrook Beach Road

Glenbrook Beach Road forms a continuation of McLarin Road heading southwards from Glenbrook Beach. It is classified as a collector road and connects Glenbrook Beach with Brookside Road to the south. It is a two-lane road with a painted centreline, as shown in Figure 5, with no passing lines provided on the approach to a hillcrest section.

Heading southwards from the settlement of Glenbrook Beach, the 60 km/hr speed limit transitions to 80 km/hr immediately to the south of the crossroads intersection with McLarin Road / Beach Road / Dunsmuir Road.

Figure 5 – Glenbrook Beach Road Traffic Environment

Traffic counts on Glenbrook Beach Road are in the order of 1,624 vehicles per day, based on traffic counts obtained from Auckland Transport from April 2021. Corresponding Weekday peak hour traffic flows are in the order of 200 vehicles per hour during both morning and evening peak times.

3.2 Future Traffic Flows

Forecast future traffic flow data for 2030 has been determined from traffic generation and analyses discussed in Chapter 4 of this report, based on the identified future growth potential within the Glenbrook Beach area.

Due to the route of McLarin Road and Glenbrook Beach Road to the south being the only route out of Glenbrook Beach for traffic adjoining the wider road network, the section of McLarin Road to the south of the new urban area is expected to experience the full traffic impact of traffic generated by the new urban area.

Future forecast peak hour traffic flows on McLarin Road to the south of the subject site and on Glenbrook Beach Road are in the order of around 920 vehicles per hour during both morning and evening peak times in 2030, which corresponds with a forecast daily traffic flow of around 7,500 vehicles per day. This represents an increase in the region of 400% to 500% compared to recorded 2021 traffic flows.

Further analysis in relation to trip distribution across the wider road network and intersection analyses are undertaken in Chapter 7 of this ITA.

3.3 Traffic Safety

Information from the New Zealand Transport Agency's "Crash Analysis System" for the five-year period, January 2016 to December 2020, was obtained for the roads leading to Glenbrook Beach area, as shown in Figure 6.

Source: https://cas.nzta.govt.nz/query-builder/

Figure 6 – Local Crash Records

3.3.1 Mclarin Road Crashes

One crash has been recorded along McLarin Road, which occurred at its intersection with Beach Road.

The crash was caused by a U-turning vehicle failing to give way, causing minor injury.

3.3.2 Glenbrook Beach Road Crashes

Fourteen crashes have been recorded along Glenbrook Beach Road.

The fourteen crashes that occurred are summarised as follows:

- Eleven were related to vehicles losing control along bends. Four caused serious injuries and two caused minor;
- Two resulted from vehicles losing control on a straight section of road; and
- One involved a head-on crash, caused by a vehicle losing control, resulting in minor injury.

None of the crashes related to intersections.

3.3.3 Brookside Road Crashes

Six crashes have been recorded on Brookside Road between its intersections with Glenbrook Road and Glenbrook Beach Road.

The six crashes that occurred are summarised as follows:

- Three were related to vehicles losing control on straight roads. Two minor injuries were reported;
- One was associated with a U-turn vehicle failing to give way;
- One was a rear-end crash on the northbound left-turn slip lane at the intersection of Brookside Road / Glenbrook Road, causing minor injury; and
- The other was caused by a driver missing the intersection and went off the opposite side.

3.3.4 Mission Bush Road Crashes

Five crashes have been recorded on Mission Bush Road between its intersections with Brookside Road and Glenbrook-Waiuku Road.

The five crashes that occurred are summarised as follows:

- Four were related to vehicles losing control when cornering, causing two serious injuries; and
- One was the result of a west bound right turn vehicle failing to give way.

3.3.5   Glenbrook Road Crashes

One crashes was recorded on Glenbrook Road near its intersections with Brookside Road, in which a vehicle lost control along the right turn.

3.3.6   Glenbrook-Waiuku Road Crashes

Fifteen crashes have been recorded on Glenbrook-Waiuku Road between its intersections with Brookside Road and Mission Bush Road.

The fifteen crashes that occurred are summarised as follows:

- Ten were related to vehicles losing control along bends, causing three minor injuries;

- Two were associated with vehicles turning right into Caltex petrol station getting rear-ended, One caused serious injury and the other caused minor injury;

- One involved a vehicle losing control on straight road and went off to the left.

- One was the result of a vehicle hitting a parking car, resulting in minor injuries; and

- The other was a head-on crash, in which one of the vehicles swung wide and caused serious injury.

3.3.7   Overall Conclusions

While the above crash analyses confirm a number of clusters or lengths of road over which loss of control type crashes occurred, it should be noted that the five-year analysis period encompasses the implementation of roading improvements and upgrades associated with the development of the Glenbrook 3 Precinct. Measures such as edge and curve delineation treatments aimed at reducing loss of control crashes, would not have been in place for a sufficient period of time to determine their effectiveness.

Overall, apart from loss of control crashes which are expected to have been addressed by delineation improvements, the reported crash history would not suggest a traffic safety problem in this general location that would be exacerbated by additional traffic generated by development of the subject site.

3.4   Public Transport Accessibility

There are currently no public transport services serving Glenbrook Beach, with the nearest existing bus stops to the subject site being located over 8 km away on Glenbrook Road, which is served by the route 395 between Papakura an Waiuku.

However, as the population within the area grows, services are expected to be provided, including a bus service along Glenbrook Beach Road to connect to Waiuku. Thus, the area in the general vicinity of the site is expected to have improved accessibility to public transport services in the future.

3.5   Pedestrian Facilities

Footpaths are provided along the northern side of Mclarin Road in the vicinity of the subject site, as part of the stage 1 Glenbrook Beach developments. It is expected that southern footpaths will be provided along the site frontage and connected to the existing pedestrian network as part of the subject development.

Existing stage 1 footpaths are shown in Figure 7.

Figure 7 – Mclarin Road Footpaths

3.6   Cyclist Facilities

No dedicated cyclist facilities are provided in the area, with cyclists being required to share the road with other road users.

The area is considered accessible by cycle for those who choose to travel by this mode of transport.

3.7 Walking and Cycling Accessibility

The accessibility of the site by walking and cycling is illustrated in Figure 8. In general, 1,000 metres is accepted as being the maximum desirable walking distance and 5,000 metres the maximum desirable cycling distance.

Key locations within desirable walking distance of the site include the wider residential settlement of Glenbrook Beach, including the beach fronts at Glenbrook Beach and Kahawai Point.

Key destinations within desirable cycling distance of the subject site include most of the properties along Glenbrook Beach Road, which are all within a cycling time of around 20 minutes. This level of accessibility for pedestrians and cyclists serves to enhance amenity values within the wider newly established urban settlement at Glenbrook Beach.
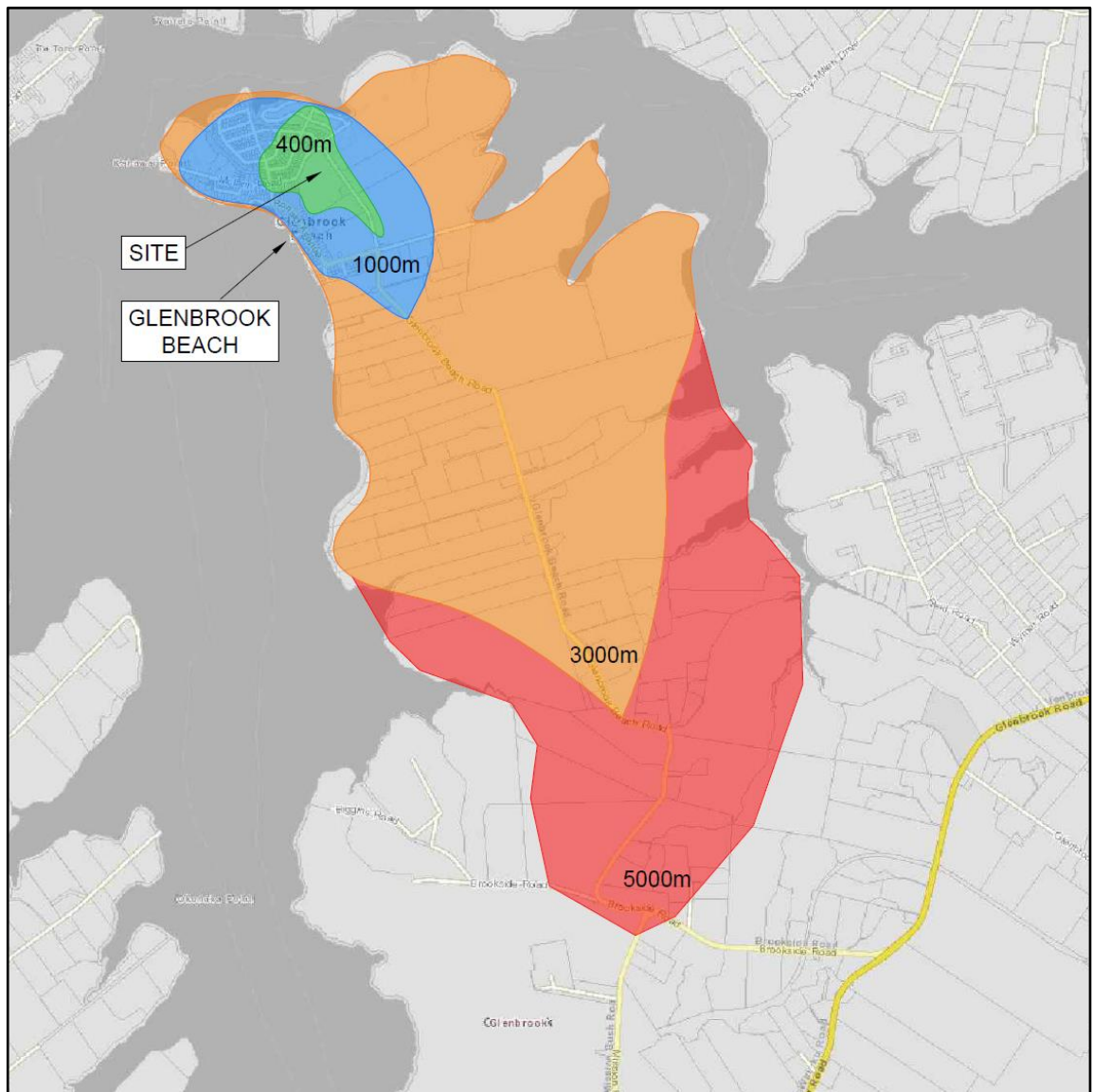
Figure 8 – Walking and Cycling Isochrones

4.0 PROPOSED PLAN CHANGE

4.1 Residential Density

The Proposed Plan Change rezones 8 hectares of Greenfield land at 80 McLarin Road in Glenbrook to residential land from its current Future Urban zoning, to enable the provision of 100 new residential dwellings, including an associated road network.

The indicative Masterplan is shown in Figure 9 for the future residential development, based on a dwelling yield of 100 lots.
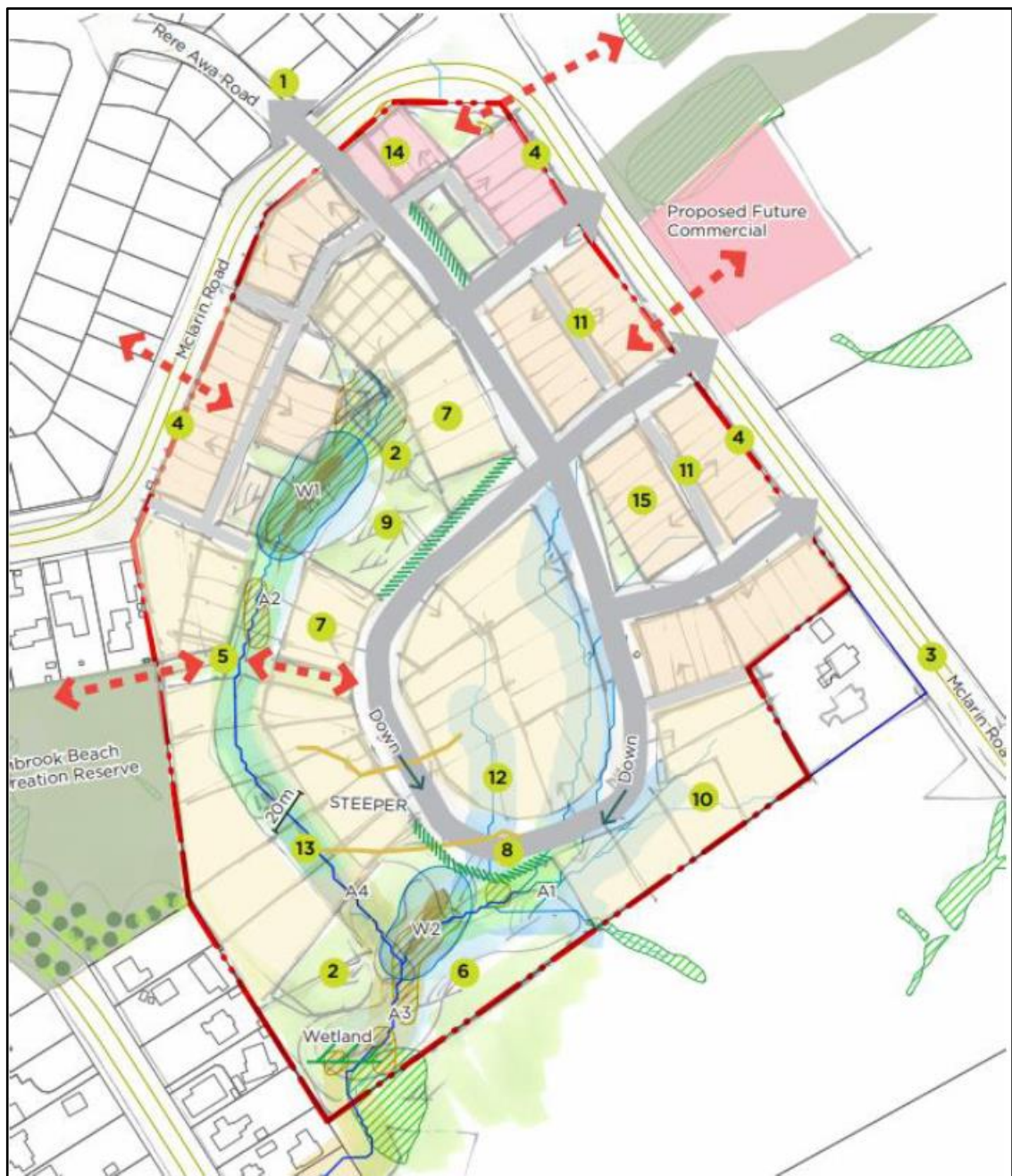
Figure 9 – Indicative Masterplan

The salient transportation features are summarised as follows:

- New intersections off McLarin Road to serve the subject site are most likely to be priority controlled, with the exception of a roundabout adjacent to the southwestern corner of the proposed future Commercial Centre, as proposed in the Glenbrook 3 Precinct Plan.

- An internal roading layout and design that encourages a low speed environment through a combination of physical dimension and alignment.

- Footpaths, grass berms and on-street parking zones will be provided internally within the development site.

- Good levels of pedestrian connectivity through the site and to the adjoining residential areas, open spaces and reserves and to future commercial land to the northeast, to ensure the walkability of the development including identified crossing points.

4.2   Traffic Generation Potential

In respect of traffic generation potential of the rezoned land, typical traffic generation rates have been sourced from the New Zealand Trips and Parking Database (NZTPD).

The traffic generation rate of residential dwellings does vary depending on the type of unit and the location of the development. The NZTPD indicates typical daily traffic generation rates of 8 to 10 traffic movements per dwelling per day with corresponding peak hour traffic generation rates of about 1 traffic movement per dwelling per hour.

In respect of directionality, typically in the morning peak hour 75% of the movements will be departures and 25% arrivals. In the evening peak hour, 65% will be arrivals and 35% departures.

Given the above, Table 1 indicates the potential traffic generation of the residential development enabled by the Plan Change for the 8 hectare land area.

Table 1 – Plan Change Traffic Generation

Direction	Daily Traffic	AM Peak Hour	PM Peak Hour
In	400-500	25	65
Out	400-500	75	35
TOTAL	**800-1,000**	**100**	**100**

The traffic generation potential of the rezoned site is in the order of 1,000 traffic movements per day with commuter peak hour traffic generation of about 100 traffic movements per hour.

4.3   Road Design Philosophy

The roading design philosophy for future residential development at 80 McLarin Road is proposed to be consistent with that of the Glenbrook 3 Precinct chapter, which outlines the following three road typologies:

- Type A Principal Road with a 20-metre legal road reserve width,

- Type B Critical Local Road with a 17-metre legal road reserve width, and

- Type C Minor Local Road with a 14-metre legal road reserve width

4.3.1   Type A Principal Road

The Principal Road typology for the Glenbrook 3 Precinct applies only to McLarin Road to the west of the subject site.

The proposed road cross section for the 20 metre wide road reserve is shown in Figure 10.
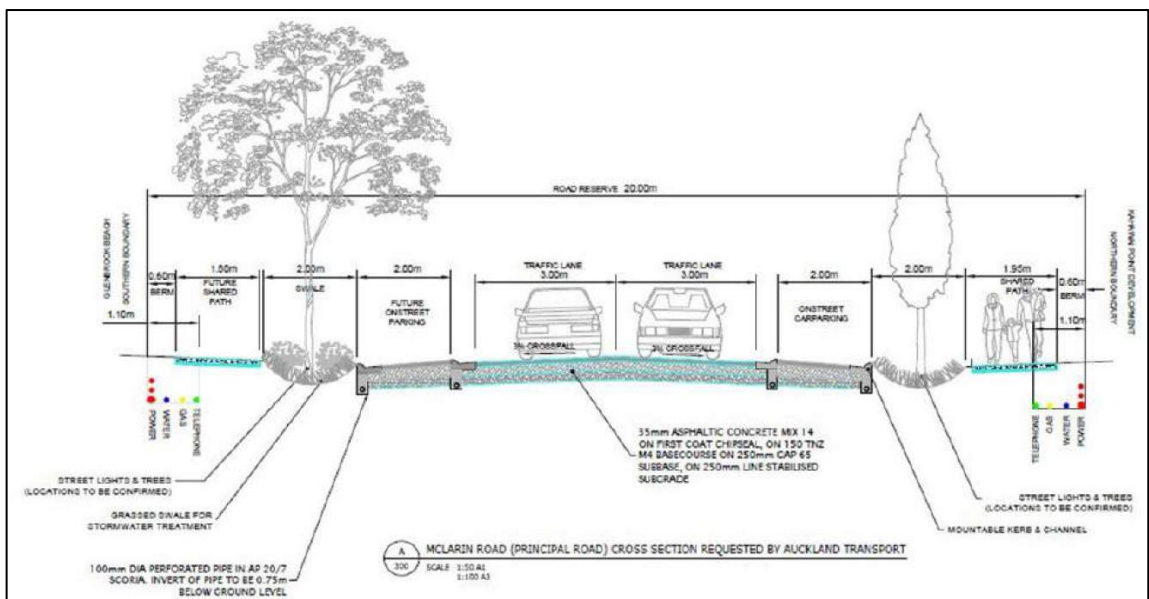
Source: Auckland Unitary Plan Operative in Part

Figure 10 – Type A Principal Road Cross-Section (McLarin Road)

The proposed 20 metre road cross section makes allowance for:

- A 1.95 metre wide shared path on one side, with provision for a 1 metre wide shared path on the other side,

- Provisions for on-street parking on both sides of the road plus grass berm and landscape areas,

- A 50km/hr design speed,

- A 6 metre carriageway providing one traffic lane in each direction.

4.3.2   Type B Critical Local Road

The Critical Local Road typology applies to the length of McLarin Road bordering the subject site, as well as to a network of collector roads within the Glenbrook 3 Precinct. As noted in Section 4.3, this section of McLarin Road is expected to incorporate new access intersections to serve the subject site. The Critical Local Road typology is also expected to be used for key collector road connections linking the subject site with McLarin Road.

The proposed road cross section for the 17-metre wide road reserve is shown in Figure 11.
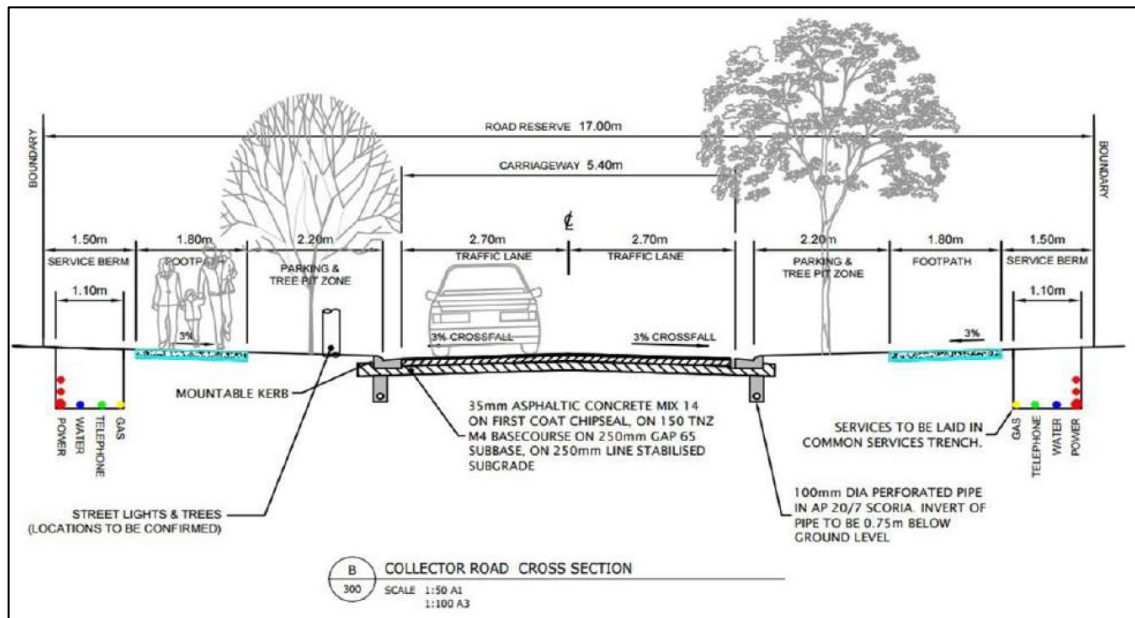
Source: Auckland Unitary Plan Operative in Part

Figure 11 – Type B Critical Local Road Cross-Section

The proposed 17 metre road cross section makes allowance for:

- A 1.8 metre wide footpath on both sides of the road,
- Parking and tree pit zones on both sides of the road plus service berm areas,
- A 5.4 metre carriageway width clear of drainage channels.

4.3.3   Type C Minor Local Road

The Minor Local Road Typology applies to the remainder of the internal road network within the Glenbrook 3 Precinct, adjoining the Critical Local Road network. The Minor Local Road typology is also expected to be used to serve residential frontages within the subject site, which do not front the Critical Local Roads.

The typical road cross section of the 14 metre Local Road is shown in Figure 12.
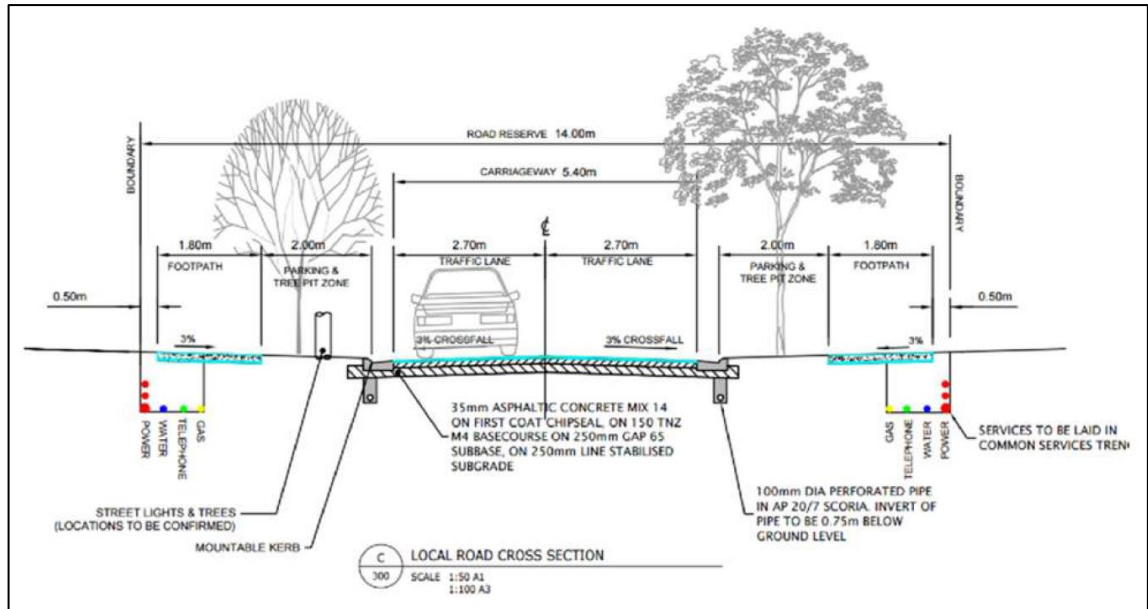
Source: Auckland Unitary Plan Operative in Part

Figure 12 – Type C Minor Local Road Cross-Section

The proposed 14 metre road cross section makes allowance for:

- A 1.8 metre wide footpath on both sides of the road,

- Parking and tree pit zones on both sides of the road plus service berm areas,

- A 5.4 metre carriageway width clear of drainage channels.

4.4   Potential Intersections with McLarin Road

Access to the 8 hectare block of land is expected to be provided via multiple locations off McLarin Road, including a roundabout opposite the location for the future local centre, while other intersections are expected to be priority controlled, the exact locations for which are still to be determined.

Based on the Indicative Masterplan, all sections of McLarin Road fronting the subject site have been assessed for their ability to support future access intersections to the site. For the purposes of this assessment the sections of the McLarin Road frontage have been subdivided as follows:

- The eastern boundary to the site

- The northern boundary to the site, creating a crossroads intersection with Rere Awa Road

- The north-western boundary to the site

The key aspects in relation to new intersections with the public road network include:

- The provision of appropriate sight distances, and

- The design of the proposed intersection.

4.4.1 Intersection Sight Distances

The operational safety at an intersection is influenced by the available sight distance, the speed of approaching traffic, and the ability of a vehicle to avoid a collision, either by stopping in time or by being able to take other evasive action.

Appropriate sight distance standards at an intersection are indicated in the AUSTROADS publication "Guide to Road Design" Part 4A "Unsignalised and Signalised Intersections". There are three key sight distance parameters indicated in the guide:

1. Safe Intersection Sight Distance (SISD) provides a sufficient distance for a driver of vehicle on the major road to observe a vehicle from a minor road approach moving into a collision situation and to decelerate to a stop before reaching the collision point. It is measured from driver eye height (1.15m) to the top of an approaching car (1.25m).

2. Approach Sight Distance (ASD) which is a minimum requirement to provide the driver of a vehicle adequate distance to observe the roadway layout in sufficient time to react and stop if necessary, before entering a conflict area. It is measured from driver eye height (1.15m) to the road surface (0m).

3. Minimum Gap Sight Distance (MGSD) provides a sufficient distance for a driver of a vehicle entering onto a major road to see a vehicle in the conflicting traffic stream in order to safely commence the desired manoeuvre. It is measured from driver eye height (1.15m) to the object height of approaching vehicle (0.65m).

These criteria are shown in Figure 13.
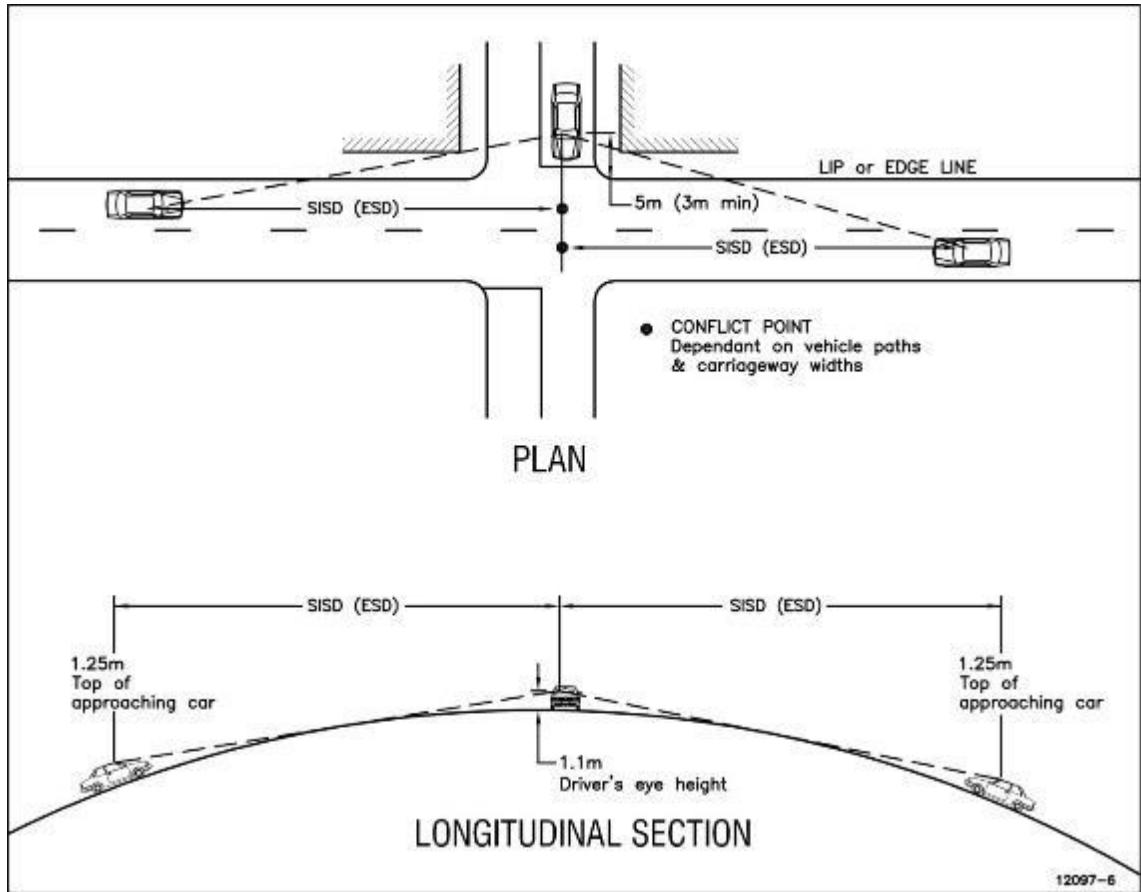
Figure 13 – Safe Intersection Sight Distance Measurement

In relation to sight distance, Figure 14 shows the sight distances available while Table 2 provides an assessment against the AUSTROADS guide. The operating speeds on McLarin Road used for sight distance requirements are based on on-site observations.

As the proposed intersection locations along the site's eastern and northwestern boundaries are located on an open length of road with broadly the same limits to the available visibility lines, these locations have been assessed as a single entity, using the worst-case sight distances, which occur opposite Rere Awa Road.

Eastern Site Frontage, to the North

Eastern Site Frontage, to the south

Frontage opposite Rere Awa Road, facing East

Frontage opposite Rere Awa Road, facing West

Figure 14 – Intersection Sight Distances

Table 2 – McLarin Road / Proposed Intersection Sight Distance Assessment
McLarin Road Eastern Frontage

Safe Intersection Sight Distance			
Direction	Speed	Recommended Sight Distance	Minimum Available Sight Distance on McLarin Road Frontage
To the north	30 km/hr	51 metres *	83 metres
To the south	60 km/hr	123 metres	150 metres
Minimum Gap Sight Distance			
Direction	Speed	Recommended Sight Distance	Minimum Available Sight Distance on McLarin Road Frontage
To the north	30 km/hr	42 metres	83 metres
To the south	60 km/hr	83 metres	150 metres

* Interpolated value, as the lowest speed value in the Guide is based on 40km/hr

McLarin Road Northern frontage (opposite Rere Awa Road)

Safe Intersection Sight Distance			
Direction	Speed	Recommended Sight Distance	Minimum Available Sight Distance on McLarin Road Frontage
To the east	20 km/hr	31 metres *	75 metres
To the west	30 km/hr	51 metres *	> 51 metres achievable, subject to removal of vegetation at site frontage, to ensure visual permeability
Minimum Gap Sight Distance			
Direction	Speed	Recommended Sight Distance	Minimum Available Sight Distance on McLarin Road Frontage
To the east	20 km/hr	28 metres	75 metres
To the west	30 km/hr	42 metres	> 42 metres achievable, subject to removal of vegtation at site frontage, to ensure visual permeability

* Interpolated value, as the lowest speed value in the Guide is based on 40km/hr

McLarin Road Northwestern frontage

Safe Intersection Sight Distance			
Direction	**Speed**	**Recommended Sight Distance**	**Minimum Available Sight Distance on McLarin Road Frontage**
To the east	30 km/hr	51 metres *	> 51 metres achievable, subject to removal of vegtation at site frontage, to ensure visual permeability
To the west	30 km/hr	51 metres *	70 metres
Minimum Gap Sight Distance			
Direction	**Speed**	**Recommended Sight Distance**	**Minimum Available Sight Distance on McLarin Road Frontage**
To the east	30 km/hr	42 metres	> 51 metres achievable, subject to removal of vegtation at site frontage, to ensure visual permeability
To the west	30 km/hr	42 metres	70 metres

* Interpolated value, as the lowest speed value in the Guide is based on 40km/hr

From Table 2, the sight distances available from between the potential intersection locations and traffic approaching from McLarin Road can be made to meet or exceed those recommended by the Austroads guidelines. Therefore future access intersections to the subject site can be supported at all of these locations.

4.4.2   McLarin Road Intersection Design

The traffic environment along McLarin Road in the vicinity of the subject site is shown in Figure 15.

Eastern Site Frontage, facing North

Eastern Site Frontage, facing South

Frontage opposite Rere Awa Road

Figure 15 – McLarin Road Intersections Traffic Environment

In its current form bordering the subject site, McLarin Road caters for one 3 metre traffic lane in each direction, with on-street parking provided along the section fronting the recently developed SHA.

The AUSTROADS publication "Guide to Traffic Management" Part 6 "Intersections, Interchanges and Crossings" establishes warrants for appropriate treatments to accommodate intersection turning manoeuvres. Based on forecast future peak hour traffic flows on McLarin Road and the traffic generation potential of the 8 hectares of land at 80 McLarin Road, the proposed new intersections to the site from McLarin Road would meet the warrant for a priority intersection with a channelised turn treatment (CHR), as indicated in figure 16.
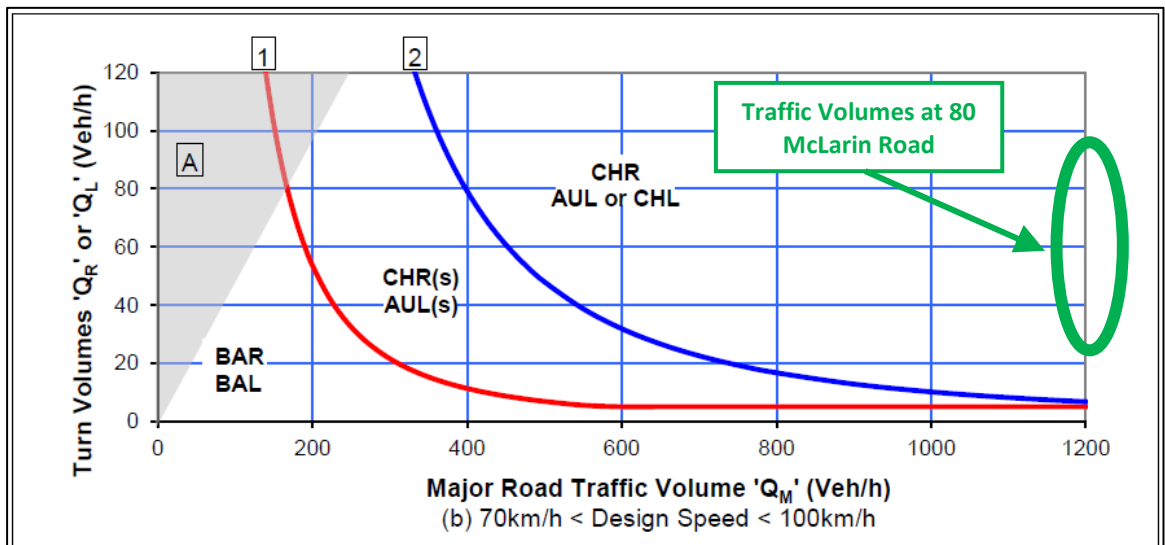
Figure 16 – Warrants for turn treatments on major roads at unsignalized intersections

To provide for the turning movements generated by the 8 hectares of land at 80 McLarin Road, widening would be required along the sides of McLarin Road fronting the subject site to accommodate channelised right-turn bays. The existing traffic lane widths of 3 metres would be retained. The proposed road widening is on the basis of retaining the current width available for recessed roadside parking, where this does not interfere with visibility sight lines at the new intersections. These matters of design detail would need

to be resolved at the time of subdivision consent and the associated Engineering Plan Approvals by the Council.

There is currently a 60/50 speed threshold on the northbound approach to the roundabout with Okoreka Road, as shown in Figure 17. As noted earlier, it is expected that this threshold would be relocated southwards, to extend the 50km/hr speed limit past the eastern boundary of the subject site, encompassing future access intersections to the new development.

The final designs for these intersections would also need to be resolved at the subdivision consent stage of any development on the 8 ha subject site that results in the new link road being provided to McLarin Road.

Figure 17 – McLarin Road 60 / 50 Speed Threshold

5.0   EXISTING INTERSECTIONS

All additional traffic generated by the Residential Zone for the 8 hectare property will gain access to the public road network via McLarin Road, which continues southwards as Glenbrook Beach Road around half a kilometre to the south of the subject site, as shown in Figure 18.

Figure 18 – Existing Intersections forming scope of traffic impact assessment

Around 5.5 kilometres to the south of the subject site, Glenbrook Beach Road adjoins Brookside Road, which provides onward access to the wider road network to the south and east, via Mission Bush Road, Glenbrook-Waiuku Road and Glenbrook Road.

Around 0.3 km to the east of the intersection of Glenbrook Beach Road / Brookside Road, Mission Bush Road provides southward access towards the township of Waiuku, via

Glenbrook-Waiuku Road. A further 1.8 km to the east, Brookside Road adjoins Glenbrook Road, which provides eastward access towards Pukekohe and the wider Auckland sub-region.

The following key intersections have been identified as key locations of traffic impact on the adjoining road network for traffic generated by the 8 hectare rezoned property, as shown in Figure 14:

- Glenbrook Beach Road / Brookside Road

- Brookside Road / Mission Bush Road

- Mission Bush Road / Glenbrook-Waiuku Road

- Glenbrook Road / Brookside Road

5.1 Glenbrook Beach Road / Brookside Road

5.1.1 Description

Glenbrook Beach Road intersects with Brookside Road at a priority intersection, at which the through movement is provided between Glenbrook Beach Road to the north and Brookside Road to the east. The layout of the intersection is shown in Figure 19.

Figure 19 – Glenbrook Beach Road and Brookside Road Existing Intersection

All approach roads have a single traffic lane in each direction.

Recent safety improvements were implemented at this intersection in connection with the Glenbrook 3 SHA development, including edge and curve delineation measures.

5.1.2 Current Traffic Flows

The results of turning movement counts carried out at the intersection on 6th July 2021 during the morning (7:45 am to 8:45 am) and 5th July 2021 during afternoon (4:45 pm to 5:45 pm) weekday peak periods are shown in Figure 20 for the respective peak hour during these periods.
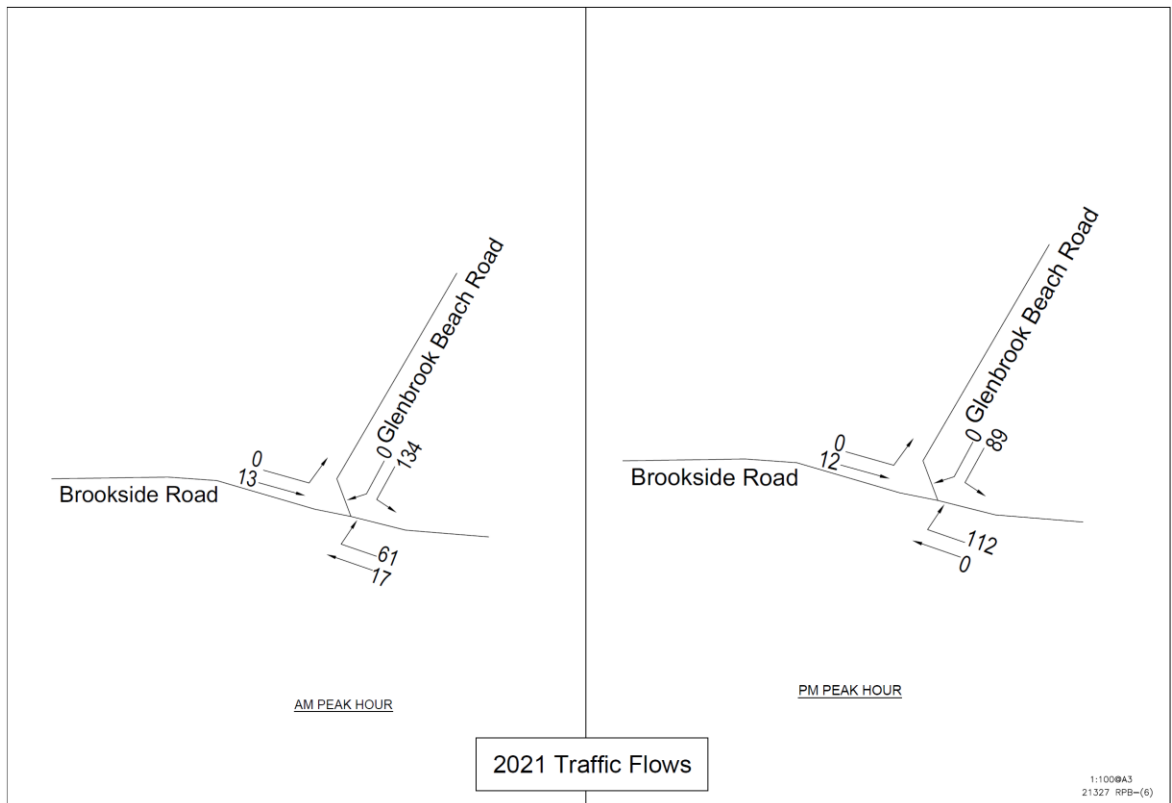
Figure 20 – Glenbrook Beach Road and Brookside Road 2021 Traffic Flows

5.1.3 Current Intersection Operation

Observation of the intersection during the morning and afternoon peak periods indicates that it generally operates well within its overall capacity.

To determine the current intersection operational parameters, the intersection has been modelled using the SIDRA Intersection software package for the traffic flows observed during the traffic counts in July 2021. The results of this analysis are summarised in Table 3 and shown in detail in Attachment 1.

Table 3 – Glenbrook Beach Road / Brookside Road SIDRA Results

Scenario	Model Parameter			
	Deg. Satn.	LOS[1]	Ave. Delay	Queue Length
AM Peak Hour	0.073	A	0.8 s	0 veh
PM Peak Hour	0.061	A	0.5 s	0 veh

The following provides a key to the items shown in the table:

Deg. Satn. – Movement Degree of Saturation
Ave. Delay – Average Delay (in seconds) per vehicle
Queue Length – 95 percent queue length (in vehicles)
LOS – Level of Service

The SIDRA analysis results are consistent with the on-site observations and confirm that the intersection currently operates well within its practical capacity.

5.2 Brookside Road / Mission Bush Road

5.2.1 Description

Brookside Road intersects with Mission Bush Road at a priority intersection, at which the through movement is provided between Brookside Road to the east and Mission Bush Road to the south. Traffic departing from the subject site at Glenbrook Beach along from Brookside Road to the west is thus required give way to traffic from the south. The layout of the intersection is shown in Figure 21.

Recent safety improvements were implemented at this intersection in connection with the Glenbrook 3 SHA development, including edge and curve delineation measures, removal of vegetation to improve visibility along the through movement between Brookside Road and Mission Bush Road, new Give Way signage and improvements to lighting.

---

[1] SIDRA indicates that Intersection LS 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 lanes.

Figure 21 – Brookside Road and Mission Bush Road Existing Intersection

All approach roads have a single traffic lane in each direction, however channelised left-turn lanes are provided for the movements from Brookside Road west to Brookside Road east and from Mission Bush Road south to Brookside Road west.

5.2.2   Current Traffic Flows

The results of turning movement counts carried out at the intersection on 6th July 2021 during the morning (7:45 am to 8:45 am) and 5th July 2021 during afternoon (4:45 pm to 5:45 pm) weekday peak periods are shown in Figure 22 for the respective peak hour during these periods.
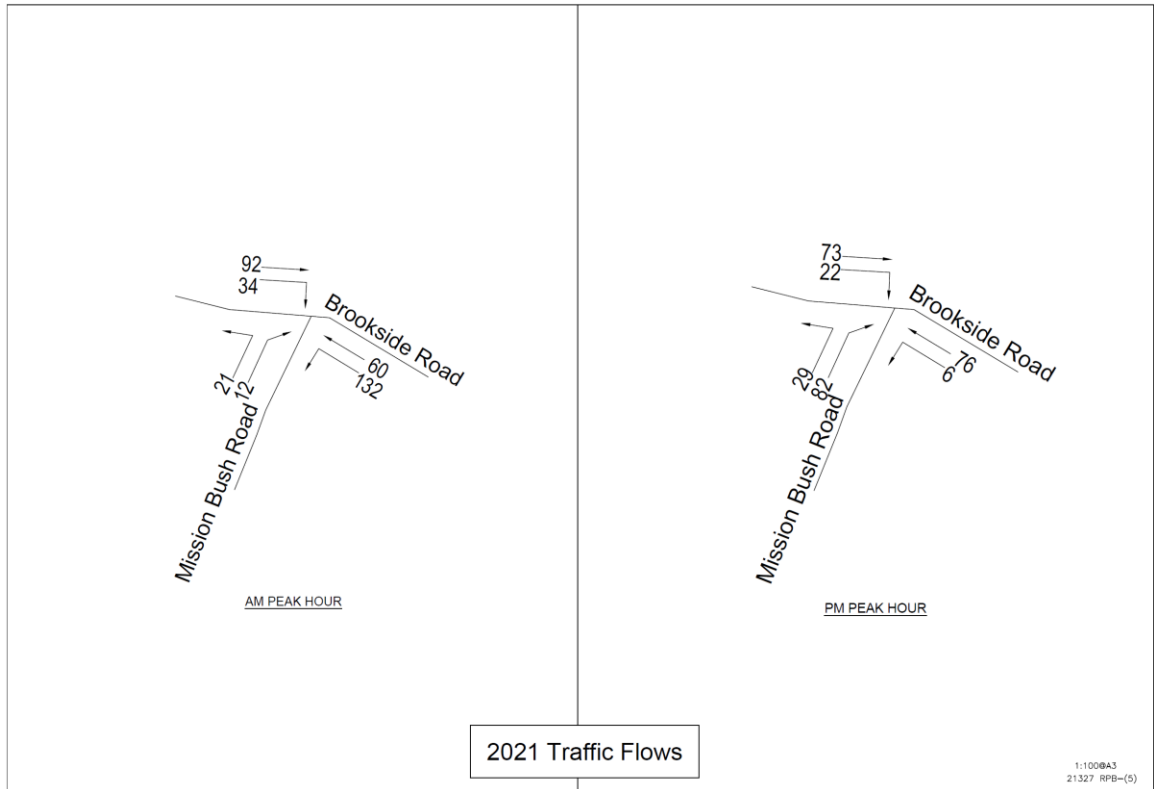
Figure 22 – Brookside Road and Mission Bush Road 2021 Traffic Flows

5.2.3 Current Intersection Operation

Observation of the intersection during the morning and afternoon peak periods indicates that it generally operates well within its overall capacity.

To determine the current intersection operational parameters, the intersection has been modelled using the SIDRA Intersection software package for the traffic flows observed during the traffic counts in July 2021. The results of this analysis are summarised in Table 4 and shown in detail in Attachment 1.

Table 4 – Brookside Road / Mission Bush Road SIDRA Results

Scenario	Model Parameter			
	Deg. Satn.	LOS[2]	Ave. Delay	Queue Length
AM Peak Hour	0.071	A	4.1 s	0.2 veh
PM Peak Hour	0.075	A	3.5 s	0.3 veh

[2] SIDRA indicates that Intersection LS 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 lanes.

The SIDRA analysis results are consistent with the on-site observations and confirm that the intersection currently operates well within its practical capacity.

5.3   Mission Bush Road / Glenbrook-Waiuku Road

5.3.1   Description

Mission Bush Road intersects with Glenbrook-Waiuku Road at a priority intersection, at which the through movement is provided along Glenbrook-Waiuku Road. The layout of the intersection is shown in Figure 23.

All approach roads have a single traffic lane in each direction and a right-turn lane is provided for the movement from Glenbrook-Waiuku Road into Mission Bush Road.

Recent safety improvements were implemented at this intersection in connection with the Glenbrook 3 SHA development, including a painted hatched area between Glenbrook-Waiuku Road northbound and the left-turn into Mission Bush Road and the installation of 'no overtaking' markings in both directions.

Figure 23 – Mission Bush Road and Glenbrook-Waiuku Road Existing Intersection

5.3.2 Current Traffic Flows

The results of turning movement counts carried out at the intersection on 6th July 2021 during the morning (7:45 am to 8:45 am) and 5th July 2021 during afternoon (4:45 pm to 5:45 pm) weekday peak periods are shown in Figure 24 for the respective peak hour during these periods.
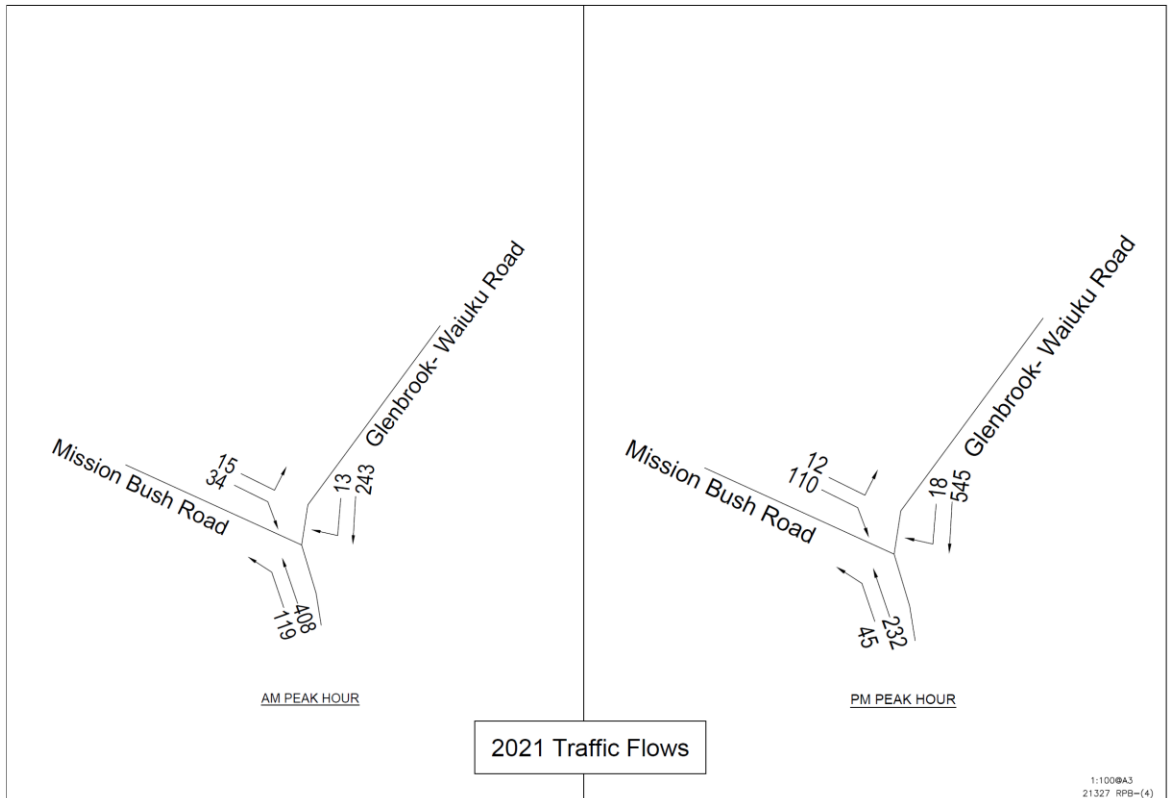
Figure 24 – Mission Bush Road and Glenbrook-Waiuku Road 2021 Traffic Flows

5.3.3 Current Intersection Operation

Observation of the intersection during the morning and afternoon peak periods indicates that it generally operates well within its overall capacity.

To determine the current intersection operational parameters, the intersection has been modelled using the SIDRA Intersection software package for the traffic flows observed during the traffic counts in July 2021. The results of this analysis are summarised in Table 5 and shown in detail in Attachment 1.

Table 5 – Mission Bush Road / Glenbrook-Waiuku Road SIDRA Results

Scenario	Model Parameter			
	Deg. Satn.	LOS[3]	Ave. Delay	Queue Length
AM Peak Hour	0.286	A	2.0 s	0.1 veh
PM Peak Hour	0.383	A	3.0 s	0.3 veh

The SIDRA analysis results are consistent with the on-site observations and confirm that the intersection currently operates well within its practical capacity.

5.4 Glenbrook Road / Brookside Road

5.4.1 Description

Brookside Road intersects with Glenbrook Road and Glenbrook-Waiuku Road at a priority intersection, at which the through movement is provided between Glenbrook Road and Glenbrook-Waiuku Road. The layout of the intersection is shown in Figure 25.

Figure 25 – Glenbrook Road and Brookside Road Existing Intersection

All approach roads have a single traffic lane in each direction, however channelised left-turn lanes are provided for the movements from Brookside Road to Glenbrook Road and from Glenbrook-Waiuku Road to Brookside Road.

---

[3] SIDRA indicates that Intersection LS 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 lanes.

Recent safety improvements were implemented at this intersection in connection with the Glenbrook 3 SHA development, including resealing works, roadside hazard treatments and edge and curve delineation measures.

5.4.2 Current Traffic Flows

The results of turning movement counts carried out at the intersection on 6th July 2021 during the morning (7:45 am to 8:45 am) and 5th July 2021 during afternoon (4:45 pm to 5:45 pm) weekday peak periods are shown in Figure 26 for the respective peak hour during these periods.
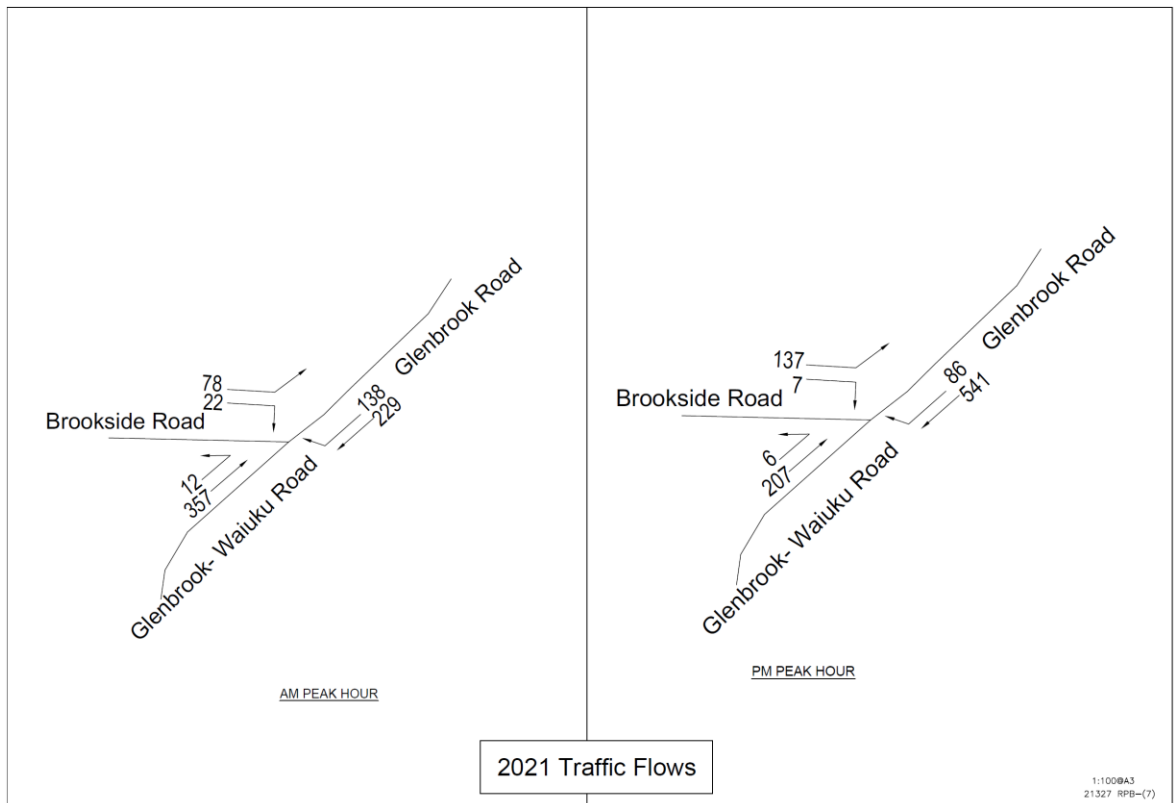
Figure 26 – Glenbrook Road and Brookside Road 2021 Traffic Flows

5.4.3 Current Intersection Operation

Observation of the intersection during the morning and afternoon peak periods indicates that it generally operates well within its overall capacity. The most critical traffic manoeuvres affecting the intersection operation are those undertaken by trucks accessing the Glenbrook Steel Mill, which turn right from Glenbrook Road into Brookside Road and undertake the the reciprocal left-turn manoeuvre in the opposite direction.

To determine the current intersection operational parameters, the intersection has been modelled using the SIDRA Intersection software package for the traffic flows observed

during the traffic counts in July 2021. The results of this analysis are summarised in Table 6 and shown in detail in Attachment 1.

Table 6 – Glenbrook Road and Brookside Road SIDRA Results

Scenario	Model Parameter			
	Deg. Satn.	LOS[4]	Ave. Delay	Queue Length
AM Peak Hour	0.257	A	2.8 s	0.7 veh
PM Peak Hour	0.379	A	3.2 s	0.5 veh

The SIDRA analysis results are consistent with the on-site observations and confirm that the intersection currently operates well within its practical capacity.

6.0 AUCKLAND UNITARY PLAN - OPERATIVE IN PART

6.1 Traffic Generation

Standard E27.6.1 of the AUP-OIP sets out when resource consents as a restricted discretionary activity are required based on traffic generation. Such consent is required for developments exceeding 100 dwellings or which generate more than 100 vehicle movements in any hour where there is not a requirement for an assessment of transport or trip generation effects.

As the Proposed Plan Change enables an anticipated dwelling yield of 100 dwellings and generates 100 vehicle movements per hour during peak periods, this Standard will be applicable and the relevant assessment criteria are considered later in this assessment.

6.2 Other AUP-OIP Standards

A range of standards exist under the AUP-OIP for the activities that will be developed on the site including those related to:

- Car parking (Standard E27.6.2 of the AUP-OIP);

- Cycle parking (Standard E27.6.2 (6) of the AUP-OIP);

- Loading and Servicing (Standard E27.6.3 of the AUP-OIP); and

- Vehicle Access (Standard E27.6.4 of the AUP-OIP);

---

[4] SIDRA indicates that Intersection LS 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 lanes.

Developments on the site would be anticipated to comply with the above standards unless a Resource Consent was granted for a non-compliance.

7.0   PLAN CHANGE TRAFFIC EFFECTS ASSESSMENT

The traffic generation potential of the rezoned land is anticipated to be in the order of 1,000 traffic movements per day with commuter peak hour traffic generation of about 100 traffic movements per hour. All of this traffic will access the road network via a new intersection with McLarin Road and from there be distributed to the south towards the intersections with Glenbrook-Waiuku Road or Glenbrook Road.

7.1   Analysis Methodology

7.1.1   Assessment Process

A four-step process has been used in the methodology to assess the traffic related effects of the Plan Change:

1.   Trip Generation;

2.   Trip Distribution;

3.   Trip Assignment; and

4.   Analysis of Intersection Operation of Assigned Trips.

In the first step, the amount of traffic generated is estimated using recognised data sources. In the second step, the directions the trips use to approach and depart the development are estimated. In the third step, the trips are assigned to specific street segments and intersection turning movements. The fourth step involves analysing the effects on vehicle access and intersection capacity associated with the Plan Change.

7.1.2   Base Traffic Conditions

Prior to assigning vehicle trips to the road network and carrying out an assessment, it is important to determine the underlying base traffic conditions for analysis purposes. In this respect the traffic counts carried out in July 2021 have been used as the underlying base for assessment purposes.

As described earlier, Glenbrook Beach has an approved Special Housing Area (Kahawai Point SHA) with a long term development potential of some 800 dwellings with 80 retirement apartments and a local retail centre with a Gross Floor Area (GFA) of some 2,000 sqm.

It is anticipated that development will be completed by the year 2030 with the approximate development scale and timeframes indicated in Table 7.

Table 7 – Kahawai Point SHA Staging

Stage	Timeframe	Households (cumulative)	Other Activities	Daily Vehicle Trips
1	First Year	50	n.a.	400
2	Second Year	180 (230)	n.a.	1,840
3	Fifth Year	285 (515)	Retail Centre	4,325
4	Tenth Year	285 (800)	80 unit retirement	6,800

As of the time when the traffic surveys were done that form the basis of this assessment, some 115 dwellings had been completed as part of the SHA.

To form the "base" traffic conditions for the analysis for the property at 80 McLarin Road, traffic generated by the remainder of the Kahawai Point SHA development has been added to the surveyed 2021 intersection traffic flows. In addition to this, a traffic growth rate of 3% has been applied to traffic on Glenbrook Road through to 2030 which has been adopted as the design year for assessment purposes. This approach to develop the "base" traffic conditions is shown in Figure 27.

DESIGN BASE TRAFFIC CONDITIONS

Traffic Growth
2021 – 2030
Glenbrook Road

80 McLarin Road Traffic
Completed 2030

SHA Development Traffic (net increase to 2030)

2021 Surveyed Traffic Flows (including 160 SHA)
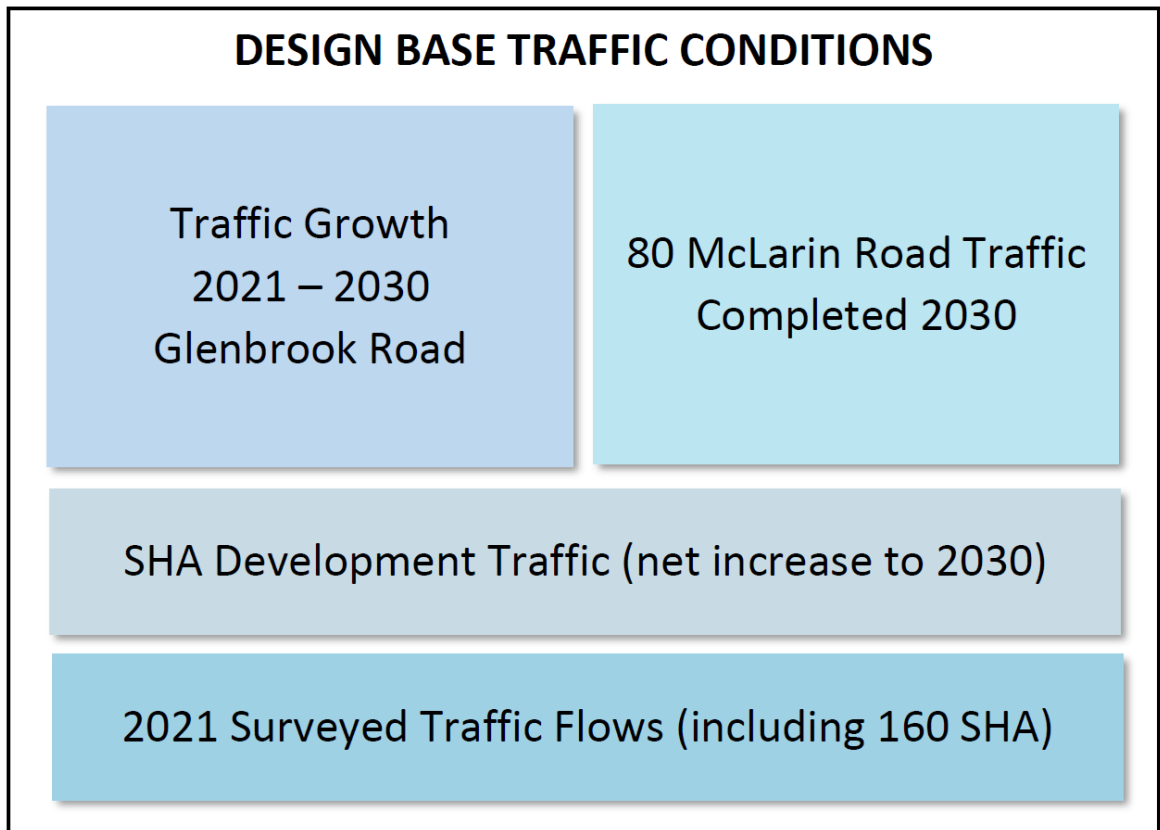
Figure 27 – Base Traffic Conditions

7.2 Trip Generation

As outlined in Section 4.2 of this ITA, the traffic generating potential of the rezoned residential land is anticipated to be in the order of 1,000 traffic movements per day with commuter peak hour traffic generation of about 100 traffic movements per hour. These values have been used for assessment purposes.

7.3 Trip Distribution and Assignment

The distribution of traffic generated by the 8 hectares is based on the surveyed traffic flows entering and exiting the area, as shown in Figure 28. It should be noted that there is little variation between the am and pm peak periods. The distribution of additional traffic onto Glenbrook Beach Road, Brookside Road, Glenbrook Road has been based on surveyed traffic movements.
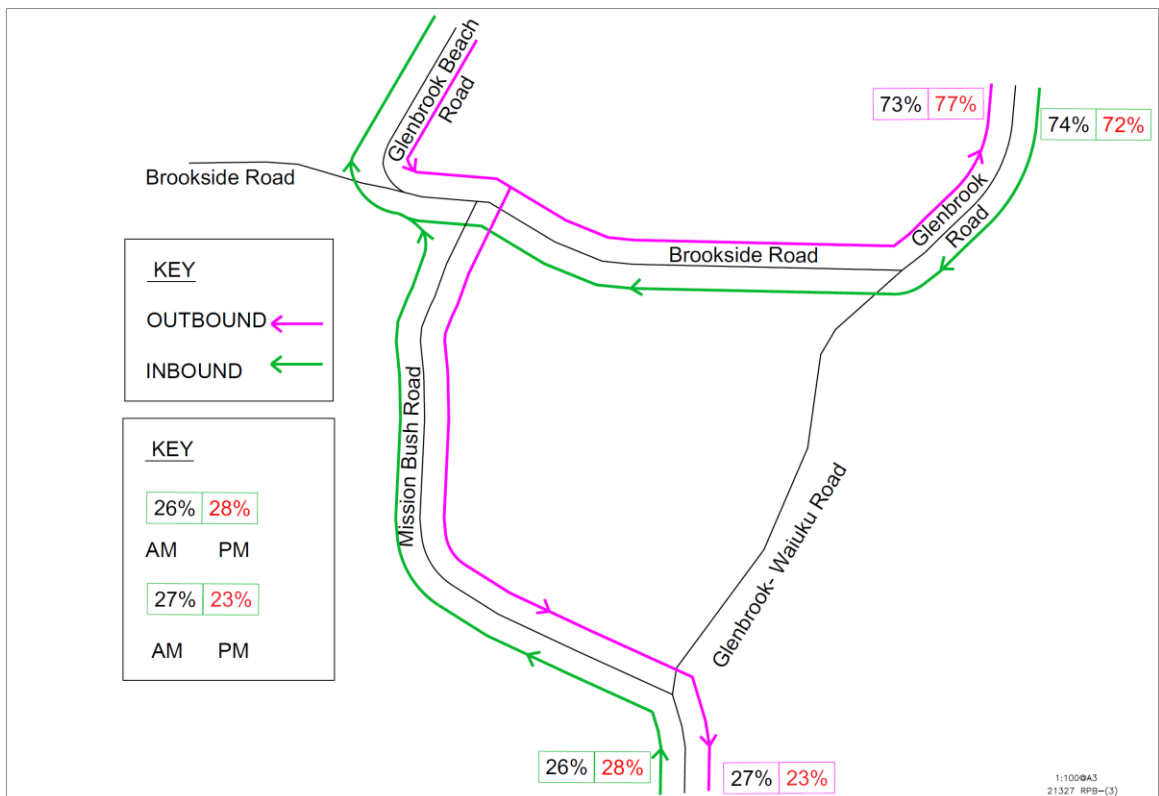
Figure 28 – Modelled Traffic Distribution

The resulting turning movements at the intersections considered as part of this assessment, including plan change taffic, are shown in Attachment 2 for the 2030 design year.

7.4   2030 Effects on Intersections with Plan Change

For the traffic generation and traffic distribution discussed above, the following intersections have been analysed using the SIDRA Intersection software package:

- Glenbrook Beach Road / Brookside Road

- Brookside Road / Mission Bush Road

- Mission Bush Road / Glenbrook-Waiuku Road

- Glenbrook Road / Brookside Road

7.4.1   Glenbrook Beach Road / Brookside Road

The 2030 traffic flows for this intersection are shown in Figure 31 while the summary results of the SIDRA Intersection analysis are shown in Table 8. The detailed SIDRA Intersection results are included in Attachment 4.
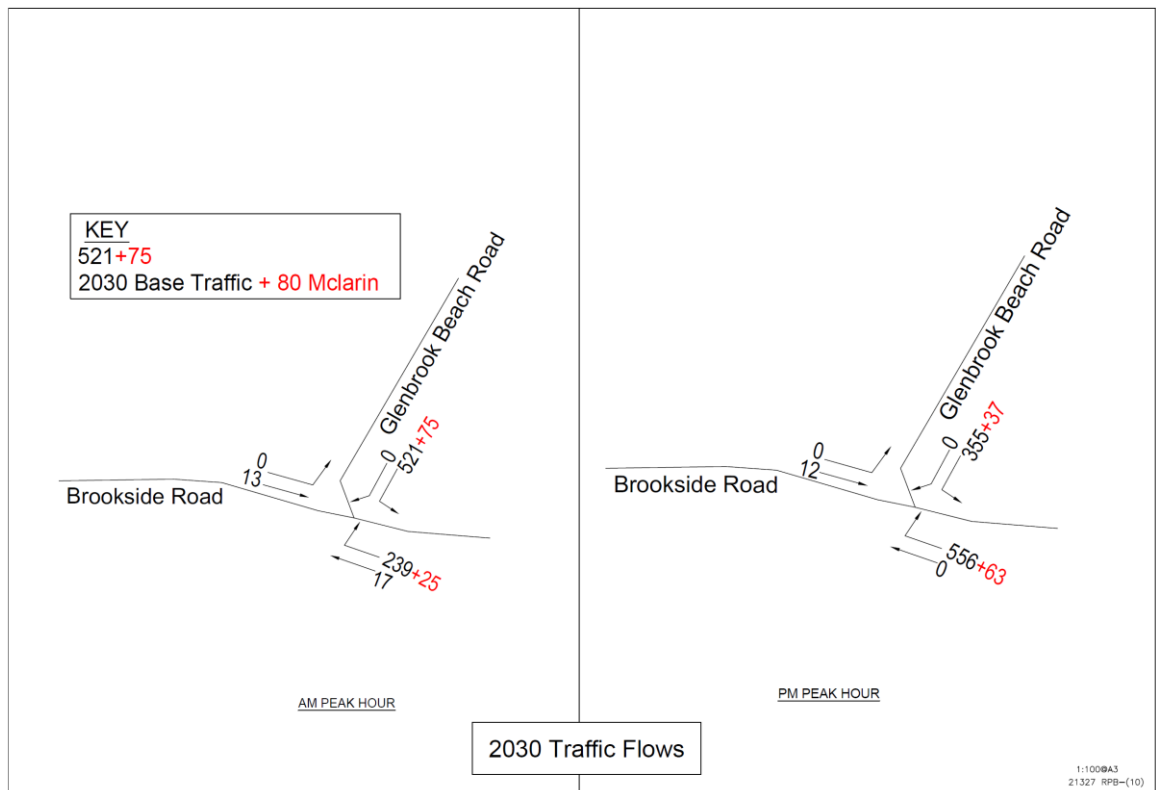
Figure 29 – Glenbrook Beach Road / Brookside Road Turning Movements

Figure 30 shows the intersection layout as modelled in SIDRA. The intersection has been set up as a give-way control intersection, with the through movement assigned to Brookside Road East / Glenbrook Beach Road and the Give Way control on Brookside Road West.
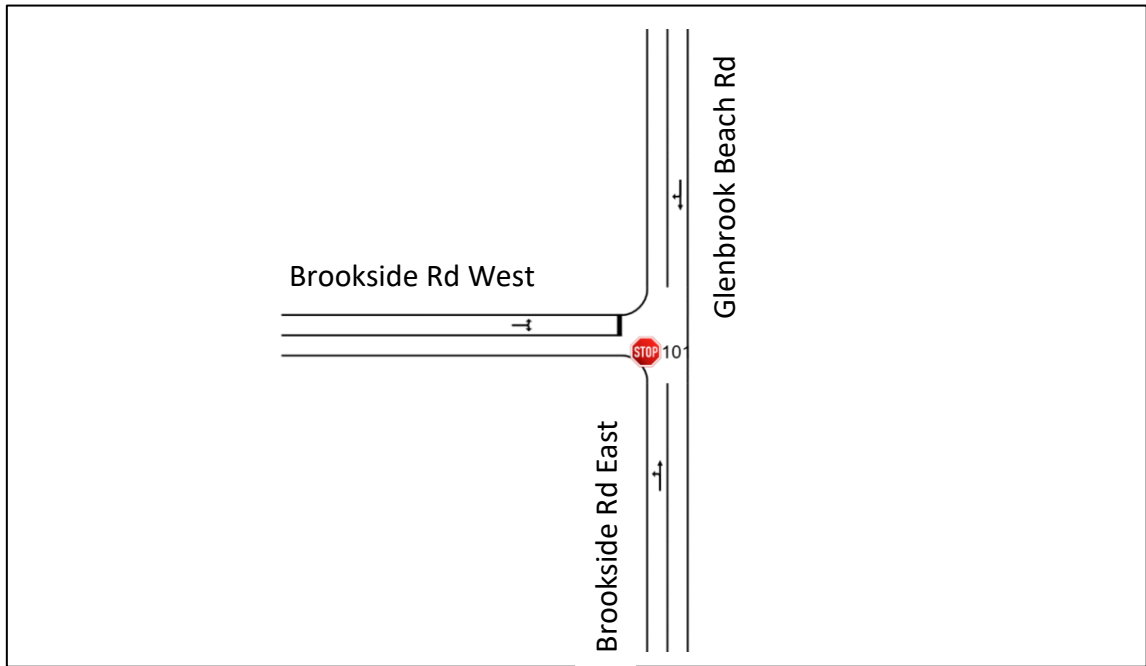
Figure 30 – Glenbrook Beach Road / Brookside Road Modelling Layout

Table 8 – Glenbrook Beach Road / Brookside Road Summary SIDRA Analysis Results

Analysis Period	Model Parameter			
	Deg. Satn.	LOS	Ave. Delay	Queue Length
AM Peak Hour	0.395	A	0.2 s	0 veh
PM Peak Hour	0.335	A	0.2 s	0 veh

The SIDRA analysis results indicate that the intersection will operate well within its practical capacity in 2030.

7.4.2 Brookside Road / Mission Bush Road

The 2030 traffic flows for this intersection are shown in Figure 31 while the summary results of the SIDRA Intersection analysis are shown in Table 9.

The detailed SIDRA Intersection results are included in Attachment 4.

Figure 31 – Brookside Road / Mission Bush Road Turning Movements

Figure 32 shows the layout of the intersection of Brookside Road / Mission Bush Road as modelled in SIDRA. The intersection is setup as an existing layout with give-way control. A short right turn bay is provided on Brookside Road (westbound) to turn into the western leg of Brookside Road.
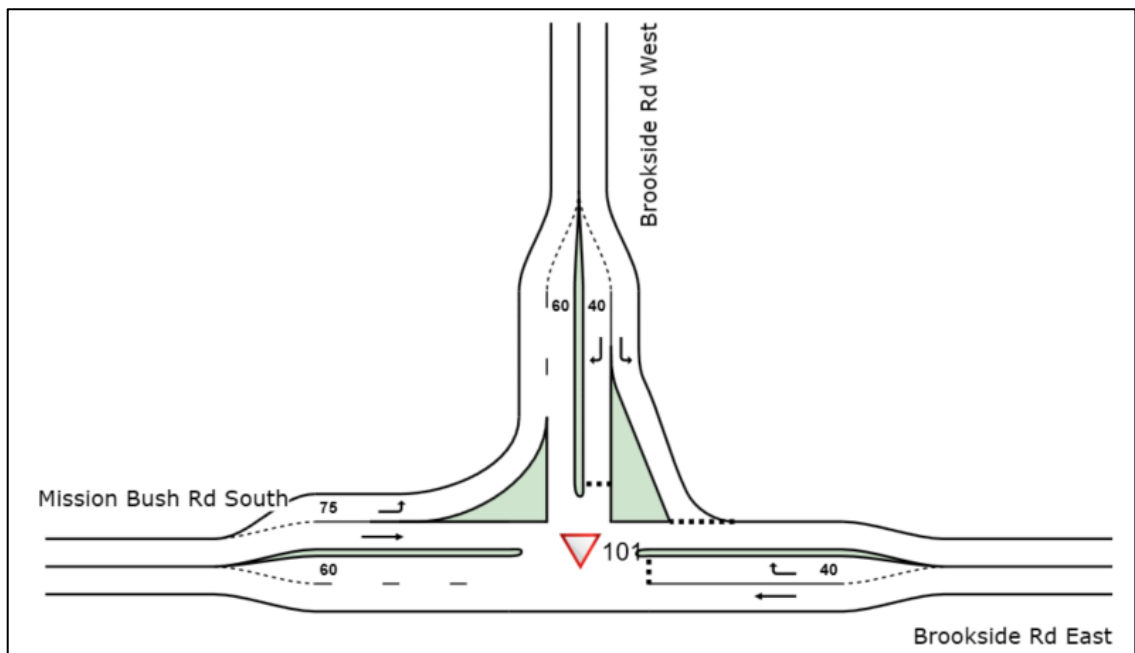
Figure 32 – Brookside Road / Mission Bush Road Modelling Layout

Table 9 – Brookside Road / Mission Bush Road Summary SIDRA Analysis Results

Analysis Period	Model Parameter			
	Deg. Satn.	LOS	Ave. Delay	Queue Length
AM Peak Hour	0.342	NA	5.1 s	1.9 veh
PM Peak Hour	0.618	NA	6.7 s	4.6 veh

The SIDRA analysis results indicate that the intersection will operate well within its practical capacity in 2030.

7.4.3 Mission Bush Road / Glenbrook-Waiuku Road

The 2030 traffic flows for this intersection are shown in Figure 33 while the summary results of the SIDRA Intersection analysis are shown in Table 10.

The detailed SIDRA Intersection results are included in Attachment 4.
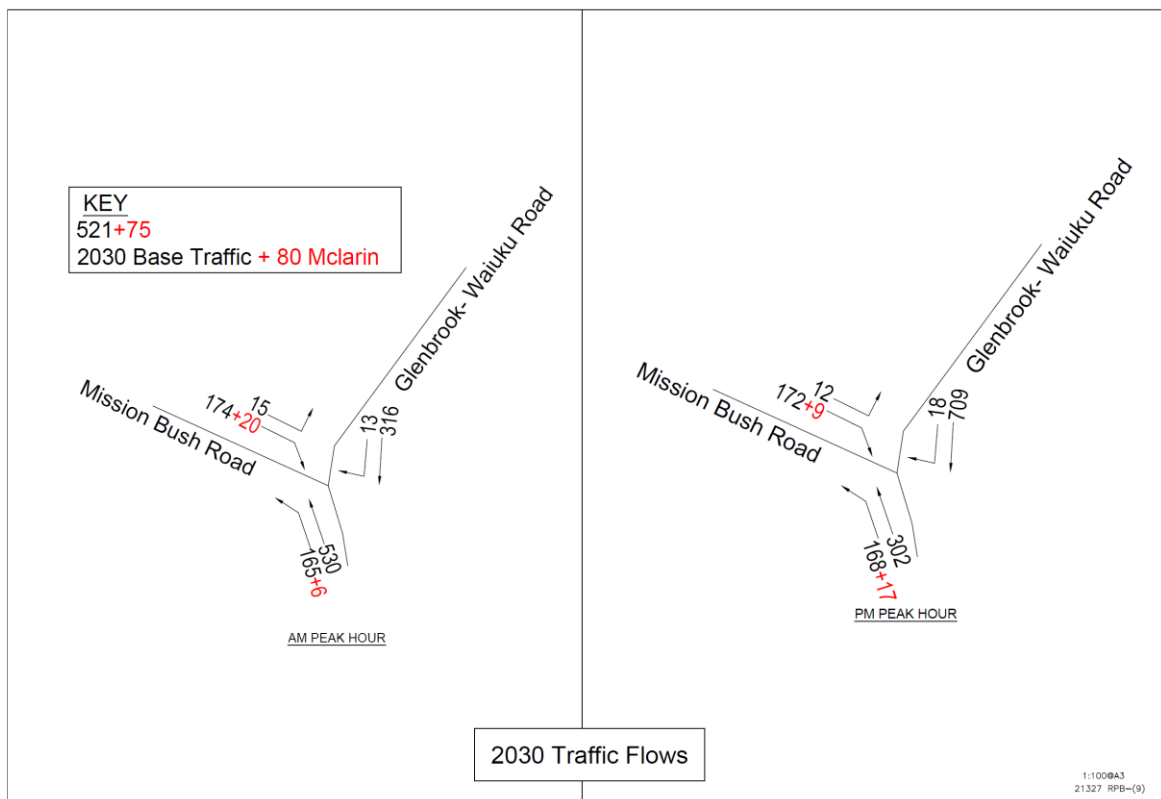
Figure 33 – Mission Bush Road / Glenbrook-Waiuku Road Turning Movements

Figure 34 shows the layout of the intersection of Mission Bush Road and Glenbrook-Waiuku Road as modelled in SIDRA. The intersection has been modelled as a T-junction. Glenbrook-Waiuku Road currently has a right turn bay for traffic turning into Mission

Bush Road. Glenbrook-Waiuku Road has a short lane provided for left turning traffic into Mission Bush Road.
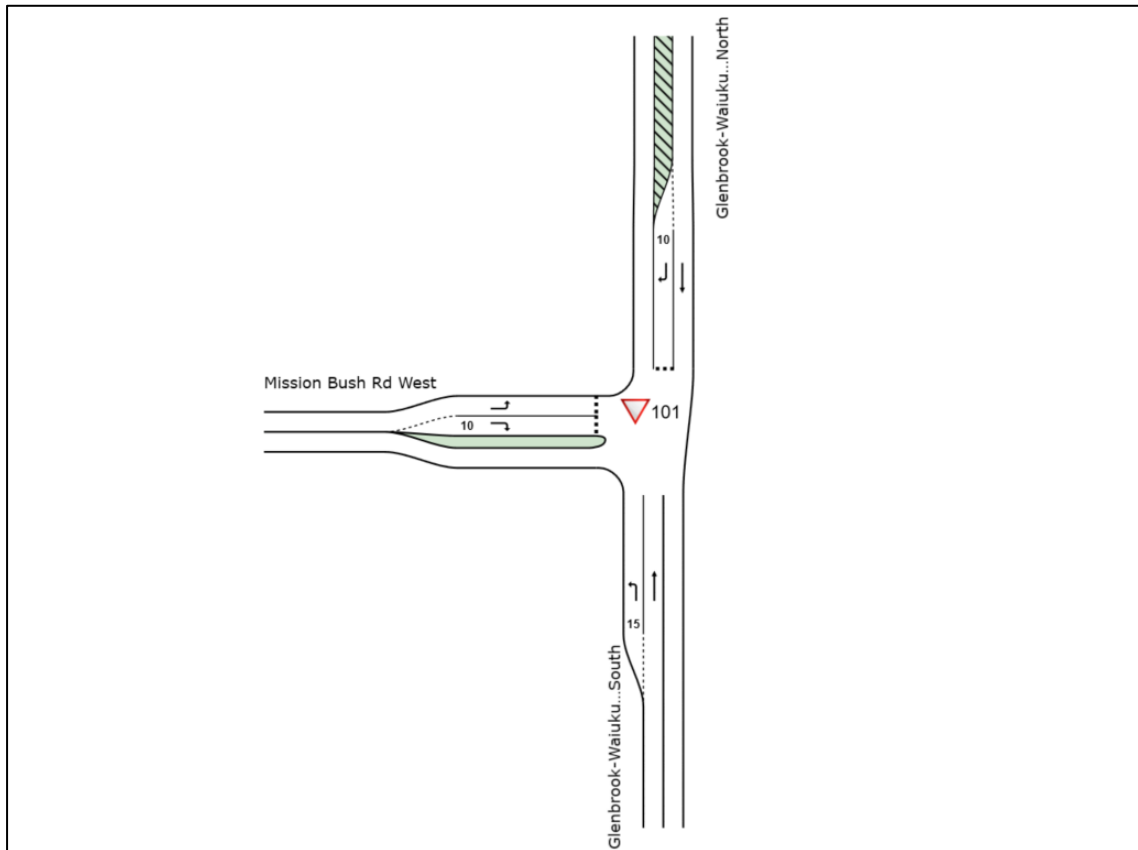
Figure 34 – Mission Bush Road / Glenbrook-Waiuku Road Modelling Layout

Table 10 – Mission Bush Road / Glenbrook-Waiuku Road Summary SIDRA Analysis Results

Analysis Period	Model Parameter			
	Deg. Satn.	LOS	Ave. Delay	Queue Length
AM Peak Hour	0.286	NA	2.7 s	0.5 veh
PM Peak Hour	0.383	NA	3.4 s	0.6 veh

The SIDRA analysis results indicate that the intersection will operate well within its practical capacity in 2030.

7.4.4 Glenbrook Road / Brookside Road

The 2030 traffic flows for this intersection are shown in Figure 35 while the summary results of the SIDRA Intersection analysis are shown in Table 11.

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The detailed SIDRA Intersection results are included in Attachment 4.
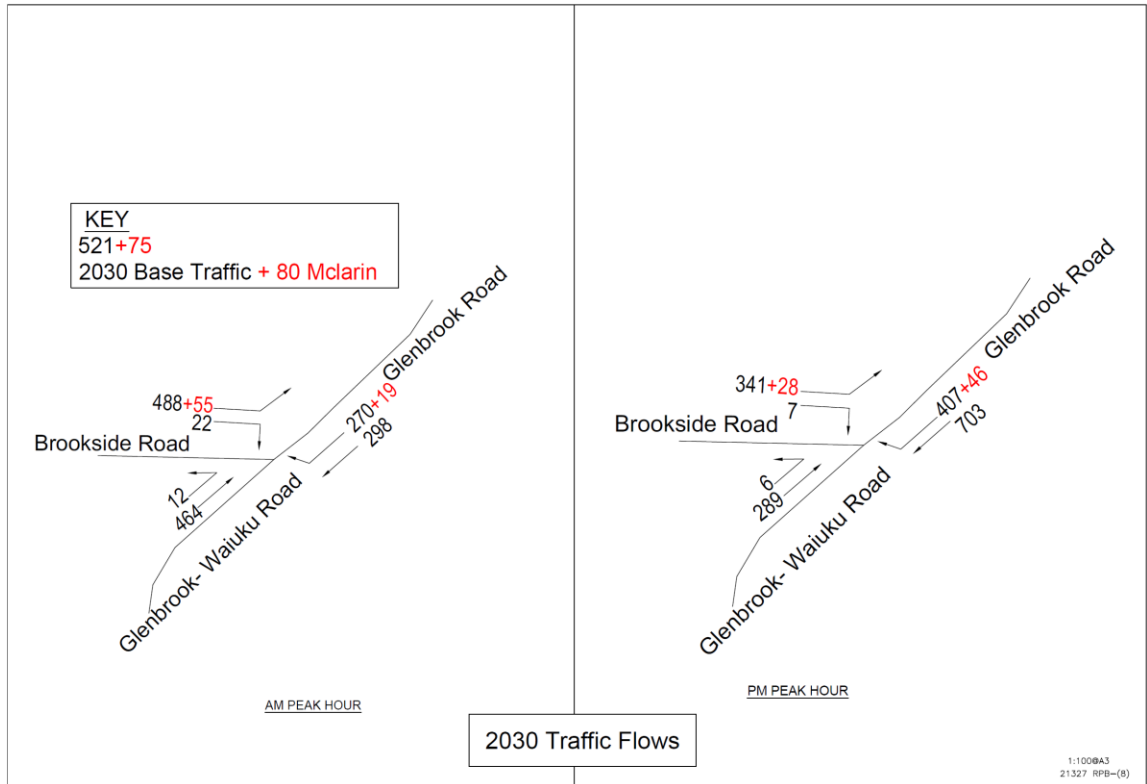
Figure 35 – Glenbrook Road / Brookside Road Turning Movements

Figure 36 shows the intersection layout as modelled in SIDRA. The intersection has been modelled as a T-junction. This includes an existing right-turn bay on the Glenbrook Road approach from the north and segregated left-turn lanes on the approaches from both Brookside Road and Glenbrook-Waiuku Road.
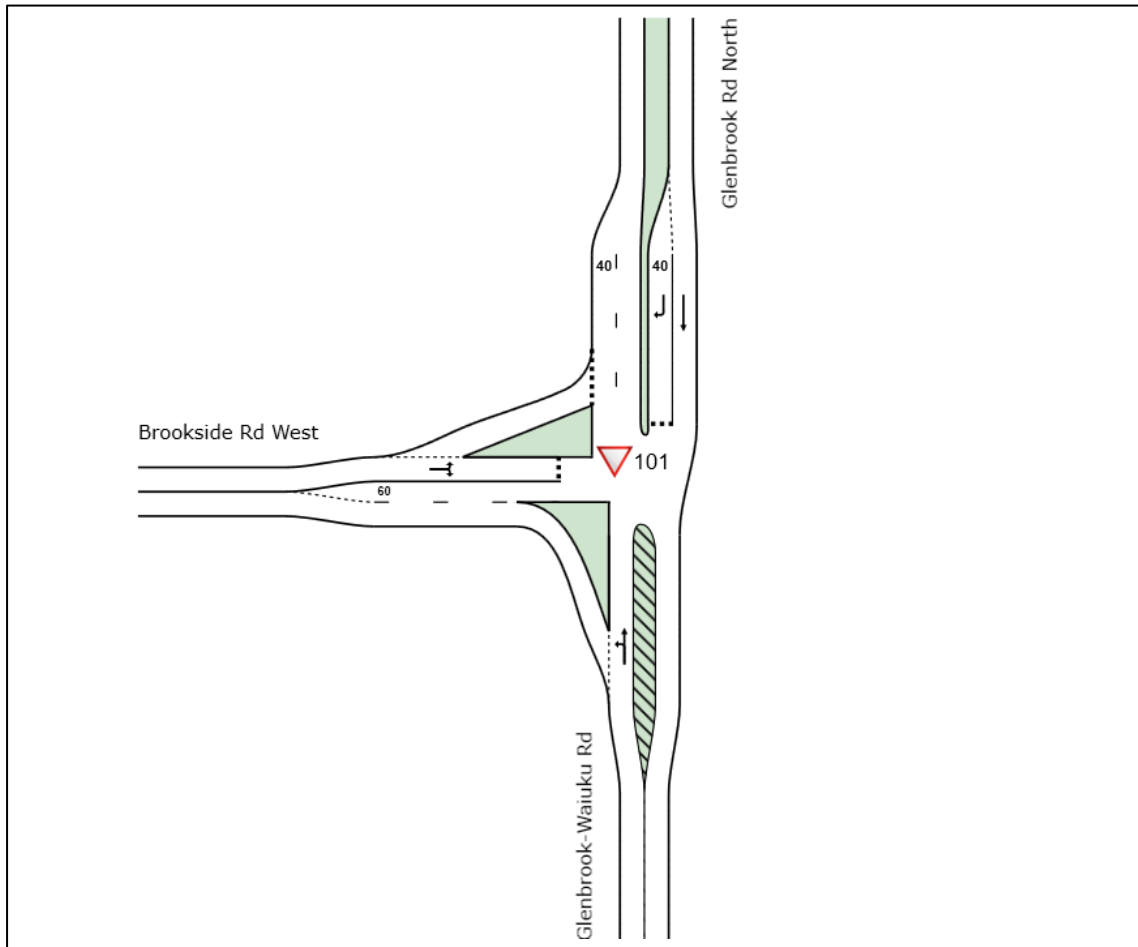
Figure 36 – Glenbrook Road / Brookside Road Modelling Layout

Table 11 – Glenbrook Road / Brookside Road Summary SIDRA Analysis Results

Analysis Period	Model Parameter			
	Deg. Satn.	LOS	Ave. Delay	Queue Length
AM Peak Hour	0.583	NA	6.1 s	4.2 veh
PM Peak Hour	0.523	NA	5.2 s	4.7 veh

The SIDRA analysis results indicate that the intersection will operate well within its practical capacity in 2030.

7.5   Summary of Effects

The analysis including the additional traffic generated in the 2030 design year for the development enabled by the Proposed Plan Change at 80 McLarin Road indicates that all four intersections considered as part of this assessment continue to operate within their overall capacities.   While average vehicle delays do increase for some traffic

movements, the level of additional delay incurred by motorists is not significant in the context of a journey.

7.6   Walking and Cycling Effects

The development of the 8 hectare site for residential purposes will generate additional pedestrian and walking demands in this location. Origins and destinations for these trips will vary.

The local residential area provides a walkable and cycling friendly environment, being located on generally flat terrain and with future pedestrian connections which will provide good permeability between the 8 hectare subject site and adjoining urban areas on the opposite side of McLarin Road. This will include both new residential development and the proposed future local centre located to the northeast of the subject site, as shown in Figure 9.

Ensuring good levels of accessibility for pedestrians and cyclists in the area will serve to enhance amenity values within the wider newly established urban settlement at Glenbrook Beach.

8.0   AUP-OIP ASSESSMENT CRITERIA

Section E27.8.2 of the AUP-OIP indicates the assessment criteria for a range of traffic and parking non-compliances. The activities enabled for the site by the Plan Change will include the development of 100 dwellings, with a traffic generation potential of up to 100 vehicles per hour, both of which border the AUP-OIP trip generation thresholds for requiring consent as a discretionary activity.

For completeness, an assessment has been made against the relevant assessment criteria indicated in the AUP-OIP.

8.1   Exceeding Trip Generation Thresholds

Standard E27.8.2(3) of the AUP-OIP sets out assessment criteria for any activity or subdivision which exceeds the trip generation thresholds under Standard E27.6.1. The infringement relates to peak hour trip generation exceeding 100 vehicles per hour.

The assessment criteria are:

(a)   the effects on the function and the safe and efficient operation of the transport network including pedestrian movement, particularly at peak traffic times;

The capacity assessments undertaken in Chapter 7 of this report confirm that the traffic generated by the activities enabled by the Plan Change does not result in any adverse traffic effects on the existing adjoining road network. Key intersections to the south of Glenbrook Beach, which provide onward access to destinations such as Waiuku, Pukekohe and Paerata, are shown to be continuing to operate well within their practical capacities and the additional traffic is not expected to contribute towards any adverse safety outcomes.

On this basis, the traffic effects of the Proposed Plan Change can be safely accommodated on the adjoining road network without adversely compromising its function, safety or capacity.

(b)   the implementation of mitigation measures proposed to address adverse effects which may include measures such as travel planning, providing alternatives to private vehicle trips including accessibility to public transport, staging development, or contributing to improvements to the local transport network; or

Following the recently granted consent for the development of the Kahawai Point SHA within the Glenbrook 3 Precinct, a package of mitigation measures has been implemented on the adjoining road network. This includes improvements to address safety at key intersections and a reduced speed limit along Glenbrook

Beach Road. No further mitigation measures have been identified as being required to support the proposed Plan Change at 80 McLarin Road.

(c)   the trip characteristics of the proposed activity on the site.

As noted earlier in Section 4.0 of this assessment, weekday peak hour traffic generation of the Plan Change is anticipated to be in the order of 100 traffic movements per hour during the weekday AM and PM peak hours respectively. This traffic will join the wider road network via McLarin Road and Glenbrook Beach Road.

Recently consented residential development which is currently taking place to the north of the subject site, as part of the Glenbrook 3 SHA, will eventually comprise some 843 dwellings. This development would be expected to generate around 544 to 680 additional peak hour traffic movements upon its full completion. The additional 100 or so peak hour trips resulting from the development at 80 McLarin Road is not considered to be significant alongside the traffic generation for the development that has already been consented.

9.0   CONCLUSIONS

Based on the analyses described in this report, the following conclusions can be made in respect of the Proposed Plan Change to enable residential development on the site at 80 McLarin Road in Glenbrook:

- The weekday peak hour traffic generation of the activities enabled by the Plan Change will be in the order of 100 traffic movements per hour in the AM and PM Peak hours respectively. The proposed residential development at 80 McLarin Road follows consent for the development of some 800 dwellings within the Glenbrook 3 Precinct to the north of the site, which would be expected to generate in the order of 680 peak hour trips upon its full completion.

- Key intersections to the south of the site, which provide onward access to local destinations such as Waiuku, Pukekohe and Paerata, will continue to operate with adequate capacity to cater for the anticipated additional traffic generated by the Proposed Plan Change.

- Following the recent completion of safety improvements on the adjoining road network to the south of Glenbrook Beach, provided as part of the Glenbrook 3 Precinct SHA development, the network is expected to continue to function safely. The proposed development at 80 McLarin Road is not expected to contribute towards any new adverse safety effects.

- Development enabled by the Plan Change will be served by access, parking and servicing arrangements designed to an appropriate standard consistent with the requirements of the AUP-OIP and Glenbrook 3 Precinct Plan, or as otherwise approved by way of a Resource Consent.

Overall, it is considered that the traffic engineering effects of the potential activities enabled by the Proposed Plan Change can be accommodated on the road network without compromising its function, capacity or safety. Therefore, the proposal is considered to have a less than minor impact.

ATTACHMENT 1

2021 SIDRA Intersection Analysis Results

Glenbrook Beach Road / Brookside Road – AM Peak

MOVEMENT SUMMARY

🛑 Site: 101 [Glenbrook Beach Road / Brookside Road - Existing - AM (Site Folder: Glenbrook Beach Road / Brookside Road)]

Glenbrook Beach Road / Brookside Road
T Intersection
Site Category: Existing Design
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Brookside Rd East														
1	L2	17	0.0	18	0.0	0.043	4.6	LOS A	0.0	0.0	0.00	0.12	0.00	48.6
2	T1	61	0.0	64	0.0	0.043	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	49.1
Approach		78	0.0	82	0.0	0.043	1.0	NA	0.0	0.0	0.00	0.12	0.00	49.0
North: Glenbrook Beach Rd														
8	T1	134	0.0	141	0.0	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
9	R2	1	0.0	1	0.0	0.073	4.8	LOS A	0.0	0.0	0.00	0.00	0.00	49.0
Approach		135	0.0	142	0.0	0.073	0.0	NA	0.0	0.0	0.00	0.00	0.00	50.0
West: Brookside Rd West														
10	L2	1	0.0	1	0.0	0.010	7.6	LOS A	0.0	0.2	0.17	0.90	0.17	45.2
12	R2	13	0.0	14	0.0	0.010	7.2	LOS A	0.0	0.2	0.17	0.90	0.17	43.7
Approach		14	0.0	15	0.0	0.010	7.3	LOS A	0.0	0.2	0.17	0.90	0.17	43.8
All Vehicles		227	0.0	239	0.0	0.073	0.8	NA	0.0	0.2	0.01	0.10	0.01	49.2

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.

Glenbrook Beach Road / Brookside Road – PM Peak

MOVEMENT SUMMARY

🛑 **Site: 101 [Glenbrook Beach Road / Brookside Road - Existing- PM (Site Folder: Glenbrook Beach Road / Brookside Road)]**

Glenbrook Beach Road / Brookside Road
T Intersection
Site Category: Existing Design
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Brookside Rd East														
1	L2	1	0.0	1	0.0	0.061	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	49.3
2	T1	112	0.0	118	0.0	0.061	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		113	0.0	119	0.0	0.061	0.0	NA	0.0	0.0	0.00	0.00	0.00	49.9
North: Glenbrook Beach Rd														
8	T1	89	0.0	94	0.0	0.049	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	49.9
9	R2	1	0.0	1	0.0	0.049	4.9	LOS A	0.0	0.0	0.01	0.01	0.01	49.0
Approach		90	0.0	95	0.0	0.049	0.1	NA	0.0	0.0	0.01	0.01	0.01	49.9
West: Brookside Rd West														
10	L2	1	0.0	1	0.0	0.009	7.8	LOS A	0.0	0.2	0.18	0.90	0.18	45.2
12	R2	12	0.0	13	0.0	0.009	7.2	LOS A	0.0	0.2	0.18	0.90	0.18	43.7
Approach		13	0.0	14	0.0	0.009	7.3	LOS A	0.0	0.2	0.18	0.90	0.18	43.8
All Vehicles		216	0.0	227	0.0	0.061	0.5	NA	0.0	0.2	0.01	0.06	0.01	49.5

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.

Brookside Road / Mission Bush Road – AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Brookside Road / Mission Bush Road - Existing - AM (Site Folder: Brookside Road / Mission Bush Road)]**

Brookside Road / Mission Bush Road
T Intersection
Site Category: Existing Design
Give-Way (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
East: Brookside Rd East														
5	T1	132	0.0	139	0.0	0.071	3.7	LOS A	0.0	0.0	0.00	0.44	0.00	47.5
6	R2	60	0.0	63	0.0	0.056	5.0	LOS A	0.2	1.3	0.20	0.53	0.20	45.1
Approach		192	0.0	202	0.0	0.071	4.1	LOS A	0.2	1.3	0.06	0.47	0.06	46.8
North: Brookside Rd West														
7	L2	92	0.0	97	0.0	0.060	4.5	LOS A	0.2	1.7	0.06	0.48	0.06	46.4
12	R2	34	0.0	36	0.0	0.020	4.8	LOS A	0.1	0.4	0.14	0.51	0.14	45.4
Approach		126	0.0	133	0.0	0.060	4.6	LOS A	0.2	1.7	0.08	0.49	0.08	46.2
West: Mission Bush Rd South														
1	L2	21	0.0	22	0.0	0.012	4.4	LOS A	0.0	0.0	0.00	0.47	0.00	47.4
11	T1	12	0.0	13	0.0	0.006	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		33	0.0	35	0.0	0.012	2.8	NA	0.0	0.0	0.00	0.30	0.00	48.4
All Vehicles		351	0.0	369	0.0	0.071	4.1	NA	0.2	1.7	0.06	0.46	0.06	46.8

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.

Brookside Road / Mission Bush Road – PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Brookside Road / Mission Bush Road - Existing - PM (Site Folder: Brookside Road / Mission Bush Road)]**

Brookside Road / Mission Bush Road
T Intersection
Site Category: Existing Design
Give-Way (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
East: Brookside Rd East														
5	T1	6	0.0	6	0.0	0.003	3.6	LOS A	0.0	0.0	0.00	0.44	0.00	47.5
6	R2	76	0.0	80	0.0	0.075	5.3	LOS A	0.3	1.8	0.26	0.55	0.26	44.9
Approach		82	0.0	86	0.0	0.075	5.2	LOS A	0.3	1.8	0.24	0.54	0.24	45.2
North: Brookside Rd West														
7	L2	73	0.0	77	0.0	0.050	4.7	LOS A	0.2	1.4	0.17	0.47	0.17	46.0
12	R2	22	0.0	23	0.0	0.013	4.7	LOS A	0.0	0.2	0.11	0.51	0.11	45.5
Approach		95	0.0	100	0.0	0.050	4.7	LOS A	0.2	1.4	0.16	0.48	0.16	45.9
West: Mission Bush Rd South														
1	L2	29	0.0	31	0.0	0.016	4.4	LOS A	0.0	0.0	0.00	0.47	0.00	47.4
11	T1	82	0.0	86	0.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		111	0.0	117	0.0	0.044	1.2	NA	0.0	0.0	0.00	0.12	0.00	49.4
All Vehicles		288	0.0	303	0.0	0.075	3.5	NA	0.3	1.8	0.12	0.36	0.12	47.1

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.
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.

Mission Bush Road / Glenbrook-Waiuku Road – AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Mission Bush Road / Glenbrook-Waiuku Road - Existing - AM (Site Folder: Mission Bush Road / Glenbrook-Waiuku Road)]**

Mission Bush Road / Glenbrook-Waiuku Road
T Intersection
Site Category: Existing Design
Give-Way (Two-Way)

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: Glenbrook-Waiuku Rd South														
1	L2	119	0.0	125	0.0	0.067	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.6
2	T1	530	0.0	558	0.0	0.286	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		649	0.0	683	0.0	0.286	0.9	NA	0.0	0.0	0.00	0.10	0.00	49.2
North: Glenbrook-Waiuku Rd North														
8	T1	316	0.0	333	0.0	0.171	3.4	LOS A	0.0	0.0	0.00	0.45	0.00	47.5
9	R2	13	0.0	14	0.0	0.024	8.6	LOS A	0.1	0.5	0.55	0.72	0.55	44.2
Approach		329	0.0	346	0.0	0.171	3.7	LOS A	0.1	0.5	0.02	0.46	0.02	47.3
West: Mission Bush Rd West														
10	L2	15	0.0	16	0.0	0.017	6.7	LOS A	0.1	0.4	0.49	0.63	0.49	45.4
12	R2	34	0.0	36	0.0	0.032	6.1	LOS A	0.1	0.6	0.42	0.68	0.42	45.5
Approach		49	0.0	52	0.0	0.032	6.3	LOS A	0.1	0.6	0.44	0.66	0.44	45.5
All Vehicles		1027	0.0	1081	0.0	0.286	2.0	NA	0.1	0.6	0.03	0.24	0.03	48.4

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.
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.

Mission Bush Road / Glenbrook-Waiuku Road – PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Mission Bush Road / Glenbrook-Waiuku Road - Existing - PM (Site Folder: Mission Bush Road / Glenbrook-Waiuku Road)]**

Mission Bush Road / Glenbrook-Waiuku Road
T Intersection
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Glenbrook-Waiuku Rd South														
1	L2	45	0.0	47	0.0	0.026	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.6
2	T1	302	0.0	318	0.0	0.163	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		347	0.0	365	0.0	0.163	0.6	NA	0.0	0.0	0.00	0.07	0.00	49.5
North: Glenbrook-Waiuku Rd North														
8	T1	709	0.0	746	0.0	0.383	3.5	LOS A	0.0	0.0	0.00	0.45	0.00	47.4
9	R2	18	0.0	19	0.0	0.025	6.7	LOS A	0.1	0.5	0.43	0.63	0.43	45.2
Approach		727	0.0	765	0.0	0.383	3.6	LOS A	0.1	0.5	0.01	0.46	0.01	47.3
West: Mission Bush Rd West														
10	L2	12	0.0	13	0.0	0.010	5.6	LOS A	0.0	0.3	0.36	0.54	0.36	45.8
12	R2	110	0.0	116	0.0	0.116	6.6	LOS A	0.3	2.2	0.50	0.77	0.50	45.2
Approach		122	0.0	128	0.0	0.116	6.5	LOS A	0.3	2.2	0.49	0.75	0.49	45.3
All Vehicles		1196	0.0	1259	0.0	0.383	3.0	NA	0.3	2.2	0.06	0.37	0.06	47.7

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.

Glenbrook Road / Brookside Road– AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Glenbrook Road / Brookside Road - Existing - AM (Site Folder: Glenbrook Road / Brookside Road)]**

Glenbrook Road / Brookside Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd														
1	L2	12	0.0	13	0.0	0.257	4.5	LOS A	0.0	0.0	0.00	0.01	0.00	50.5
2	T1	464	0.0	488	0.0	0.257	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	49.8
Approach		476	0.0	501	0.0	0.257	0.2	NA	0.0	0.0	0.00	0.01	0.00	49.8
North: Glenbrook Rd North														
8	T1	298	0.0	314	0.0	0.161	3.4	LOS A	0.0	0.0	0.00	0.45	0.00	47.5
9	R2	138	0.0	145	0.0	0.212	7.9	LOS A	0.7	5.1	0.52	0.78	0.52	44.5
Approach		436	0.0	459	0.0	0.212	4.8	LOS A	0.7	5.1	0.17	0.56	0.17	46.5
West: Brookside Rd West														
10	L2	78	0.0	82	0.0	0.100	6.5	LOS A	0.4	2.5	0.46	0.66	0.46	46.0
12	R2	22	0.0	23	0.0	0.100	5.8	LOS A	0.4	2.5	0.46	0.66	0.46	45.3
Approach		100	0.0	105	0.0	0.100	6.3	LOS A	0.4	2.5	0.46	0.66	0.46	45.8
All Vehicles		1012	0.0	1065	0.0	0.257	2.8	NA	0.7	5.1	0.12	0.31	0.12	47.9

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.

Glenbrook Road / Brookside Road– PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Glenbrook Road / Brookside Road - Existing - PM (Site Folder: Glenbrook Road / Brookside Road)]**

Glenbrook Road / Brookside Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd														
1	L2	6	0.0	6	0.0	0.149	4.4	LOS A	0.0	0.0	0.00	0.01	0.00	50.6
2	T1	269	0.0	283	0.0	0.149	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach		275	0.0	289	0.0	0.149	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.9
North: Glenbrook Rd North														
8	T1	703	0.0	740	0.0	0.379	3.5	LOS A	0.0	0.0	0.00	0.45	0.00	47.4
9	R2	86	0.0	91	0.0	0.104	6.3	LOS A	0.3	2.4	0.40	0.64	0.40	45.4
Approach		789	0.0	831	0.0	0.379	3.8	LOS A	0.3	2.4	0.04	0.47	0.04	47.2
West: Brookside Rd West														
10	L2	137	0.0	144	0.0	0.121	5.5	LOS A	0.5	3.4	0.36	0.56	0.36	46.3
12	R2	7	0.0	7	0.0	0.121	6.6	LOS A	0.5	3.4	0.36	0.56	0.36	45.5
Approach		144	0.0	152	0.0	0.121	5.6	LOS A	0.5	3.4	0.36	0.56	0.36	46.2
All Vehicles		1208	0.0	1272	0.0	0.379	3.2	NA	0.5	3.4	0.07	0.38	0.07	47.6

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.

ATTACHMENT 2

2030 Turning Movements – Proposed Plan Change

AM Peak Hour

KEY
521+75
2030 Base Traffic + 80 Mclarin

Glenbrook Road

270+19
298

458+55
22

464
12

Brookside Road

Glenbrook- Waiuku Road

316
13

530
165+6

15
174+20

192+19
132

Glenbrook Beach Road

0
521+75

472+55
174+20

239+25
17

67+6
12

Mission Bush Road

0
13

Brookside Road

PM Peak Hour

Glenbrook Road

407+46
703

341+28
7

269
6

Brookside Road

Glenbrook - Waiuku Road

18
709

302
168+17

12
172+9

397+46
6

Glenbrook Beach Road

355+37
0

277+28
84+9

556+63
0

152+17
82

Mission Bush Road

Brookside Road

0
12

Brookside Road

KEY

521+75

2030 Base Traffic + 80 Mclarin

ATTACHMENT 3

2030 SIDRA Intersection Analysis Results – Base Model

Glenbrook Beach Road / Brookside Road – AM Peak

MOVEMENT SUMMARY

🛑 **Site: 101 [Glenbrook Beach Road / Brookside Road - Base - AM (Site Folder: Glenbrook Beach Road / Brookside Road)]**

Glenbrook Beach Road / Brookside Road
T Intersection
Site Category: Existing Design
Stop (Two-Way)

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: Brookside Rd East														
1	L2	17	0.0	18	0.0	0.139	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	49.1
2	T1	239	0.0	252	0.0	0.139	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		256	0.0	269	0.0	0.139	0.3	NA	0.0	0.0	0.00	0.04	0.00	49.6
North: Glenbrook Beach Rd														
8	T1	655	0.0	689	0.0	0.354	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	50.0
9	R2	1	0.0	1	0.0	0.354	5.9	LOS A	0.0	0.1	0.00	0.00	0.00	49.0
Approach		656	0.0	691	0.0	0.354	0.0	NA	0.0	0.1	0.00	0.00	0.00	50.0
West: Brookside Rd West														
10	L2	1	0.0	1	0.0	0.016	8.4	LOS A	0.0	0.3	0.43	0.93	0.43	44.6
12	R2	13	0.0	14	0.0	0.016	8.9	LOS A	0.0	0.3	0.43	0.93	0.43	43.0
Approach		14	0.0	15	0.0	0.016	8.9	LOS A	0.0	0.3	0.43	0.93	0.43	43.1
All Vehicles		926	0.0	975	0.0	0.354	0.2	NA	0.0	0.3	0.01	0.02	0.01	49.8

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.

Glenbrook Beach Road / Brookside Road – PM Peak

MOVEMENT SUMMARY

🛑 **Site: 101 [Glenbrook Beach Road / Brookside Road - Base - PM (Site Folder: Glenbrook Beach Road / Brookside Road)]**

Glenbrook Beach Road / Brookside Road
T Intersection
Site Category: Existing Design
Stop (Two-Way)

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: Brookside Rd East														
1	L2	1	0.0	1	0.0	0.301	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	49.3
2	T1	556	0.0	585	0.0	0.301	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		557	0.0	586	0.0	0.301	0.1	NA	0.0	0.0	0.00	0.00	0.00	49.9
North: Glenbrook Beach Rd														
8	T1	355	0.0	374	0.0	0.193	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	50.0
9	R2	1	0.0	1	0.0	0.193	7.7	LOS A	0.0	0.1	0.00	0.00	0.00	49.0
Approach		356	0.0	375	0.0	0.193	0.0	NA	0.0	0.1	0.00	0.00	0.00	50.0
West: Brookside Rd West														
10	L2	1	0.0	1	0.0	0.015	10.5	LOS B	0.0	0.3	0.47	0.92	0.47	44.6
12	R2	12	0.0	13	0.0	0.015	8.9	LOS A	0.0	0.3	0.47	0.92	0.47	42.9
Approach		13	0.0	14	0.0	0.015	9.0	LOS A	0.0	0.3	0.47	0.92	0.47	43.1
All Vehicles		926	0.0	975	0.0	0.301	0.2	NA	0.0	0.3	0.01	0.01	0.01	49.8

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).
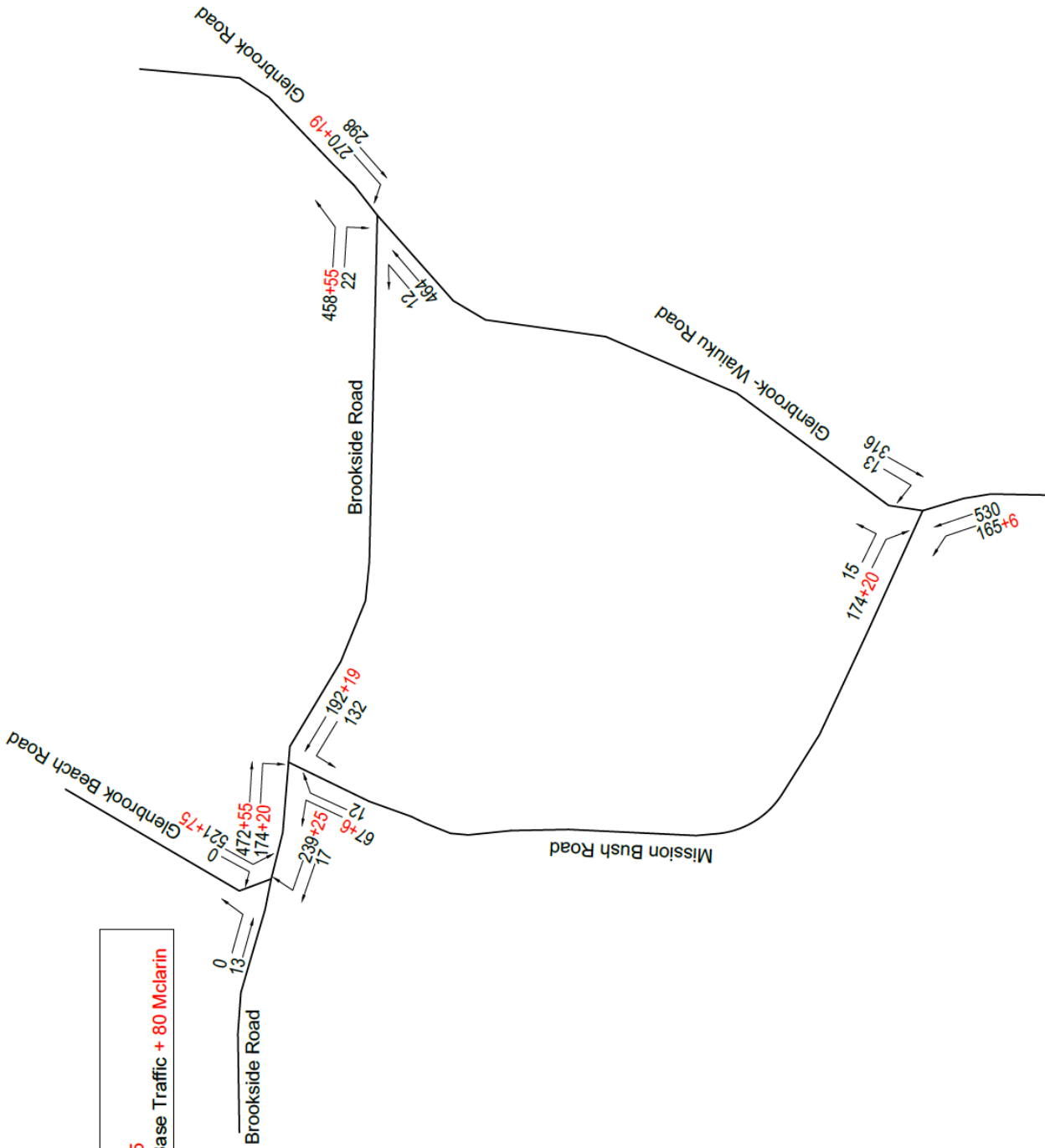Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Brookside Road / Mission Bush Road – AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Brookside Road / Mission Bush Road - Base - AM (Site Folder: Brookside Road / Mission Bush Road)]**

Brookside Road / Mission Bush Road
T Intersection
Site Category: Existing Design
Give-Way (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
East: Brookside Rd East														
5	T1	132	0.0	139	0.0	0.071	3.7	LOS A	0.0	0.0	0.00	0.44	0.00	47.5
6	R2	192	0.0	202	0.0	0.267	7.6	LOS A	1.0	7.2	0.51	0.77	0.53	43.6
Approach		324	0.0	341	0.0	0.267	6.0	LOS A	1.0	7.2	0.30	0.64	0.32	45.3
North: Brookside Rd West														
7	L2	470	0.0	495	0.0	0.305	4.5	LOS A	1.6	11.4	0.07	0.47	0.07	46.4
12	R2	174	0.0	183	0.0	0.105	4.8	LOS A	0.3	2.0	0.17	0.53	0.17	45.4
Approach		644	0.0	678	0.0	0.305	4.6	LOS A	1.6	11.4	0.10	0.49	0.10	46.1
West: Mission Bush Rd South														
1	L2	67	0.0	71	0.0	0.038	4.4	LOS A	0.0	0.0	0.00	0.47	0.00	47.3
11	T1	12	0.0	13	0.0	0.006	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		79	0.0	83	0.0	0.038	3.8	NA	0.0	0.0	0.00	0.40	0.00	47.8
All Vehicles		1047	0.0	1102	0.0	0.305	5.0	NA	1.6	11.4	0.15	0.53	0.16	46.0

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.

Brookside Road / Mission Bush Road – PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Brookside Road / Mission Bush Road - Base - PM (Site Folder: Brookside Road / Mission Bush Road)]**

Brookside Road / Mission Bush Road
T Intersection
Site Category: Existing Design
Give-Way (Two-Way)

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
East: Brookside Rd East														
5	T1	6	0.0	6	0.0	0.003	3.7	LOS A	0.0	0.0	0.00	0.44	0.00	47.5
6	R2	397	0.0	418	0.0	0.530	9.2	LOS A	3.4	23.8	0.60	0.94	0.90	42.6
Approach		403	0.0	424	0.0	0.530	9.1	LOS A	3.4	23.8	0.59	0.93	0.88	42.7
North: Brookside Rd West														
7	L2	277	0.0	292	0.0	0.191	4.8	LOS A	0.9	6.2	0.20	0.48	0.20	46.0
12	R2	84	0.0	88	0.0	0.050	4.8	LOS A	0.1	0.9	0.15	0.52	0.15	45.4
Approach		361	0.0	380	0.0	0.191	4.8	LOS A	0.9	6.2	0.19	0.49	0.19	45.8
West: Mission Bush Rd South														
1	L2	152	0.0	160	0.0	0.086	4.5	LOS A	0.0	0.0	0.00	0.47	0.00	47.3
11	T1	82	0.0	86	0.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		234	0.0	246	0.0	0.086	2.9	NA	0.0	0.0	0.00	0.30	0.00	48.4
All Vehicles		998	0.0	1051	0.0	0.530	6.1	NA	3.4	23.8	0.31	0.63	0.42	45.1

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.
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.

Mission Bush Road / Glenbrook-Waiuku Road – AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Mission Bush Road / Glenbrook-Waiuku Road - Base - AM (Site Folder: Mission Bush Road / Glenbrook-Waiuku Road)]**

Mission Bush Road / Glenbrook-Waiuku Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd South														
1	L2	165	0.0	174	0.0	0.094	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.6
2	T1	530	0.0	558	0.0	0.286	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		695	0.0	732	0.0	0.286	1.2	NA	0.0	0.0	0.00	0.13	0.00	49.1
North: Glenbrook-Waiuku Rd North														
8	T1	316	0.0	333	0.0	0.171	3.4	LOS A	0.0	0.0	0.00	0.45	0.00	47.5
9	R2	13	0.0	14	0.0	0.030	10.4	LOS B	0.1	0.7	0.64	0.81	0.64	43.2
Approach		329	0.0	346	0.0	0.171	3.7	LOS A	0.1	0.7	0.03	0.47	0.03	47.3
West: Mission Bush Rd West														
10	L2	15	0.0	16	0.0	0.017	6.7	LOS A	0.1	0.4	0.49	0.63	0.49	45.4
12	R2	174	0.0	183	0.0	0.165	6.3	LOS A	0.5	3.3	0.46	0.75	0.46	45.4
Approach		189	0.0	199	0.0	0.165	6.3	LOS A	0.5	3.3	0.46	0.74	0.46	45.4
All Vehicles		1213	0.0	1277	0.0	0.286	2.7	NA	0.5	3.3	0.08	0.31	0.08	48.0

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.

Mission Bush Road / Glenbrook-Waiuku Road – PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Mission Bush Road / Glenbrook-Waiuku Road - Base - PM (Site Folder: Mission Bush Road / Glenbrook-Waiuku Road)]**

Mission Bush Road / Glenbrook-Waiuku Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd South														
1	L2	168	0.0	177	0.0	0.095	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.6
2	T1	302	0.0	318	0.0	0.163	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		470	0.0	495	0.0	0.163	1.7	NA	0.0	0.0	0.00	0.19	0.00	48.7
North: Glenbrook-Waiuku Rd North														
8	T1	709	0.0	746	0.0	0.383	3.5	LOS A	0.0	0.0	0.00	0.45	0.00	47.4
9	R2	18	0.0	19	0.0	0.030	8.0	LOS A	0.1	0.7	0.51	0.70	0.51	44.5
Approach		727	0.0	765	0.0	0.383	3.6	LOS A	0.1	0.7	0.01	0.46	0.01	47.3
West: Mission Bush Rd West														
10	L2	12	0.0	13	0.0	0.010	5.6	LOS A	0.0	0.3	0.36	0.54	0.36	45.8
12	R2	172	0.0	181	0.0	0.189	6.9	LOS A	0.5	3.7	0.55	0.79	0.55	45.1
Approach		184	0.0	194	0.0	0.189	6.8	LOS A	0.5	3.7	0.53	0.77	0.53	45.1
All Vehicles		1381	0.0	1454	0.0	0.383	3.4	NA	0.5	3.7	0.08	0.41	0.08	47.5

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.

Glenbrook Road / Brookside Road– AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Glenbrook Road / Brookside Road - Base - AM (Site Folder: Glenbrook Road / Brookside Road)]**

Glenbrook Road / Brookside Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd														
1	L2	12	0.0	13	0.0	0.257	4.5	LOS A	0.0	0.0	0.00	0.01	0.00	50.5
2	T1	464	0.0	488	0.0	0.257	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	49.8
Approach		476	0.0	501	0.0	0.257	0.2	NA	0.0	0.0	0.00	0.01	0.00	49.8
North: Glenbrook Rd North														
8	T1	298	0.0	314	0.0	0.161	3.4	LOS A	0.0	0.0	0.00	0.45	0.00	47.5
9	R2	270	0.0	284	0.0	0.527	12.6	LOS B	2.7	19.1	0.73	1.02	1.15	42.1
Approach		568	0.0	598	0.0	0.527	7.8	LOS A	2.7	19.1	0.35	0.72	0.55	44.8
West: Brookside Rd West														
10	L2	458	0.0	482	0.0	0.495	8.2	LOS A	3.4	23.5	0.61	0.90	0.87	45.1
12	R2	22	0.0	23	0.0	0.495	7.3	LOS A	3.4	23.5	0.61	0.90	0.87	44.4
Approach		480	0.0	505	0.0	0.495	8.2	LOS A	3.4	23.5	0.61	0.90	0.87	45.1
All Vehicles		1524	0.0	1604	0.0	0.527	5.5	NA	3.4	23.5	0.32	0.56	0.48	46.3

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.

Glenbrook Road / Brookside Road– PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Glenbrook Road / Brookside Road - Base - PM (Site Folder: Glenbrook Road / Brookside Road)]**

Glenbrook Road / Brookside Road
T Intersection
Site Category: Existing Design
Give-Way (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	95% BACK OF QUEUE [Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Glenbrook-Waiuku Rd														
1	L2	6	0.0	6	0.0	0.149	4.5	LOS A	0.0	0.0	0.00	0.01	0.00	50.6
2	T1	269	0.0	283	0.0	0.149	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach		275	0.0	289	0.0	0.149	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.9
North: Glenbrook Rd North														
8	T1	703	0.0	740	0.0	0.379	3.5	LOS A	0.0	0.0	0.00	0.45	0.00	47.4
9	R2	407	0.0	428	0.0	0.551	9.4	LOS A	3.6	25.3	0.61	0.96	0.95	43.7
Approach		1110	0.0	1168	0.0	0.551	5.7	LOS A	3.6	25.3	0.23	0.64	0.35	46.0
West: Brookside Rd West														
10	L2	341	0.0	359	0.0	0.290	5.7	LOS A	1.3	9.4	0.41	0.59	0.41	46.1
12	R2	7	0.0	7	0.0	0.290	7.0	LOS A	1.3	9.4	0.41	0.59	0.41	45.4
Approach		348	0.0	366	0.0	0.290	5.7	LOS A	1.3	9.4	0.41	0.59	0.41	46.1
All Vehicles		1733	0.0	1824	0.0	0.551	4.8	NA	3.6	25.3	0.23	0.53	0.31	46.6

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.

ATTACHMENT 4

2030 SIDRA Intersection Analysis Results – Plan Change

Glenbrook Beach Road / Brookside Road – AM Peak

MOVEMENT SUMMARY

🛑 **Site: 101 [Glenbrook Beach Road / Brookside Road - Development - AM (Site Folder: Glenbrook Beach Road / Brookside Road)]**

Glenbrook Beach Road / Brookside Road
T Intersection
Site Category: Existing Design
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: Brookside Rd East														
1	L2	17	0.0	18	0.0	0.152	4.6	LOS A	0.0	0.0	0.00	0.03	0.00	49.1
2	T1	264	0.0	278	0.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	49.7
Approach		281	0.0	296	0.0	0.152	0.3	NA	0.0	0.0	0.00	0.03	0.00	49.7
North: Glenbrook Beach Rd														
8	T1	730	0.0	768	0.0	0.395	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	50.0
9	R2	1	0.0	1	0.0	0.395	6.2	LOS A	0.0	0.1	0.00	0.00	0.00	49.0
Approach		731	0.0	769	0.0	0.395	0.0	NA	0.0	0.1	0.00	0.00	0.00	50.0
West: Brookside Rd West														
10	L2	1	0.0	1	0.0	0.018	8.5	LOS A	0.0	0.3	0.48	0.94	0.48	44.4
12	R2	13	0.0	14	0.0	0.018	9.3	LOS A	0.0	0.3	0.48	0.94	0.48	42.8
Approach		14	0.0	15	0.0	0.018	9.3	LOS A	0.0	0.3	0.48	0.94	0.48	42.9
All Vehicles		1026	0.0	1080	0.0	0.395	0.2	NA	0.0	0.3	0.01	0.02	0.01	49.8

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.

Glenbrook Beach Road / Brookside Road – PM Peak

MOVEMENT SUMMARY

🛑 Site: 101 [Glenbrook Beach Road / Brookside Road - Development - PM (Site Folder: Glenbrook Beach Road / Brookside Road)]

Glenbrook Beach Road / Brookside Road
T Intersection
Site Category: Existing Design
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: Brookside Rd East														
1	L2	1	0.0	1	0.0	0.335	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	49.0
2	T1	619	0.0	652	0.0	0.335	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.8
Approach		620	0.0	653	0.0	0.335	0.1	NA	0.0	0.0	0.00	0.00	0.00	49.8
North: Glenbrook Beach Rd														
8	T1	392	0.0	413	0.0	0.213	0.0	LOS A	0.0	0.1	0.01	0.00	0.01	50.0
9	R2	1	0.0	1	0.0	0.213	8.4	LOS A	0.0	0.1	0.01	0.00	0.01	48.8
Approach		393	0.0	414	0.0	0.213	0.0	NA	0.0	0.1	0.01	0.00	0.01	50.0
West: Brookside Rd West														
10	L2	1	0.0	1	0.0	0.017	11.1	LOS B	0.0	0.3	0.52	0.94	0.52	43.2
12	R2	12	0.0	13	0.0	0.017	9.3	LOS A	0.0	0.3	0.52	0.94	0.52	40.8
Approach		13	0.0	14	0.0	0.017	9.4	LOS A	0.0	0.3	0.52	0.94	0.52	41.0
All Vehicles		1026	0.0	1080	0.0	0.335	0.2	NA	0.0	0.3	0.01	0.01	0.01	49.8

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.

Brookside Road / Mission Bush Road – AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Brookside Road / Mission Bush Road - Development - AM (Site Folder: Brookside Road / Mission Bush Road)]**

Brookside Road / Mission Bush Road
T Intersection
Site Category: Existing Design
Give-Way (Two-Way)

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
East: Brookside Rd East														
5	T1	132	0.0	139	0.0	0.071	3.7	LOS A	0.0	0.0	0.00	0.44	0.00	47.5
6	R2	210	0.0	221	0.0	0.312	8.3	LOS A	1.3	9.2	0.55	0.83	0.63	43.1
Approach		342	0.0	360	0.0	0.312	6.5	LOS A	1.3	9.2	0.34	0.68	0.39	44.9
North: Brookside Rd West														
7	L2	527	0.0	555	0.0	0.342	4.6	LOS A	1.9	13.4	0.07	0.47	0.07	46.4
12	R2	195	0.0	205	0.0	0.118	4.8	LOS A	0.3	2.2	0.17	0.53	0.17	45.4
Approach		722	0.0	760	0.0	0.342	4.6	LOS A	1.9	13.4	0.10	0.49	0.10	46.1
West: Mission Bush Rd South														
1	L2	74	0.0	78	0.0	0.042	4.4	LOS A	0.0	0.0	0.00	0.47	0.00	47.3
11	T1	12	0.0	13	0.0	0.006	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		86	0.0	91	0.0	0.042	3.8	NA	0.0	0.0	0.00	0.40	0.00	47.8
All Vehicles		1150	0.0	1211	0.0	0.342	5.1	NA	1.9	13.4	0.16	0.54	0.18	45.8

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.

Brookside Road / Mission Bush Road – PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Brookside Road / Mission Bush Road - Development - PM (Site Folder: Brookside Road / Mission Bush Road)]**

Brookside Road / Mission Bush Road
T Intersection
Site Category: Existing Design
Give-Way (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
East: Brookside Rd East															
5	T1	6	0.0	6	0.0	0.003	3.7	LOS A	0.0	0.0	0.00	0.44	0.00	47.5
6	R2	443	0.0	466	0.0	0.618	10.5	LOS B	4.6	32.0	0.66	1.03	1.13	41.8
Approach		449	0.0	473	0.0	0.618	10.4	LOS B	4.6	32.0	0.65	1.03	1.11	41.9
North: Brookside Rd West															
7	L2	306	0.0	322	0.0	0.211	4.8	LOS A	1.0	6.9	0.20	0.48	0.20	46.0
12	R2	92	0.0	97	0.0	0.055	4.8	LOS A	0.1	1.0	0.16	0.52	0.16	45.4
Approach		398	0.0	419	0.0	0.211	4.8	LOS A	1.0	6.9	0.19	0.49	0.19	45.8
West: Mission Bush Rd South															
1	L2	169	0.0	178	0.0	0.096	4.5	LOS A	0.0	0.0	0.00	0.47	0.00	47.3
11	T1	82	0.0	86	0.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		251	0.0	264	0.0	0.096	3.0	NA	0.0	0.0	0.00	0.31	0.00	48.3
All Vehicles		1098	0.0	1156	0.0	0.618	6.7	NA	4.6	32.0	0.34	0.67	0.52	44.7

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.

Mission Bush Road / Glenbrook-Waiuku Road – AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Mission Bush Road / Glenbrook-Waiuku Road - Development - AM (Site Folder: Mission Bush Road / Glenbrook-Waiuku Road)]**

Mission Bush Road / Glenbrook-Waiuku Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd South														
1	L2	172	0.0	181	0.0	0.097	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.6
2	T1	530	0.0	558	0.0	0.286	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		702	0.0	739	0.0	0.286	1.2	NA	0.0	0.0	0.00	0.13	0.00	49.0
North: Glenbrook-Waiuku Rd North														
8	T1	316	0.0	333	0.0	0.171	3.4	LOS A	0.0	0.0	0.00	0.45	0.00	47.5
9	R2	13	0.0	14	0.0	0.031	10.7	LOS B	0.1	0.7	0.65	0.82	0.65	43.1
Approach		329	0.0	346	0.0	0.171	3.7	LOS A	0.1	0.7	0.03	0.47	0.03	47.3
West: Mission Bush Rd West														
10	L2	15	0.0	16	0.0	0.017	6.7	LOS A	0.1	0.4	0.49	0.63	0.49	45.4
12	R2	195	0.0	205	0.0	0.186	6.3	LOS A	0.5	3.7	0.47	0.75	0.47	45.4
Approach		210	0.0	221	0.0	0.186	6.4	LOS A	0.5	3.7	0.47	0.74	0.47	45.4
All Vehicles		1241	0.0	1306	0.0	0.286	2.7	NA	0.5	3.7	0.09	0.32	0.09	47.9

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.

Mission Bush Road / Glenbrook-Waiuku Road – PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Mission Bush Road / Glenbrook-Waiuku Road - Development - PM (Site Folder: Mission Bush Road / Glenbrook-Waiuku Road)]**

Mission Bush Road / Glenbrook-Waiuku Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd South														
1	L2	185	0.0	195	0.0	0.105	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.6
2	T1	302	0.0	318	0.0	0.163	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		487	0.0	513	0.0	0.163	1.8	NA	0.0	0.0	0.00	0.20	0.00	48.6
North: Glenbrook-Waiuku Rd North														
8	T1	709	0.0	746	0.0	0.383	3.5	LOS A	0.0	0.0	0.00	0.45	0.00	47.4
9	R2	18	0.0	19	0.0	0.031	8.2	LOS A	0.1	0.7	0.52	0.71	0.52	44.4
Approach		727	0.0	765	0.0	0.383	3.6	LOS A	0.1	0.7	0.01	0.46	0.01	47.3
West: Mission Bush Rd West														
10	L2	12	0.0	13	0.0	0.010	5.6	LOS A	0.0	0.3	0.36	0.54	0.36	45.8
12	R2	180	0.0	189	0.0	0.198	7.0	LOS A	0.6	4.0	0.55	0.80	0.56	45.1
Approach		192	0.0	202	0.0	0.198	6.9	LOS A	0.6	4.0	0.54	0.78	0.55	45.1
All Vehicles		1406	0.0	1480	0.0	0.383	3.4	NA	0.6	4.0	0.08	0.41	0.08	47.4

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.
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.

Glenbrook Road / Brookside Road– AM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Glenbrook Road / Brookside Road - Development - AM (Site Folder: Glenbrook Road / Brookside Road)]**

Glenbrook Road / Brookside Road
T Intersection
Site Category: Existing Design
Give-Way (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	95% BACK OF QUEUE [Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Glenbrook-Waiuku Rd														
1	L2	12	0.0	13	0.0	0.257	4.5	LOS A	0.0	0.0	0.00	0.01	0.00	50.5
2	T1	464	0.0	488	0.0	0.257	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	49.8
Approach		476	0.0	501	0.0	0.257	0.2	NA	0.0	0.0	0.00	0.01	0.00	49.8
North: Glenbrook Rd North														
8	T1	298	0.0	314	0.0	0.161	3.4	LOS A	0.0	0.0	0.00	0.45	0.00	47.5
9	R2	288	0.0	303	0.0	0.583	13.8	LOS B	3.2	22.4	0.77	1.07	1.30	41.6
Approach		586	0.0	617	0.0	0.583	8.5	LOS A	3.2	22.4	0.38	0.76	0.64	44.4
West: Brookside Rd West														
10	L2	513	0.0	540	0.0	0.553	8.7	LOS A	4.2	29.3	0.64	0.95	0.98	44.9
12	R2	22	0.0	23	0.0	0.553	7.7	LOS A	4.2	29.3	0.64	0.95	0.98	44.2
Approach		535	0.0	563	0.0	0.553	8.6	LOS A	4.2	29.3	0.64	0.95	0.98	44.8
All Vehicles		1597	0.0	1681	0.0	0.583	6.1	NA	4.2	29.3	0.35	0.60	0.56	46.0

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.

Glenbrook Road / Brookside Road– PM Peak

MOVEMENT SUMMARY

▽ **Site: 101 [Glenbrook Road / Brookside Road - Development - PM (Site Folder: Glenbrook Road / Brookside Road)]**

Glenbrook Road / Brookside Road
T Intersection
Site Category: Existing Design
Give-Way (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: Glenbrook-Waiuku Rd														
1	L2	6	0.0	6	0.0	0.149	4.5	LOS A	0.0	0.0	0.00	0.01	0.00	50.6
2	T1	269	0.0	283	0.0	0.149	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	49.9
Approach		275	0.0	289	0.0	0.149	0.1	NA	0.0	0.0	0.00	0.01	0.00	49.9
North: Glenbrook Rd North														
8	T1	703	0.0	740	0.0	0.379	3.5	LOS A	0.0	0.0	0.00	0.45	0.00	47.4
9	R2	453	0.0	477	0.0	0.623	10.4	LOS B	4.7	32.7	0.66	1.03	1.13	43.2
Approach		1156	0.0	1217	0.0	0.623	6.2	LOS A	4.7	32.7	0.26	0.68	0.44	45.7
West: Brookside Rd West														
10	L2	370	0.0	389	0.0	0.314	5.7	LOS A	1.5	10.4	0.42	0.60	0.42	46.1
12	R2	7	0.0	7	0.0	0.314	7.0	LOS A	1.5	10.4	0.42	0.60	0.42	45.4
Approach		377	0.0	397	0.0	0.314	5.8	LOS A	1.5	10.4	0.42	0.60	0.42	46.1
All Vehicles		1808	0.0	1903	0.0	0.623	5.2	NA	4.7	32.7	0.25	0.56	0.37	46.3

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.